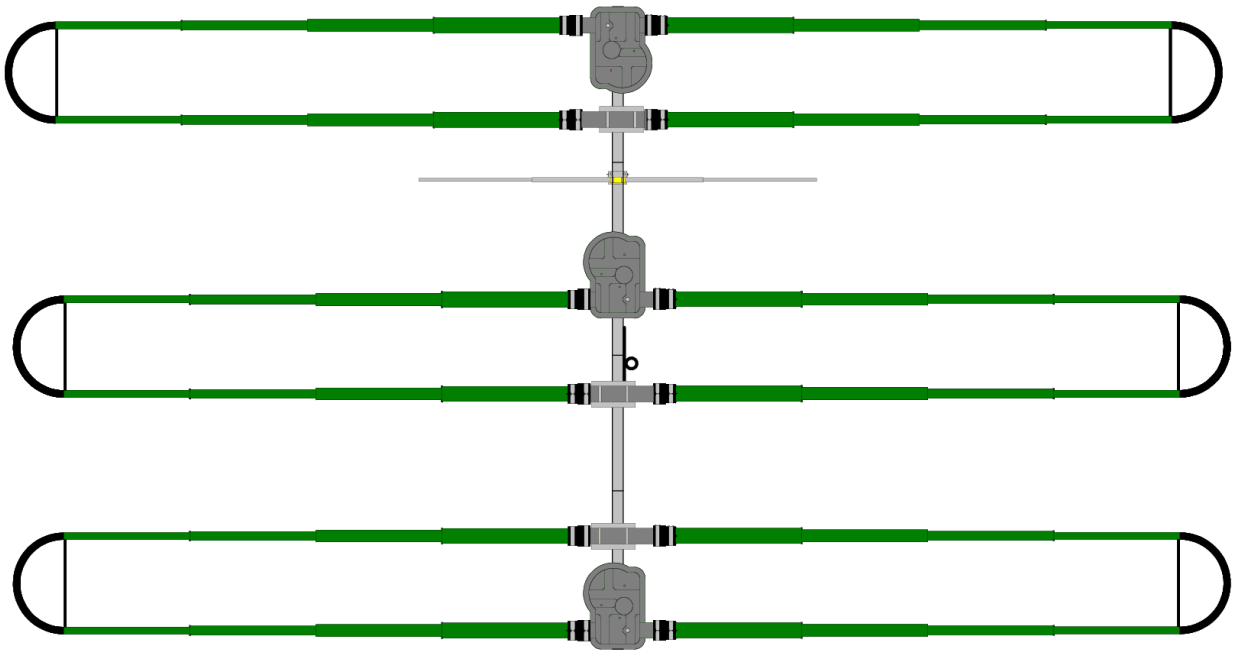
steppIR COMMUNICATION SYSTEMS

DB18E Yagi Assembly Manual



This assembly manual is intended to be printed in full COLOR. If the manual is printed in black and white, many important details could be lost.

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DB18E Yagi Specifications

Specifications	DB18E Yagi
Boom length	19 ft / 5.79 m
Boom outside diameter	1.75 in—2 in / 4.45—5.08 cm
Longest element	39 ft / 11.9 m
Turning radius	21.58 ft / 6.57 m
Weight	110 lb / 50.0 kg
***Projected Area**	22.17 sq ft / 2.06 sq m
Wind rating	100 mph
Adjustable elements	3
Power Rating	3000 watts continuous
Feed points	3
Frequency coverage	6.8 MHz—54 MHz
Control cable	16 conductor shielded, 22AWG

Frequency	Gain, dBi	Front to rear, dB
40M	6.2	20
30M	7.0	20
20M	7.4	25
17M	8.3	25
15M	8.5	20
12M	8.8	15
10M	9.0	11
6M w/passive	10.1	30

*Projected area is the total perpendicular surface area measured in square feet/square meters, that is exposed to wind. To calculate wind load you always take the largest projected area whether that is from the perspective perpendicular to the boom or perpendicular to the elements. In the case of SteppIR Yagi's, the maximum projected area will always be the sum of the surface area's perpendicular to the Yagi elements. This calculation is a constant number and will not change regardless of EIA specification changes. Do not mistake this projected area calculation as anything more than a datapoint to present to your structural engineer, tower manufacturer or rotator manufacturer so that they can determine what is necessary for your application.

When sizing an antenna to a tower, many factors need to be taken into consideration including, but not limited to: projected area of antenna in square feet or square meters, weight of the antenna and other items on tower, turning radius, element lengths, antenna height, location exposure category, locations three-second gust wind-speed, locations maximum radial ice loading.

Improper specification of an antenna or rotator to a tower can result in product failure, injury or death. SteppIR is not an expert on tower or rotator sizing and for this reason will never offer any recommendation – this specification process is meant for industry professionals such as a structural engineer, tower manufacturer or rotator manufacturer. Please do not attempt to self-specify our products – the information provided by SteppIR is to be utilized by industry professionals only and we will not accept any liability for improperly specified antenna/tower/rotator applications.

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BEFORE YOU BEGIN INSTALLATION

1. Go to the SteppIR web site at www.steppir.com and download the latest manual for your antenna, and also the Operators Manual for the controller.

2. Read the manuals from cover-to-cover ---TWICE! Don't just read them –Study them, so you are familiar the terminology used about the antennas and have a good idea of how the antenna is assembled and where the various parts go.

3. As you go through the manuals make notes of any instructions you may not clearly understand, then call or email for clarifications. It is better to have it all sorted out before you start assembly. We don't mind answering your questions beforehand.

4. Now, wait for notification your antenna is being shipped.

5. If the antennas is to arrive on Wednesday----DO NOT plan an antenna party for Saturday!

6. Even if you plan to install the antenna weeks later, the first thing to do is to unpack the antenna and do a complete inspection. Make sure nothing is missing or has been damaged in shipment.

7. Do a complete inventory of every part, nut and bolt. Yes it takes time, but it also allows you to notify SteppIR if anything is missing and allow time to get it to you before you start assembly of the antenna. There is nothing more frustrating than realizing that something is missing, just hours before you want to install the antenna.

8. Go back to the SteppIR website and download the latest manual. SteppIR constantly is improving and adding to the manual, so even though your paper instruction manual is going to have all the data you need, it makes sense to check for the latest updates online. This is especially true If you purchased the antenna and a period of time has passed between arrival and install dates.

9. Take the controller and power supply out of their wrappings and connect them. The controller does not have to be connected to the antenna in order to familiarize yourself with it. In fact, it is best to get familiar with the controller when it is not connected to the antenna. Turn on the controller and read through the Operators Manual again while operating the controller in all it modes. Go through the menus so you know what each does and how to navigate through the various menus and functions.

10. Once the antenna is completely assembled and ready to mount on the antenna tower, use an antenna analyzer, if you have one, to test resonance of the antenna.. If you don't have an analyzer, try to borrow one. It will save you a lot of time and worry. Check the antenna on each band for some sign of resonance within the frequency range. Leave the antenna on the default frequency and tune the analyzer to see where the dip occurs. It will be somewhere below the lower band edge on each band with the antenna 3 or 4 feet above the ground on sawhorses. Also, don't expect to see a 1:1 SWR here, just look for a good indication of resonance.

11. DO NOT put the antenna up onto the tower until you are positive it is working correctly—this is what these tests are helping you determine. Err on the side of caution.

12. Once it has been determined this part of the antenna is working correctly do the following: Select the lowest band and establish the dip condition by tuning the analyzer. Do not touch the analyzer again. Retract the elements and then reselect the same band. The antenna should come back to very near the same setting. Do this 2 or 3 times on each band. Also, try going from the band being tested to any other band and back again and observe that the antenna comes back to the same resonant point. Now you know the antenna is tuning correctly from band to band and is consistent.

SteppIR - Why Compromise?

The SteppIR antenna was originally conceived to solve the problem of covering the six ham bands (20m, 17m, 15m, 12m, 10m and 6m) on one tower without the performance sacrifices caused by interaction between all of the required antennas.

Yagi's are available that cover 40 meters through 10 meters by using interlaced elements or traps or log periodic techniques, but do so at the expense of significant performance reduction in gain and front to back ratios. With the addition of the WARC bands on 30m, 17m and 12m, the use of interlaced elements and traps has clearly been an exercise in diminishing returns.

Obviously, an antenna that is precisely adjustable in length while in the air would solve the frequency problem, and in addition would have vastly improved performance over existing fixed length Yagi's. The ability to tune the antenna to a specific frequency, without regard for bandwidth, results in excellent gain and front to back at every frequency.

The patented folded dipole loop elements on the DB36 allow for outstanding performance on 40m and 30m with element lengths that are 40% shorter than a full sized Yagi—at the expense of only 0.3dB of gain!

The SteppIR design was made possible by the convergence of determination and high tech materials. The availability of new lightweight glass fiber composites, Teflon blended thermoplastics, high conductivity copper-beryllium and extremely reliable stepper motors has allowed the SteppIR to be a commercially feasible product.

The current and future SteppIR products should produce the most potent single tower antenna systems ever seen in Amateur Radio! We thank you for using our SteppIR antenna for your ham radio endeavors.

73 and good DX!

John Mertel

John Mertel
President/CEO
WA7IR

BILL OF MATERIALS— as shipped

Item	Description	Qty Per
	Antenna box (61 X 13” X 10”)	
09-1025	conical grinding stone, 3/4", (ENCO)	1
10-1013-02	Telescoping Pole, 18 foot 4 section **(in pole box)**	12
10-1054-02	Truss Support, 30m/40m, 36" **(in pole box)**	2
10-1059-01	Polyolefin Heat Shrink 1-1/2" x 6"	24
10-1059-21	Polyolefin Heat Shrink 1.1” x 6”	12
21-6040	Splitter, 6" 3-1/2mm, Stereo Male to Two RCA Female	1
60-1006-22	QUICK DISCONNECT, 1-1/2" to 1-1/4", Fernco	12
70-2025-13	CPVC tube, 49" x 3/4", with coupler **(in pole box)**	6
70-2025-23	CPVC tube, 39-7/8" x 3/4", w/o coupler **(in pole box)**	6
70-2037	Connector Junction Box, DB11, DB18, & DB18E	1
70-3000-11	33V, 3.03A 100watt, Power Supply w/Cord	1
70-3403-01	EHU, 40m Driven	1
70-3406-01	EHU, DB18/18E 40m Driven w/ Normal Passive Relay	2
70-6010-01	Adapter, 25pin Dsub Field Splice	1
72-0010-51	Kit, 10' 4 Conductor Cable, 24' 6 Conductor Cable, and 24" Coax Seal	1
	Flash Drive - Instruction Manual	1
70-6001-01	DB 6m passive element	1
	Sweep box (32” X 24” X 7”)	
72-0018-31	Kit, 39' Element Truss, 2E, 3E, DB18/18E/36/42 end Elements	2
72-0018-61	Kit, 39' Element Truss, DB18E Driven, for antenna with Boom Truss	1
72-0030-61	Kit, Sweep Hardware	3
72-0035-02	Kit, DB18/18E Boom Assembly Hardware Kit	1
72-0036-02	Kit, DB18/18E Director Hardware	1
72-0037-02	Kit, DB18/18E Reflector Hardware	1
72-0039-01	Kit, DB18E Driven Hardware Kit	1
72-0040-01	Kit, DB18/18E Mast Plate Hardware	1
72-0041-11	Kit, DB18E Glue, Tape, and Anti-Seize	1
72-0042-01	Kit, DB18/18E Coax Antenna Switch Hardware: Bag 1	1
72-0042-11	Kit, DB18/18E Coax Antenna Switch Hardware: Bag 2	1

BILL OF MATERIALS—as shipped (continued)

Item	Description	QTY
	Sweep Box (continued)	
72-0043-01	Kit, DB18/18E Boom Truss	1
72-1001-71	Kit, DB18 and DB18E 6m Hardware	1
10-1153-01	Poly Sweeps (100psi)	6
	Boom Box (74” x 4” x 4”)	
10-1511-01	Sweep Diverter	12
10-1059-21	Polyolefin Heat Shrink 1.1” x 6”	12
10-1503-21	Fiberglass rod, 3/8" x 31-3/4" long, black	6
10-1608-01	Element Return Plate	3
10-1610-23	Boom to Mast plate 11" X 1/4"	1
10-1618-11	Boom Truss Support Mast, 1-3/4" x 30", For DB18/18E	1
70-1015-11	EST return tube, 1-3/4" x 12", fiberglass (DB style)	3
70-2030-11	DB style mounting plate with foam mounting guide	3
70-3001-01	Antenna Coax Switch Box	1
	Boom box (pre-built)	
10-1202-11	DB style aluminum boom section, 2.00" X 72"	1
10-1202-41	DB style aluminum boom section, 1-3/4" x 48"	2
10-1202-52	DB18 boom section, 2" x 72"	1
10-1203-02	Boom Section, DB 1-3/4" X 12" (center splice)	1

ASSEMBLY KITS- BILL OF MATERIALS

72-0010-51	Control Cable Kit	
Item	**Description**	**Qty Per**
21-5013	Control cable, 6 conductor, 22awg, shielded	24ft
21-5001-01	Control cable, 4 conductor, 22awg, shielded	10ft
09-1022	Coax Seal, 12' x 1/2".	24in

72-0018-31	Element Truss Kit	
Item	**Description**	**Qty Per**
10-1510-21	Element Truss Coupler (sets)	4
21-7001-01	Dacron double braided poly rope, 1/8"	75ft
10-1601-03	Saddle, 1-3/4" x 3/4"	2
60-0083	Turnbuckle, 1/4" x 4", Eye to Eye, S/S	2
60-0110	Bolt, 1/4"-20 x 1-1/4", S/S	1
60-0030	Nut, 1/4"-20, Nylock, S/S (5c)	1
60-0065	Bolt, 5/16" x 3-1/2", S/S (5c)	2
60-0046	Nut, 5/16" -18, Nylock, S/S	2
60-0033	Washer, 5/16", Flat, S/S	2
60-0014	Nut, 6-32 Nylock	16
60-0014-01	Screw, 6-32 X 7/8", Panhead	15
60-0158	Thimble, 1/8", Heavy galvanized	2
60-0157	Wire Clips, 1/8", galvanized	4
10-1028-01	Anti-seize single packets, TMP-1	1
09-0001	Electrical tape 3/4" PVC MERCO 307	1
60-0112	Set Screw, 10-32 x 1/4", Cup Point, S/S	1

72-0018-61	Element Truss Kit	
Item	**Description**	**Qty Per**
21-7001-01	Dacron double braided poly rope, 1/8"	75ft
60-0083	Turnbuckle, 1/4" x 4", Eye to Eye, S/S	2
60-0093	Bolt, 5/16"-18 X 2-3/4", Hex Head, S/S	1
60-0046	Nut, 5/16" -18, Nylock, S/S	1
60-0033	Washer, 5/16", Flat, S/S	4
10-1510-21	Element Truss Coupler (sets)	4
60-0014	Nut, 6-32 Nylock	16
60-0014-01	Screw, 6-32 X 7/8", Panhead	16
60-0158	Thimble, 1/8", Heavy galvanized	2
60-0157	Wire Clips, 1/8", galvanized	4
10-1028-01	Anti-seize single packets, TMP-1	1
09-0001	Electrical tape 3/4" PVC MERCO 307	1

ASSEMBLY KITS- BILL OF MATERIALS

72-0030-61	Sweep Hardware Kit	
Item	**Description**	**Qty Per**
60-0014	Nut, 6-32 Nylock	28
60-0016	Washer, 6-32, Flat	20
60-0186	Screw, 6-32 x 2", 18-8 SS, Button Socket CS	28
10-1155-01	Sweep Clamp, SCH-160 Clamp half	8
60-9000	Turn Key, Long Arm Hex Tip 5/64"	1

72-0035-02	Boom assembly hardware kit	
Item	**Description**	**Qty Per**
60-0037-21	Eyebolt, 5/16" x 4", S/S	1
60-0041	Washer, 1/4", Flat (5c)	30
60-0046	Nut, 5/16" -18, Nylock, S/S	2
60-0029	Bolt, 1/4"-20 x 3", Hex Head, S/S	9
60-0030	Nut, 1/4"-20, Nylock, S/S (5c)	9
60-0033	Washer, 5/16", Flat, S/S	3
60-0103	Bolt, 5/16" X 3", hex head, S/S	1

72-0036-02	Director Hardware	
Item	**Description**	**Qty Per**
10-1601-03	Saddle, 1-3/4" x 3/4"	12
60-0017	Screw, 10-32 x 3/4", Panhead, S/S (5c)	11
60-0018	Washer, 10-32, Flat, S/S (5c)	11
60-0019	Nut, 10-32, Nylock, S/S	11
60-0046	Nut, 5/16" -18, Nylock, S/S	13
60-0065	Bolt, 5/16" x 3-1/2", S/S (1c)	13

72-0037-02	Reflector Hardware	
Item	**Description**	**Qty Per**
10-1601-03	Saddle, 1-3/4" x 3/4"	12
60-0017	Screw, 10-32 x 3/4", Panhead, S/S (5c)	11
60-0018	Washer, 10-32, Flat, S/S (5c)	11
60-0019	Nut, 10-32, Nylock, S/S	11
60-0046	Nut, 5/16" -18, Nylock, S/S	13
60-0065	Bolt, 5/16" x 3-1/2", S/S (1c)	13

ASSEMBLY KITS- BILL OF MATERIALS

72-0039-01	Driven Hardware Kit	
Item	**Description**	**Qty Per**
10-1601-03	Saddle, 1-3/4" x 3/4"	4
10-1601-22	Saddle, 2" x 3/4"	8
60-0017	Screw, 10-32 x 3/4", Panhead, S/S (5c)	11
60-0018	Washer, 10-32, Flat, S/S (5c)	11
60-0019	Nut, 10-32, Nylock, S/S	11
60-0046	Nut, 5/16" -18, Nylock, S/S	13
60-0065	Bolt, 5/16" x 3-1/2", S/S (1c)	13

72-0040-01	Mast Plate Hardware	
Item	**Description**	**Qty Per**
10-1601-22	Saddle, 2" x 3/4"	12
60-0034	Washer, 3/8", Flat, S/S	4
60-0046	Nut, 5/16" -18, Nylock, S/S	14
60-0050	Nut, 3/8", S/S, Nylock	3
60-0085	Bolt, 3/8" x 4", Hex Head, full thread, S/S	1
60-0112	Set Screw, 10-32 x 1/4", Cup Point, S/S	50
60-0113	Screw, 10-32 x 5/8", Panhead, Phillips, S/S	4
60-0114	Bolt, 5/16" x 3-3/4", Hex Head, S/S	14

72-0041-11	Glue, Tape, Anti-Seize	
Item	**Description**	**Qty Per**
09-0001	Electrical tape 3/4" PVC MERCO 307	2
10-1509-02	Diverter Cone	6
72-0009-03	Kit, Glue	1
10-1028-21	TM-1 Thread Magic Anti-seize sticks	1

72-0042-01	Coax Antenna Switch Hardware Bag 1	
Item	**Description**	**Qty Per**
10-1601-22	Saddle, 2" x 3/4"	2
10-1619-01	BRACKET, Coax Switch	1
60-0019	Nut, 10-32, Nylock, S/S	3
60-0046	Nut, 5/16" -18, Nylock, S/S	2
60-0113	Screw, 10-32 x 5/8", Panhead, Phillips, S/S	3
60-0065	Bolt, 5/16" x 3-1/2", S/S (1c)	2

72-0042-11	Coax Antenna Switch Hardware Bag 2	
Item	**Description**	**Qty Per**
21-5001-01	Control cable, 4 conductor, 22awg, shielded	3ft
21-6301-30	Coax jumper, 4', PL259/RG213	1
21-6301-80	Coax jumper, 8', PL259/RG213	1
21-6301-96	Coax jumper, 11' 6", PL259/RG213	1

ASSEMBLY NOTES

Before beginning assembly of this antenna, please read the manual in it's entirety to familiarize yourself with the task at hand. Doing so will eliminate potential confusion.

Be sure to do an inventory of your parts as soon as possible after receipt of the antenna, and well before your intended installation date - this way we can get you the parts required before it's too late.

Be sure to check the insides of the aluminum tubing and the telescoping poles when unpacking your boxes. In certain situations we put items inside these pieces to reduce the amount of boxes used for shipping, which in turn reduces your shipping costs.

A large, cleared flat area is recommended for assembly of an antenna of this size and complexity. Typically, an area 40 ft x 25 ft would be ideal. We recommend using sawhorses or sturdy tables when installing the boom. By having the boom elevated, it is easier to ensure that the elements are level. Rubber or nitrile gloves are recommended when applying the anti-seize to the stainless steel fasteners or the aluminum boom sections.

Be sure to refer to the DB18E configuration drawing on the following page so that you can fully understand how the antenna operates. In addition, the configuration drawing identifies EHU placement, which is important as you progress in your installation of the antenna.

Use of a level for adjusting the Element Housing Units (EHU's) is highly recommended. This is a surprisingly accurate and consistent method. When all the EHU's are level, secure the boom to the sawhorses so that it cannot shift—this will help considerably when you are leveling the mast plate.

Be sure to use the anti-seize compound supplied to prevent the galling of the stainless steel fasteners. If you do not use the anti-seize, count on issues with the stainless steel hardware galling. Heat is one of the primary culprits with galling, so if you use a ratchet, steady speed as you tighten will help minimize galling. We have found that when the anti-seize is applied to the bolt portion of the hardware, it will eliminate any galling issues.

NEVER ATTEMPT TO WIRE OR CHANGE WIRING ON THE ANTENNA WHEN THE ELECTRONIC CONTROLLER IS CONNECTED TO THE CONTROL CABLE, EVEN IF IT IS TURNED OFF. This is the number one cause of installation failures for our products. Even with power off, damage can occur. When the power is "off" on your controller, there is still a very small amount of power feeding to the stepper motors, to effectively "lock" them in place. This leads to less need for calibration of the antenna.

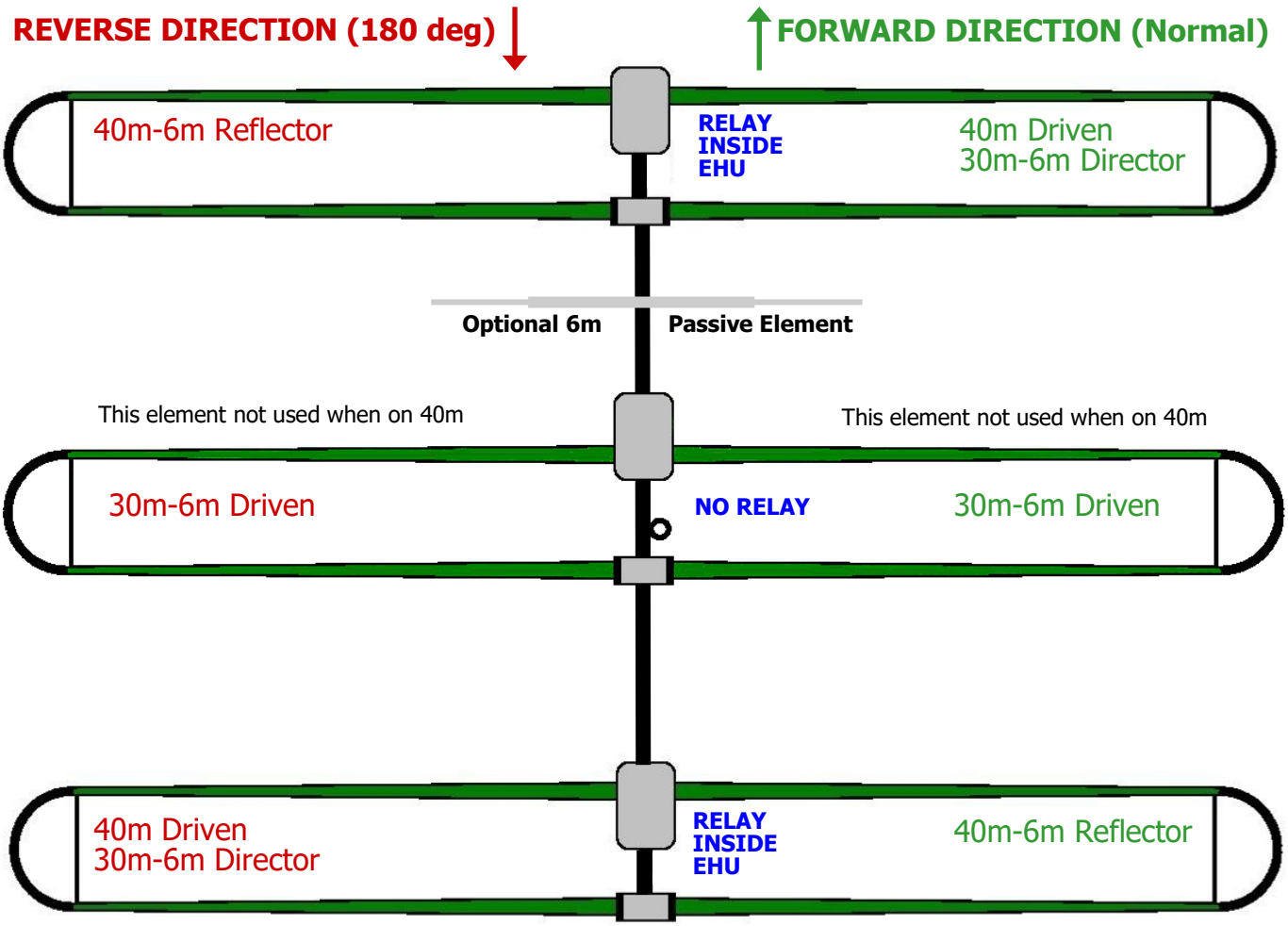
ANTENNA CONFIGURATION GUIDE

The DB18E Yagi antenna uses loop elements for 30m and 40M performance. The loop elements used for 40m and 30m are 40% shorter than a full size element, with very little sacrifice in performance (-0.3dB).

The DB18E uses an integral coax switch to select which one of the three elements are driven to give equal performance in forward and reverse directions. Each of the loop elements has a relay inside of the EHU. The control of the antenna and coax switch is integrated into the SDA100 controller for effortless tuning.

The DB18E is a 2 element Yagi on 40m and has three elements on 30m-6m. An optional 6m passive element kit is available.

The drawing below shows the element configuration of the DB18E, so you can better understand what is happening when you push the buttons on the SDA100 controller!



From time to time, we get complaints from customers regarding galling of stainless steel fasteners.

Here is an excerpt from the Industrial Fastener Institute's Standards Book: *Thread galling seems to be the most prevalent with fasteners made of stainless steel, aluminum, titanium and other alloys which self-generate an oxide surface film for corrosion protection. During fastener tightening, as pressure builds between the contacting and sliding thread surfaces, protective oxides are broken, possibly wiped off and interface metal high points shear or lock together. This cumulative clogging-shearing-locking action causes increasing adhesion. In the extreme, galling leads to seizing - the actual freezing together of the threads. If tightening is continued, the fastener can be twisted off or its threads ripped out.*

During minor galling, the fastener can still be removed, but in severe cases of galling, a strong bond between the bolt and nut can prevent removal of fasteners. Unfortunately, little is known on how to control it, but here are two ways to minimize this effect: *Decreasing installation RPM speed will cause less friction and decrease heat generation. Lubrication used prior to assembly can dramatically reduce or eliminate galling. Recommended lubricants should contain higher amounts of molybdenum disulfide, such as graphite which is very commonly used as a solid lubricant or special anti-galling lubricants sold by chemical companies.*

We provide an anti-seize compound stick called "Thread Magic" with all of our antennas and **strongly encourage** you to use it to reduce the aggravation of galling. Nylock nuts are no exception—apply the anti-seize on fastemers that use Nylock nuts as well. The Thread Magic stick is fantastic and is good for all metal fastener use—and, you can get plenty of anti-seize on the fastener without getting it on your hands!

Turn-of-nut tightening of nuts to bolts is recommended where torque values are not named, with metal to metal connections. Turn the wrench/socket until it is flush with the material it will seat against and snug-tightened, and then turn approximately 2/3 of a rotation past that point. When in doubt use common sense to ensure the fastener is not too loose, or not too tight—both positions can cause issues. On all connections, check the tightness 30 minutes or more later to ensure no creeping has taken effect.

Contrary to popular belief, galling of stainless steel is not a symptom of a "cheap" fastener - it is prevalent in all types of stainless steel, aluminum and titanium fasteners. You can be assured that the stainless steel fasteners we provide with our products are manufactured of very high quality.

Save yourself a lot of grief and always use a thread lubricant when working with stainless steel fasteners.

BOOM LAYOUT

Our boom pieces are all drilled on a very precise drill press. This ensures that all the bolts are snug when assembled. It is always better to be too tight than too loose. Always apply an anti-seize lubricant to stainless steel bolts that are using stainless steel nuts. This will prevent the two from galling together. Galling of stainless steel is common and has nothing to do with the quality of the material. Refer to the galling information in the Preamble section of this manual.

