steppIR COMMUNICATION SYSTEMS

Dipole Assembly Manual

REV 2.01 10/09/2024

13406 SE 32nd St. Bellevue, WA 98005 | consumer.steppir.com | 425.453.1910 | sales@steppir.com

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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.

Yagis are available that cover 20 meters through 10 meters by using interlaced elements or traps, 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 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 yagis. 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 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.

Warm Regards,

John Mertel

John Mertel, WA7IR

President/CEO

PREPARING FOR ASSEMBLY

- 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 the antenna. 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.
- Be sure to refer to the antenna configuration drawing 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.

IMPORTANT NOTES!

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 causes of 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. Rubber or nitrile gloves are recommended when applying the anti -seize to the stainless steel fasteners or the aluminum boom sections.

Never attempt to wire or change wiring on the antenna when the 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 SPECIFICATIONS

Dipole	
Boom length	N/A
Boom outside diameter	N/A
Longest element	33ft / 10.05m
Turning radius	18ft / 5.48m
Weight	15lb / 6.8kg
Wind load - EIA-222-F/G	1.9sq-ft / 0.17 sq-m
Wind load - EIA-222-C	-
Wind rating	100mph / 160kph
Adjustable elements	1
Power rating	3KW
Feed points	1
Frequency coverage	13.8MHz—54MHz
Control cable	4 Conductor, 22GA, Shielded

PARTS CHECKLIST

Use the following parts list to take an inventory of your parts to ensure that everything is accounted for. The items in blue represent available options — you will need to check these items off only if you purchased them.

✓	QTY	PART #	DESCRIPTION
	2	10-1013-02	Telescoping Pole, 18 foot 4 section
	6	10-1059-01	Polyolefin Heat Shrink 1-1/2”
	1	20-6208-01	25 Pin male connector
	1	20-6209-01	25 Pin Sub Back Shell
	2	60-1006-22	Quick Disconnect Boot, 1-1/2" to 1-1/4", Fernco
	1	70-1007-01	Foam plug assembly
	1	70-2030-11	DB style mounting plate
	1	70-3000-01	33 Volt supply with cord.
	1	70-3402-01	EHU, Dipole Assembly
	1	72-0054-21	Kit, EHU DB Plate Hardware
	1	72-2015-21	Kit, 20m Dipole Hardware
	1	70-6010-01	DB25 Field Splice
	1	70-4005-01	Controller Assy, OptimizIR
	1	-	Manual, OptimizIR Controller
	1	70-4001-01	Controller Assy, SDA 100
	1	-	Manual, SDA 100 Controller
	-	21-5001-01	Control cable, 4 Conductor

Kit: 72-0054-21 EHU DB Plate Hardware

✓	QTY	PART #	DESCRIPTION
	11	60-0017	Screw, 10-32 x 3/4", Panhead
	11	60-0018	Washer, 10-32, Flat
	11	60-0019	Nut, 10-32, Nylock

Kit: 72-2015-21 EHU DB Plate Hardware

✓	QTY	PART #	DESCRIPTION
	8”	09-1022	Coax Seal, 12' x 1/2".
	4	10-1601-03	Saddle, 1-3/4" x 3/4"
	4	60-0046	Nut, 5/16" -18, Nylock
	4	60-0075	Bolt, 5/16" X 3-1/4", S/S
	2	60-0112	Set Screw, 10-32 x 1/4", Cup Point, S/S

Section 1: Overview

It is important to know that there are two different types of Element Housing Units (EHU). The two types are Driven and Passive. A Driven EHU acts as the driven element of the antenna and connects to your radio via coax. A Passive EHU does not have a coax connection and functions as the director or reflector element of the antenna. Some EHUs on our antennas have relays which allow them to switch between functioning as a passive or driven element!

Figure 1 provides an overview of a SteppIR EHU (the specific model shown is a 20m driven).