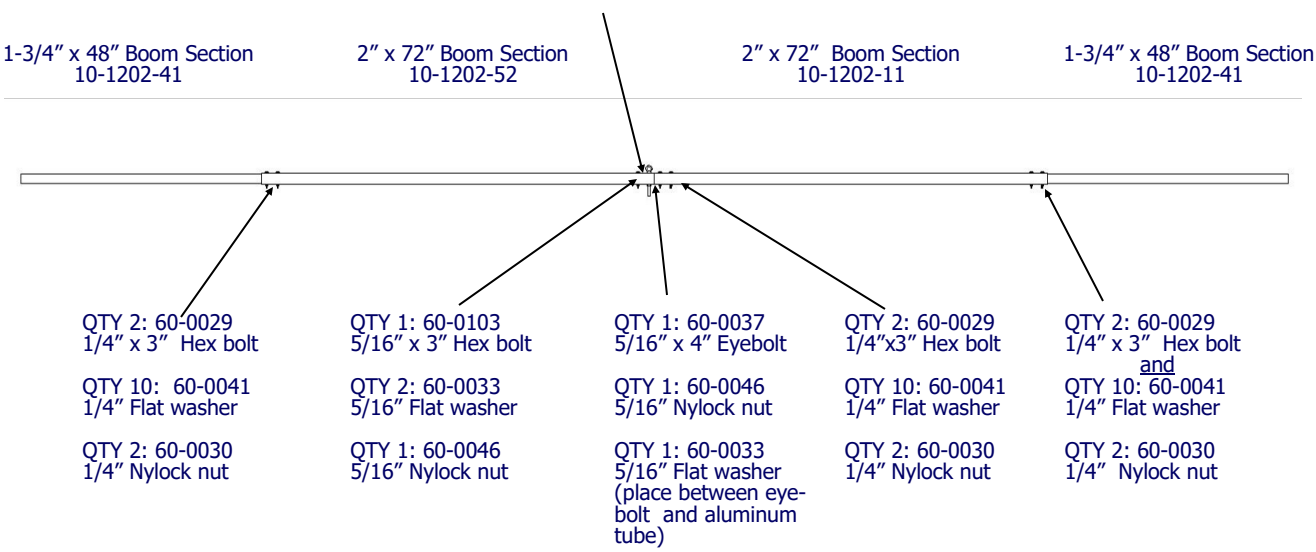
Each bolt has a specific length for the particular tubing it is holding together. It is important that the shank of the bolt is engaged in the tubing, since that is the strongest portion of the bolt. Use 5 washers per bolt to secure the bolt as shown in figure 1.02 on the following page.

Apply a thin film of a lubricant such as Anti-seize or Noalox to the male engagement area of the aluminum boom sections. Failure to do so may cause the tubes to seize inside each other. Match the boom pieces as shown below and slide each boom piece together until the pre-drilled holes align.

Secure the correct bolts and washers onto the boom as shown in figure 1.01. Repeat this for each section until the boom is completely assembled. Note that boom piece 10-1202-52 has two 1/4" drill holes on the end that connects to the 1-3/4" boom section, and 5/16" drill holes on the end that the EZ eyebolt attaches to. The rest of the bolts are 1/4". Figure 1.10 in Chapter One, Section 1.1 shows a detailed drawing of the EZ-Eyebolt.

Secure the 5/16" eyebolt as shown in figure 1.03 and figure 1.04. This eyebolt is part of our EZ-Eye system, which helps to level the boom and also assists in keeping the boom from shifting during high winds. This will be covered in more detail later in this manual.

FIG. 1.01



BOOM BOLT DETAIL

When securing the boom bolts to the boom, install the head of the bolts on the same side of the boom, so that they will be facing upward when the boom is secured to the tower.

The 1/4" boom bolts require 5 washers, as shown below in figure 1.02. IMPORTANT: There is a single 5/16" hex head boom bolt, located next to the EZ-Eye eyebolt. This hex head bolt will require only two washers, placed between the Nylock nut and the aluminum tube as shown in figure 1.03.

Figure XX shows the center boom splice assembly.

FIG. 1.02 **Inserting the boom bolts into the boom**

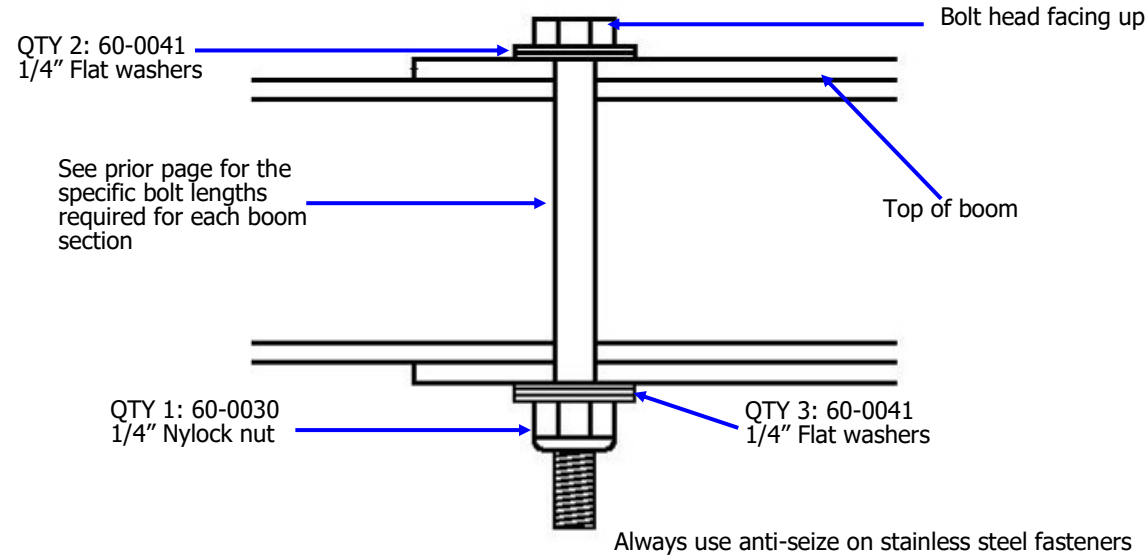
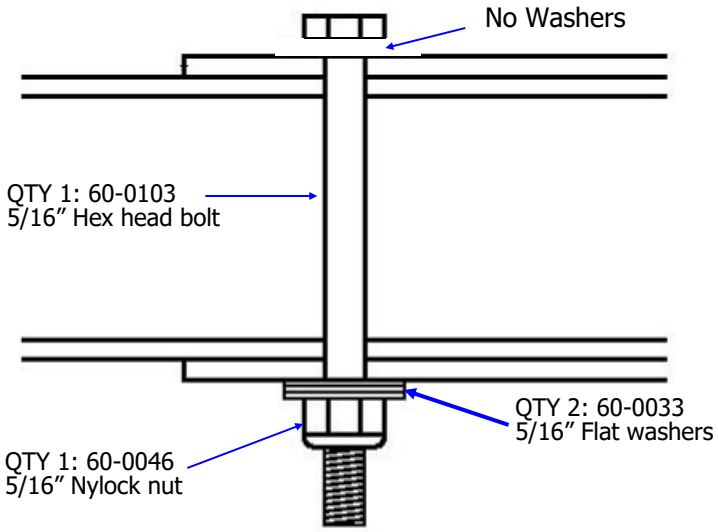


FIG. 1.03 **5/16" Boom bolt configuration**

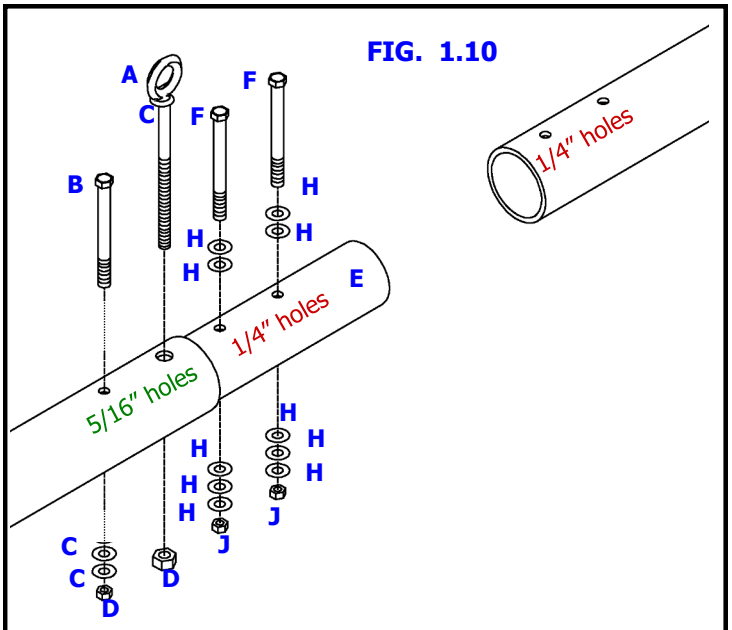


CONNECTING THE EZ-EYEBOLT TO THE BOOM

The DB18E uses two 2" x 72" aluminum boom sections and two 1-3/4" x 72" aluminum boom sections. The 2" boom sections are held together using a boom center-splice (PN 10-1203-01). The 1-3/4" boom sections telescope inside the 2" sections and are secured using 1/4" bolts.

It is important to note that while the 2" boom sections look identical, there is a subtle difference. One of the boom pieces (PN 10-1202-11) has two 1/4" drilled holes on each end of the tube. The other 2" boom piece (PN 10-1202-52) has two 1/4" drilled holes on the end that receives the 1-3/4" pipe, and a set of 5/16" drilled holes on the other end—which accommodates the EZ-Eye assembly. Because of this, the center-splice that is used to join the two pieces of 2" boom section also has a set of two drilled 5/16" holes on one side, and a set of two 1/4" drilled holes on the other side as shown in figure 1.10. Be sure to match the correct hole sizes on the center-splice to the proper sections of 2" boom.

FIG. 1.10



Key	QTY	Part #	Description
A	1	60-0037	5/16"x4" Eyebolt
B	1	60-0103	5/16" x 3" Hex head bolt
C	3	60-0033	5/16" Flat washer
D	2	60-0046	5/16" Nylock nut
E	1	10-1203-01	1-3/4" x 12" Boom center-splice
F	2	60-0029	1/4" x 3" Hex head bolt
H	10	60-0041	1/4" Flat washer
J	2	60-0030	1/4" Nylock nut

CONNECTING THE EZ-EYEBOLT TO THE BOOM (continued)

Apply some anti-seize or Noalox to each side of the boom center-splice and insert the end with the two 1/4" drilled holes into the section of boom that matches. Carefully align the holes and insert the 1/4" hex head bolts (PN 60-0029), flat washers (PN 60-0041) and Nylock nuts (PN 60-0030) as shown in figure 1.11. Be sure that your washer configuration for each bolt matches figure 1.02 , covered earlier in the chapter.

Slide the other section of 2" boom over the center-splice, align the holes and insert the 5/16" hex head bolt (PN 60-0103), 5/16" washers (PN 60-0033) and 5/16" Nylock nut (PN 60-0046) as shown in figure 1.12.

When inserting the EZ-Eyebolt onto the boom as shown in figure 1.13, use a mallet and a piece of wood as shown in figure 1.14. Using the mallet directly on they eyebolt can damage it. There is a 5/16" washer and nut on the eyebolt when you receive it—remove the regular nut and replace it with a 5/16" Nylock nut but keep the washer on the eyebolt so that it is flush with the shoulder portion of the eyebolt. Align the eyebolt so that it is centered on the boom and tighten. Be sure that all the bolts are now tightened.

Figure 1.15 shows the completed 2" boom piece with center-splice.

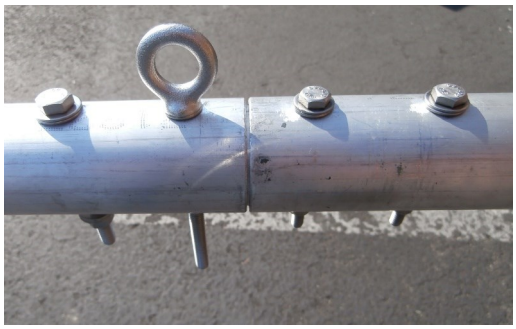
FIG. 1.11

FIG. 1.12

FIG. 1.13

FIG. 1.14

FIG. 1.15



MAST PLATE-TO-BOOM OVERVIEW DRAWING

When you have finished assembling the boom, use clamps or cord to secure the boom in place onto the sawhorses or whatever structure you are using to support the boom. By doing this, you are "locking" the boom into a level position, which will make the leveling of the mast plate much easier.

The DB18E employs a special system, called the EZ-Eye, for both mounting and leveling the boom. The EZ-Eye is also used in preventing the boom from shifting during high winds.

Figure 2.01 shows an exploded drawing of the boom and mast plate assembly, along with the EZ-Eye system. This parts explosion is a useful referral tool as you complete the steps in this section.

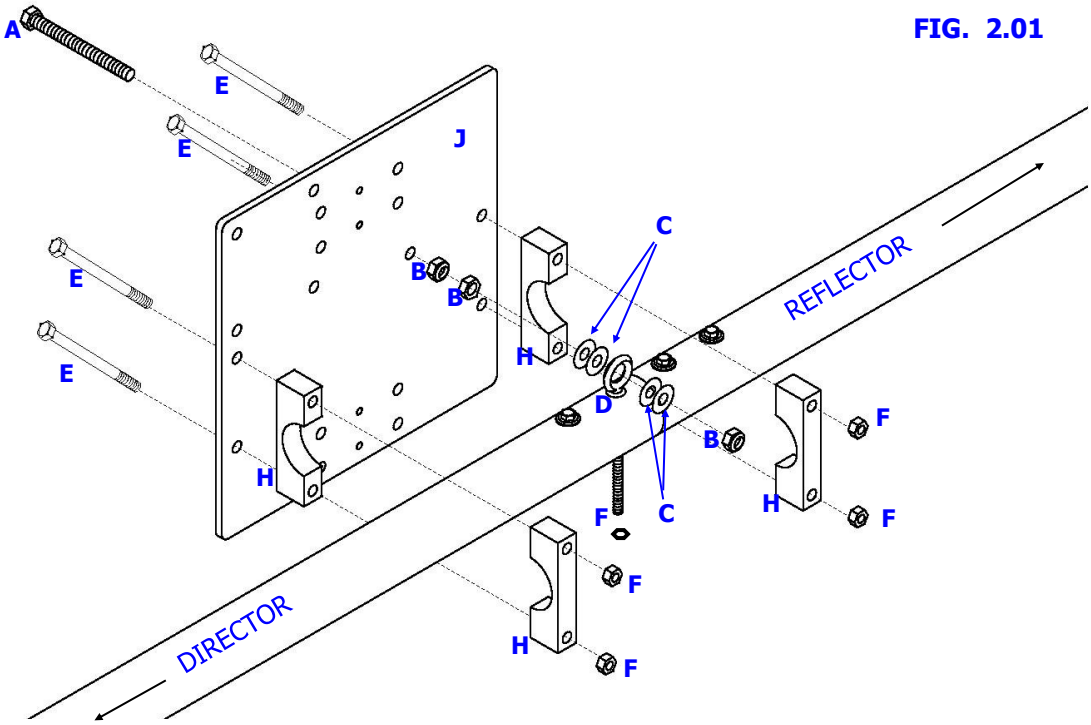


FIG. 2.01

Key	QTY	Part #	Description
A	1	60-0085	3/8" x 4" Threaded EZ Eye bolt
B	3	60-0050	3/8" Nylock nut
C	4	60-0034	3/8" Washer
D	1	60-0037	5/16" Stainless steel eyebolt
E	4	60-0114	5/16" x 3-3/4" Hex head bolt
F	5	60-0046	5/16" Nylock nut
H	4	10-1601-22	2" Aluminum saddle half
J	1	10-1610-22	11-1/2" Aluminum mast plate

PREPARING THE MAST PLATE FOR THE EZ-EYE

Insert the 3/8" x 4" threaded bolt (PN 60-0085) through the mast plate (PN 10-1610-22) as shown in figure 2.02 and secure with the 3/8" Nylock nut (PN 60-0085).

BE SURE TO LIBERALLY COAT THE THREADED BOLT WITH ANTI-SEIZE LUBRICANT. Figure 2.03 shows the proper method, note that there is lubricant applied to four portions of the bolt. If you do not do this, the bolt will likely gall. For information on galling, see the Preamble section of this manual.

The EZ-Eye bolt is fully threaded, which can create friction, which then turns into heat. When the initial Nylock nut was threaded on to secure the bolt to the mast plate, the nut "pushed" the anti-seize compound down the bolt as it was tightened. Therefore, be sure to apply anti-seize to the 3/8" bolt again.

Thread the second 3/8" Nylock nut onto the bolt, so that the end of bolt is protruding just outside of the Nylock nut as shown in figure 2.04. You are doing this so that the end of the Nylock nut, the portion that has the nylon in it, is manually "threaded". Remove the nut, turn it around so that the nylon portion of the nut is facing downward, and tighten as shown in the second photo in figure 2.04. The reason for doing this will be more apparent on the next page. Tighten the Nylock nut until there is approximately 3/8" of clearance between the two Nylock nuts as shown in figure 2.05.

Most of the drawings and pictures in this manual are oriented facing the boom as it is mounted on the mast plate. When looking straight at the boom and mast plate, the director is on the left, the driven in the middle, and the reflector on the right. To be sure your mast plate is oriented properly, refer to figure 2.06. When you are looking at the boom (meaning that you can visually SEE the boom) as it is mounted on the mast plate, these 4 holes should be on the upper left side.

FIG. 2.02

FIG. 2.03

FIG. 2.04

FIG. 2.05

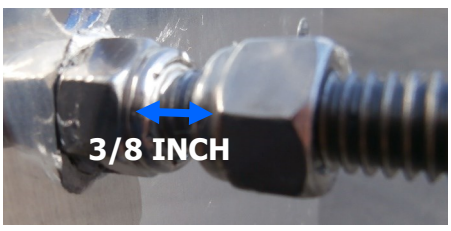
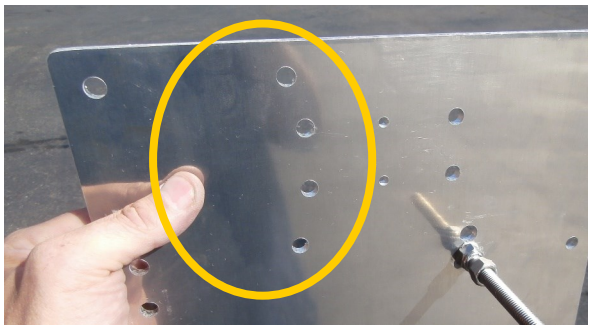


FIG. 2.06



MOUNTING THE BOOM TO THE MAST PLATE (continued)

ATTACH THE BOOM TO THE MAST PLATE

Slide the 5/16" x 3.75" hex head bolts (PN 60-0114) into the mast plate, and place the first half of the 2 inch aluminum saddles (PN 10-1601-61) onto the bolts as shown in figure 2.10. Place two 3/8" washers (PN 60-0034) onto the EZ-Eye threaded bolt as shown in figure 2.11, BEFORE inserting the threaded bolt into the EZ-Eye. Position the mast plate to the boom, sliding the 4" threaded bolt through the eyebolt as shown in figure 2.12.

Attach the other half of the 2" aluminum saddles, apply anti-seize to the bolts and thread on the 5/16" Ny-lock nuts (PN 60-0046). Tighten the nuts until the boom is snug, but you can still rotate it. Place the re-maining two 3/8" flat washers onto the threaded bolt used for the EZ-Eye and thread on the last 3/8" Ny-lock nut until it is close to the 3/8" washers as shown in figure 2.13.

Use a short level and attach a wrench on each of the 3/8" "leveling" nuts as shown in figure 2.14. Adjust the nuts as needed to level the boom to the mast plate. When the mast plate is level with the boom, tighten all of the nuts firmly, and don't forget to install the set screws in the saddles as shown in figure 2.15. Only the exposed half of the saddles will require a set screw. Figure 2.16 shows the completed EZ-Eye assembly.

FIG. 2.10

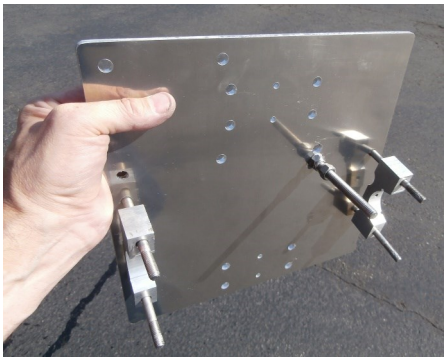


FIG. 2.11

FIG. 2.12

FIG. 2.13

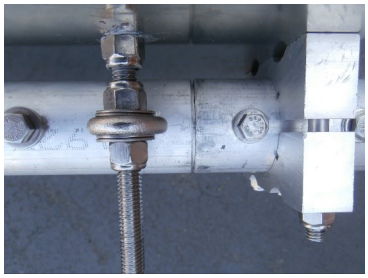
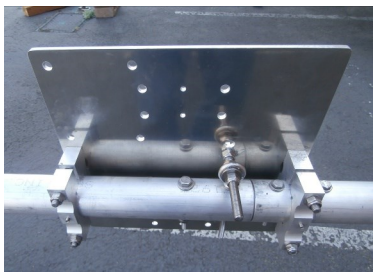


FIG. 2.14

FIG. 2.15

FIG. 2.16



ELEMENT HOUSING UNIT (EHU) PLACEMENT

Each of the EHU's on the DB18E Yagi are treated as a driven element, depending on what mode you are in or direction you are facing. The coax from the ham shack feeds into an integral coax switch, which seamlessly switches in and out the correct EHU behind the scenes. Because of this, the EHU's can have many different names—this can be confusing.

For the purpose of building the antenna, we refer to the elements as Director, Driven and Reflector, as shown in figure 3.01 below. When operating on 30m-6m, this is exactly what the EHU's function as then the antenna is operating in the forward direction.

All the drawings in this manual are oriented so that you are looking inward at boom with the director to the left and the reflector to the right, as shown in figure 3.01.

For a detailed look at what each element is doing at any given time, refer to the antenna configuration guide in the Preamble section of this manual.

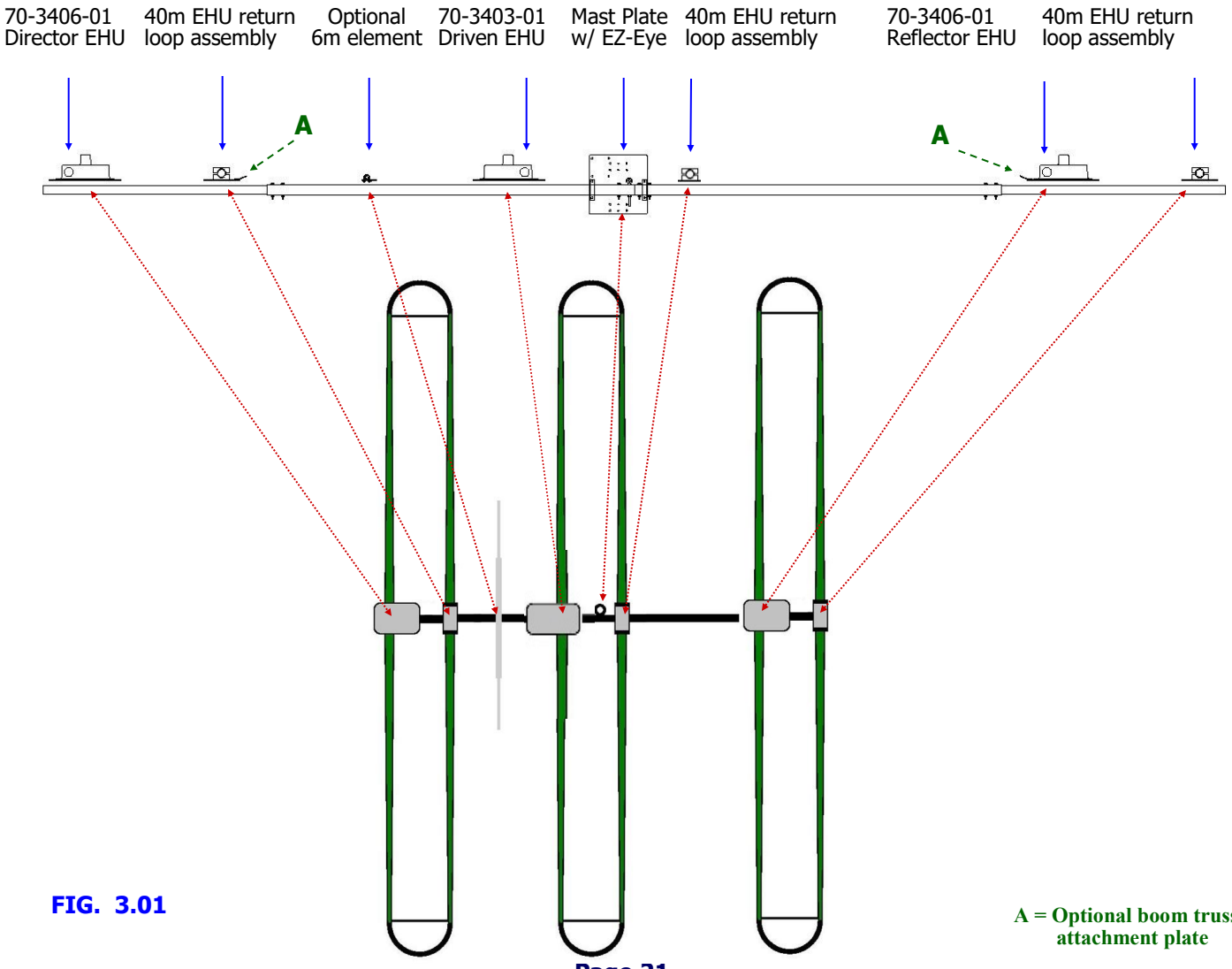


FIG. 3.01

A = Optional boom truss attachment plate

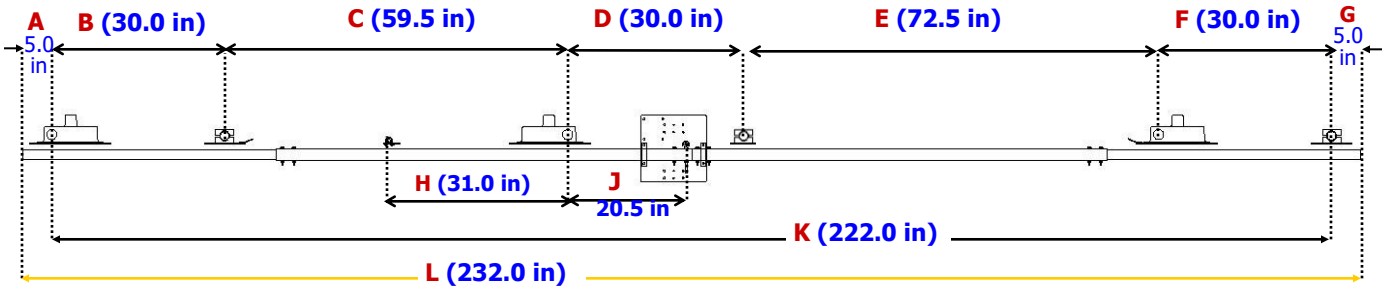
EHU CENTER-TO-CENTER SPACING MEASUREMENTS

It is critically important that the center-to-center spacing is correct when assembling your SteppIR DB18E Yagi. Use figure 3.02 for placement of each of the elements. Start from the left edge of the boom and measure from there.
As you assemble each of the element housing units (EHU's), refer to this drawing. We recommend this sequence:

1. Secure the element mounting plates to the boom using the correct saddles and fasteners (be sure to use anti-seize on all stainless steel fasteners). Tighten enough to hold them in place, but loose enough so you can move the mounting plates for final tightening.
2. Wire the EHU's and secure them to the element mounting plates (don't forget the gasket!). The mounting plate itself acts as the lid for the DB18E EHU's.
3. Measure your center-to-center lengths, level the mounting plates and firmly tighten.
4. Re-measure all of your lengths and correct if needed. Take your time, get it right.

All of this is covered in greater detail in this manual, but it's important to understand the proper flow BEFORE you start—it will save a lot of time.