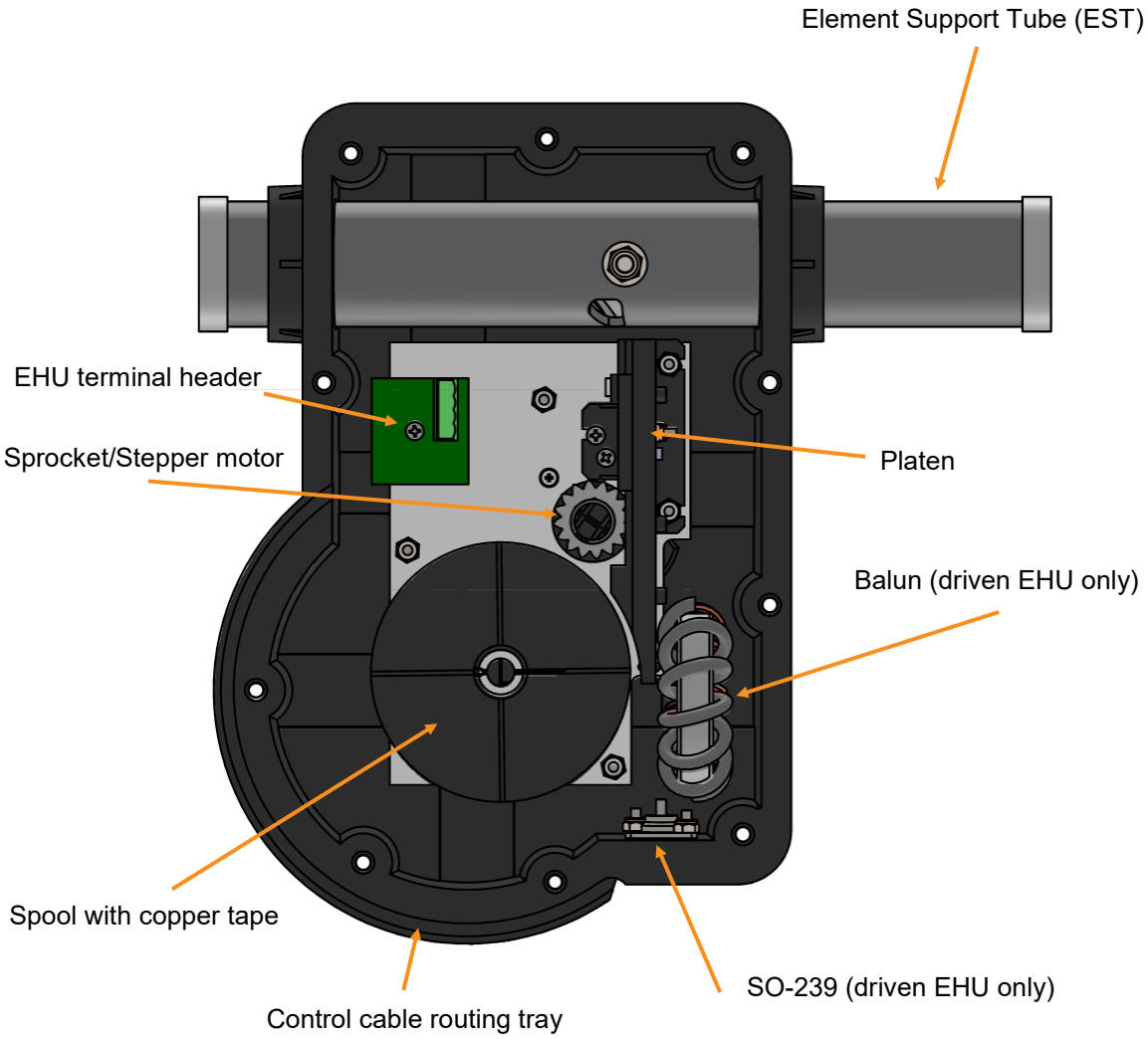


Figure 1

Section 1.1: Wiring the EHUs

1. Trim approximately 1.5 inches of the outer jacket of the control cable.
2. Remove the shield material, the support thread and cut the ground wire off.
3. Attach electrical tape at the end of the trimmed control cable jacket so that there is no chance for a short.
4. 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 recommended by the connector manufacturer.* **Figure 1.10** shows the control cable should look like when you are finished with the trimming.
5. Dip each of the copper wires into connector protector before inserting into the terminal plug. **Figure 1.11** shows what the connector protector will look like.
6. The terminal header assembly consists of the terminal header and the terminal plug as shown in. The plug is shipped loosely attached to the header. Remove this plug when wiring and firmly plug back in when completed.
7. Follow the wire sequence in **figure 1.13** or **figure 1.14** for each EHU. *Be careful to ensure that there are no bare wires protruding out from the terminal clamps, to avoid potential shorts. Also make sure you are clamping down on bare wire, and not the insulation of the wire* 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 1.12**. 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 1.12** shows a blue line crossing out the text in question. The orange circle shows the correct wiring sequence.

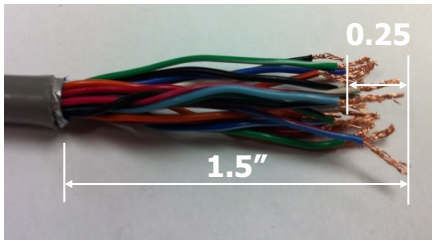


Figure 1.10

Figure 1.11

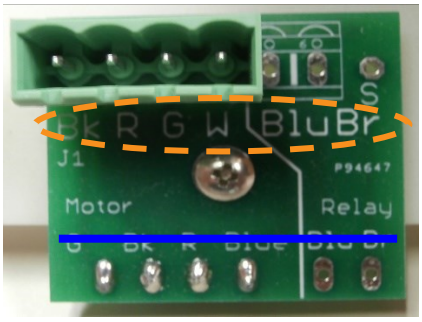


Figure 1.12

6 Pin Header Wiring Sequence

BLACK | RED | GREEN | WHITE | BLUE | BROWN

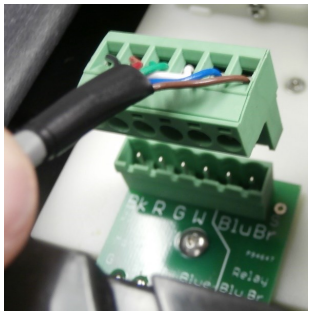


Figure 1.13

4 Pin Header Wiring Sequence

BLACK | RED | GREEN | WHITE

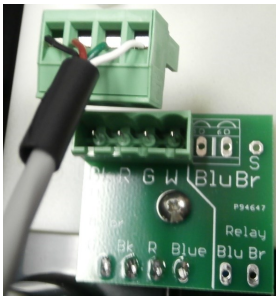


Figure 1.14

8. Check to be sure the terminal plug is firmly inserted into the terminal header.
9. Lay the control cable wire inside the wire tray of the EHU as shown in **figure 1.15**. 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 1.16**.
10. Cut three 1-inch strips of coax seal for each EHU as shown in **figure 1.17**. The remainder can be used to seal the driven element SO239 connector, should you wish to.
11. Apply coax seal on top of the control cable and work it around the cable as shown in **figure 1.18**. 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 1.19**.
12. 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

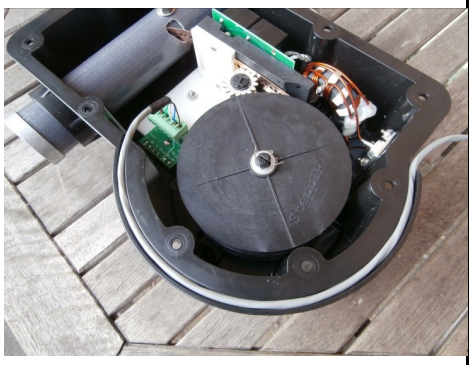


Figure 1.15

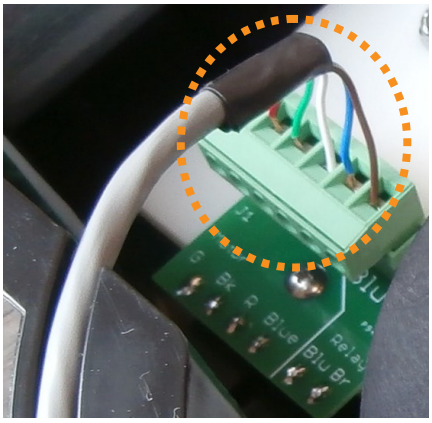


Figure 1.16

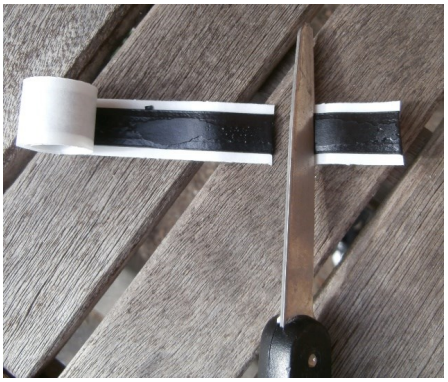


Figure 1.17

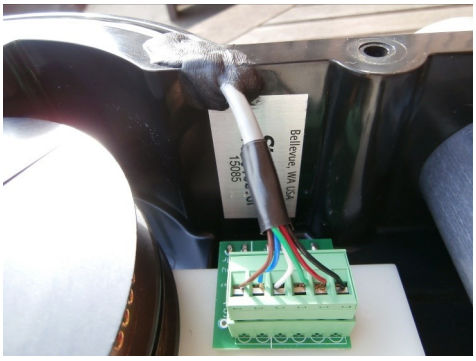


Figure 1.18

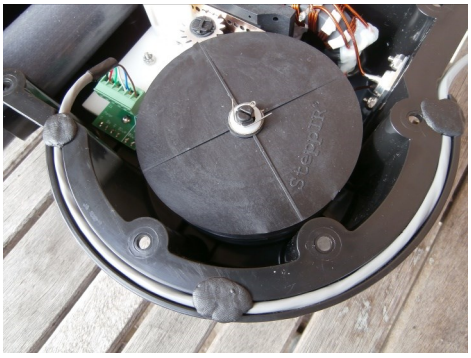


Figure 1.19

Section 1.2: Preparing the control cable

1. Strip the jacket and aluminum shielding off of the control cable as shown in **figure 1.20**, 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.

Section 1.3: Connecting control cable to the 25 pin connector

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 1.30**.
3. Place the connector between the back-shell halves as shown in **figure 1.31** and secure with the provided hardware.

Section 1.4: Connecting control cable to the DB25 Field Splice

The optional DB25 Field replaces the standard connector with a convenient solder-less connector. 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.

The terminals may be closed by default. If so, turn the terminal screw ccw ~10 turns to open it before inserting the wires.

2. Connect each wire to the appropriate terminal and tighten using a flat head screwdriver.
3. Consult the table on the next page for the correct wiring sequence.
4. Position the control cable between the cable clamp halves as shown in **figure 1.40**.

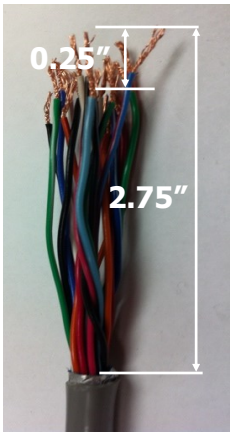


Figure 1.20

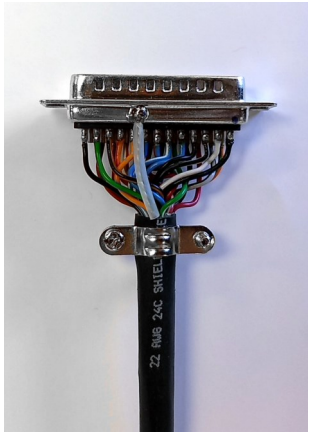


Figure 1.30

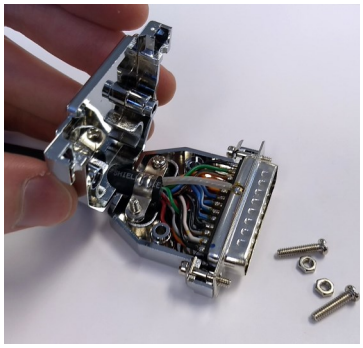


Figure 1.31

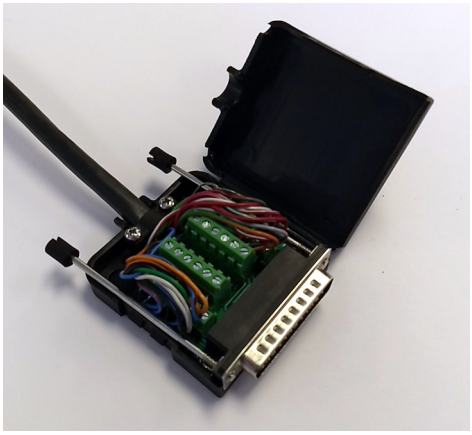


Figure 1.40

INSTALL EHU ON MOUNTING PLATE

Don't forget to apply anti-seize to all stainless steel hardware to prevent galling!