FIG. 3.02



KEY	Start measurement at center-point of:	Finish measurement at center-point of:	Measurement distance between points
A	Boom edge*	Director EHU	05.00 inches
B	Director EHU	Loop return	30.00 inches
C	Loop return	Driven EHU	59.50 inches
D	Driven EHU	Loop return	30.00 inches
E	Driven EHU	Reflector EHU	72.50 inches
F	Reflector EHU	Loop return	30.00 inches
G	Loop return	Boom edge*	05.00 inches
H	6m passive (optional)	Driven EHU	31.00 inches
J	Driven EHU	EZ-Eye Eyebolt	20.50 inches
K	Director EHU	Reflector EHU	222.00 inches
L	Boom edge*	Boom edge*	232.00 inches

* There is no center-point measurement at the boom edge—place the ruler literally on the edge of the boom

ELEMENT HOUSING UNIT (EHU) WIRING OVERVIEW

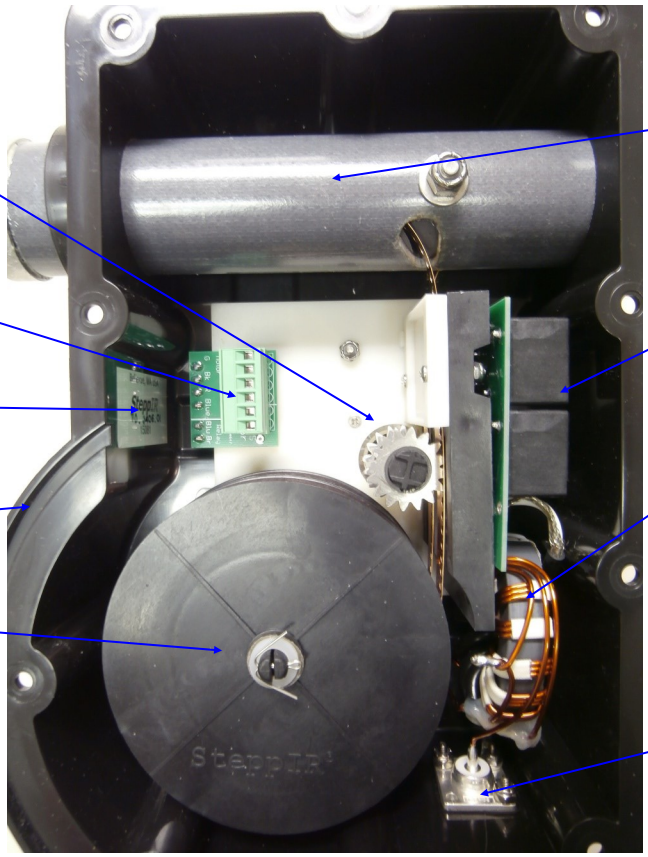
When wiring the EHU's on the DB18E Yagi, it is important to know that there are two different types of EHU. The two end "loop" elements can function as either a passive element or a driven element, depending on what band or direction that antenna is in. Because of this, the end elements utilize relays inside the EHU. The center element functions solely as the driven element when on 30m thru 6m. There is no relay inside this EHU because its purpose is singular.

There are wiring differences that need to be noted as well—the center EHU, which has no relays, uses 4 conductor control cable to power the stepper motor. The end elements, with the relays, use 6 conductor control cable, 4 wires to control the stepper motor, and 2 wires to control the relays. It is critical that the right control cable is used for the respective EHU or the antenna will not function correctly, and the electronic controller could be damaged.

This brings up an important note: **NEVER DO ANY WIRING WHEN THE ELECTRONIC CONTROLLER IS CONNECTED TO THE CONTROL CABLE**. Even if the power is turned off of the controller, damage can occur. This is the number one cause of antenna installation failures, so please be sure to heed the advice.

Figure 3.10 gives an overview of the inside of a SteppIR EHU.

FIG. 3.10



EHU WIRING

Trim approximately 1.5 inches of the outer jacket of the control cable (4 or 6 wire, depending on which EHU). Remove the shield material, the support thread and cut the ground wire off as shown in figure 3.10. Attach electrical tape at the end of the trimmed control cable jacket so that there is no chance for a short. Remove 0.25 inches of the insulation from each of the individual 22 AWG wires, leaving bare copper. Tinning of the copper wire ends with solder is not required but may be helpful in keeping the ends together while attaching the control cable wires. Figure 3.11 shows the control cable should look like when you are finished with the trimming. Dip each of the copper wires into connector protector before inserting into the terminal plug. Figure 3.12 shows what the connector protector will look like.

The terminal header assembly consists of the terminal header and the terminal plug as shown in figure 3.14. The plug is shipped loosely attached to the header. Remove this plug when wiring and firmly plug back in when completed.

Follow the wire sequence in figure 3.14 for each EHU. The 6 pin wiring sequence is for the director and reflector elements, and the 4 pin wiring sequence is for the driven element. *Be careful to ensure that there are no bare wires protruding out from the terminal clamps, to avoid potential shorts.*

The wiring sequence for each EHU is also imprinted on the PCB that the terminal header is mounted on (located inside the EHU), as shown in figure 3.13. Pay no attention to the second row of imprinted text, these pins are for use in the manufacturing of the board itself and are of no use to you. Figure 3.13 shows a blue line crossing out the text in question. The yellow circle shows the correct wiring sequence.

FIG. 3.10

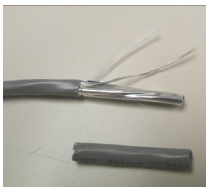


FIG. 3.11

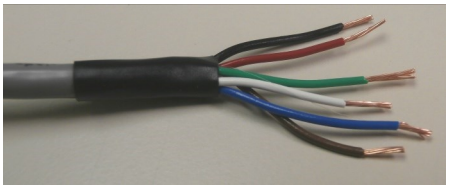
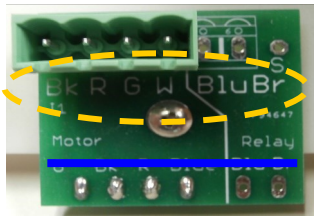


FIG. 3.12

FIG. 3.13

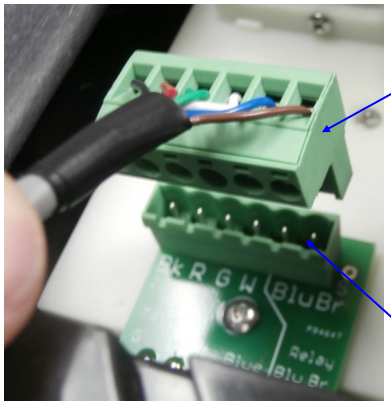


6 Pin Header Wiring Sequence (EHU's with Relays)

BLACK | RED | GREEN | WHITE | BLUE | BROWN

4 Pin Header Wiring Sequence (EHU's without Relays)

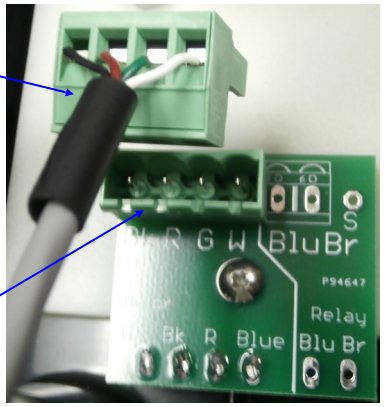
BLACK | RED | GREEN | WHITE



TERMINAL PLUG

TERMINAL HEADER

FIG. 3.14



EHU WIRING (continued)

Check to be sure the terminal plug is firmly inserted into the terminal header.

Lay the control cable wire inside the wire tray of the EHU as shown in figure 3.15. This trough acts as a strain relief so that the cable will not be pulled out of the EHU. It is a good idea to leave a small amount of slack between the plug and the point which the tray starts as shown in figure 3.16.

Using the coax seal and cut into 1 inch strips as shown in figure 3.17. You will need three strips. The remainder can be used to seal the driven element SO239 connectors, should you wish to.

Apply coax seal on top of the control cable and work it around the cable and on top of the cable tray as shown in figure 3.18. This will help keep water from entering into the EHU. Apply the coax seal to the remaining areas of the wire tray as shown in figure 3.19.

Repeat wiring and coax seal preparation for each EHU. When finished, the EHU's will be secured to the aluminum element mounting plates. This is covered in detail in the next chapter.

FIG. 3.15

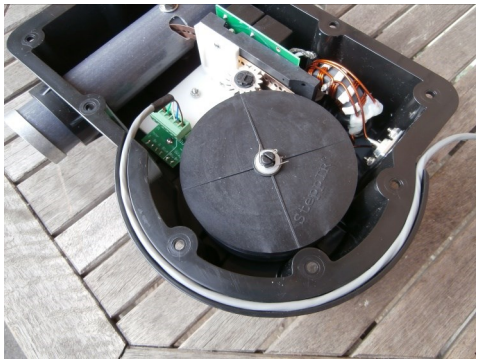


FIG. 3.16

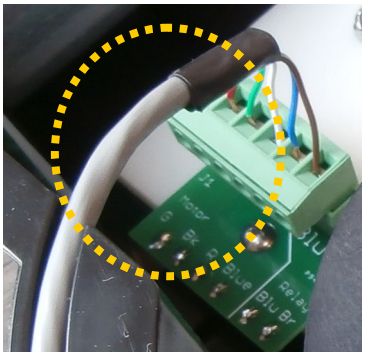


FIG. 3.17

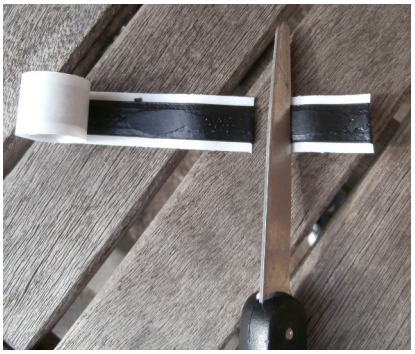


FIG. 3.18

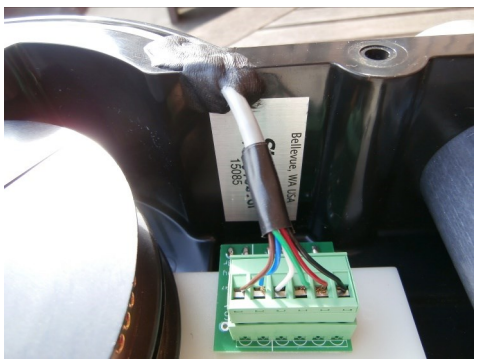
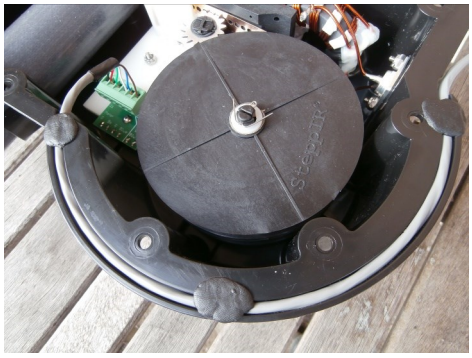


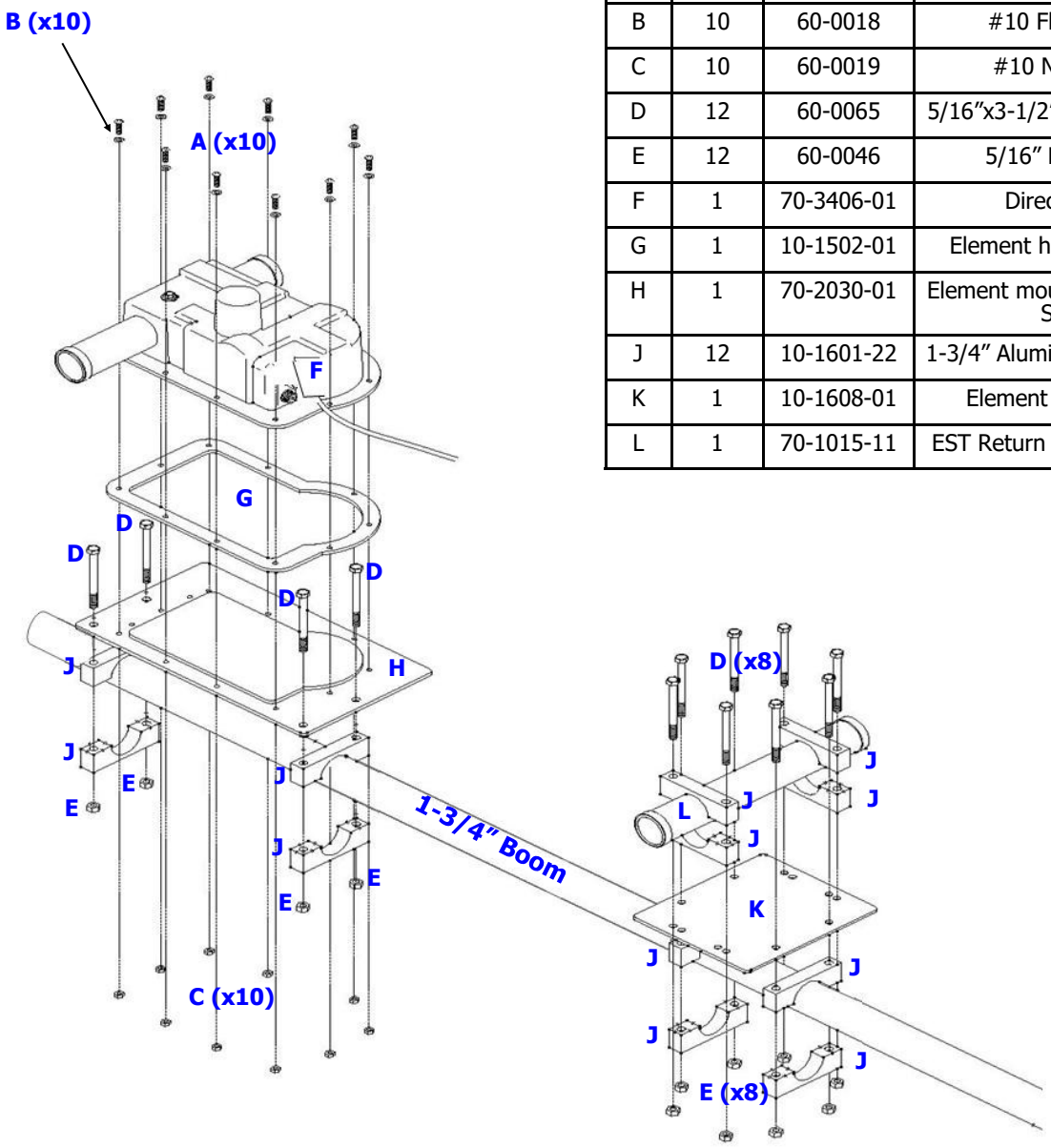
FIG. 3.19



DIRECTOR EHU & RETURN TUBE ASSEMBLY DRAWING

The parts explosion drawing in figure 3.20 gives you an overview of the assembly of the director EHU. Detailed instructions follow.

FIG. 3.20



Key	QTY	Part #	Description
A	10	60-0017	#10x 3/4" Machine screw
B	10	60-0018	#10 Flat washer
C	10	60-0019	#10 Nylock nut
D	12	60-0065	5/16"x3-1/2" Hex head bolt
E	12	60-0046	5/16" Nylock nut
F	1	70-3406-01	Director EHU
G	1	10-1502-01	Element housing gasket
H	1	70-2030-01	Element mounting plate (DB Style)
J	12	10-1601-22	1-3/4" Aluminum saddle half
K	1	10-1608-01	Element return plate
L	1	70-1015-11	EST Return tube (DB Style)

SECURE MOUNTING PLATE AND EHU TO BOOM—DIRECTOR

Refer to the center-to-center measurements in figure 3.02 in Chapter Three, Section 3.0 when installing each of the EHU's and mounting plates to the boom. The EHU should already be wired before placing it on the aluminum mounting plate.

Position the aluminum mounting plate (PN 10-1015-11) and align the 1-3/4" aluminum saddle halves (PN 10-1601-03) as shown in figure 3.21. Insert the 5/16" x 3-1/2" hex head bolts (PN 60-0065) and thread on the 5/16" Nylock nuts (PN 60-0046). Insert a set screw on the exposed side of the aluminum saddle. Tighten, but allow the mounting plate to be loose enough for adjusting the center-to-center measurement. Be sure to use anti-seize on all stainless steel fasteners.

Place the EHU gasket (PN 10-1502-01) onto the mounting plate as shown in figure 3.22. Align the gasket with the holes on the mounting plate. Place the EHU (PN 70-3406-01) onto the mounting plate and attach using the #10 x 3/4" machine screws (PN 60-0017), #10 flat washers (PN 60-0018) and #10 Nylock nuts (PN 60-0019) as shown in figure 3.23. Be sure that the flat washer is between the machine screw head and the EHU housing as shown in figure 3.24 . Tighten the Nylock nuts enough to compress the gasket material but do not over tighten or you can crack the plastic EHU housing.

Measure the proper distance from the edge of the boom to the center point of the element (5.0 inches) as shown in figure 3.25. *(A tip from Adam Blackmer K7EDX, SteppIR operations manager— use the mold spline located on the EHU housing as a place to hold your tape measure edge when measuring center-to-center as shown in figure 3.26*)

Level the EHU as shown in figure 3.27 and tighten the aluminum saddles firmly.

FIG. 3.21

FIG. 3.22

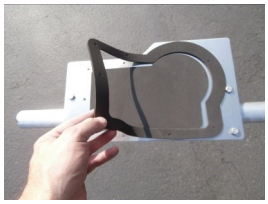


FIG. 3.23

FIG. 3.24

FIG. 3.25

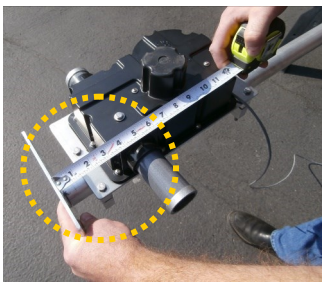


FIG. 3.26

FIG. 3.27

RETURN TUBE MOUNTING—DIRECTOR EHU

Install the element return mounting plate (PN 10-1608-01). Use four of the 1-3/4" aluminum saddles, 5/16" x 3-1/2" hex head bolts and 5/16" Nylock nuts as shown in figure 3.30. Tighten the nuts, but leave loose enough to adjust for the center-to-center measurement. Again using four of the 1-3/4 aluminum saddles, 5/16" x 3-1/2" hex head bolts, and Nylock nuts, loosely install the return tube saddles as shown in figure 3.31.

Insert the element return tube (PN 70-1015-11) as shown in figure 3.32. Be sure that the return tube is protruding out approximately 2.5 inches away from the aluminum saddle edge on each side, as shown in figure 3.34. Tighten the saddles to a maximum of 7 ft lb (9.5Nm). This is very important. The aluminum saddles can crush the fiberglass tubes if the saddles are too tight.

Measure 30 inches from the center-point of the Director EHU to the center-point of the element return tube as shown in figure 3.33. Level the return bracket assembly as shown in figure 3.34 and tighten the saddle bolts firmly. Do not forget to use anti-seize on all stainless steel fasteners, and also remember to install a set screw into each saddle pair (one set screw per saddle pair).

NOTE: If you purchased the optional boom truss kit, be sure to mount the truss attachment plate (PN 10-1607-01) on the Director return tube as shown in figure 3.35. The attachment plate is inserted between the top of the hex head bolts and the return tube mounting plate. If you did not purchase the boom truss option, disregard this note.

Figure 3.36 shows the completed director EHU and return bracket.

FIG. 3.30

FIG. 3.31

FIG. 3.32

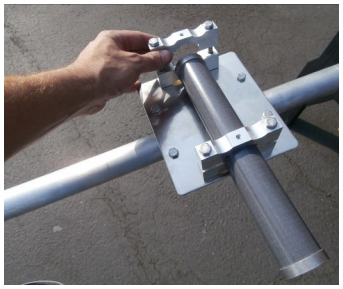


FIG. 3.33

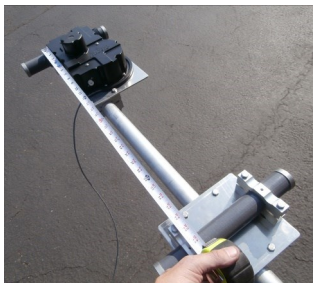


FIG. 3.34

FIG. 3.35

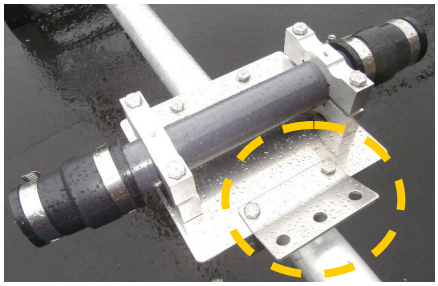
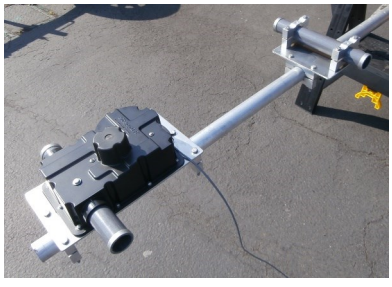
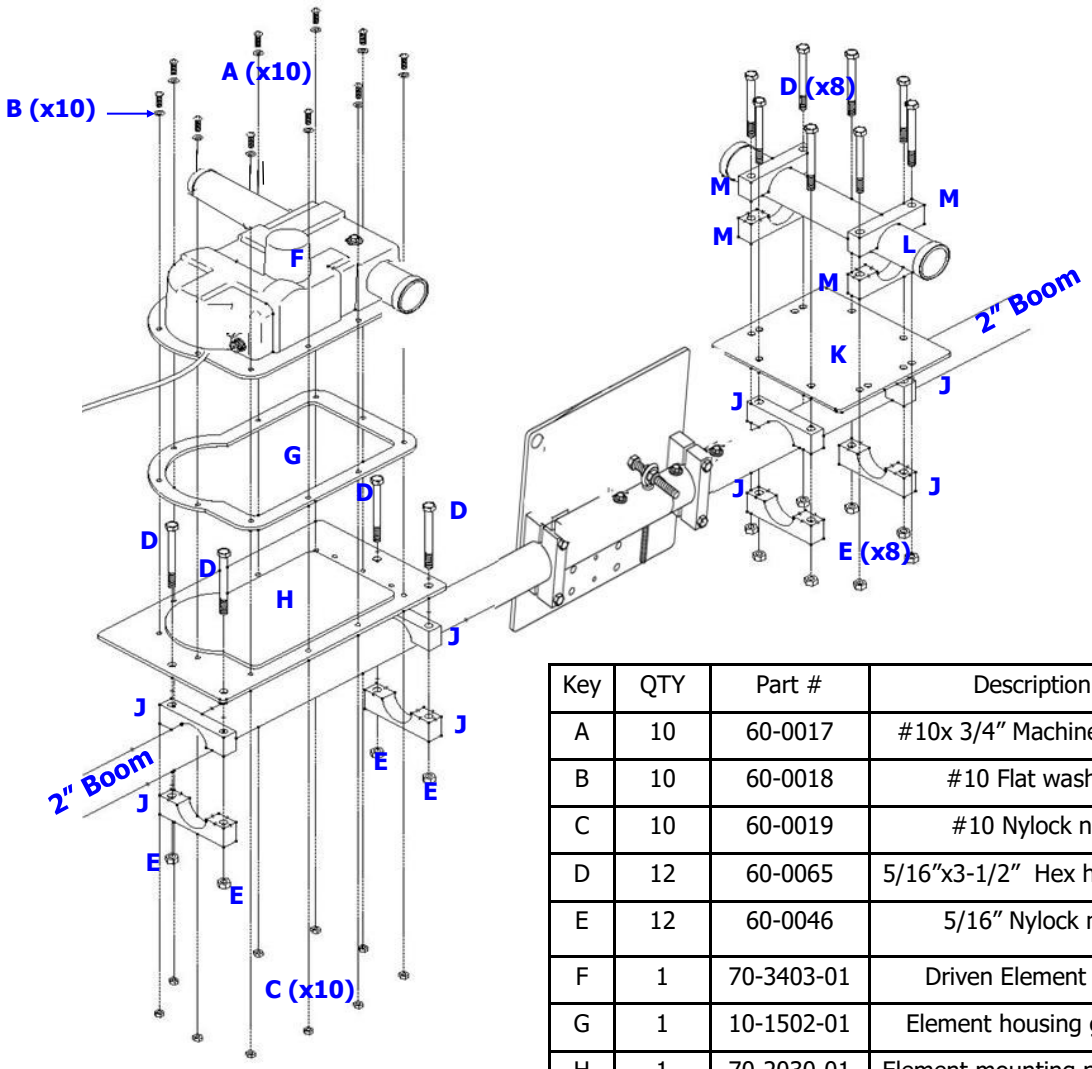


FIG. 3.36



DRIVEN ELEMENT EHU AND RETURN TUBE ASSEMBLY

The parts explosion drawing in figure 3.40 gives you an overview of the assembly of the driven EHU & return tube. Detailed instructions follow.



Key	QTY	Part #	Description
A	10	60-0017	#10x 3/4" Machine screw
B	10	60-0018	#10 Flat washer
C	10	60-0019	#10 Nylock nut
D	12	60-0065	5/16"x3-1/2" Hex head bolt
E	12	60-0046	5/16" Nylock nut
F	1	70-3403-01	Driven Element EHU
G	1	10-1502-01	Element housing gasket
H	1	70-2030-01	Element mounting plate (DB Style)
J	8	10-1601-22	2" Aluminum saddle half
K	1	10-1608-01	Element return plate
L	1	70-1015-11	EST Return tube (DB Style)
M	4	10-1601-03	1-3/4" Aluminum saddle half

SECURE MOUNTING PLATE AND EHU TO BOOM—DRIVEN ELEMENT

Refer to the center-to-center measurements in figure 3.02 in Chapter Three, Section 3.0 when installing each of the EHU's and mounting plates to the boom. The EHU should already be wired before placing it on the aluminum mounting plate.

Position the aluminum mounting plate (PN 10-1015-11) and align the 2" aluminum saddle halves (PN 10-1601-22) as shown in figure 3.41. Insert the 5/16" x 3-1/2" hex head bolts (PN 60-0065) and thread on the 5/16" Nylock nuts (PN 60-0046). Insert a set screw on the exposed side of the aluminum saddle. Tighten, but allow the mounting plate to be loose enough for adjusting the center-to-center measurement. Be sure to use anti-seize on all stainless steel fasteners.

Place the EHU gasket (PN 10-1502-01) onto the mounting plate as shown in figure 3.42. Align the gasket with the holes on the mounting plate. Place the EHU (PN 70-3406-01) onto the mounting plate and attach using the #10 x 3/4" machine screws (PN 60-0017), #10 flat washers (PN 60-0018) and #10 Nylock nuts (PN 60-0019) as shown in figure 3.43. Be sure that the flat washer is between the machine screw head and the EHU housing as shown in figure 3.44. Tighten the Nylock nuts enough to compress the gasket material but do not over tighten or you can crack the plastic EHU housing.

Measure 20.5 inches from the center-point of the driven element EHU to the center of the EZ-Eye eyebolt as shown in figure 3.45. This measurement should allow for accurate initial placement of the Driven EHU, but ALWAYS defer to the center-to-center measurements as your priority. The center-to center length from the director EHU to the Driven EHU, which should be 89.5 inches.

Level the EHU as shown in figure 3.46 and tighten the aluminum saddles firmly. Figure 3.47 shows the completed Driven EHU.

FIG. 3.41

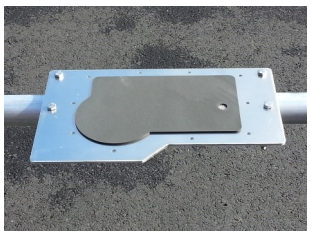


FIG. 3.42

FIG. 3.43

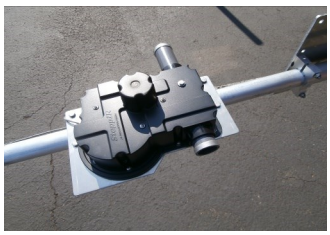


FIG. 3.44

FIG. 3.45

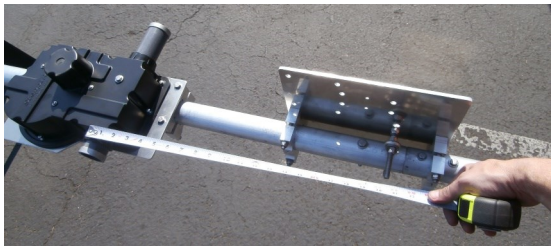
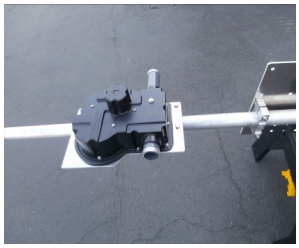


FIG. 3.46

FIG. 3.47



MOUNTING THE ELEMENT RETURN TUBE—DRIVEN

Install the element return mounting plate (PN 10-1608-01). Use four of the 2" aluminum saddles (PN 10-1601-22), 5/16" x 3-1/2" hex head bolts and 5/16" Nylock nuts as shown in figure 3.50. Tighten the nuts, but leave loose enough to adjust for the center-to-center measurement. Using four of the 1-3/4 aluminum saddles (PN 10-1601-03), 5/16" x 3-1/2" hex head bolts, and Nylock nuts, loosely install the 1-3/4" aluminum return tube saddles (PN 10-1601-03) as shown in figure 3.51.

Insert the element return tube (PN 10-1015-11) as shown in figure 3.52. Be sure that the return tube is protruding out approximately 2.5 inches away from the aluminum saddle edge on each side, as shown in figure 3.53. Tighten the saddles to a maximum of 7 ft lb (9.5Nm). This is very important. The aluminum saddles can crush the fiberglass tubes if the saddles are too tight.

Measure 30 inches from the center-point of the Director EHU to the center-point of the element return tube as shown in figure 3.54. Level the return bracket assembly as shown in figure 3.53 and tighten the saddle bolts firmly. Do not forget to use anti-seize on all stainless steel fasteners, and also remember to install a set screw into each saddle pair (one set screw per saddle pair).

Figure 3.55 shows the completed Driven EHU and return bracket.