1. Mount the EHU onto the mounting plate using **figure 2** below as a reference.
2. Tighten the hardware firmly but be careful not to overtighten or you will risk damaging the EHU flange.

Key	QTY	Part Number	Description
A	10	60-0017	Screw, 10-32 x 3/4", Panhead
B	10	60-0018	Washer, 10-32, Flat
C	1	70-3402-01	EHU, Dipole
D	1	70-2030-11	DB style mounting plate
E	10	60-0019	Nut, 10-32, Nylock

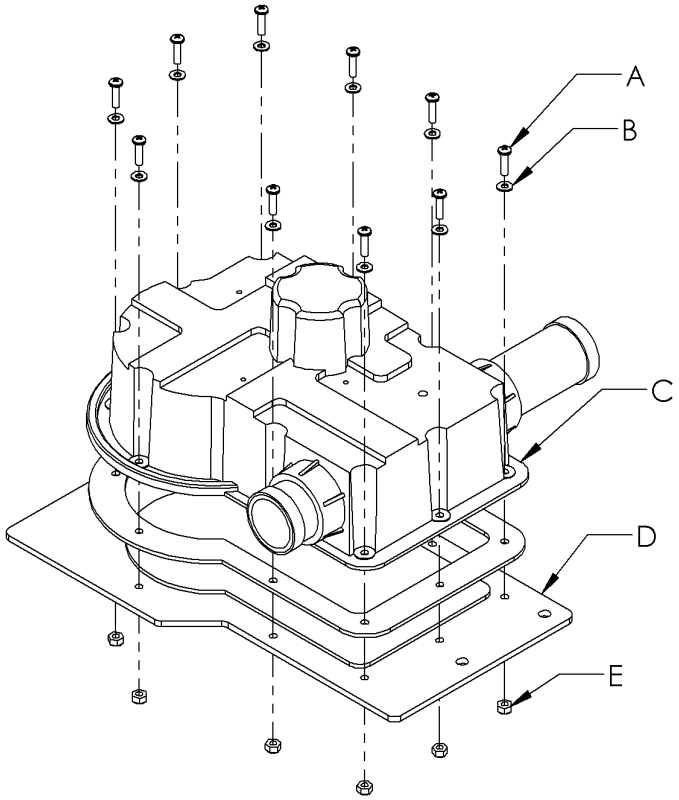


Figure 2

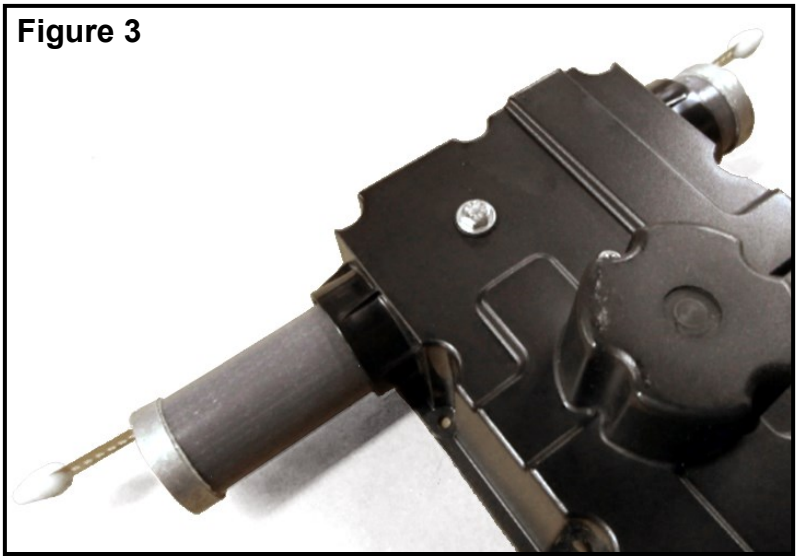
PRELIMINARY WIRING TESTS

Section 3: EHU mechanical test

Read the controller operator manual so that you are familiar with its operation. You will 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 may turn off. If it does, you will need to turn the controller back on. The controller will now read “Manual Mode Elements Home”.
2. *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.
3. Go into Setup mode by pressing the SETUP button and navigate to the “Create/Modify” menu.
4. Now CONNECT the control cable to the controller.
5. Select each element *(REF = reflector, DVR = driven, D1 = director 1, etc.)* and extend them to around 16” as indicated on the controller display. There will be approximately 3 inches of copper strip protruding out of each side of the EHU as shown in **figure 3.** This will allow you to put an ohm meter probe on the copper tapes during the tests.
6. 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.
7. If the tapes extend properly, press the react button to retract the elements and proceed to the next assembly step.

Figure 3



PREPARE THE TELESCOPING POLES

Remember to remove the black rubber plug from the base of each telescoping pole and check for debris inside!

Section 4: Extend the telescoping poles

- 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 installing the poles onto the antenna

Section 4.1: Secure polyolefin heat shrink to the telescoping pole joints

- Each telescoping pole uses 3 polyolefin heat shrink pieces (PN 10-1059-01). Once finished, the seal is secure and waterproof. This product requires a heat gun for activation of the adhesive.
- When positioning the heat shrink, place it so that the joint of the telescoping pole is centered in the middle of the heat shrink. **Figure 4.10** below shows how this is done.
- 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.
- We recommend wearing heat-resistant gloves while doing this so that you can reposition the heat-shrink as needed (it will try to slide down the pole).

Figure. 4.10

Section 4.2: Install the foam plugs

- Each 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 4.20**.
- 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 4.20**. 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 4.20.** Be sure that the plastic housing bottoms out on the pole tip.
- Repeat for the other telescoping pole tip.