FIG. 3.50

FIG. 3.51

FIG. 3.52

FIG. 3.53

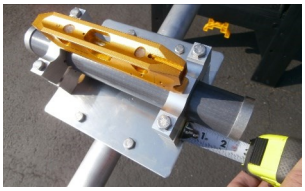
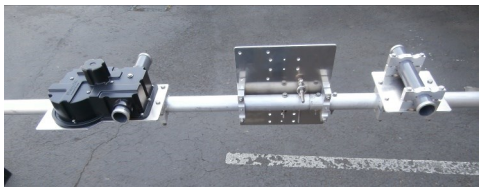


FIG. 3.54

FIG. 3.55

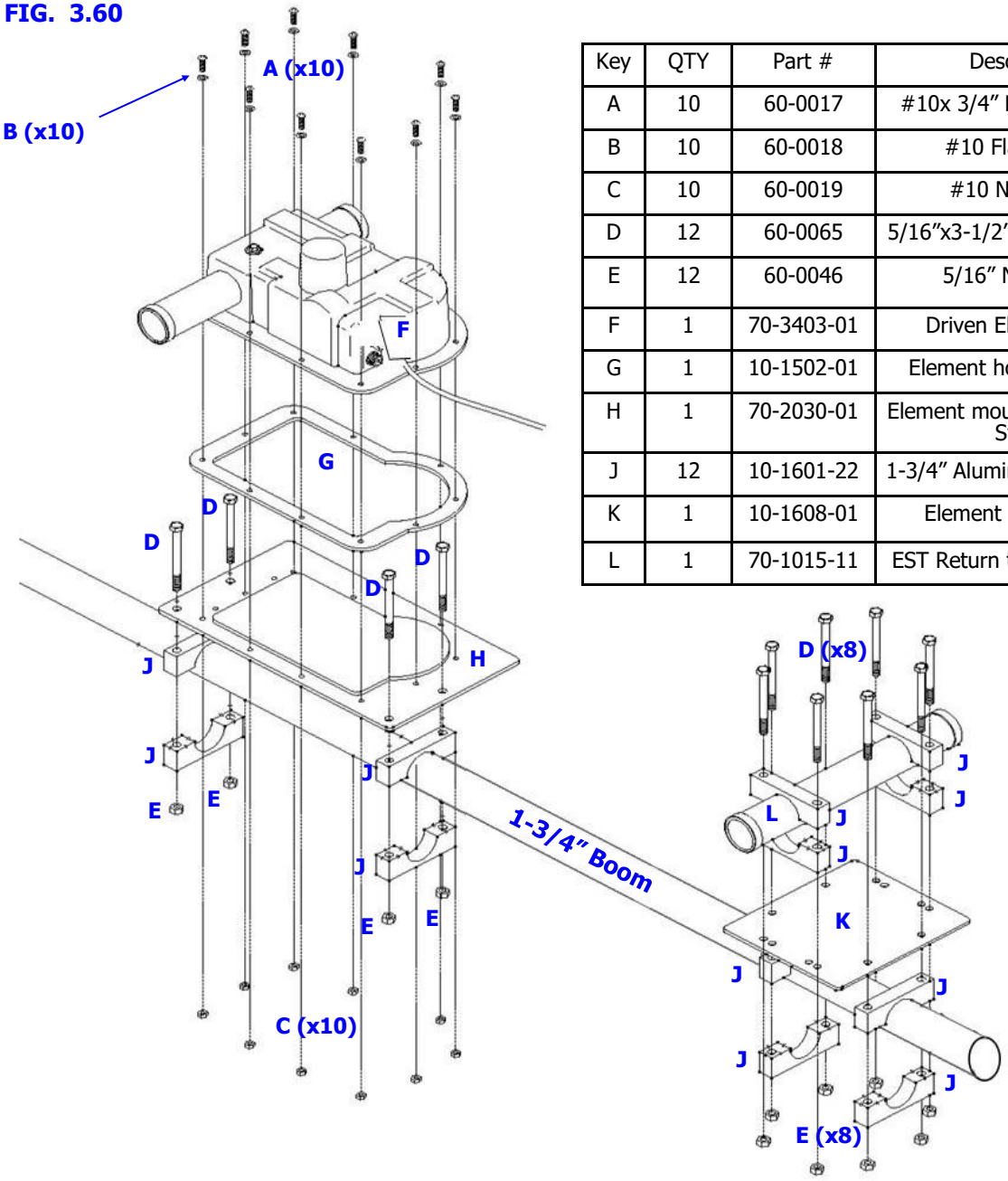


REFLECTOR EHU & RETURN TUBE ASSEMBLY DRAWING

The parts explosion drawing in figure 3.60 gives you an overview of the assembly of the reflector EHU. Detailed instructions follow.

NOTE: If you have purchased the optional boom truss, be sure to refer to Chapter Eight before assembling and mounting the Reflector EHU. Even though the installation of the boom truss does not take place until the DB18E Yagi is nearly completed, there are two truss attachment plates (PN 10-1607-01) that need to be installed while working in Chapter Three, one of them is on the Reflector mounting plate.

FIG. 3.60



Key	QTY	Part #	Description
A	10	60-0017	#10x 3/4" Machine screw
B	10	60-0018	#10 Flat washer
C	10	60-0019	#10 Nylock nut
D	12	60-0065	5/16"x3-1/2" Hex head bolt
E	12	60-0046	5/16" Nylock nut
F	1	70-3403-01	Driven Element EHU
G	1	10-1502-01	Element housing gasket
H	1	70-2030-01	Element mounting plate (DB Style)
J	12	10-1601-22	1-3/4" Aluminum saddle half
K	1	10-1608-01	Element return plate
L	1	70-1015-11	EST Return tube (DB Style)

SECURE MOUNTING PLATE AND EHU TO BOOM—REFLECTOR

Refer to the center-to-center measurements in figure 3.02 in Chapter Three, Section 3.0 when installing each of the EHU's and mounting plates to the boom. The EHU should already be wired before placing it on the aluminum mounting plate.

Position the aluminum mounting plate (PN 10-1015-11) using the four 1-3/4" aluminum saddle halves (PN 10-1601-22), 5/16" x 3-1/2" hex head bolts (PN 60-0065) and 5/16" Nylock nuts (PN 60-0046) as shown in figure 3.61. Insert a set screw on the exposed side of the aluminum saddle. Tighten but allow the mounting plate to be loose enough for adjusting the center-to-center measurement. Be sure to use anti-seize on all stainless steel fasteners.

Place the EHU gasket (PN 10-1502-01) onto the mounting plate as shown in figure 3.62. Align the gasket with the holes on the mounting plate. Place the EHU (PN 70-3406-01) onto the mounting plate and attach using the #10 x 3/4" machine screws (PN 60-0017), #10 flat washers (PN 60-0018) and #10 Nylock nuts (PN 60-0019) as shown in figure 3.63. Be sure that the flat washer is between the machine screw head and the EHU housing as shown in figure 3.64. Tighten the Nylock nuts enough to compress the gasket material but do not over tighten or you can crack the plastic EHU housing.

Measure the proper distance from the driven element to the reflector element, which should be 102.50 inches from center-point to center-point.

Level the EHU as shown in figure 3.65 and tighten the aluminum saddles firmly. Figure 3.66 shows the completed reflector EHU.

FIG. 3.61

FIG. 3.62

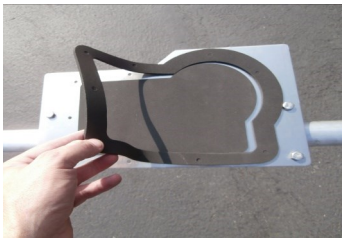


FIG. 3.63

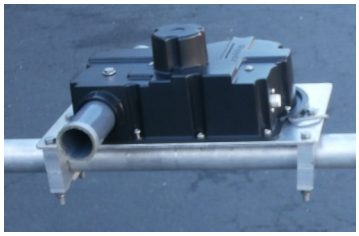


FIG. 3.64

FIG. 3.65

FIG. 3.66

RETURN TUBE MOUNTING—REFLECTOR EHU

Install the element return mounting plate (PN 10-1608-01). Use four of the 1-3/4" aluminum saddles, 5/16" x 3-1/2" hex head bolts and 5/16" Nylock nuts as shown in figure 3.70. Tighten the nuts, but leave loose enough to adjust for the center-to-center measurement. Again using four of the 1-3/4 aluminum saddles, 5/16" x 3-1/2" hex head bolts, and Nylock nuts, loosely install the return tube saddles as shown in figure 3.71.

Insert the element return tube (PN 10-1015-11) as shown in figure 3.72. Be sure that the return tube is protruding out approximately 2.5 inches away from the aluminum saddle edge on each side, as shown in figure 3.73. Tighten the saddles to a maximum of 7 ft lb (9.5Nm). **This is very important.** The aluminum saddles can crush the fiberglass tubes if the saddles are too tight.

Measure 30 inches from the center-point of the reflector EHU to the center-point of the return tube as shown in figure 3.74. The center-point of the return tube should also be approximately 5 inches away from the right edge of the boom as shown in figure 3.75. Remember, the center-to-center measurements always get the priority.

Level the return bracket assembly as shown in figure 3.76 and tighten the saddle bolts firmly. Do not forget to use anti-seize on all stainless steel fasteners, and also remember to install a set screw into each saddle pair (one set screw per saddle pair).

FIG. 3.70

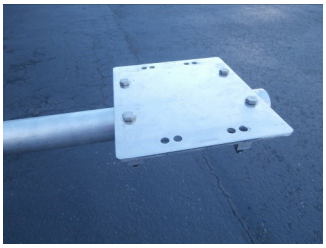


FIG. 3.71

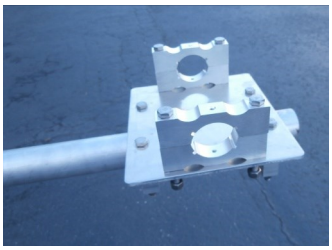


FIG. 3.72

FIG. 3.73

FIG. 3.74

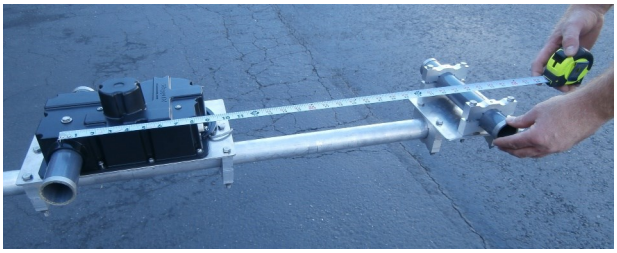


FIG. 3.75

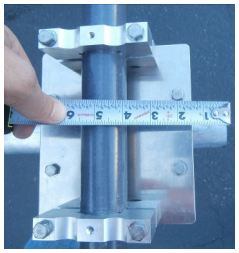
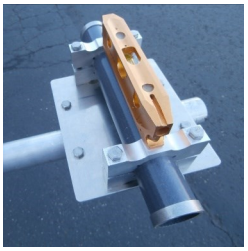


FIG. 3.76



MOUNTING THE COAX SWITCH HOUSING ASSEMBLY

The DB18E Yagi offers high performance regardless of which band or direction the antenna is in. To do this, at any given time each EHU functions as a Driven element. This is accomplished by using a single feed line, and switching in and out each driven element using a relay. The coax switch housing is where the relays and the relay board are located.

The installation of the coax switch box is not difficult, but as with all wiring functions, it is critical that you take great care to ensure that the wiring is correct. Always make sure the electronic controller is completely disconnected from the control cable and the power is off while doing any wiring.

Locate the coax switch mounting bracket (PN 10-1619-01). Use two 5/16" x 3-1/2" hex head bolt (PN 60-0065) and two 5/16" Nylock nuts (PN 60-0046) to connect to the boom using two 2" aluminum saddle halves (PN 10-1601-22) as shown in figure 4.01.

Position the base portion of the coax switch box onto the mounting plate. Line up the two holes located on the inside of the aluminum case with the holes in the mounting plate as shown in figure 4.02. Insert two #10 x 5/8" machine screws (PN 60-01130) through the holes, Philips head positioned on top. Secure with two #10 Nylock nuts (PN 60-0019) as shown in figure 4.03 . A nut drive works well if you have one available. Be sure the coax switch is level before tightening. Do not forget to use a set screw on the exposed portion of the aluminum saddle. Figure 4.04 shows the mounted coax switch base.

Locate the 4 conductor control cable, it will be a single piece, 3 ft in length. Trim the cable jacket off (about 1-1/2" will suffice) and remove the foil. Be careful when removing the cable jacket—too much pressure can cause damage to the other wires. Trim the reinforcing thread so that you end up with a cable end that looks like figure 4.05.

Only three of the four wires are used, along with the shield wire. The green wire needs to be trimmed as shown in figure 4.06. Use electrical tape to cover the end of the trimmed green wire, to ensure that there is no opportunity for an electrical short to occur. Figure 4.07 shows the completed control wire prep. It is not required, but you may want to tin the ends of the control cable, to prevent fraying of the copper strands.

FIG. 4.01

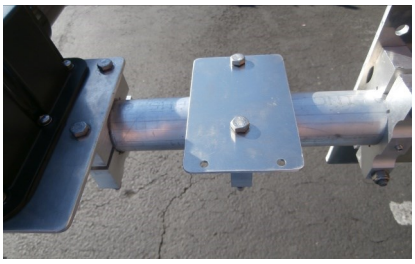


FIG. 4.02

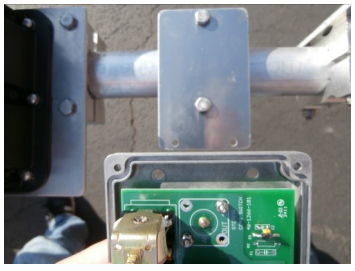


FIG. 4.03

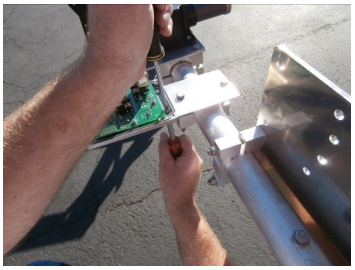


FIG. 4.04

FIG. 4.05

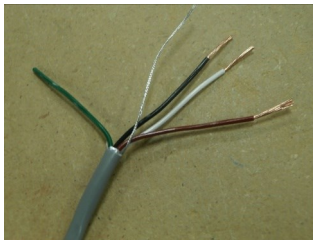


FIG. 4.06

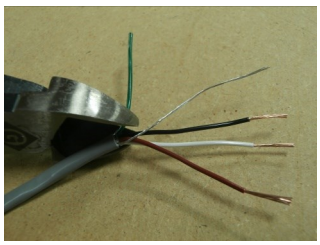
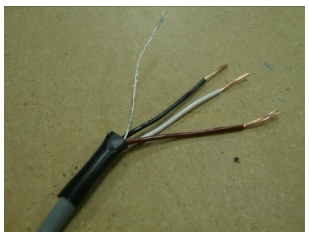


FIG. 4.07



COAX SWITCH WIRING

Figure 4.10 shows the wiring sequence for the coax switch. **BE CERTAIN TO NOT USE TERMINAL PIN R4 AS SHOWN IN** figure 4.11**.** This is the green that was cut off in the earlier step.

Always dip your bare copper wire ends into the provided connector protector before securing to the terminal connections. Insert wires as shown in figure 4.12.

Form a knot in the control cable as shown in figure 4.13. This will serve nicely as a strain relief. Be careful not to over-stress the control cable while forming your knot. Additionally, a tie wrap works well.

FIG. 4.10

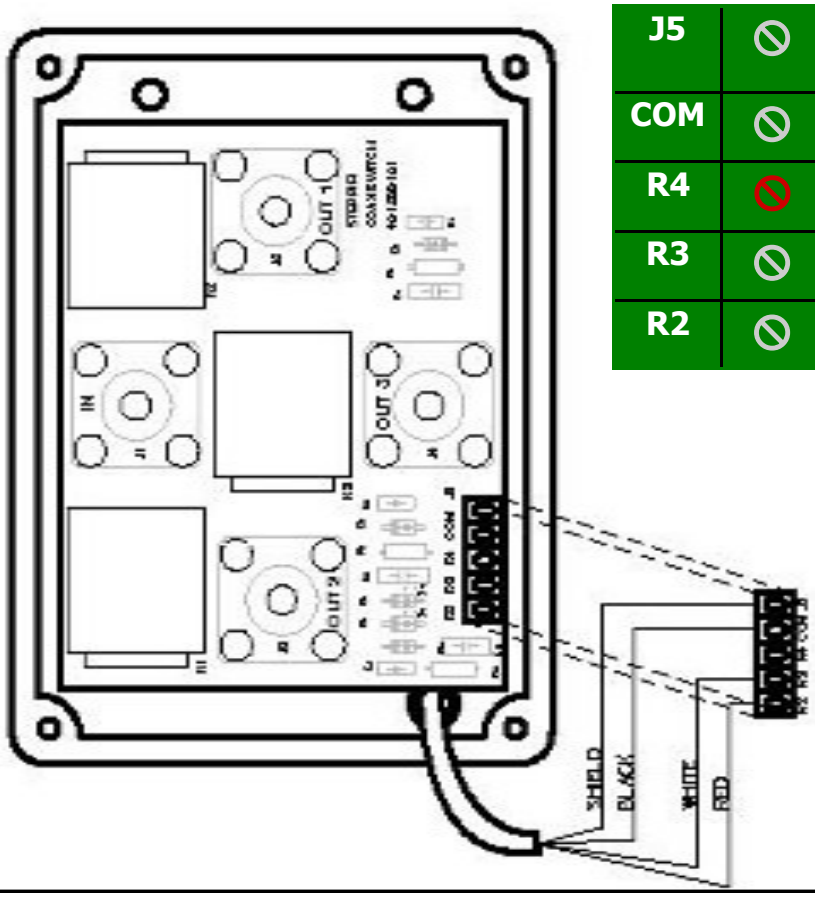


FIG. 4.11

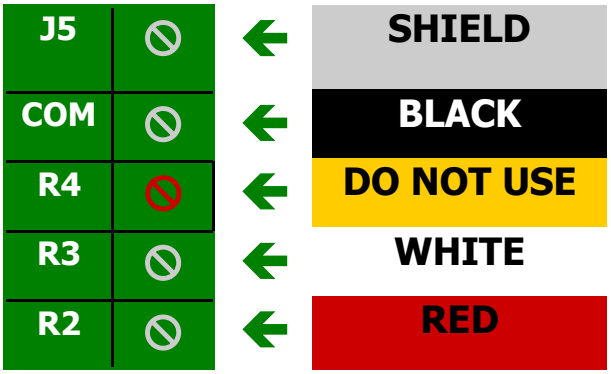


FIG. 4.12

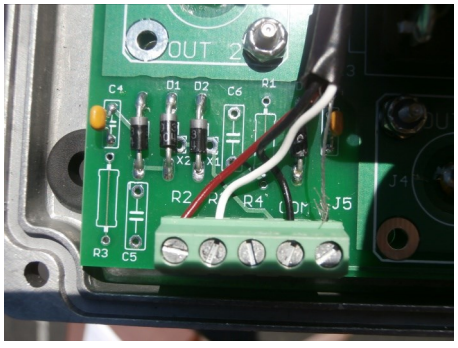
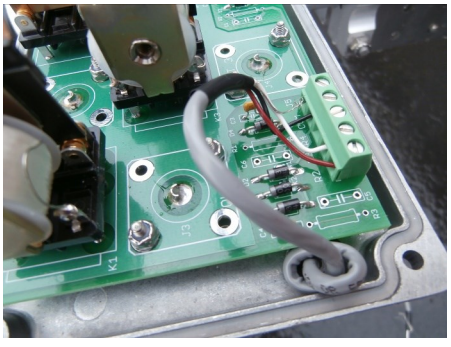


FIG. 4.13



SEALING & SECURING THE COAX SWITCH HOUSING

Locate the small plastic baggie that contains the enclosure gasket and the screws used for securing it as shown in figure 4.20. Inside this baggie there will also be two tiny 1/4" screws—these will not be used.

The gasket is more accurately described as "piping" material. Push this material into the gasket tray as shown in figure 4.21. There is plenty of material, and you will need to trim it as shown in figure 4.22.

Lower the top half of the enclosure and position so that the mounting holes are lined up as shown in figure 4.23. Locate the flathead threaded screws included in the plastic baggie. The screws will be inserted from the bottom of the housing as shown in figure 4.24. Tighten so that the lid is firmly in place.

You will likely need to take the lid off for the final wiring test, but leaving it in place is necessary in order to protect the components of the coax switch housing while completing assembly of the antenna.

Figure 4.25 shows the completed coax switch housing.

FIG. 4.20

FIG. 4.21

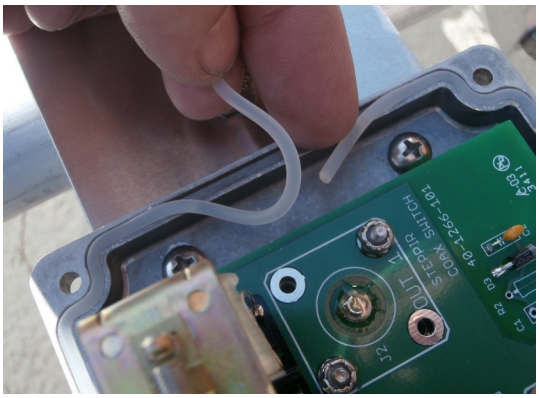


FIG. 4.22

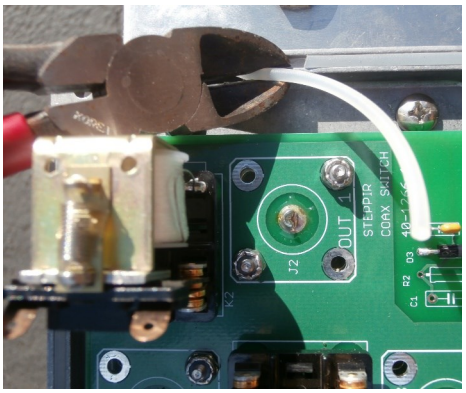


FIG. 4.23

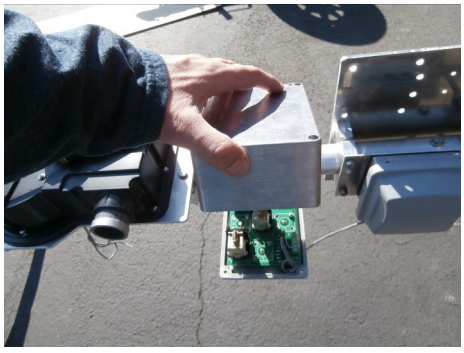


FIG. 4.24

FIG. 4.25

ATTACH THE COAX JUMPERS & FEED LINE

Figure 4.30 shows the coax switch housing with the appropriate coax connections. The table in figure 4.31 identifies the orientation of the feedline and the three coax jumpers. Route the coax jumpers along the boom, being careful to avoid placement on sharp edges. Secure with electrical tape.

Taping of the coax jumpers and control cable to the boom should be one of the last items done before mounting the DB18E onto the mast. The coax jumpers will need to be disconnected during the wiring testing covered in Chapter Five.

Figure 4.32 shows how the coax jumpers should be routed to each EHU. NOTE: The drawing shows the coax jumpers as being below the boom—this is for illustration purposes only. The coax jumpers should be taped against the antenna boom. It is a good idea to label each coax jumper in case you ever need to remove them.

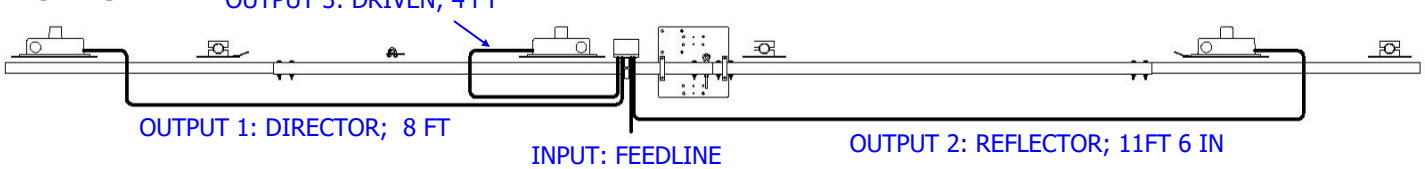
As a last step we recommend waterproofing the PL259 connectors using coax-seal. It is a good idea to first put a layer of tape over the PL259's and apply the coax-seal over the tape for ease of removal, should it prove necessary. Do not do this step until the entire antenna has been tested and is ready to put up on the tower.

FIG. 4.30

FIG. 4.31

COAX SWITCH SO239 CONNECTOR	COAX PURPOSE	JUMPER LENGTH
IN	FEEDLINE FROM SHACK	NA
OUT 1	COAX JUMPER TO DIRECTOR EHU	8 FT
OUT 2	COAX JUMPER TO REFLECTOR EHU	11 FT 6 IN
OUT 3	COAX JUMPER TO DRIVEN EHU	4 FT

FIG. 4.32



MOUNT THE CONNECTOR JUNCTION BOX ONTO BOOM

The connector junction box is the "hub" for all wiring. It has a hinged cover, which allows for easy access inside. Having pluggable connections makes it much easier to access wiring. An added feature is the inclusion of a 25 pin female connector located on the inside of the connector junction box. This makes it easy to do antenna testing at the install site, as opposed to having to go all the way inside the ham shack to access the electronic controller. **NOTE:** If you purchased the optional boom truss or element truss kit, the connector junction box mounts in a different location than that shown in the following steps. Refer to Chapter Eight, Section 8.0 for details.

In most cases, the connector junction box will be in "ready to mount" position. There are occasions where you will receive a junction box with the mounting plate in the wrong configuration, due to the many different configurations used for our various antennas. While we try to make sure this does not happen, if it does, the fix is an easy one. Unscrew the #6 Nylock nuts as shown in figure 5.01. You will need a Phillips screwdriver for the other end of the screw, located inside the junction box enclosure. Be careful to avoid damaging the circuit board that the screw rests on when removing the screw. Detach the mounting plate from the junction box and reposition as shown in figure 5.02. Reattach the screws and nuts and tighten.

The connector junction box attaches to the saddle bolts used for mounting the boom onto the mast plate as shown in figure 5.03. Remove the 5/16" Nylock nuts from the aluminum saddle bolts and mount the connector junction box onto the saddle bolts. The hinged cover needs to open from the bottom, as shown in figure 5.04. When the mounting plate is configured correctly, place the Nylock nuts on the bolts again and tighten

NOTE: If you have purchased the optional boom truss, the location of the connector junction box will impede the ability to attach the saddle halves to the mast plate as explained in Chapter Ten. Doing this step now will save some frustration later on. Figure 5.05 shows the two #10 machine screws. Follow the instructions in Chapter Ten and then continue with Chapter Five.

FIG. 5.01

FIG. 5.02

FIG. 5.03

FIG. 5.04

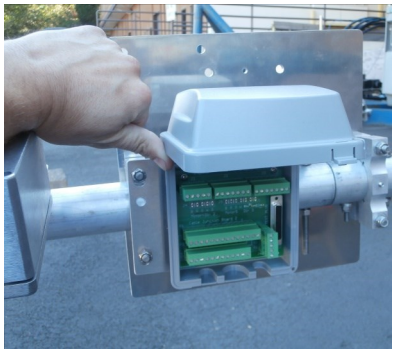
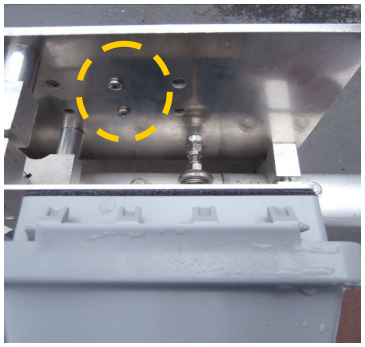


FIG. 5.05



WIRING THE CONNECTOR JUNCTION BOX

Every electrical function is routed through the connector junction box. There are six junction connections, each of which consists of a female header that is attached to the circuit board inside the box, and a male plug for each as shown in figure 5.10. When we ship the connector junction box, the plugs will already be attached to the female headers and will need to be removed for wiring as shown in figure 5.11. Figure 5.12 shows the connector junction box with the plugs removed.

The table below identifies each of the connector junctions inside the connector junction box and provides notes for each connection.

Note: The wiring drawings for Figure 5.14, 5.15 and 5.16 mentioned below, will follow this page.

Figure 5.14 shows detailed wiring information for each of the connector junctions inside the box. Be sure to dip each of the exposed wires into the included connector protector before inserting into the terminal strip inside the junction box. Figure 5.15 shows in detail the diagram for connecting the 16 wire control cable to the P1 and P2 plugs inside the junction box. Figure 5.16 shows in detail the diagram for connecting the control cable from the coax switch to the junction box. When connecting the wiring for J6 (coax switch housing), the green wire will need to be trimmed and taped in the same manner covered in Chapter Four, section 4.0.

- When routing wires through the cover of the junction box, **DO NOT** seal around the wires. The channel is left open to allow any condensation collecting in the box to escape.
- Don't forget to relieve strain from your cables in the junction box. This can be done by using a zip tie on the inside of the box to prevent the cables from pulling out.
- Use dielectric grease (included in the box) to protect each bare conductor. Apply the grease to the plug/header connection as well.
- We recommend using a small zip tie through the hole next to the junction box's latch to keep it permanently closed. Do this **AFTER** final wiring and testing.

FIG. 5.10

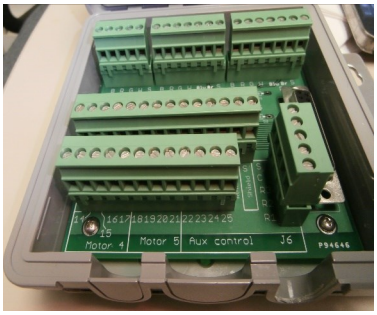


FIG. 5.11

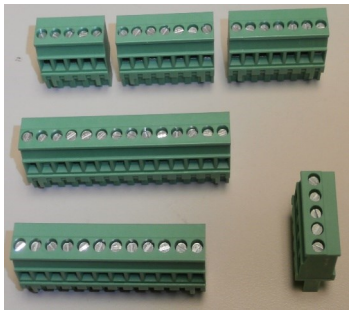
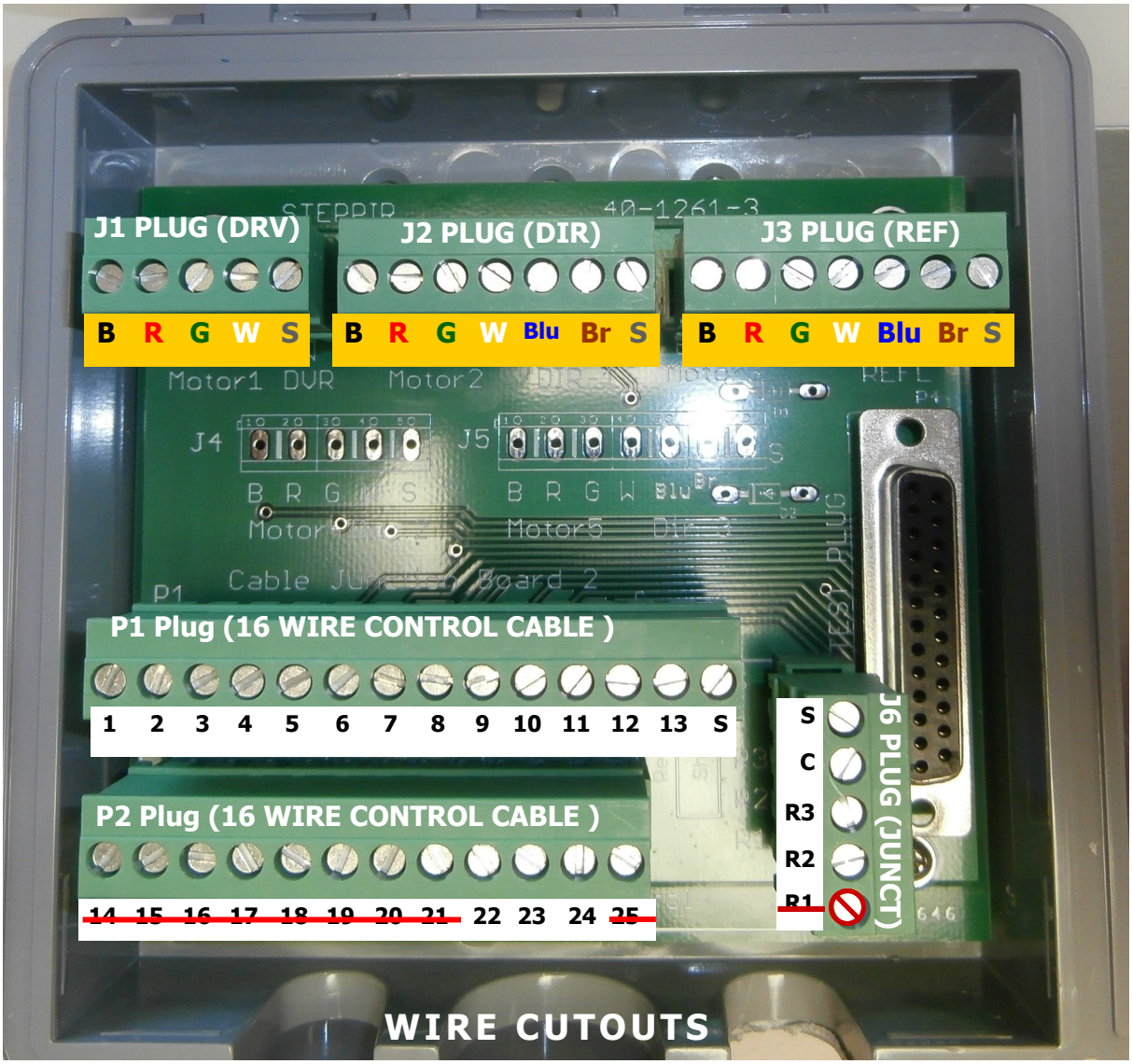


FIG. 5.12

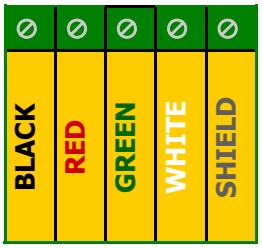
ID	Cable Routed From:	Installation Notes
J1	DRIVEN ELEMENT	4 wire control cable, plus shield wire (all wires used).
J2	DIRECTOR	6 wire control cable, plus shield wire (all wires used).
J3	REFLECTOR	6 wire control cable, plus shield wire (all wires used).
P1	CONTROL CABLE FROM HAM SHACK	The first 13 wires of the 16 the conductor cable used, plus the shield wire.
P2	CONTROL CABLE FROM HAM SHACK	ONLY pins 22, 23 and 24 are used on the P2 junction. The rest are NOT USED.
J6	COAX SWITCH HOUSING	4 wire control cable; the green wire needs to be trimmed and taped; R1 is NOT USED. 3 total wires used, plus shield wire.

WIRING THE CONNECTOR JUNCTION BOX (continued)

FIG. 5.14

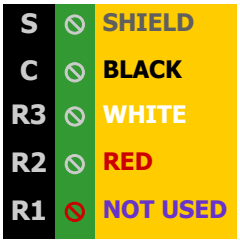


4 wire control cable key



6 wire control cable key

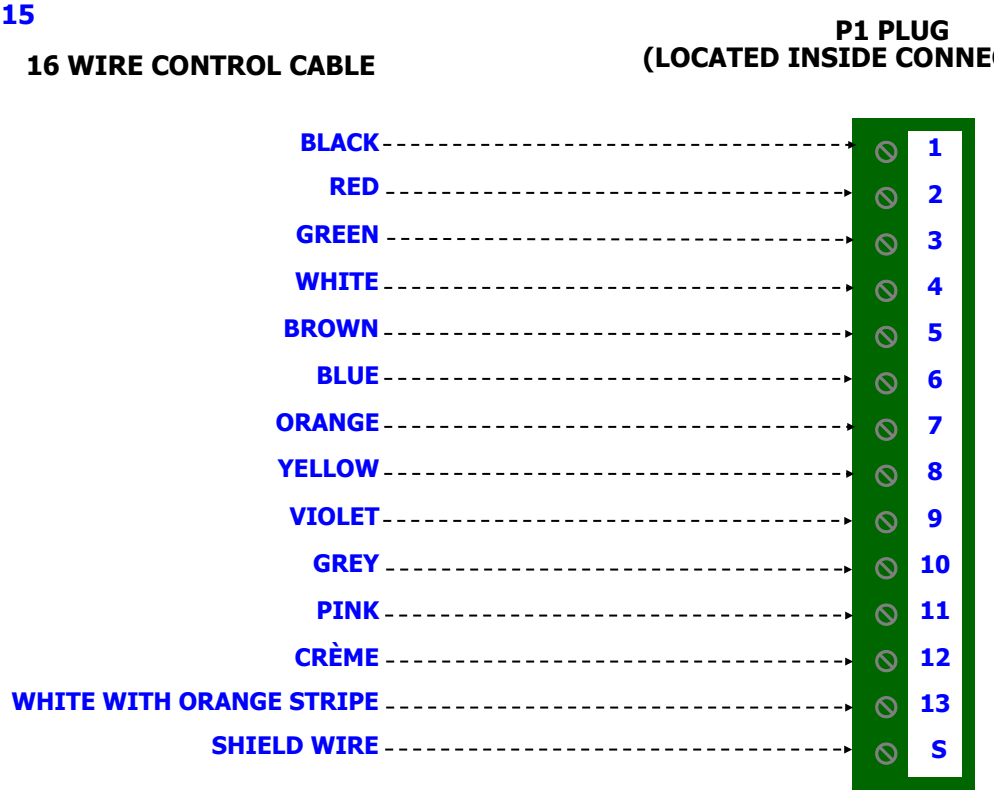
Coax switch wiring key

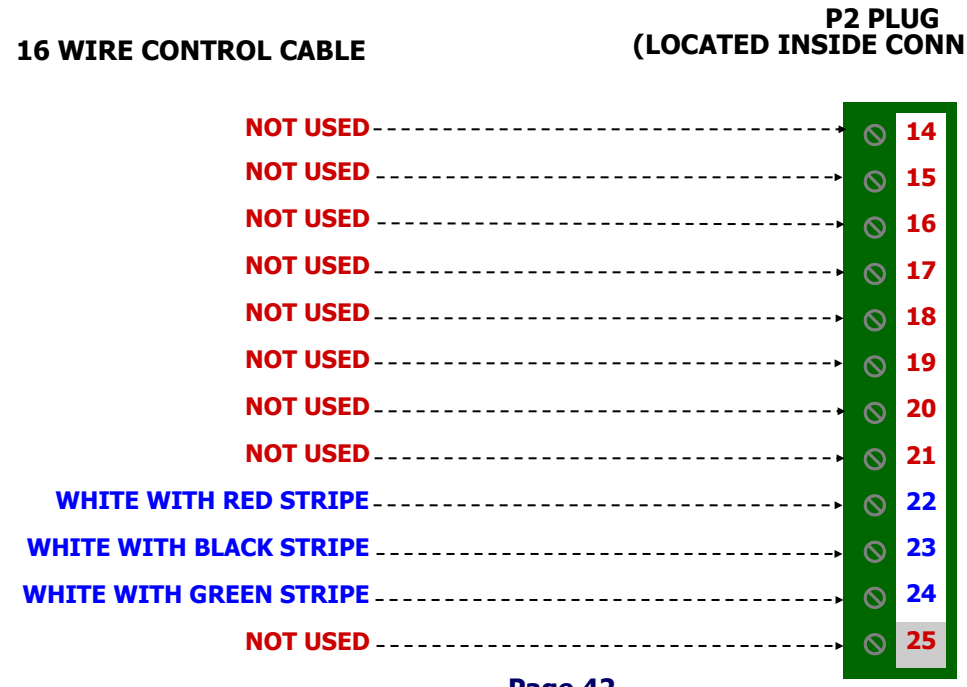


WIRING THE CONNECTOR JUNCTION BOX (continued)

WIRING THE CONNECTOR JUNCTION BOX (P1 & P2 PLUG TO 16 WIRE CONTROL CABLE)

FIG. 5.15

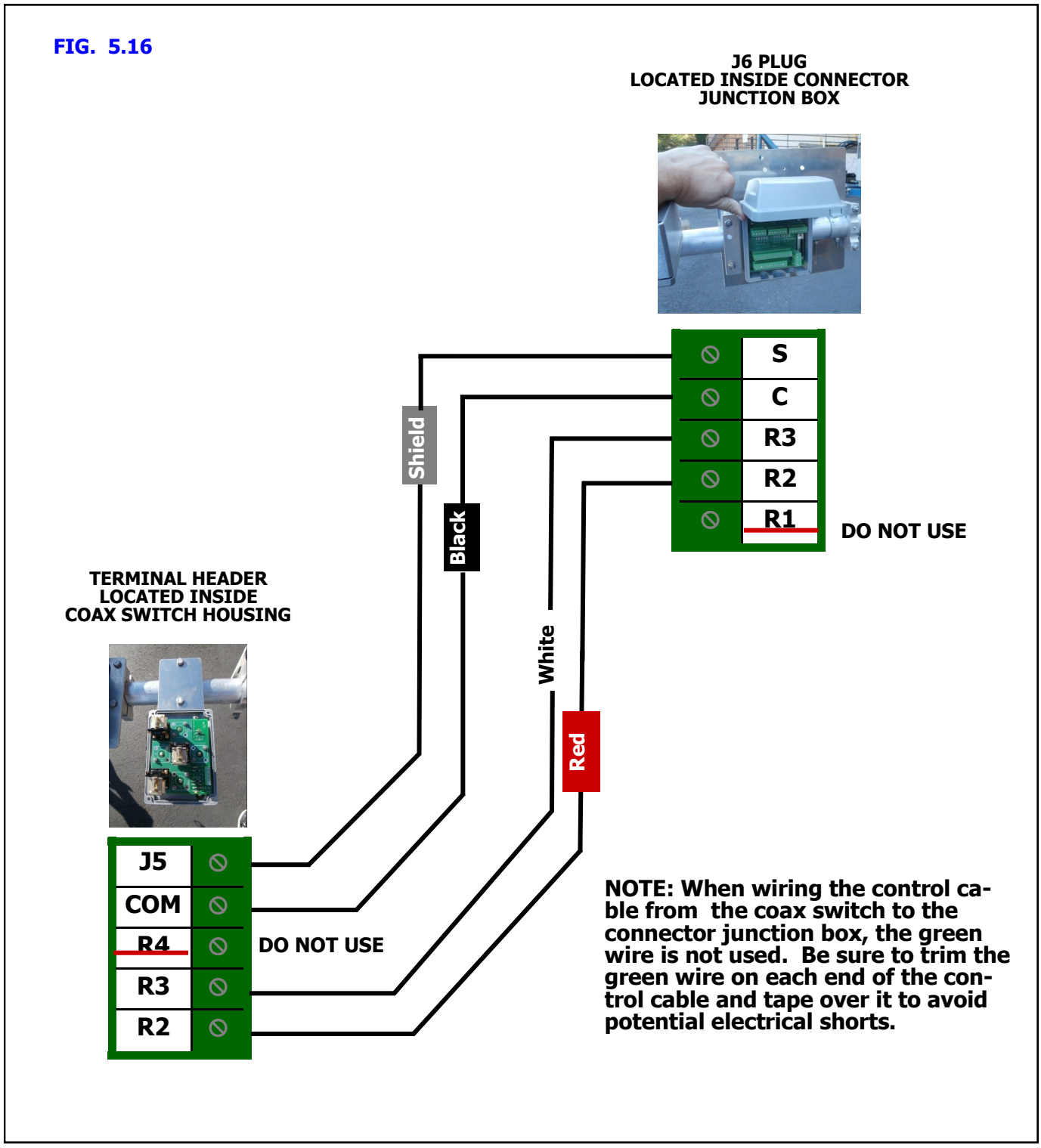




WIRING THE CONNECTOR JUNCTION BOX (continued)

CONNECT CONTROL CABLE FROM COAX SWITCH TO JUNCTION BOX

FIG. 5.16



WIRING THE CONNECTOR JUNCTION BOX (continued)

PREPARING THE CONTROL CABLE

1. Strip the jacket and aluminum shielding off of the control cable as shown in figure 5.20, approximately 2.75" from end of control cable, being careful not to damage the individual wires.
2. Strip the plastic insulation off of each of the control cable wires, approximately 0.25" in length should be bare wire.

CONNECTING CONTROL CABLE TO THE DB25 SOLDERED CONNECTOR

If you purchased the default DB25 connector, follow the steps below to connect it to your control cable. If you purchased the optional DB25 Field Splice upgrade, skip ahead to the next section.

1. Solder each wire to the appropriate pin of the 25 pin connector. Refer to the table on the following page for the correct wiring sequence.
2. Attach the clamp to the control cable approximately 1" from the connector and secure with the provided hardware as shown in figure 5.21.
3. Place the connector between the back-shell halves as shown in figure 5.22 and secure with the provided hardware.

CONNECTING CONTROL CABLE TO THE OPTIONAL DB25 FIELD SPLICE

The optional DB25 Field replaces the standard connector with a convenient solder-less connection of the control cable to the SteppIR controller. If you purchased this option, follow the steps below to connect it to your control cable.

1. Apply the provided dielectric grease to the exposed copper portion of each wire.
2. Connect each wire to the appropriate terminal and tighten using a flat head screwdriver. Note that the terminals may be closed by default. If so, turn the terminal screw ccw ~10 turns to open it before inserting the wires. Consult the table on the next page for the correct wiring sequence.
3. Position the control cable between the cable clamp halves as shown in figure 5.23.
4. Tighten the two pan head screws until the cable is snug, but do not over-tighten.
5. Thread the two thumb screws into the connector face as shown in figure 5.23.
6. Plug the DB25 splice into the back of the controller and twist the thumb-screws to secure it.

FIG. 5.20

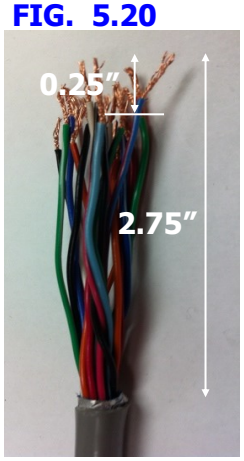


FIG. 5.21

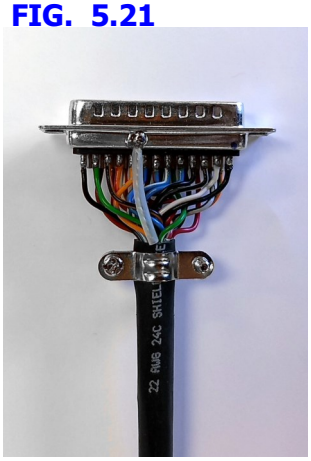


FIG. 5.22

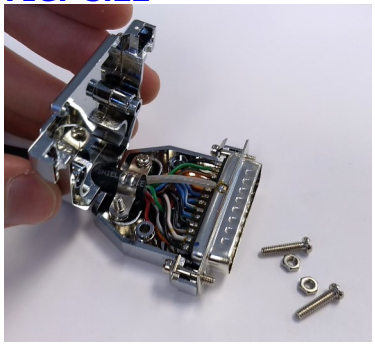
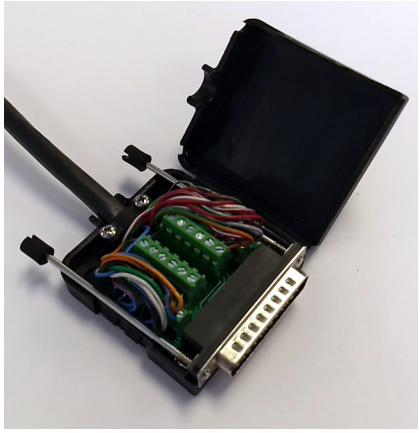


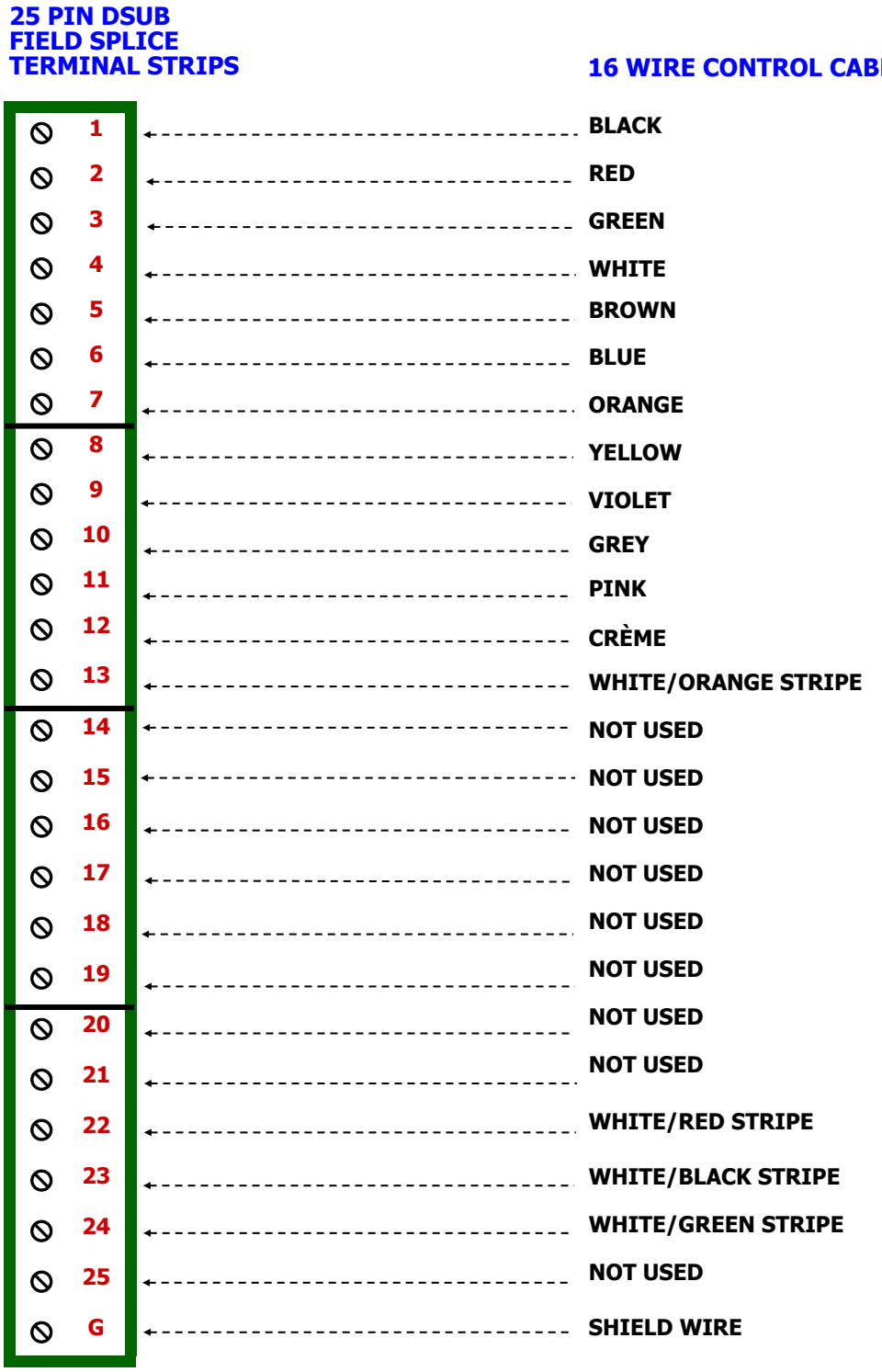
FIG. 5.23



WIRING THE CONNECTOR JUNCTION BOX (continued)

CONNECTING CONTROL CABLE TO DB25 FIELD SPLICE (continued)

FIG. 5.27



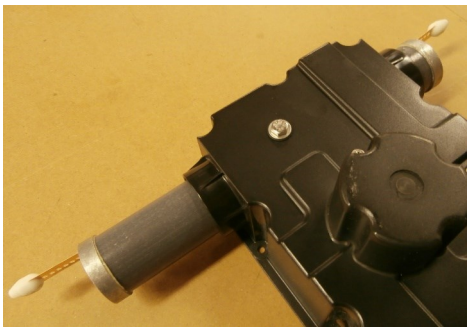
Note: If you are wiring the control cable yourself using a 25 pin connector and backshell instead of using the above dSub field splice, use the same pin numbers shown above. For the 25 pin connector installation, you would solder the ground wire to the case of the 25 pin connector and then put the backshell on.

WIRING TEST

Read the SDA-100 Operators Manual so that you are familiar with operation of the controller. You will also need an ohm meter or continuity tester for most of these tests. At this time the controller should NOT be connected to your radio or computer. Also, the coax jumper cables and fiberglass poles should not be installed on the antenna.

1. With the control cable NOT CONNECTED to the controller, turn the controller on. It should read "Manual Mode Elements Home". If not, push the "Retract" button. After the controller is finished tuning it will turn off. You will need to turn the controller back on. The controller will now read "Manual Mode Elements Home".
2. The next step is to test that each of the elements will extend their copper tapes out properly.
3. ENSURE THAT ALL THE ELEMENTS ARE CLEAR OF ANY OBSTRUCTIONS. The copper tape will be extended out from both sides of each EHU for approximately 6 inches.
4. Go into Setup mode and select "Create, Modify".
5. Now CONNECT the control cable to the controller.
6. Select each element (you can only do one at a time), Ref, DVR, D1 and extend them to around 16" as indicated on the controller display. There actually will be approximately 3 inches of copper strip protruding out of each side of the EHU as shown in figure 5.30. This will allow you to put an ohm meter probe on the copper tapes during the tests. Clarification of the abbreviations on the screen of the SDA 100 controller—REF is the reflector, DVR is the driven element (6-30m), and D1 is the director.

FIG. 5.30



7. If at this point if any of the tapes do not extend, or the individual EHU/element does not correspond to the correct controller description, (I.E.: The Antenna Reflector is controlled by the REF position on the controller.) STOP, retract the elements, disconnect the control cable and correct any wiring errors. Then start at the beginning of these instructions.

8. Now DISCONNECT the control cable BEFORE exiting "Create, Modify". This is to prevent the elements from moving when changing the controller to the first test frequency. Exit "Create, Modify" by pushing the "Setup" button.
9. Set the controller to the "Normal" direction by pushing the button labeled "Norm". The green LED next to the button should light.
10. Set the controller to any frequency in the 20m band (14.000-14.350mhz).
11. When the controller indicates it is no longer trying to move the elements (the LED labeled "Tuning" will stop flashing) RECONNECT the control cable again.
12. Set your ohm meter to a low ohms scale (around 200 ohms or so).

WIRING TEST (continued)

13. Measure the resistance on each of the three elements (Driven, Ref, D1) between the center conductor of the SO-239 on the EHU and EACH of the two copper tape elements on that same EHU as shown in figure 5.31 and Figure 5.32. The Driven element should measure a very low resistance of 3 ohms or less (has Continuity) while REF and D1 should measure as an OPEN circuit (a very high resistance value, NO continuity). Note that when an element is in the "driven" mode there will be continuity between the copper tapes on that EHU. Rest assured it is only a short at DC and not RF frequencies, this is intended by the design of the balun. These tests confirm that the Driven element is acting as a driven and that REF and D1 will act as passive elements on 6-30m.

FIG. 5.31

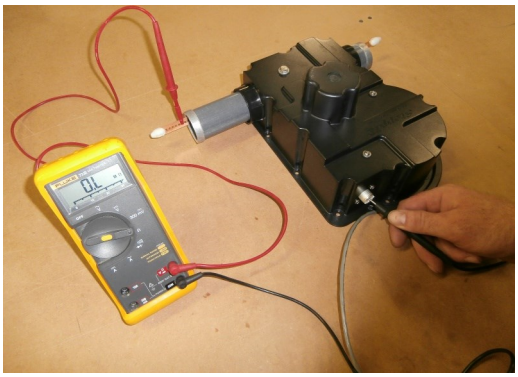


FIG. 5.32

14. The next test is to verify the Coax Switch Box has selected the proper coax line.
15. On the antenna Coax Switch Box, use the ohm meter to verify there is very low resistance, less than 3 ohms (has Continuity) between the center conductor of the SO -239 connector labeled "IN" and the center conductor of the SO-239 labeled "OUT3" as shown in figure 5.33. Verify that an Open circuit (very high resistance reading, No Continuity) exists between the center pin of the "IN" coax connector and "OUT1" center pin as shown in figure 5.34 and also between "IN" and "OUT2" coax connector center pins as shown in figure 5.35.

FIG. 5.33

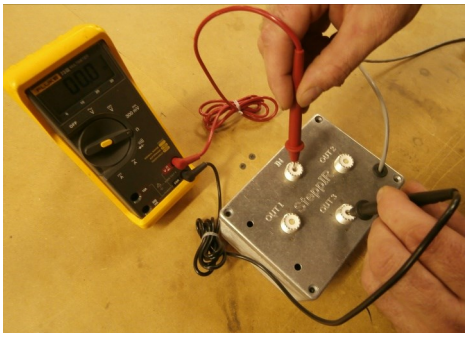


FIG. 5.34

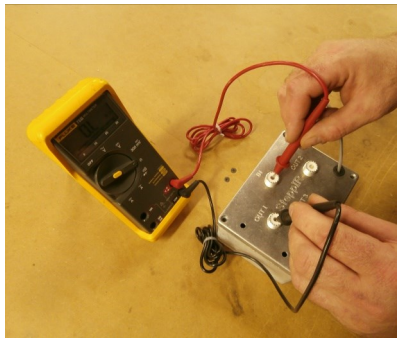
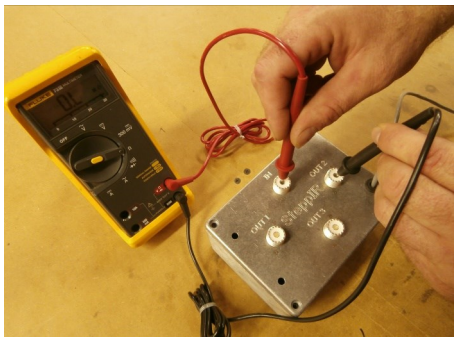


FIG. 5.35



16. If any of these tests fail, Stop, Push Retract, Disconnect the controller cable and check your wiring and correct any mistakes. Then restart the test procedure at the beginning.