Figure. 4.20

ATTACH THE FIBERGLASS POLES TO THE EHU

- Slide the rubber quick-disconnect boots (PN 60-1006-22) onto the telescoping fiberglass poles, smaller side first following **figure 5** below.
- Insert the telescoping poles into the element housing tube (EHT) until the pole butts up against the diverter.
- Slide the quick disconnect boot down the pole until it butts up against the edge of the element housing tube.
- Tighten both hose clamps on 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 mast.

Key	QTY	Part Number	Description
A	2	60-1006-22	Quick Disconnect Boot, 1-1/2" to 1-1/4"
B	2	10-1013-02	Telescoping Pole, 18 foot 4 section

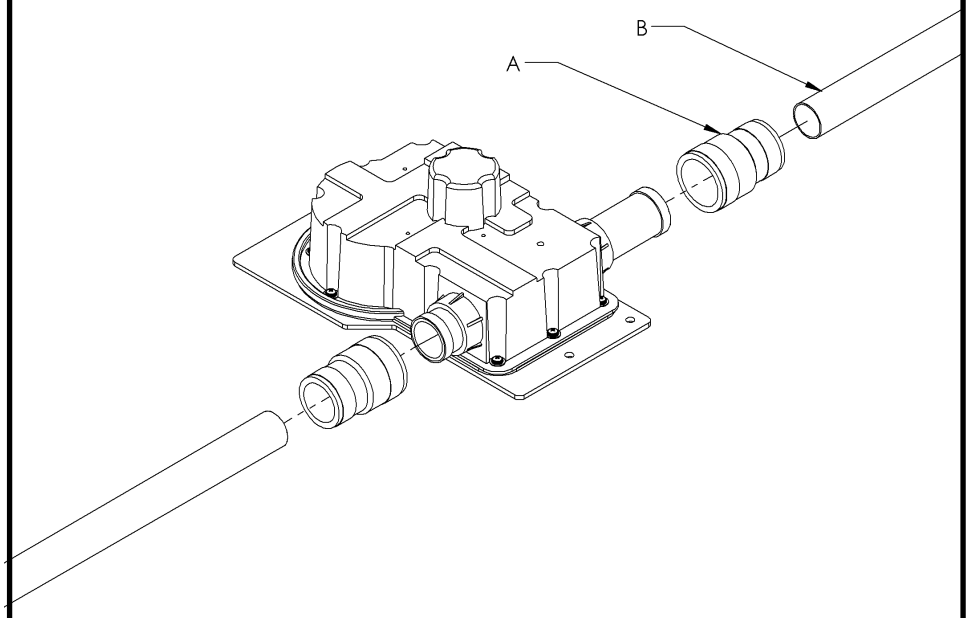


Figure 5

INSTALL MAST CLAMPS

Don't forget to apply anti-seize to all stainless steel hardware to prevent galling!

- Install the clamps on the EHU mounting plate following **figure 6** below. The default clamps allow for mounting onto a 1-3/4" mast.
- **Apply silicon to drain hole (E) to prevent water ingress.**
- You are now ready to mount the antenna onto your tower!
- Once installed, tighten the set screws to prevent the antenna from twisting on the mast in heavy winds.

Key	QTY	Part Number	Description
A	4	60-0075	Bolt, 5/16" X 3-1/4", S/S
B	4	10-1601-03	Saddle, 1-3/4" x 3/4"
C	4	60-0046	Nut, 5/16" -18, Nylock
D	2	60-0112	Set Screw, 10-32 x 1/4", Cup Point, S/S
E			Drain Hole