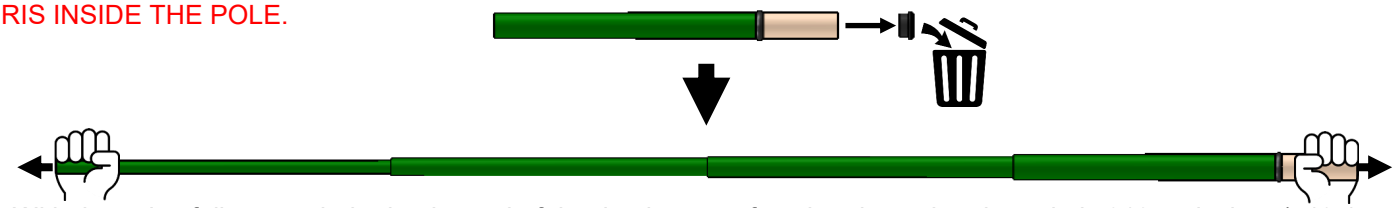
17. If all the tests results are good from step 15, DISCONNECT the control cable.

WIRING TEST (continued)

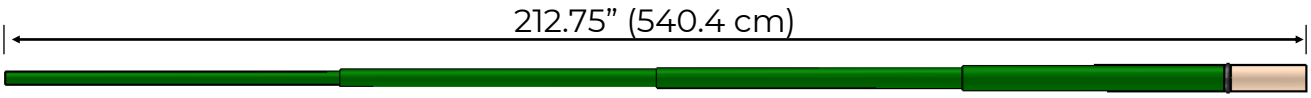
18. Set the controller to any frequency in the 40m band (7.00 – 7.300Mhz) and stay in the "NORM" direction and wait for the "Tuning" LED to stop.
19. RE-CONNECT the control cable. Now D1 is the driven element and should measure less then 3 ohms (has Continuity) between the EHU coax connector center pin and EACH of the two copper elements. The Driven element is not used on 40m and is disconnected by the Coax Switch Box. The REF EHU should now measure as an OPEN circuit (very high resistance, No continuity) between the coax connector center pin and EACH of the copper tapes.
20. The antenna Coax Switch Box should now measure less than 3 ohms (has Continuity) between the "IN" coax connector center pin and the "OUT1" connector center pin. There should also be an OPEN circuit (very high resistance, No continuity) between "IN" and "OUT2" coax connector center pins and also between "IN" and "OUT3" coax connector center pins.
21. DISCONNECT the control cable from the back of the controller.
22. Set the controller to the "180" direction, stay on the same 40m frequency, and wait for the "Tuning" LED to stop.
23. RE-CONNECT the control cable and repeat the above procedure except now REF is the driven element and should measure less than 3 ohms (has Continuity) between the EHU coax connector center pin and the EACH of the copper tapes. The Driven EHU is still not used on 40m. D1 EHU should now measure as an OPEN circuit (no continuity, very high resistance) from the center pin of the coax connector to EACH of the copper tapes.
24. The antenna Coax Switch Box should now measure less than 3 ohms (has Continuity) between the "IN" coax connector center pin and the "OUT2" connector center pin. There should be an Open circuit (No continuity, very high resistance) between the center pin of the "IN" coax connector and "OUT1" connector center pin and also the "IN" and "OUT3" coax connector center pins.
25. If the results of these tests are good DISCONNECT the control cable. On the controller push the "SETUP" button and select "Retract Elements" and choose "YES". Wait until the "Tuning" LED stops.
26. RE-CONNECT the control cable. You should still be in "SETUP". Scroll through and select "CALIBRATE" and then choose "YES". The copper tape will go back into the EHUs, and you will now hear a ratcheting sound for approximately 70 seconds. When finished the controller and antenna are now synchronized.
26. Push "POWER" and the controller will now turn off. DISCONNECT the control cable.
27. This concludes the tests and verifies the antenna is wired correctly and that all of the relays are switching correctly.

PREPARING THE TELESCOPING POLES

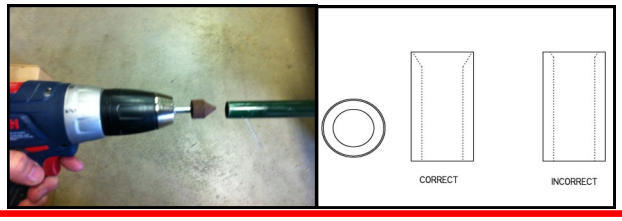
1. Extend the telescoping poles (PN 10-1013-02) to full length by firmly locking each section of the pole in place. A good methodology is to position each half of the joint so that they are several inches apart (while still within each other), and then pull quickly and firmly. Do this for each pole.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



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

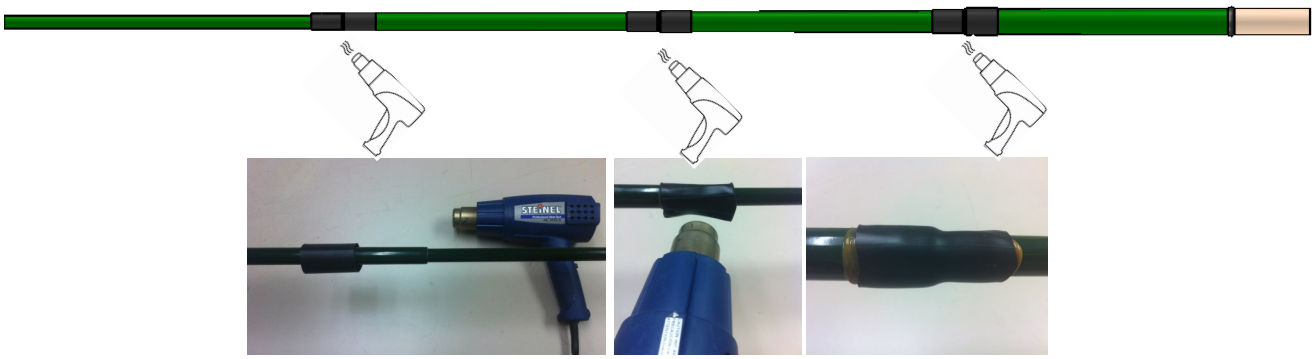


3. Using the conical drill bit, chamfer the tips of the 40/30 poles as shown below. The image below shows the proper angle to chamfer to. Clean out the interior of the fiberglass poles after chamfering it.



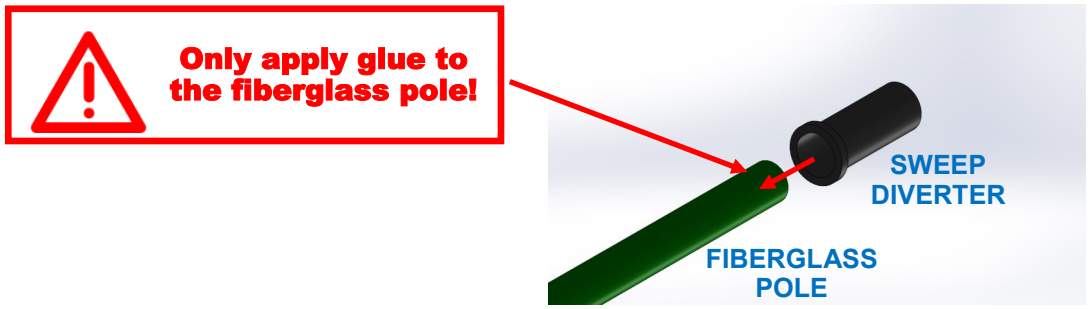
LOOK INSIDE OF THE TELESCOPING POLE TO VERIFY NOTHING IS BLOCKING IT. YOU SHOULD BE ABLE TO SEE LIGHT AT THE OTHER END IF THE POLE IS KEPT STRAIGHT. DEBRIS INSIDE THE TELESCOPING POLES CAN LEAD TO FAILURE OF THE EHU.

4. Each telescoping pole uses 3 polyolefin heat shrink pieces 1.5" x 3" (PN 10-1059-01), one covering each joint after it has been pulled tight. Once finished, the seal is secure and waterproof. This product requires a heat gun for activation of the adhesive.
5. When positioning the heat shrink, place it so that the joint of the telescoping pole is centered in the middle of the heat shrink.
6. Using a heat gun (hair dryers will NOT work), apply heat evenly around the entire area of heat shrink. Note: there are 4 blue colored lines imprinted on the tubing. The joint is considered done being heated and waterproof when the lines change color to a yellowish green. Each line needs to change color to ensure even adhesion temperatures.
7. The heat shrink will want to slide as it is heated so wear gloves and reposition the heat shrink to keep it centered on the joint as needed. Caution: The heat shrink will be HOT, wear insulated gloves!

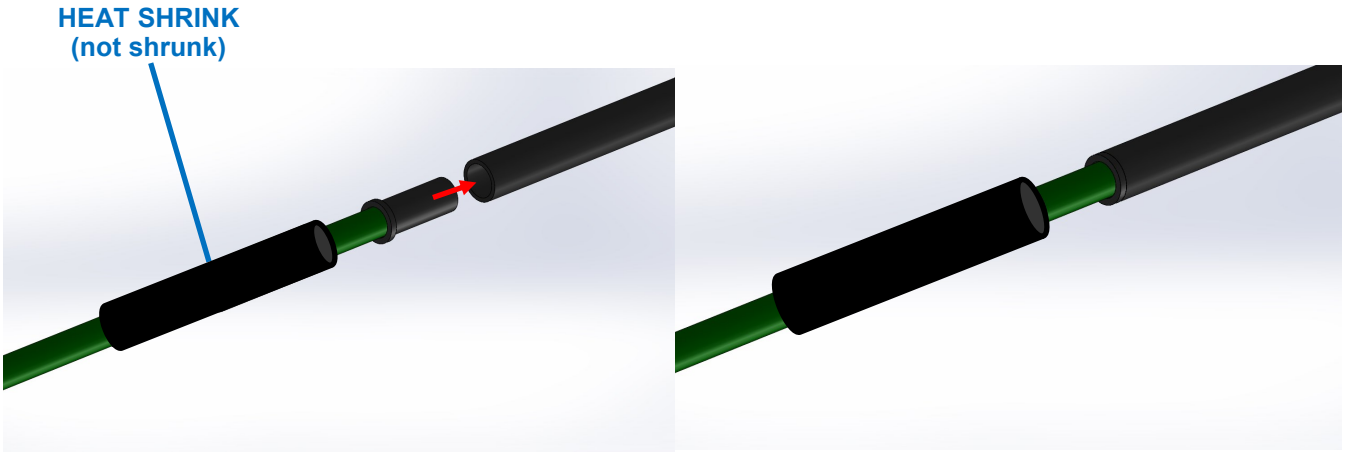


ATTACHING SWEEPS AND DIVERTERS TO FIBERGLASS

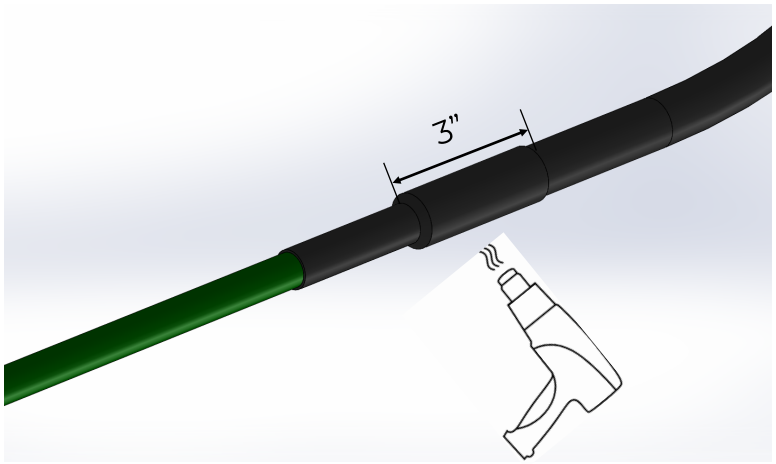
8. Use the glue kit (PN 72-0009-03) from the glue/tape kit to attach the sweep diverters (PN 10-1511-01) to the tips of the fiberglass telescoping poles. ONLY APPLY GLUE TO THE FIBERGLASS. Slowly rotate the sweep diverter as you slide it onto the pole to let the glue cover the most surface area possible.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



9. Put a piece of polyolefin heat shrink 1.1” x 6” (PN 10-1059-21) onto the telescoping pole, leaving the diverter clear. It should be down on the pole far enough that it doesn’t interfere with fitting the diverter into the sweep.
10. Insert the fiberglass pole, with the sweep diverter on it, into the sweep as far as possible. DO **NOT** GLUE THE SWEEP DIVERTER INTO THE SWEEP. Reposition the heat shrink to cover the joint.



11. Shrink the polyolefin sleeve over the joint as described on step 6 on the previous page; LEAVE AT LEAST 3” OF HEAT SHRINK ON THE SWEEP SIDE OF THE JOINT. **Be EXTREMELY careful not to overheat the poly sweep, you will deform or kink the material if too much heat is applied** (if this occurs you will need to undo your work and replace the poly sweep).
12. Remember, the heat shrink will want to slide as it’s heated. Reposition it as it cools to make sure the joint is fully covered. The heat shrink will be hot; wear insulated gloves.



ATTACHING SWEEP COUPLERS TO SWEEP TUBES

- Refer to figure 6.06 during the following steps for an overview of the assembly process.
- Each of the sweep coupler halves (PN 10-1155-01) will have a notch in the mold on one side marked with silver sharpie. IT IS CRITICAL THAT THESE NOTCHES ARE POINTING TOWARDS THE SWEEPS OR THEY WILL NOT WORK PROPERLY. See figure 6.07 for the location of the mark. Be certain that each half of the coupler has the mark facing the sweep tube!

13. Place the coupler halves over the heat shrink on the sweep side of the joint. The flange on the diverter should still be visible through the heat shrink, as well as the edge of the sweep material. The non-marked side of the coupler should be placed as close to the edge of the sweep material as possible, without overhanging, as shown in the cutaway in figure 6.08 where the sweep diverter is highlighted in blue.

14. Insert four of the 6-32 x 2" socket head screw (PN 60-0186) with washer (PN 60-0016). Place the screws so that the threaded portion of the screw is facing downward. BE SURE THAT THE DRAIN HOLES FOR THE PLASTIC SWEEP TUBE ARE POINTING DOWNWARD BEFORE INSTALLING THE COUPLERS.

15. Apply anti-seize to the threads and screw the Nylock nuts on. Tighten using a 5/16" wrench/socket to turn the nut and the provided 5/64" Allen Key to hold the screw. Tighten enough so that the clamp is held in place on the sweep/heat shrink. Final tightening will happen once the fiberglass spreader is installed.

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

FIG. 6.06

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

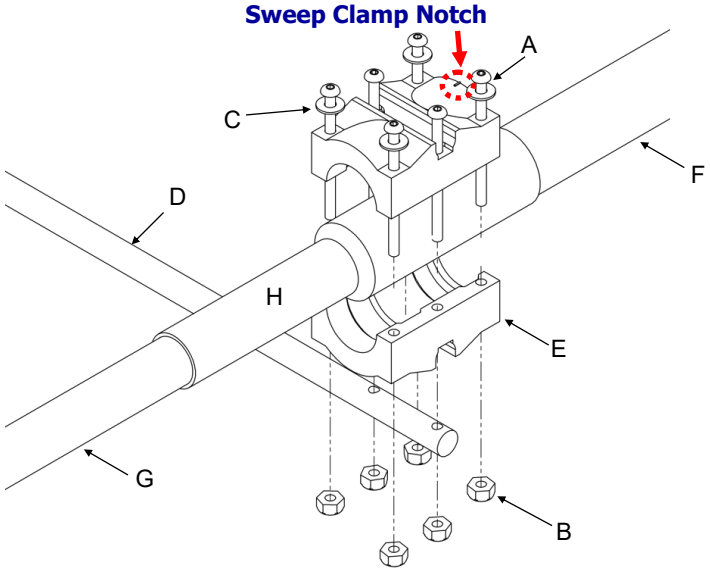
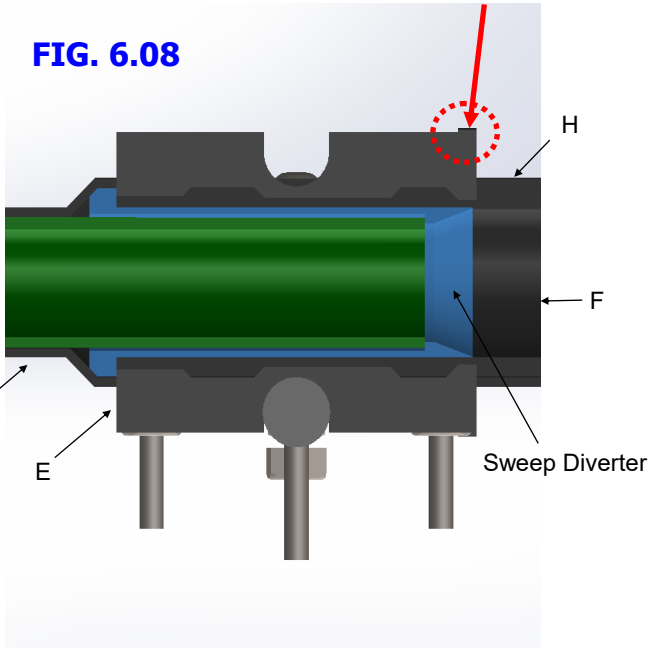


FIG. 6.07

FIG. 6.08



MOUNTING THE FIBERGLASS SPREADERS

17. Mount the black fiberglass sweep spreaders (PN 10-1503-21) to the sweep couplers. There is a concave mounting area on each side of the plastic couplers. Position the fiberglass spreader so that the holes align with the clam shell couplers as shown in figure 6.10. When installing the fiberglass spreader, you will want the spreader to be underneath the plastic coupler as shown in figure 6.11. The spreaders will be longer than the couplers on each side of the loop. This is done on purpose to ensure plenty of fiberglass material is on each side of the screw.
18. Insert 2qty 6-32 x 2" socket head screw (PN 60-0186) through each of the coupler halves and the fiberglass rod. This screw must be placed so that the Nylock nut (PN 60-0014) is resting on the fiberglass material and the screw head are resting inside the concave groove on the top of the sweep coupler. Refer to figures 6.10 and 6.11 for detail. The screws are longer than necessary so that you can get the nut on in the initial stages.
19. Tighten the Nylock nuts firmly. Be sure to use anti-seize on these screws or they will likely gall and have to be replaced.
20. Repeat the previous steps on the other side of sweep tube.

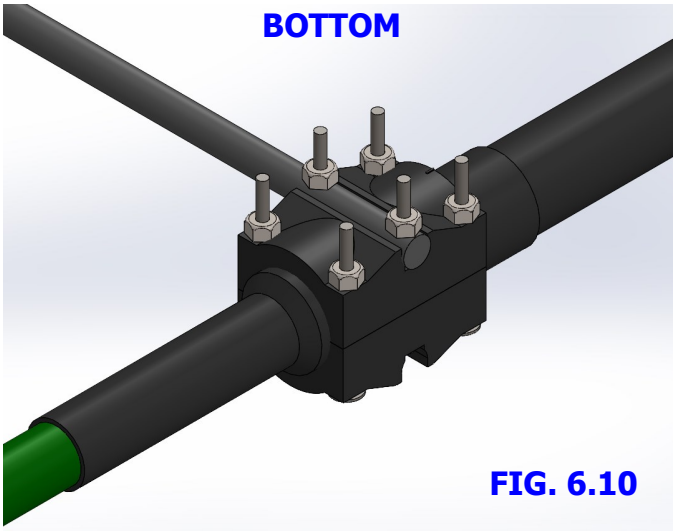


FIG. 6.10

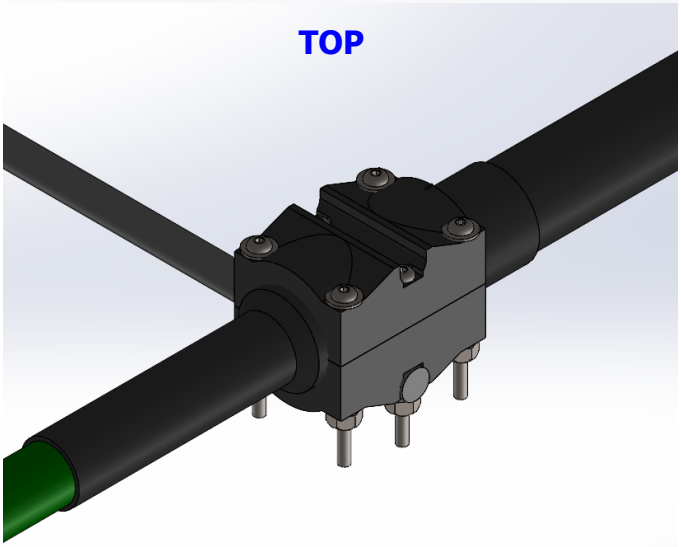


FIG. 6.11

FINAL TIGHTENING

21. Finish tightening the four screws on the outside corners of the plastic coupler. Tighten evenly, in an automobile X type pattern as shown in figure 6.14. If you do not tighten evenly, you may break the fastener. Once the outsides are firmly tight, tighten the two screws that hold the fiberglass spreader in place. Figure 6.15 shows the suggested method for tightening the screws.
22. When completely tightened, THE SWEEP COUPLER HALVES SHOULD HAVE GAP OF ABOUT 5/16" – 3/8", as shown in figure 6.16. This gap is not critical as the coupler is mostly to keep the spreader in place properly. IT IS BEST TO LET THE SCREWS SIT FOR A WHILE (15-30MIN) AND TIGHTEN IN IN-TERVALS IN ORDER TO ALLOW THE PLASTIC CLAMP MATERIAL TO RE-FORM. This also will reduce the chance of snapping a screw.
23. Figure 6.17 shows the completed sweep—repeat the process for each sweep.

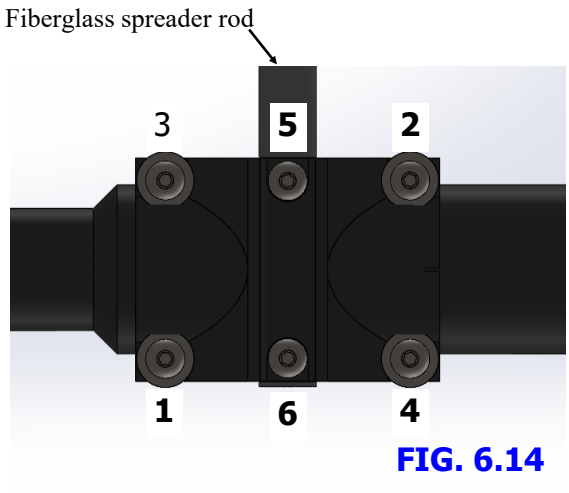


FIG. 6.14

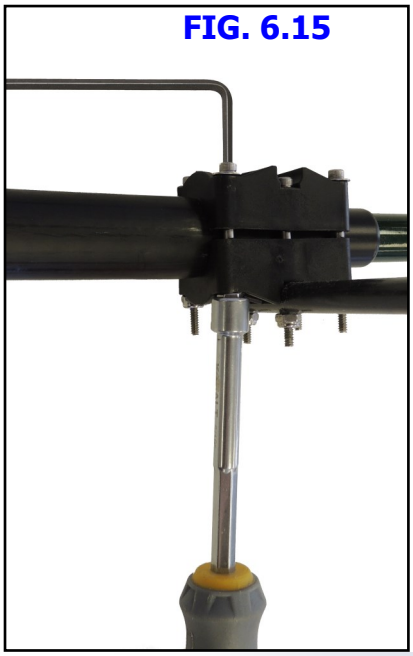


FIG. 6.15

FIG. 6.16

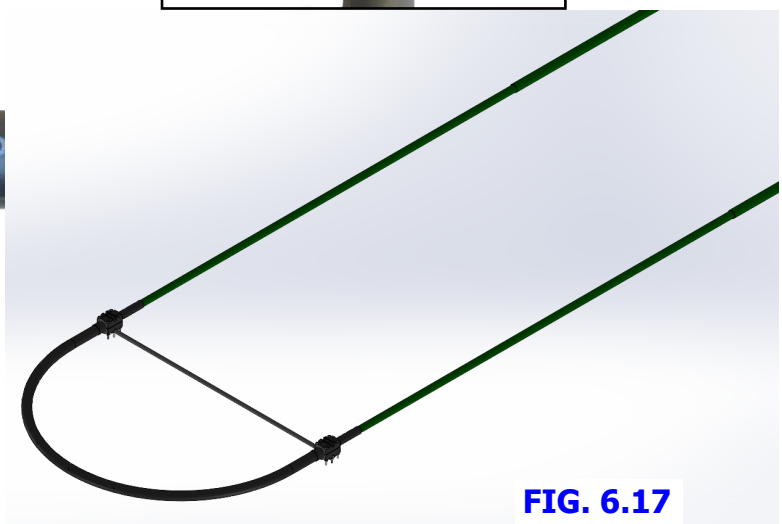


FIG. 6.17

ATTACH FOAM PLUGS TO NON LOOP ELEMENT TIPS

Each 20m-6m telescoping pole tip requires a breathable foam plug to allow for venting of the EHU. The foam plug assembly (PN 70-1007-01) consists of a special UV resistant foam plug material, and a plastic housing as shown in figure 6.30.

The foam plug is installed inside the plastic housing at the factory. No trimming or chamfering is required for the 20m-6m telescoping poles used for the driven element.

The fit of the plastic housing on the pole tip is purposely very tight, so that the foam plug assembly will stay in place. Before attaching the plastic housing, spread a small amount of dish soap around the inside edge of the plastic housing as shown in figure 6.31. This helps the housing slide on easily, and the soap will eventually evaporate, leaving you with a firm interference fit.

Insert the plastic housing onto the telescoping pole tip as shown in figure 6.32. Be sure that the plastic housing bottoms out on the pole tip, as shown in figure 6.33.

Repeat for the other telescoping pole tip.

FIG. 6.30

FIG. 6.31

FIG. 6.32

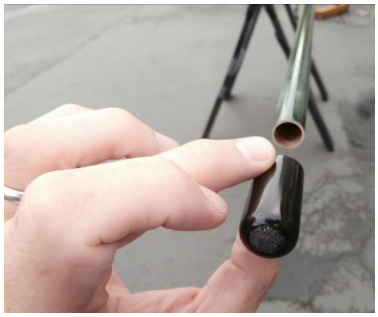
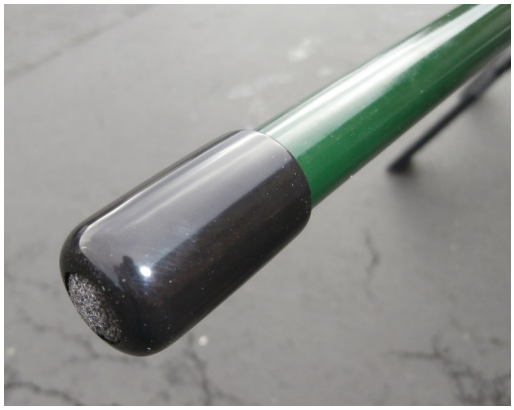


FIG. 6.33



PREPARE THE CPVC INNER-GUIDE TUBE & DIVERTER CONE

The 40/30 loops on the DB18E Yagi use a plastic tube and a diverter cone located inside the telescoping pole, to guide the copper strip out of the EHU. Note that the straight elements do not use this inner tube, only the 40/30 loops. The plastic tube is off-white and is made of CPVC. There are 3 pieces that make up the guide tube assembly: The diverter cone (PN 10-1509-02), the 39-7/8" section of 3/4" CPVC with no coupler (PN 70-2025-23) and the 49" section of 3/4" CPVC with a coupler attached to one end (PN 70-2025-13). The guide tube is not needed on the return side of the loop. Figure 7.01 shows the three pieces in the assembly.

The smaller diameter end of the diverter cone is glued to one end of the 39-7/8" CPVC tube as shown in figure 7.02 . Use the supplied glue and applicator as shown in figure 7.03. Apply the glue evenly around the outside diameter of the tube. Be sure you get even coverage all the way around the tube. Cover about 3/4" of an inch deep as shown in figure 7.03. Firmly push the 39-7/8" CPVC tube into the diverter cone end as shown in figure 7.04. Let the glue dry at least 20 minutes before moving it.

Apply glue evenly around the outside diameter of the 39-7/8" CPVC tube as shown in figure 7.05. Apply approximately 3/4" deep as per prior step. Locate the 49" CPVC tube (PN 70-2025-13) with coupler, as shown in figure 7.06. Push the 39-7/8" tube firmly into the coupler as shown in figure 7.07.