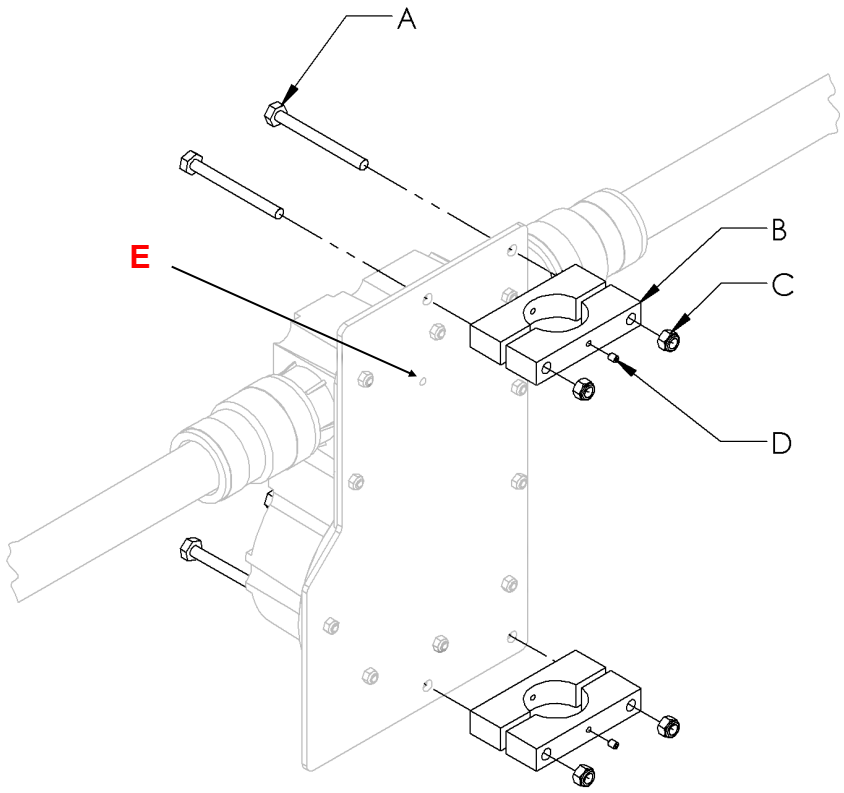
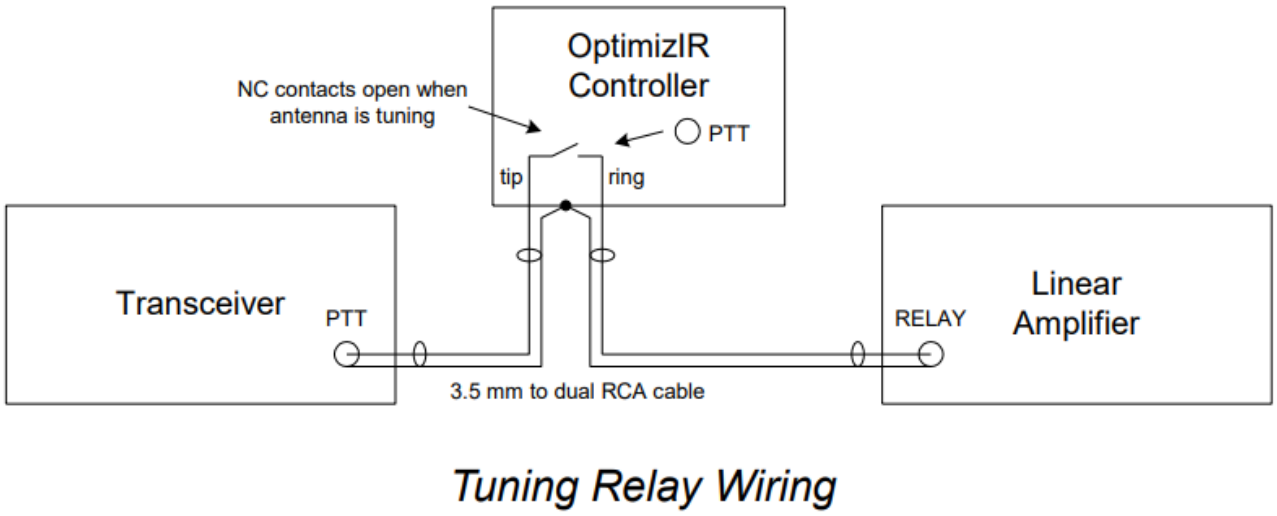


Figure 6

PTT LOCKOUT TUNING RELAY (INCLUDED)

To prevent application of unintended, excessive RF power while the SteppIR antenna is tuning, the SDA 100 and OptimizIR controller provides an isolated pair of contacts from a 3.5 mm stereo jack to interrupt the PTT relay signal to a linear amplifier. The cable is provided, but any standard 3.5 mm stereo plug to two RCA plug cable sold for audio applications works well in most cases. Some more modern amplifier relay control schemes are different and may not accommodate an RCA plug. Older amplifiers may use high voltage in their PTT circuit which may be a problem for some transceivers. Please read your amplifier and transceiver manuals carefully. The 3.5 mm plug tip and ring connect to isolated relay contacts inside the controller that interrupt the PTT circuit. The sleeve connection serves as a ground/shield. **Figure 6.01**

Figure 6.01



Tuning Relay Wiring

1:1 BALUN (OPTIONAL)

A balun is an electrical circuit used to help resolve the inherent problem of feeding an antenna with an electrically unbalanced (coax) feed line. It is intended to present an infinite impedance to any RF current that might otherwise flow on the outer conductor (shield) of the coax producing radiation from the line. This current, if high enough, can cause heat buildup and potential damage to the radio as well as a distorted radiation pattern and RF noise.

Why is it Optional ?:

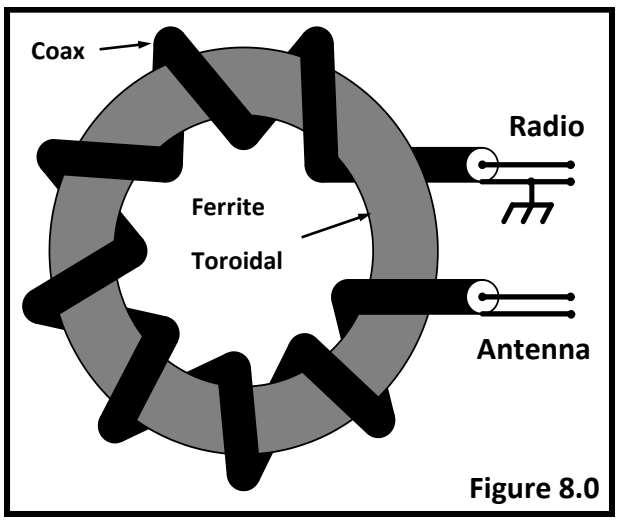


Figure 8.0

There are too many variables outside of SteppIR's control that are installation specific and therefore should be up to the customer to decide on whether they would like to add a 1:1 balun to their system.