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

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

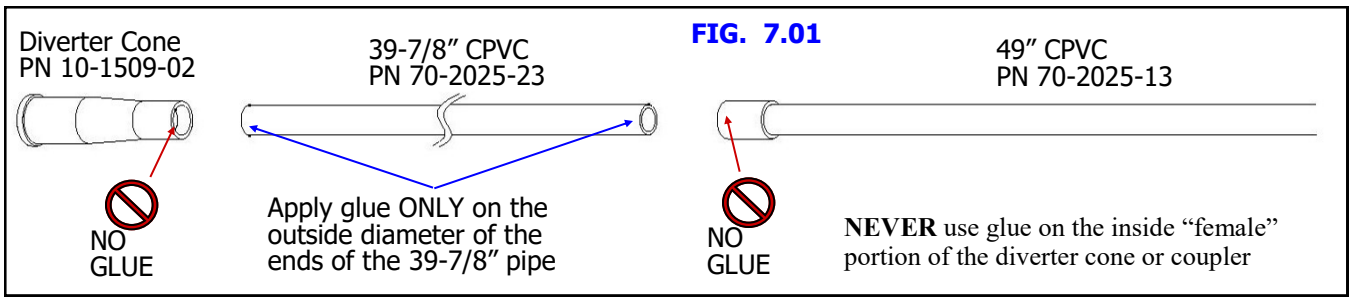


FIG. 7.01

FIG. 7.02

FIG. 7.03

FIG. 7.04

FIG. 7.05

FIG. 7.06

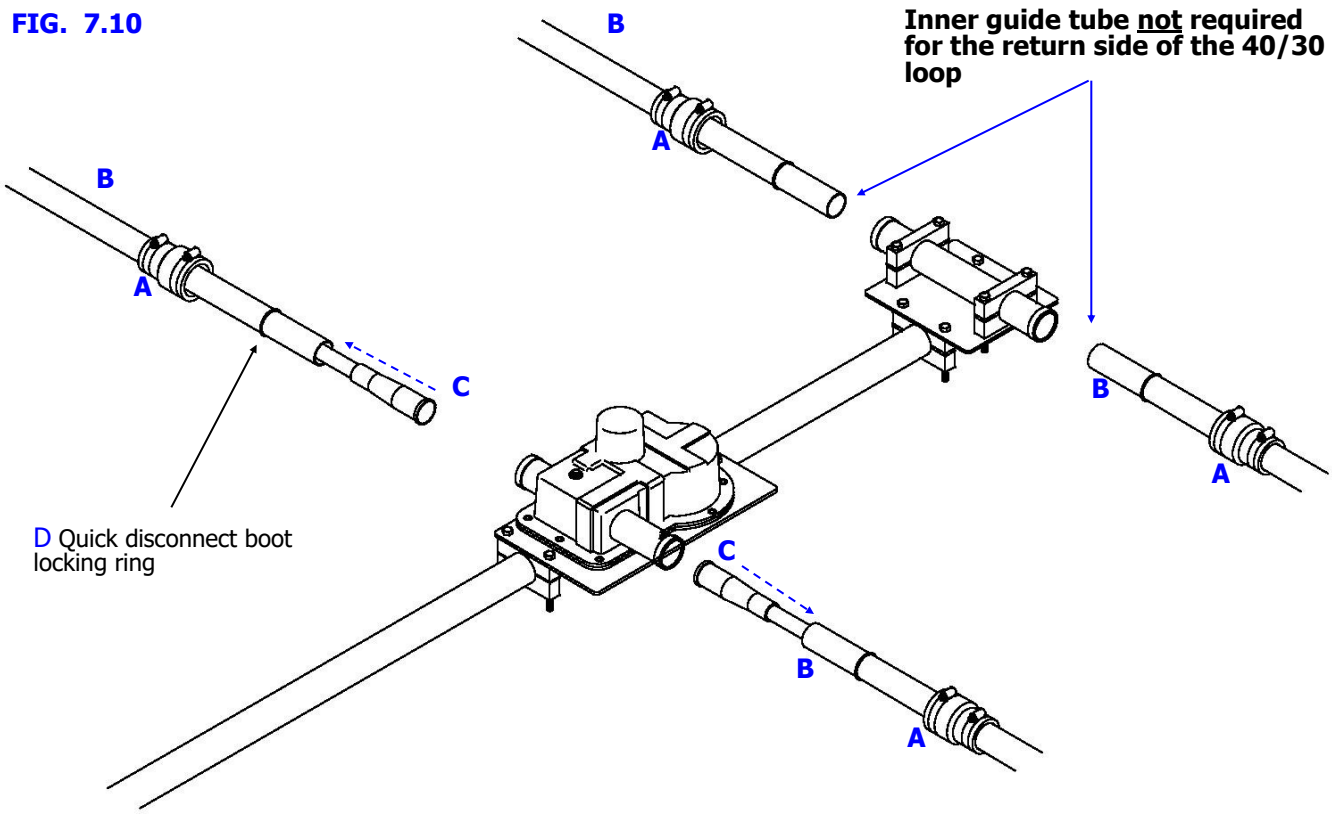
FIG. 7.07

SECURING THE ELEMENT SUPPORT TUBE (EST) TO THE EHU

When the CPVC inner guide tubes are completed, they will need to be inserted into the telescoping poles and secured to each EHU. Figure 7.10 below gives an overview of this procedure, with detailed instructions following on the next page.

This drawing shows the EHU placement for the Reflector element, the procedure is the same for the Director and Driven elements. The parts required in the table below are shown for EACH complete loop assembly.

FIG. 7.10



Key	QTY	Part #	Description
A	4	10-1006-22	Quick disconnect boot
B	4	10-1013-02	Telescoping pole
C	2	NA	Inner guide tube assembly consisting of diverter cone , 39-7/8" and 49" CPVC Plastic tube, glued together. They are only used on the EHU side of the 40/30 loop
D	4	NA	Quick disconnect boot locking ring (these are molded into the base section of each telescoping pole and are used to keep the pole from sliding out of the quick disconnect boots in high wind situations)

SECURING THE ELEMENT SUPPORT TUBE (EST) TO THE EHU (continued)

When attaching the telescoping fiberglass poles to each of the EHU's, special care must be taken to ensure that the rubber plugs that are in the base section of each pole are removed before placing the telescoping poles on-to the EHU. **Failure to remove these plugs will result in catastrophic failure of the EHU**. Figure 7.11 shows how the plug is in place for shipping purposes. Each end of the DB18E boom has a 40/30 loop for use on 40m and the middle element has a loop for use on 30m. These loops were prepared earlier in Chapter Six and should look like the one shown in figure 7.12. Be sure to put your quick disconnect boot (PN 10-1006-22) onto the pole before inserting into the EHU.

The CPVC inner guide tube is inserted into the EHU side of the loop assembly as shown in figure 7.13. The guide tube is not required for the non-EHU side of the loop. The non-EHU side of the loop is commonly re-ferred to as the "return tube". Insert the guide tube so that the edge of the diverter cone is flush with the base of the telescoping pole as shown in figure 7.14. Slide the pole base and guide tube into the EHU tube until it bottoms out firmly as shown in figure 7.15. There may a small portion of unpainted pole protruding. This is OK as it is shielded from the sun by the quick disconnect boot.

Align the telescoping pole on the return tube side of the loop. Insert the end firmly into the return tube as shown in figure 7.16. There is a raised area called a locking ring that is molded onto the base section of each of the telescoping poles. These are there so that the quick disconnect boot cannot "slide" off in the event of high winds. This raised portion of the base section will rest up against the return tube as shown in figure 7.16.

Before tightening the quick disconnect boots, twist the base sections of the telescoping poles until the loop portion of the element is as level as possible, as shown in figure 7.17. Chapter Nine shows this leveling process in greater detail, specifically figures 9.29, 9.30 and 9.31 . Tighten the quick disconnect boots firmly. Wait 20 minutes and tighten again—the flexible material will tend to cold flow initially. It is also a good idea to do a final tightening of all the quick disconnect boots and all fasteners as a last step before mounting the antenna onto the tower mast. Repeat above steps for the other half of the loop.

The installation pictures below represent the Reflector element. Repeat the above steps for the Director and Driven element. They are exactly the same with the exception of the orientation of the EHU and return tube. Figure 7.18 shows the Driven element— the loop elements mount around the mast plate.

FIG. 7.11

FIG. 7.12

FIG. 7.13

FIG. 7.14

FIG. 7.15

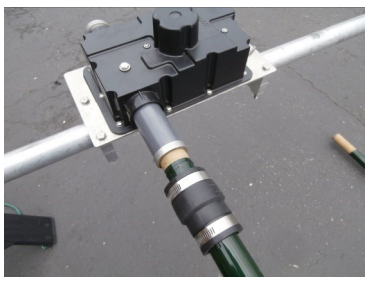
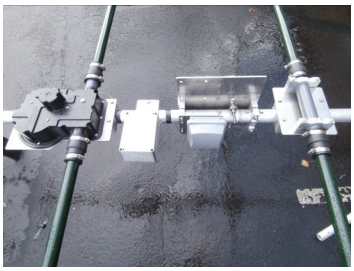


FIG. 7.16

FIG. 7.17

FIG. 7.18



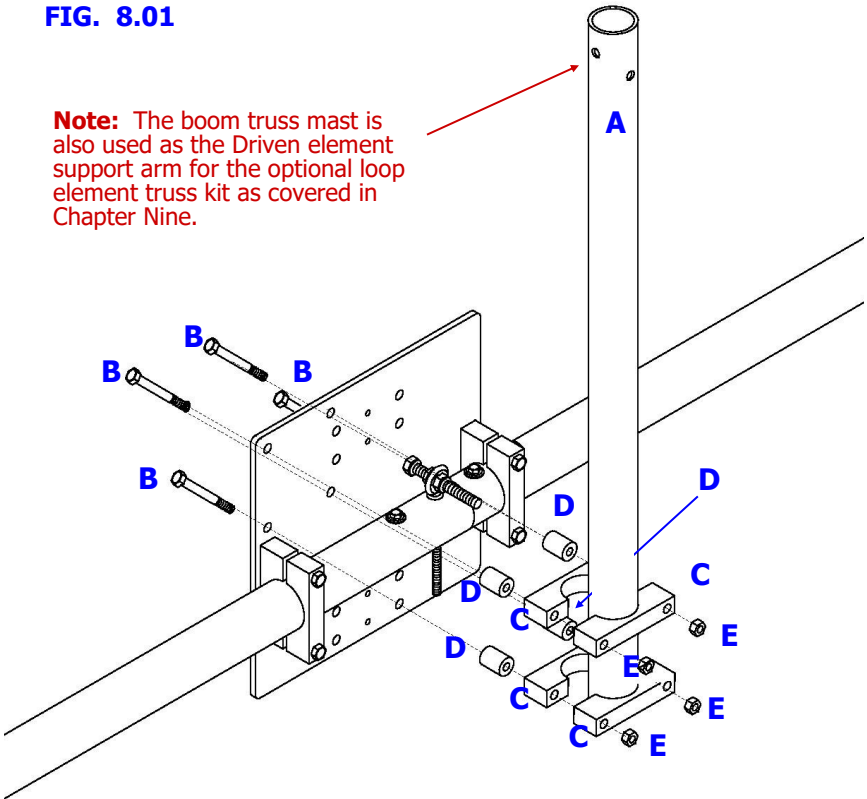
INSTALLING THE BOOM TRUSS SUPPORT MAST

Review figure 8.01. Insert four of the 5/16" x 4-1/2" hex head bolts (PN 60-0115) so the threads of the bolts are on the boom side of the mast plate. Insert the 1" aluminum spacers (PN 10-1613-01) onto the hex head bolts, followed by the first half of the 1-3/4" aluminum saddle (PN 10-1601-22) as shown in figure 8.02. Figure 8.03 shows the orientation of the spacers. Position the truss support mast so that it is resting on the aluminum saddle, then slide the other half of the saddle onto the hex head bolts as shown in figure 8.04.

When the boom truss option is purchased, the location of the connector junction box needs to be changed. Install the connector junction box on the saddles so that the lid of the junction box opens from the bottom, and the orientation matches that of figure 8.04. Holding the connector junction box in place, insert the 5/16" Ny-lock nuts (PN 60-0046) onto the hex head bolts and tighten, but leave loose enough so you can align the truss support mast in the next step. Figure 8.05 shows the completed truss support mast assembly.

FIG. 8.01

Note: The boom truss mast is also used as the Driven element support arm for the optional loop element truss kit as covered in Chapter Nine.



Key	QTY	Part #	Description
A	1	10-1618-11	30" Boom truss support mast
B	4	60-0115	5/16" x 4-1/2" Hex head bolt
C	4	10-1601-22	1-3/4" Aluminum saddle half
D	4	10-1613-01	1" aluminum spacer
E	4	60-0046	5/16" Nylock nut

FIG. 8.02

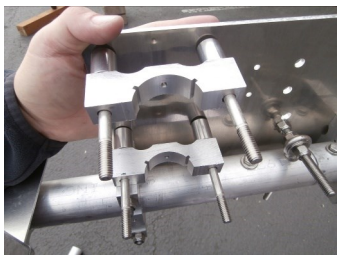


FIG. 8.03

FIG. 8.04

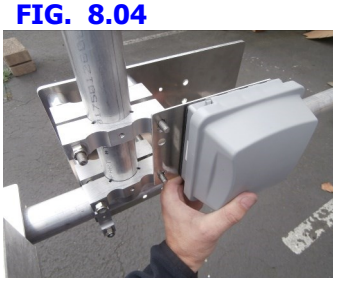


FIG. 8.05

PHILLYSTRAN TRUSS INSTALLATION

The following explosion drawing for the Phillystran truss will come in handy while working through the next section. Figure 8.10 shows the detail at the top of the truss support mast. Insert the 5/16" x 2-3/4" hex head bolt (PN 60-0107) through the boom truss mast. Position each 4 inch turnbuckle (PN 60-0083) over the bolt. Place two 5/16" flat washers (PN 60-0033) against the outside turnbuckle. Attach the 5/16" Nylock nuts (PN 60-0046). Figure 8.11 shows the Phillystran layout with appropriate fasteners.

FIG. 8.10

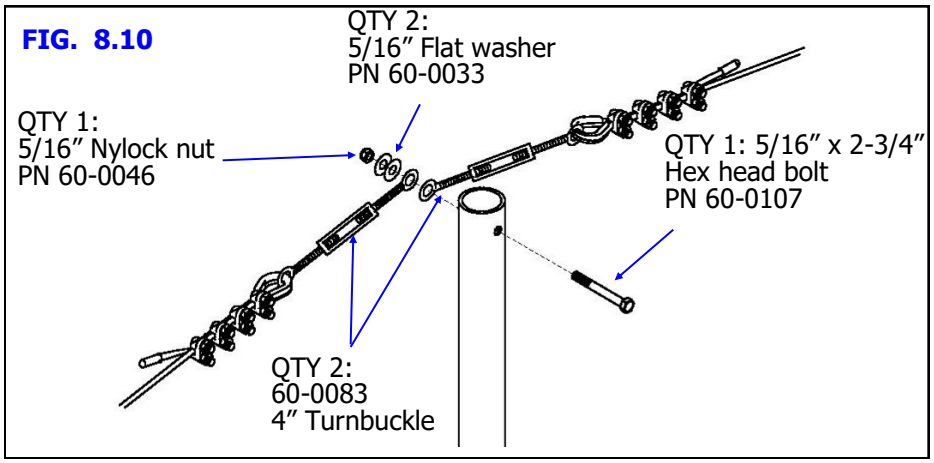
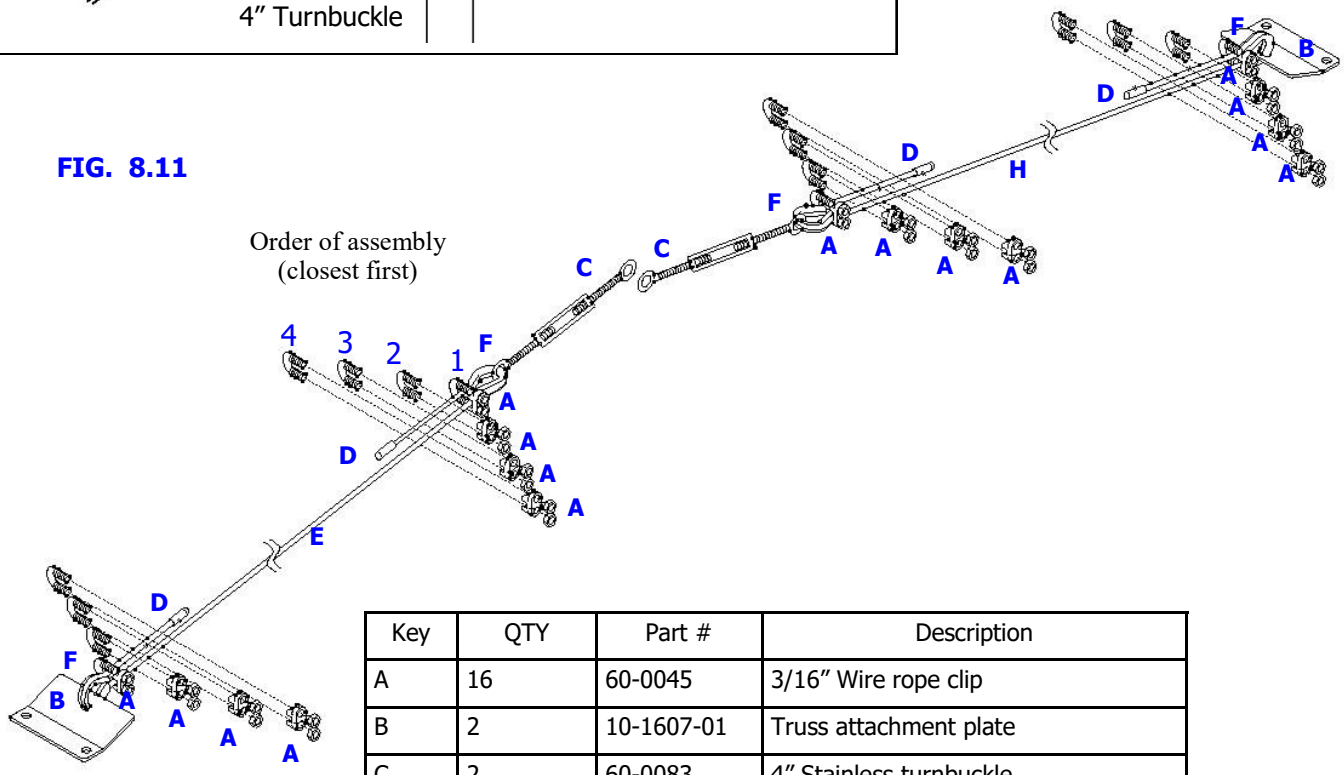


FIG. 8.11



Key	QTY	Part #	Description
A	16	60-0045	3/16" Wire rope clip
B	2	10-1607-01	Truss attachment plate
C	2	60-0083	4" Stainless turnbuckle
D	4	60-0044	Phillystran end cap
E	18 FT	21-8000	Phillystran 1200i (trim as you go)
F	4	60-0048	3/16" Wire thimble

PHILLYSTRAN TRUSS INSTALLATION (continued)

When securing the Phillystran truss cable, the rule of "don't saddle a dead horse" applies. You must be certain that the saddle portion of the wire clip is on the longer or "live" side of the Phillystran, and the U-bolt section is on the "dead" or (short) side of the Phillystran. Because of this, how you thread the Phillystran through the thimble is important. The lengths of the Phillystran are different on each side of the truss. The Director side of the truss uses approximately 85 inches of Phillystran to make up the truss, and the Reflector side uses approximately 100 inches of Phillystran. It is best to "trim as you go", that way you can minimize the opportunity for error.

When preparing the Phillystran truss, you will need to bring the Phillystran from below the thimble so that the "dead" side is facing towards the sky. Insert the 3/16" thimble (PN 60-0048) into the middle hole on the truss attachment plate as shown in figure 8.12. Loop the Phillystran around the thimble until approximately 8" of the Phillystran is on the "dead" side as shown in figure 8.13.

Figure 8.14 shows how to position the two pieces of Phillystran cable into the wire clip saddle. Position the first of the four wire clips (PN 60-0045) so that the wire clip is as close to the thimble as possible, as shown in figure 8.15. Tighten the wire clip, alternating between each nut so that the tightening force is evenly distributed. Hold each portion of the Phillystran in place while tightening, to ensure that a good mate is formed between the two cables. Wait 20 minutes and tighten some more, as cold-flow of the plastic usually occurs. A great way to do the initial tightening is to use a 7/16" deep socket and hand turn, as shown in figure 8.16. This allows you to get pretty tight and in good position on the two cables before doing the final tightening. Position the next wire clip approximately 1 inch behind the first wire clip and tighten accordingly. Repeat with the remainder of the wire clips as shown in figure 8.17.

Locate the plastic end cap (PN 60-0044) and push it onto the end of the Phillystran as shown in figure 8.18. Secure the Phillystran pieces and the cap at the end of the wire clips with electrical tape.

Figure 8.19 shows the completed truss end for the Director return tube side. Repeat for the Reflector element. Figure 8.20 shows the completed truss end on the Reflector side.

FIG. 8.12

FIG. 8.13

FIG. 8.14

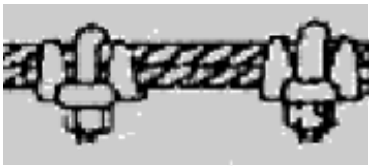


FIG. 8.15

FIG. 8.16

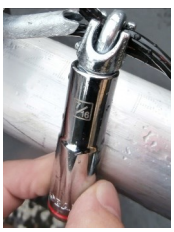


FIG. 8.17

FIG. 8.18

FIG. 8.19

FIG. 8.20

PHILLYSTRAN TRUSS INSTALLATION (continued)

When attaching the Phillystran truss material to the turnbuckle located on the truss support mast, the rule of "don't saddle a dead horse" still applies. You must be certain that the saddle portion of the wire clip is on the longer or "live" side of the Phillystran, and the U-bolt section is on the "dead" or (short) side of the Phillystran. Locate the 3/16" galvanized thimbles (PN 60-0048) and pry the end apart so that it will slide over the eye portion of the turnbuckle. When the thimble is attached, be sure to bend the ends back so that it cannot fall off. Unwind the turnbuckle so that approximately 3/8 inch of threads are still inside the frame, as shown in figure 8.20. The slack is needed so that you can appropriately tighten the Phillystran once secured to the turnbuckle.

When preparing the Phillystran truss, you will need to bring the Phillystran from below the thimble as you did on the other end of the truss. Loop the Phillystran around the thimble until the Phillystran is as tight as possible. Leave approximately 8" of the Phillystran on the "dead" side as shown in figure 8.21 and trim with a utility knife.

While holding the Phillystran so that it remains tight, position the first of the four wire clips (PN 60-0045) so that the wire clip is as close to the thimble as possible as shown in figure 8.22. Tighten the wire clips, alternating between each nut so that the tightening force is evenly distributed. Hold each portion of the Phillystran in place while tightening, to ensure that a good mate is formed between the two cables. Wait 20 minutes and tighten some more, as cold-flow of the plastic usually occurs. Position the next wire clip approximately 1 inch behind the first wire clip and tighten accordingly. Repeat with the remainder of the wire clips as shown in figure 8.23.

Locate the plastic end cap (PN 60-0044) and push it onto the end of the Phillystran as shown in figure 8.24. Secure the Phillystran pieces at the end of the wire clips with electrical tape.

Repeat for the other side of the boom. When both sides are finished, use two adjustable wrenches, one to hold the eye stationary and the other to turn the frame of the eyebolt as shown in figure 8.25. Place a level on the boom as shown in figure 8.26. When the boom is level, tighten the nuts on each end of the frame of the eyebolt so that the eyebolt cannot adjust accidentally once the antenna is in the air. As a secondary measure, weaving wire through the eyebolts and the frame can also prevent the eyebolts from loosening, as shown in figure 8.27.

FIG. 8.20

FIG. 8.21

FIG. 8.22

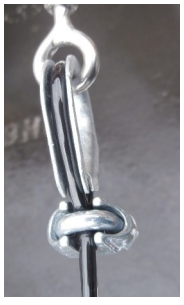


FIG. 8.23

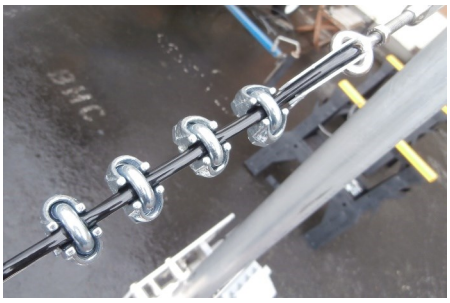


FIG. 8.24

FIG. 8.25

FIG. 8.26

FIG. 8.27

INSTALLING THE TRUSS SUPPORT MAST

The great advantage of telescoping fiberglass poles are that they are flexible and extremely strong. This is a significant benefit for such adverse weather situations as high winds, icing or snow accumulation. The only negative to this, is because of the flexibility, there is a slight natural "droop" at the element ends. This droop has no impact whatsoever on performance, but some people do not care for the look. For this reason we offer the loop element truss kit.

The 40/30 loop truss kit allows for the leveling of the Director, Driven and Reflector loop elements to the same latitude. This makes for a better overall profile for the Yagi. These trusses do not have any impact on load bearing, they are used for aesthetic improvement only. **NOTE:** The truss support arm for the Driven loop element is also used for the optional boom truss kit. Refer to chapter Eight, Section 8.0 for installation of the truss support arm and to figure 9.07 and 9.08 below.

The truss mast needs to be mounted so that it is centered on the halfway point between the EHU center-point and the return tube center-point. The overall length between the two center-points is 30 inches, so the halfway point is 15 inches. Make a mark on the boom 15 inches between the two center-points as shown in figure 9.01. Locate the truss support (PN 10-1054-01) and two 1-3/4" aluminum saddle halves (PN 10-1601-03). Place the saddles so that the edge of the saddle is on the edge of the mark as shown in figure 9.02. This will ensure that the support is indeed on the centerpoint. Insert two of the 5/16" x 3-1/2" hex head bolts (PN 60-0065) and secure with 5/16" Nylock nuts (PN 60-0046). Remember to use anti-seize on the stainless steel fasteners. Level the support before tightening as shown in figure 9.03.

Attach each of the 4 inch stainless steel turnbuckles (PN 60-0083) using the 1/4" x 1-1/4" hex head bolt (PN 60-0110), two of the 5/16" stainless steel flat washers (PN 60-0033) and 1/4" Nylock nuts (PN 60-0030) as shown in figure 9.05. The stainless steel washers are both positioned between the eye of the outside turnbuckle and the Nylock nut as shown in figure 9.06.

Figure 9.07 shows the truss mast assembly for the Driven element which is different than the truss mast for the Director and Reflector. Place two 5/16" flat washers (PN 60-0033) on the 5/16" x 2-3/4" hex head bolt (PN 60-0107). Place one of the 4 inch turnbuckles (PN 60-0083) on the bolt and slide the bolt through the truss support. Place two more 5/16" washers and the other 4 inch turnbuckle and then secure with a 5/16" Nylock nut (PN 60-0046). Figure 9.08 shows the completed Driven element truss support arm.

FIG. 9.01

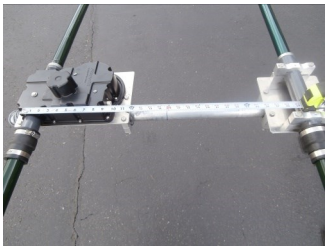


FIG. 9.02

FIG. 9.03

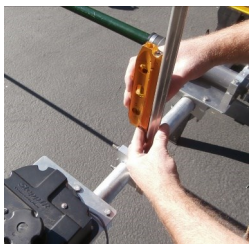


FIG. 9.04

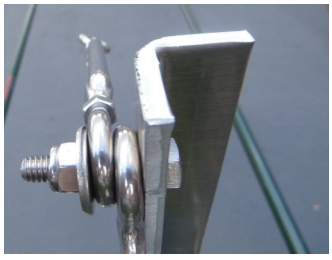


FIG. 9.05

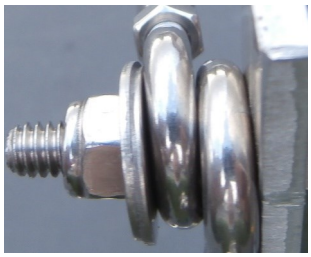


FIG. 9.06

FIG. 9.07

FIG. 9.08

ATTACH THE TRUSS COUPLERS

There are two pieces to the truss couplers (PN 10-1510-01) as shown in figure 9.10. The couplers are mounted on each side of the loop, located at the outer joint of the telescoping poles as shown in figure 9.11. The truss coupler butts up against the edge of the polyolefin heat shrink.

There are nut trays molded on one side of the truss coupler as shown in figure 9.12. These are handy for holding the #6 Nylock nut (PN 60-0014) when tightening, but you will need to position your finger over the nut to keep it from spinning when you thread on each of the #6 x 7/8" pan-head machine screw (PN 60-0014-01) as shown in figure 9.13. Only the outer four holes of the truss coupler are used for attaching it as shown in figure 9.14. Note that the top portion of the coupler (the portion facing skyward) has a hole, but this is also not used as shown in the second picture of figure 9.14. Align the truss coupler so that it is parallel to the telescoping pole and tighten each nut.

The Dacron truss cord is provided in a single piece and will need to be trimmed as you progress with the installation of the end trusses. Thread the Dacron cord through the truss coupler, leaving approximately ten inches of truss cord as shown in figure 9.15. Tie four half-hitches and leave approximately four inches of leader as shown in figure 9.16. Figure 9.17 shows the proper way to tie a half-hitch. When finished, apply electrical tape so that the leader of the Dacron rope is secured to the truss line as shown in figure 9.18.

FIG. 9.10

FIG. 9.11

FIG. 9.12

FIG. 9.13

FIG. 9.14

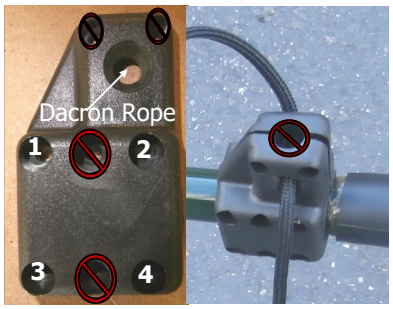


FIG. 9.15

FIG. 9.16

FIG. 9.17

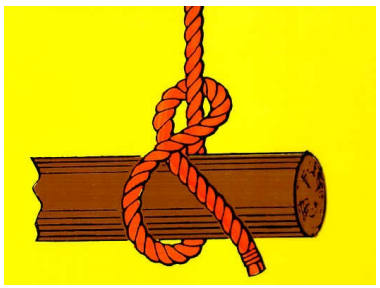


FIG. 9.18

ROUTING THE DACRON TRUSS CORD

Before inserting the cord through the eyebolt of the 4" turnbuckle, unthread each eye so that there is approximately 3/8" thread remaining in the frame of the turnbuckle portion, as shown in figure 9.20. Locate the 1/8" thimble (PN 60-0158). Spread the thimble apart enough to slide on to the eye of the turnbuckle. When the thimble is through the eyebolt, bend the tips of the thimble back as close to each other as possible, as shown in figure 9.21.

Thread the Dacron truss cord through the eye of the turnbuckle and around the 1/8" thimble as shown in figure 9.22. Pull the truss cord back down to the truss coupler on the opposite side of the loop. Insert the Dacron cord through the truss coupler (refer to prior page for instructions), pulling the cord tight so that there is no slack on either side of the cord. The procedure for securing the Dacron truss cord on this end of the loop is exactly the same as the truss coupler you prepared initially.

At this point of the installation of the 40/30 loop element truss, it is important to assemble the truss couplers and Dacron truss cord on the other side of the EHU. Because of the significant torque generated by leveling of the elements, there needs to be equal force applied on each side as shown in figure 9.23.

When the 40/30 loops on each side of EHU have both been prepared, attach two 1/8" galvanized wire clips (PN 60-0157) on each side as shown in figure 9.24. Position the first wire clip as close as possible to the tip of the thimble. Position the second wire clip an inch behind the first. Be certain that the rope is "stacked" one on top of the other as shown in figure 9.25. Tighten the wire clips firmly.

FIG. 9.20

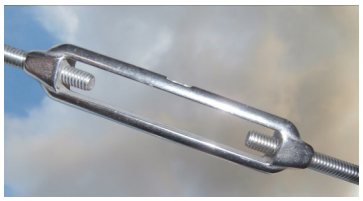


FIG. 9.21

FIG. 9.22

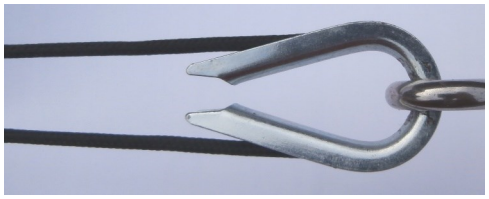


FIG. 9.23

FIG. 9.24

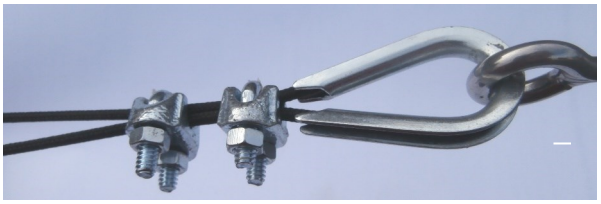
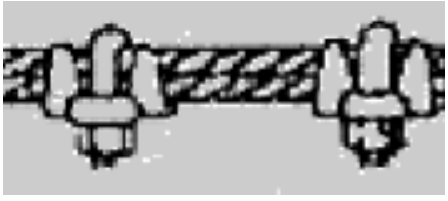


FIG. 9.25



ROUTING THE DACRON TRUSS CORD (continued)

When leveling the elements, use two adjustable wrenches as shown in figure 9.26. The wrench that is placed on the thimble is held stationary, while the wrench that is on the frame of the turnbuckle is rotated. Adjust each turnbuckle a few turns at a time until the elements are level.

Be careful not to raise the elements so that the tips are above the EHU—this can cause water to drain into your EHU during rainfall. When the elements are at the desired position, tighten the nuts on each end of the turnbuckle frame as shown in figure 9.27. Be sure to do this with ALL turnbuckles, as this will prevent the turnbuckle from unwinding. As a secondary measure, we recommend looping rope or wire through the eye and frame of the turnbuckle as shown in figure 9.28.

In addition to the leveling of the elements, it is also important to ensure that the loops at the tip of the telescoping poles are parallel to the boom. The best method for this is to loosen the quick disconnect boots on the telescoping poles and twist the base of the pole until the loops are parallel to the boom. Figure 9.29 shows a loop that is not parallel. Figure 9.30 shows the loop being adjusted. Figure 9.31 shows the level and parallel half of the 40/30 element.

When the position of the loops are as desired, tighten the quick disconnect boots firmly. Wait 30 minutes and tighten again.

FIG. 9.26

FIG. 9.27

FIG. 9.28

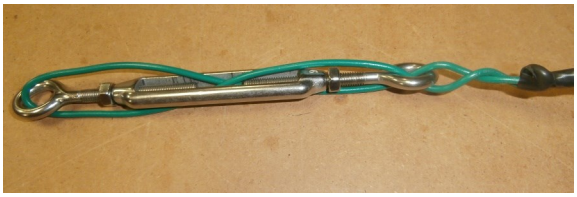


FIG. 9.29

FIG. 9.30

FIG. 9.31

PREPARING THE 6M PASSIVE ELEMENT

While the DB18E has a 3 element 6m Yagi that is standard, the spacing is a bit wide so gain is compromised and there is reduced front-to-rear. For the average 6m user, this configuration works just fine, with gain of 6.2 dBi and front-to-rear of 4 dB. Adding the 6m passive elements creates a nicely performing 4 element Yagi, with gain of 10.1dBi and front-to-rear of 30dB. As with any fixed length element, there is a limit to the effective frequency range— you can expect the 6m passive elements to function well in 50.00 MHz to 50.400 MHz frequency range, but there will be no 180 degree or bi-directional mode when operating on 6m. In addition, you will need to rotate it like a traditional Yagi for this band only.

The passive element consists of three sections of polished aluminum—a single 58" long x 1/2" OD center piece with plastic insulator, and two 36" long x 3/8 OD sections that telescope into each side of the 1/2" OD aluminum. The 1/2" aluminum has slotted ends, so that a stainless steel hose clamp can secure the two sections firmly together.

Using a measuring tape as shown in figure 9.02, measure the 3/8" aluminum pieces and mark with a permanent ink pen at the length required for the 6m passive element as shown in table 9.01.

Telescope the 3/8" aluminum sections into each end of the 1/2" aluminum section. Place the stainless steel hose clamps (PN 60-6000-60) over the slotted portion of the joint as shown in figure 9.03. Tighten enough to hold the pieces in place but loose enough to adjust if needed. Measure the overall length of the 6m passive element (refer to table) as shown in figure 9.04. If the element is the required length, tighten the stainless steel hose clamp firmly on each side.

FIG. 9.01

6m Passive element	Total Element length	3/8" Aluminum length to reach total length (per side)
D1A	112 inches / 284.5 cm	27 inches / 68.58 cm

FIG. 9.02

FIG. 9.03

FIG. 9.04

MOUNTING THE PASSIVE ELEMENT TO THE BOOM

Locate the 6m mounting plate (PN 10-1019-31). Using the 1 inch U-bolts (PN 60-0001) as shown in figure 9.11, place the 6m passive element on top of the 6m mounting plate with the slit in the plastic sleeve pointing downward. Position the plastic insulator so that it is centered between the two U-bolts. Tighten using the 1/4" Nylock nuts (PN 60-0030). Be careful not to over-tighten or you will crack the plastic insulator.

Figure 9.10 shows the center-to-center spacing of the 6m passive element. Position two 2" aluminum saddle halves (PN 10-1601-22) on the boom and insert two 5/16" x 3-1/2" hex head bolts (PN 60-0065). Attach the 6m mounting plate with the bolt holes for the aluminum saddles facing towards the director element as shown in figure 9.12. Secure with 5/16" Nylock nuts (PN 60-0046) but leave loose enough for leveling of the element. Figure 9.14 shows pertinent data for this step.

Place a level on the 6m passive element as shown in figure 9.13. When the position is correct, tighten the aluminum saddles. Be sure to use anti-seize on the stainless steel fasteners.

FIG. 9.10

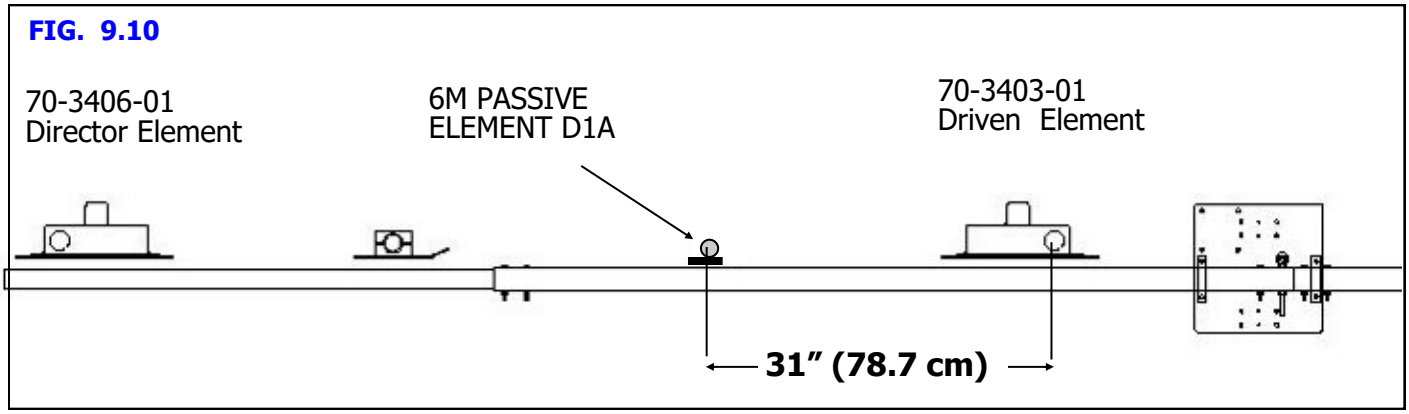


FIG. 9.11

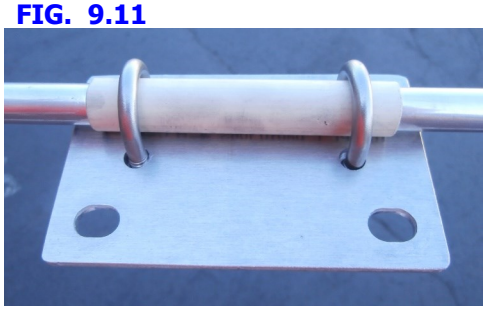


FIG. 9.12

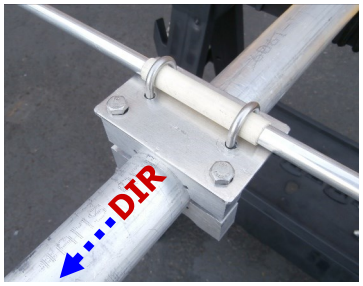


FIG. 9.13

FIG. 9.14

6m Passive element	Center-to-center measurement Driven EHU to 6m passive	Saddle Size	Hex head bolt length
D1A	31 inches / 78.7 cm	2 inch	5/16" x 3-1/2"

SECURE THE CABLES ONTO THE BOOM

When the antenna assembly is completed, the last step before attaching the DB18E Yagi to the tower mast is the securing of cable and coax to the boom. Note that in many cases, the taping of the 16 wire control cable may be the last step, done after the antenna is mounted on the tower. The most important aspect of the taping task is to be certain that **NO** control cable or coax is resting against a sharp edge. The most notable sharp edges occur when routing past an aluminum saddle, mast or mounting plates and even the threads on the stainless steel fasteners. AVOID these sharp edges! If you are routing the cable and find that you cannot avoid a sharp edge, take measures to put something between the cable and the sharp edge. In addition, be careful not to over-bend or kink any of the cables. Figure 11.01 shows an example of taping around a potential edge-hazard—in this case, the boom bolts.

There are several ways to secure the cables to the boom. The method used most of the time is to apply electrical tape. We have provided you with enough electrical tape to secure the cables to the boom. When using electrical tape, be sure to cut the tape with scissors. Do not pull the tape off until it severs, this can damage the tape. When done wrapping the electrical tape, leave a small flap on the edge of the cut end, for easier removal should the need occur at a later date. Approximately two wraps of electrical tape are sufficient for most control cable, three wraps for coax jumpers. As a general rule, applying tape approximately every two feet is adequate.

Other methods include the use of tie-wraps. Be careful when using tie-wraps! Be sure to purchase high quality, UV rated tie-wraps that are recommended for cable. Most of the standard off the shelf tie-wraps are not properly rated and will become brittle and may fail within a short period of time. Do not pull the tie wraps too tight, some brands have sharp edges and can actually damage the cable over time if pulled too tight.

When securing the cable to the boom, try to keep the cable at the bottom of the boom. The boom acts as a shield from the sun and can prolong the life of the cable. Our cable is outdoor UV rated, but it never hurts to err on the side of caution.

When taping cable that terminates at a terminal connection, such as the connector junction box or coax switch housing, be sure to leave some excess cable before taping, to avoid unnecessary stress being placed on the cable connection. Figure 11.02 shows good routing methods, with the control cable exiting out of one of the connector junction box conduit plugs and the three EHU cables exiting out the other conduit plug.

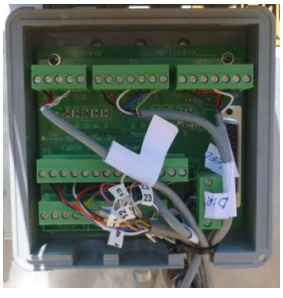
We recommend you label each of the control cable wires and the coax jumpers. The best place to label them is at the point nearest the connector junction box or the coax switch box. Labeling now will help out significantly should you need to disconnect your antenna at some point in the future. Figure 11.03 shows a connector junction box with labeled control cable. Note the tie wrap placed on the control cable as it exits the connector junction box—this is a great way to make your own strain relief, coupled with leaving slack in the cable itself when you tape it.

Excess control cable can either be coiled up and taped to the boom or trimmed to length. If you decide to trim the control cable to length, be sure you don't make it too short! Do not trim the coax cables.

FIG. 11.01

FIG. 11.02

FIG. 11.03



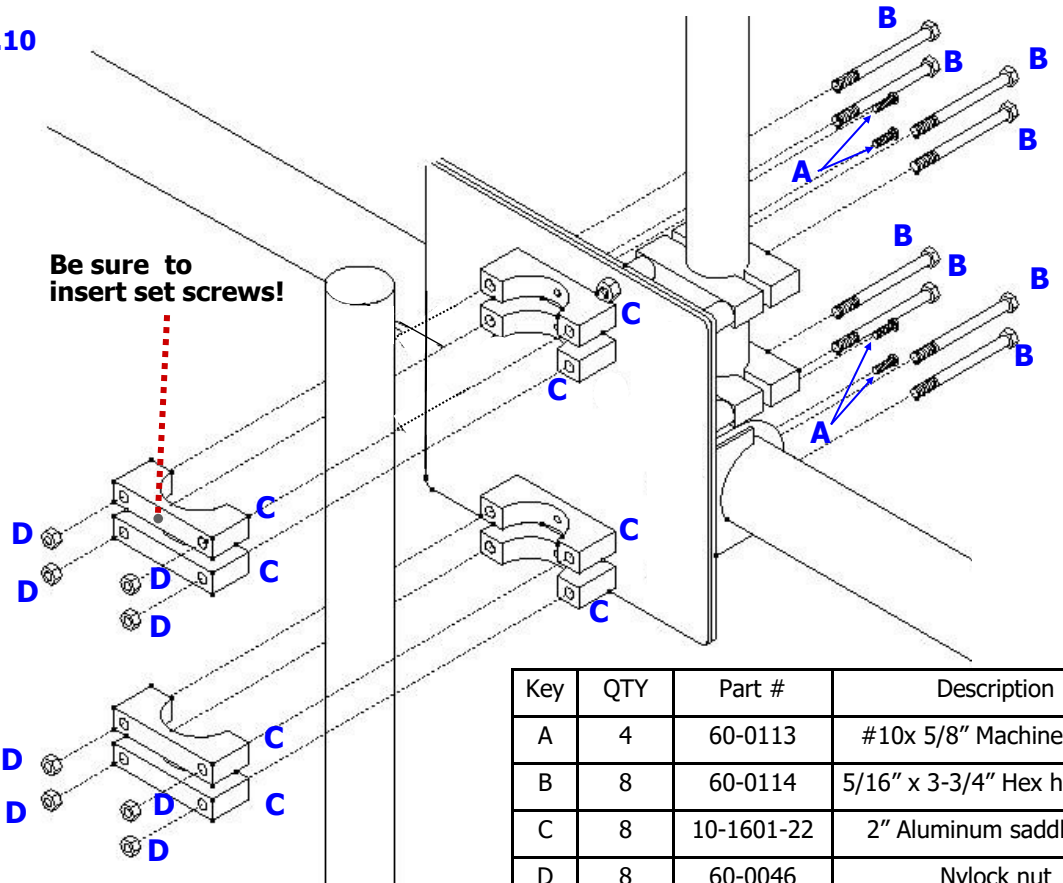
MOUNT THE DB18 ONTO THE TOWER MAST

There are many different methods and mechanisms that are used in the course of attaching an antenna to its final resting spot. The most common method by far for a Yagi antenna is to mount it on a tower, with a mast fixed in place at the top of the tower. That is the assumption with these instructions. In a best case scenario in terms of ease of access, the antenna is being mounted on a tilt-over, crank-up tower or a crank-up tower that nests at the fairly traditional 21 ft. A Yagi often times is mounted at the top of a fixed-tower, high up in the air, where someone is strapped to the tower awaiting the antenna by means of gin-pole and transmission line or a crane/bucket lift. With this in mind, the mast plate is set up on the DB18 so that the mating process from mast plate to tower mast is made as easy as possible.

The tower mast connection uses four sets of aluminum saddles to attach the antenna to the tower mast as shown in figure 11.10. In most cases the tower mast is 2 inches in diameter, but occasionally the mast size may be different, depending on the customers situation. SteppIR offers saddle sizes in 1-3/4", 2", 2-1/4", 2-1/2" and 3". Since the vast majority of installations of the DB18 will be utilizing the standard 2 inch saddles, that is the verbiage used in the instructions that follow.

The 2 inch aluminum saddle halves (PN10-1601-22) are held in place using 5/16" x 3-3/4" hex head bolts (PN 60-0114) and 5/16" Nylock nuts (PN 60-0046) as shown in figure 11.10. The first half of the aluminum saddles rest against the mast plate and are held firmly to the mast plate using #10 x 5/8" machine screws (PN 60-0113), which insert through the mast plate and thread into the portion of the aluminum saddle normally reserved for the set screw. When connecting the saddle halves to the machine screws, be sure that the bolt holes line up perfectly. This will be of critical importance when the antenna is connected to the tower mast.

FIG. 11.10



Key	QTY	Part #	Description
A	4	60-0113	#10x 5/8" Machine screw
B	8	60-0114	5/16" x 3-3/4" Hex head bolt
C	8	10-1601-22	2" Aluminum saddle half
D	8	60-0046	Nylock nut

MOUNT THE DB18E ONTO THE TOWER MAST (continued)

Figure 11.11 shows the #10 x 5/8" machine screws inserted through the mast plate. Figure 11.12 shows the a saddle half that has been mounted on the mast plate, with a machine screw below it awaiting the next saddle half. Figure 11.13 shows all of the aluminum saddle halves mounted to the mast plate.

The antenna is now nearly ready for mounting onto the tower mast.

FIG. 11.11

FIG. 11.12

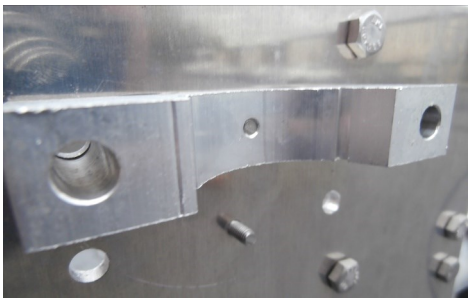
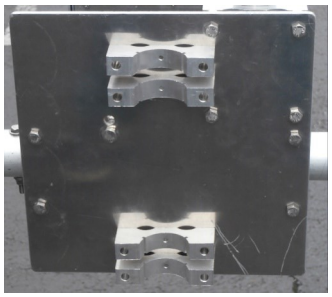


FIG. 11.13



LAST STEPS:
IT IS VERY IMPORTANT THAT YOU PERFORM EACH OF THESE STEPS BEFORE ATTACHING THE ANTENNA TO THE TOWER MAST

1. Connect the controller to the control cable and extend the elements simultaneously all the way out to the 40m band. Have someone listen as the copper strip extends outward into the support tubes. Ideally, having one person per element works best.
2. As the motors extend the copper strip, they start out moving very slowly, and then ramp up to full speed. There should be an accompanying hum for this that should never sound harsh, or choppy.
3. If there are any obstructions stopping the copper strip from making it's way out, you should notice a significant sound that will not be confused with the smooth motor sound. Listen for any significantly loud "clicks", scraping sounds or anything that sounds out of the ordinary.
4. If there is something that outright stops the copper strip from extending or retracting, you will get a harsh sound as the motors try to keep going but the tape is stuck.
5. If any of these "bad" sounds occur, try to locate the area where the problem is happening and investigate. Repeat these steps again. If all is OK, proceed to step 6.
6. Check all fasteners on the antenna to be certain that they are tight. This may seem redundant, but the time to discover a loose fastener is NOW, not when that part it was supposed to hold falls out of the sky.
7. Be sure that you have set-screws in all the saddles, where applicable. Be sure they are tightened.
8. Check all the quick disconnect boots to be sure they are as tight as possible and are in the correct position relative to the EHU and the telescoping poles.
9. Check all wiring and coax jumpers to ensure that they are secured to the boom and that they are not resting against any sharp objects.
10. If you have any of the optional trusses, be sure your turnbuckles are locked in place and that the loop element or boom is level.
11. Check to be sure that the elements are level with the boom— a level antenna looks much better when suspended in the air than one that is not!
12. Get the DB18E Yagi on that tower so you can work some good DX!

TROUBLESHOOTING TIPS

SteppIR antennas are all powered by stepper motors, hence the name. Stepper motors function by rotating the shaft a specific number of "steps" per revolution. The SDA 100 is simply counting the steps, of which for each step sequence there is a known length that the antenna is adjusting. If for some reason the antenna gets out of calibration, the method for recalibrating is pretty simple. When you press the calibrate button, the controller retracts each element until it assumes it is "home", and then keeps retracting the stepper motors for a period of time to ensure that there is no question that the elements have indeed been homed. At that point, the controller sends the elements back out to the exact frequency they were at when the calibration function started. That is why in calibration mode you will hear the antennas make a loud growling sound towards the end of the retracting—the elements are homed but the stepper motors keep right on going for a while longer before sending the elements back out.

It is important to note that if a problem arises with the elements, such as an obstruction that is impeding the path of the copper strip, the SDA 100 controller will not recognize this, so just because the controller is showing the proper length for any given band, there may still be an issue. Even though the controller may indicate that the copper strip is moving, in a troubleshooting situation it very well may not be. The controller does not have much say in the indicating of a problem—it's job is to simply get the elements to the right length. This is why we have come up with the following information for you to review when having issues:

The antenna is out of calibration—this is something that happens from time to time and is not a problem at all. Whenever you suspect a problem the very first thing that should be done is a calibrate. It is always a good idea to calibrate the antenna if you are having trouble. It is best to set the DB18E to 20M before doing the calibrate function. You only need to calibrate once. To be certain that the antenna was indeed out of calibration, check the SWR before you calibrate and check it again after you calibrate to see if there are any improvements. If the SWR is unchanged, the antenna was in calibration and is not the issue.

The lengths of the antenna are incorrect— Using the "Cause/Effect" theory, generally the first place to look for trouble is the last place you have been. Using this line of thinking, if there is a problem with your antenna, we need to be sure you are using the factory default lengths for your controller. Regardless of whether you think you have done anything that could change the lengths, as a second step in troubleshooting (the first being the simple calibration of the antenna), be sure to reset the factory default lengths.

The SDA 100 electronic controller has a defective or intermittent driver chip—It only takes a momentary short to damage a driver chip. The problem with driver chips, is that a blown driver chip or a damaged driver chip that has not failed outright can act a lot like a damaged EHU. What we don't want you to do, is jump to conclusion on an EHU issue, only to spend time and money taking your antenna down and find out that it was a driver chip problem, or some other issue with the controller in the first place. Taking the time to troubleshoot and repair a controller is **MUCH** easier than taking down an antenna to repair an EHU.

With that in mind, the following are steps for checking the voltage between the pin pairs that feed the motor windings. This information is critical to our technical support staff and you can save a lot of time by having this data available before contacting us. Instructions as follows:

With the DB-25 connector removed from the back of the controller, measure the voltage between the pin pairs that feed the motor windings. For example, pins 1 & 2 and 3 & 4 when referring to the driven element. The other elements pin pairs are listed in the troubleshooting guide These are the same pairs you use to check the resistance of the motor windings**. Be very careful not to short the pairs together or touch any other pins in the process, or you can potentially damage the controller driver chips.**

With the controller power plugged in, you should read approximately 3.5 VDC across each pin pair. At this point, change bands using the controllers band change button. As an example, switching from 20m to 10m generally gives a long enough run to get a good reading. You should be reading on your volt-ohm meter approximately 20 to 25 VAC using a 24 volt power supply. To check the next pin pair, you can then change bands back to 20m and so on through the wire pairs. If you have significantly different values at any point in the test process, you can be reasonably certain that you have a damaged driver chip for that element.

(Instructions continued on next page)

TROUBLESHOOTING TIPS (continued)

Please be aware that in some cases, we have seen driver chips partially damaged, causing them to work part of the time. This can be confusing in the test process.

If you do not have the optional 25 pin dSub splice assembly (see Chapter Five, Section 5.2) when measuring the voltages, a suggestion would be to use a bare 25pin dsub to plug into the SteppIR controller and then insert a paper clip to penetrate the pin hole. Usually about .75" long will do the trick. One paper clip being longer than the other also helps. Again, be careful NOT to short the pins. Even if the controller is turned off, there is always voltage going to the pins with a SteppIR controller. We do this to "lock" the stepper motors, and minimize the need to calibrate the antenna on a regular basis.

There is a defective coax jumper cable from the coax switch relay box output to the Director or the Reflector—our coax jumpers are manufactured by a company that specializes in these products, so a defective jumper is relatively rare, but it has happened. To check the coax jumper cable, measure the resistance between the center conductor of the PL-259 on the each end of the coax. The coax jumper should measure a very low resistance of 3 ohms or less (has continuity). If the coax jumper has high resistance (no continuity), there is likely a problem with it.

There is a defective relay inside the coax switch box— relays are mechanical devices so there is always a chance one could be defective, although we test all coax switch boxes before they leave the factory. Refer to page 51-53 for the relay test instructions.

The coax relay box is not switching due to a defective relay or the relay switching voltage is somehow not getting to the relays—this could be due to a defective control cable, a broken wire or a defective controller relay board. Refer to page 51-53 for the relay test instructions.

The Director or Reflector element is not tuning, or tuning intermittently—This could be a defective control cable, controller driver chip or a defective EHU. If you have already tested for these potential issues and to verify if the EHU is actually tuning, follow these steps:

1. Go to "Create/Modify" in setup mode and apply enough power to get a good SWR reading.
2. Select the Reflector element and change its length about 15-inches and see if you see a difference in SWR. It doesn't matter if the SWR improves or gets worse as long as it changes. This indicates the element is tuning.
3. Select the Director element and repeat the above steps. If the SWR changes the element is moving.

If the EHU looks like it is not moving and you have already done all of the wiring checks in this section, contact our technical support department for further instructions.

STEPPIR COMMUNICATION SYSTEMS

5 YEAR LIMITED PRODUCT WARRANTY

(as of May 22, 2023; Prior to that date warranty is 2 years)

Our products have a limited warranty against manufacturers defects in materials or construction for five (5) years from date of shipment. Do not modify this product or change physical construction without the written consent of Fluidmotion Inc, dba SteppIR Communication Systems.

This limited warranty is automatically void if the following occurs: improper installation, unauthorized modification and physical abuse, customer misuse or damage from weather events or natural disasters that are outside of the stated survivability of the product. For wind damage, proof of winds beyond 100 mph must be presented. Lightning or near-lightning events are not covered under this warranty. Driver chip module replacement is not covered under this warranty. This warranty is not transferrable.

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

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

Modification of this product is not authorized and may cause product failure, injury or death.

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