When Should You Use A Balun ?:

- When using coaxial cable instead of twin lead cable
- Unusual SWR readings on one band
- Excessive RF noise is observed

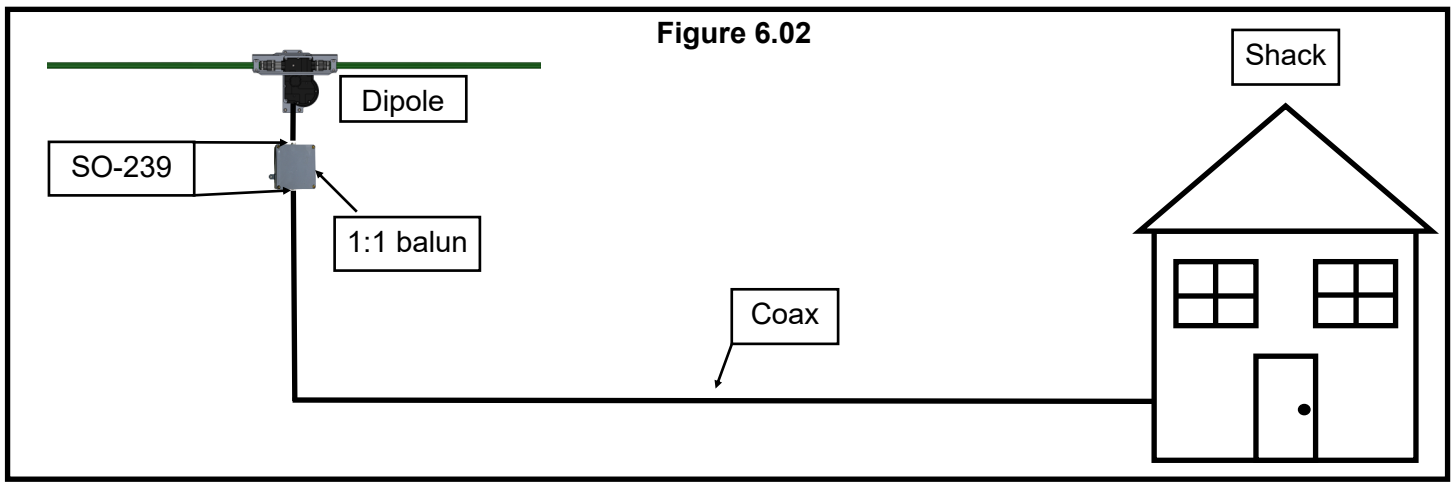


Figure 6.02

VOLTAGE/SURGE SUPPRESSOR (OPTIONAL)

- The Voltage/Surge Suppressor is can be installed at the base of the tower, or on a well grounded structure (ground rod or ground bus bar). It is recommended to mount this outside of the radio room.
- You will need to cut the control cable in order to install the Voltage/Surge Suppressor. **MAKE SURE THAT THE POWER IS TURNED OFF AND UNPLUGGED ON THE CONTROLLER AS WELL AS THE CONTROL CABLE UNPLUGGED**.
- The Voltage/Surge Suppressor **DOES NOT GO IN SERIES WITH THE CONTROL CABLE**. If you wire it this way, your control box **WILL NOT OPERATE**. The Surge Suppressor is a **SHUNT DEVICE**. To visualize the connection, think of a "T". The control cable is the top of the "T" and the Surge Suppressor is the "leg" of the "T".

Mounting the Voltage/Surge Suppressor:

1. Remove the two Galvanized U-Bolts from the mounting bracket.

2. Install the U-Bolts around the tower leg to suite your installation. If mounting to a ground post or ground bus bar then you may use the holes for the U-bolts as mounting holes to the post/bus bar.

3. Install the Voltage/Surge Suppressor, square washer plates and nuts.

4. Tighten the nuts. Over-tightening of the U-Bolts may result in bending of the aluminum bracket.

5. Visit your local hardware store or home center and pick up some Forked Crimp Style Lugs that will fit the #8 stud. You may either use crimp style lugs that need NO soldering or soldered lugs AND because they are fork style, you don't need to remove the nut to install them (Very handy when working on the tower!). It's a good idea to give the lug a tug to confirm it's crimped properly. **Soldered lugs are preferred if you have the capability to do so.**

The 8 Wire Surge Suppressor will require 16 Lugs. The 12 Wire Surge Suppressor will require 24 Lugs. The 16 Wire Surge Suppressor will require 32 Lugs.

6. If you match the colors of the leads on your control cables per stud, you should have no issues as shown in **Figure 6.03.** The Voltage/Surge Suppressor was checked at the factory for defects prior to shipment.

7. Make sure that you secure the control cable with tape or cable ties (aka Zip Ties) to the tower or ground rod as shown in **Figure 6.04**.

8. We recommend sealing up the connections by either using silicone tape or electrical tape to wrap the entire Voltage/Surge Suppressor and cable connections so that they do not corrode from moisture.

Figure 6.03

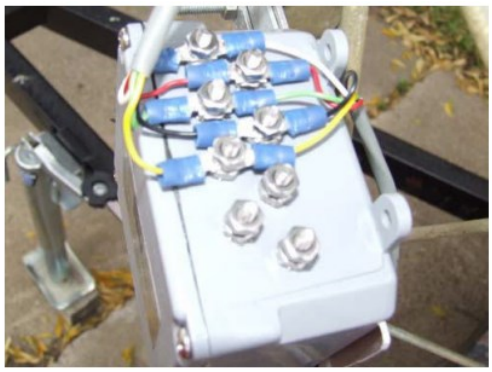


Figure 6.04

GROUNDING THE CONTROLLER (MANDATORY)

Make sure the controller is grounded! The ground lug locations are different for different controllers—the locations of the lugs for each type of controller are shown in the photos below.

To ground the controller, remove the yellow cap on the lug and take off the first nut and star washer. Attach a ring lug to the grounding wire and secure it to the ground lug by placing the ring lug, then star washer, then screwing the nut back on. Tighten with a wrench or socket. The other end of the wire should connect to any suitable ground point, typically a ground bus bar used for station ground.

Figure 6.05: *Lug location for SDA100, OptimizIR, and OptimizIR 2.0 (early models)*

Figure 6.06: Lug location for OptimizIR 2.0 (stainless steel chassis)

HOW TO TUNE YOUR DIPOLE (MANDATORY)

The impedance of a half wave horizontal dipole depends on it's height above ground. In the frequency range of 14 to 28 MHz, the typical height of an amateur radio antenna is between 1/2 and 1 wavelength above ground. At these heights the impedance of a horizontal 1/2 wave dipole is in the vicinity of 70 to 80 ohms. When the antenna is mounted at heights greater than 1/2 wavelength, it should exhibit an SWR of less than 1.5 to one. At lower heights, the SWR may be higher.

A dipole antenna's resonant frequency is determined by the length of its element, height above ground, as well as a variety of other factors. Since every installation is different, the factory default lengths in the controller for each band/frequency are almost guaranteed to be need adjustment for your particular installation. Because of this, **it is mandatory to tune the length of the antenna on all frequencies of operation before application of high power**.

This is done by pressing "Setup" and selecting the "Create/Modify" menu. In this menu, the operator can adjust the length of the driven element (DVR/DE) until the SWR is at least below 1.4-1.3. An antenna analyzer (Vector Network Analyzer) is extremely helpful for this task as it allows the user to plot SWR over a frequency range, at which you can match the SWR dip in the antenna with the frequency which you are tuning in the create/modify menu. **If you are unable to make a good match by adjusting the length of the driven element, you most likely have an issue with your connections.**

SteppIR antenna tunes are broken up into "segments" which we use to create an ideal antenna at a specific frequency. Each segment consists of a frequency, element lengths, and some miscellaneous display settings like gain, F/R, and beam width. To get the element lengths at frequencies in between segments, the controller utilizes an algorithm to calculate them with the given segment information. The controller can only "store" lengths at the start of each segment, and it calculates the lengths in between. What this means for the end user is that the antenna can only be tuned once in between each segment.

Important notes:

- Start tuning by first calibrating the antenna.
- You will want to tune starting at the highest frequency and work your way down to lower frequencies.
- Send the antenna to the recommended tune frequency, scan a large span (the SWR dip may be outside of the ham band) with your antenna analyzer and find the minimum SWR. Lengthen/shorten the dipole element until you have a low SWR at the controller frequency.
- In order to save a setting in the Create/Modify menu, you can simply exit from the screen by pressing "Setup" again, and when the controller prompts you whether you want to save your changes make sure you select "Yes" to save your changes.

On the next pages are lists of the segments, segment frequencies, and recommended tune frequencies for the dipole on the OptimizIR and SDA100 controllers.

OptimizIR / OptimizIR 2.0 recommended tuning frequencies

Segment #	Start	End	Tune Frequency	Ham Band
11	51.00	65.00	52.5	6m (50-54)
10	49.50	51.00	50.5	
9	41.00	49.50	45.25	-
8	34.50	41.00	37.75	-
7	29.00	34.50	29.35	10m (28.0-29.7)
6	27.50	29.00	28.5	
5	24.60	27.50	24.94	12m (24.89-24.99)
4	20.80	24.60	21.225	15m (21.0-21.45)
3	17.85	20.80	18.118	17m (18.068-18.168)
2	15.80	17.85	16.825	-
1	13.85	15.80	14.175	20m (14.0-14.35)

Please refer to the create/modify section of the controller manual and our Tech Support Video section on our website for more information on tuning.

OptimizIR Manual:

https://consumer.steppir.com/wp-content/uploads/2018/05/SDA-2000-OptimizIR-Manual-Version-1_4-April-17-2018.pdf

Tech Support Videos:

https://consumer.steppir.com/support/tech-support-videos/

SDA100 recommended tuning frequencies

Segment #	Start	End	Tune Frequency	Ham Band
11	51.00	65.525	52.5	6m (50-54)
10	49.50	51.00	50.5	
9	41.00	49.50	45.25	-
8	34.50	41.00	37.75	-
7	29.00	34.50	29.35	10m (28.0-29.7)
6	27.50	29.00	28.5	
5	24.60	27.50	24.94	12m (24.89-24.99)
4	20.80	24.60	21.225	15m (21.0-21.45)
3	17.85	20.80	18.118	17m (18.068-18.168)
2	15.80	17.85	16.825	-
1	13.85	15.80	14.175	20m (14.0-14.35)

Please refer to the create/modify section of the controller manual and our Tech Support Video section on our website for more information on tuning.

SDA100 Manuals:

Mustang Firmware:

https://consumer.steppir.com/wp-content/uploads/2020/10/SDA100-Operators-Guide-MUSTANG.pdf

Pinto Firmware:

https://consumer.steppir.com/wp-content/uploads/2011/10/operations-manual-SDA-100-rev-2-dec-12.pdf

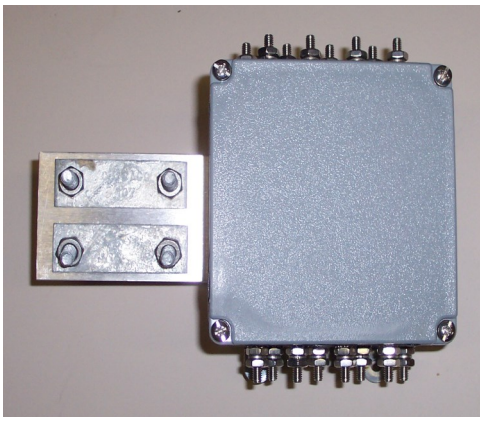
Tech Support Videos:

https://consumer.steppir.com/support/tech-support-videos/

STEPPIR OPTIONS

- **“Y” Cable**

- **Transceiver Interface (Rig Specific)**



- **Voltage suppressor** (8 conductor)

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

13406 SE 32nd St. Bellevue, WA 98005 | consumer.steppir.com | 425.453.1910 | sales@steppir.com