

# **SteppIR<sup>TM</sup>** **Antenna Systems**

**Yagi • Dipole • Vertical** (Patented)

## ***80m Coil Kit for the BigIR*** ***Instruction Manual***



**SteppIR BigIR MK III Test Installation W/80m Coil**

### **SteppIR Antennas**

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80m Coil Kit			PARTS LIST
ITEM	QTY	PART #	DESCRIPTION
BOX 1	1		80M Loading Coil
			<b>Hardware Kit for Shipping Coil Alone</b>
	4	60-1004-01	1/2" Nylon Spacer
	4	60-0072-01	10-32x1-1/2 SS Screws
	10	60-0061	10-32x7/8" SS Screws
	14	60-0019	10-32 Nylok Nuts
	1	10-1029-01	Connector Protector
	1	20-6020-01	Single Terminal Block
	1		Firmware Chip
	1		Chip Extractor
			<b>Hardware Kit for Shipping Coil <u>With</u> BigIR MK III</b>
	1	10-1029-01	Connector Protector



## The SteppIR 80m Loading Coil:

The SteppIR 80m coil is designed to mount on the base of the SteppIR BigIR vertical antenna. It will give the BigIR the capability to continuously tune from 3.4 MHz to 60 MHz.

It does this by adding a multi-tapped, high Q, base loading coil and a rotary selector switch that is controlled by the SteppIR controller.

The SteppIR coil has 4 taps on the 80m band and one tap on the 60m band plus one position that switches the coil out of the circuit. The SteppIR controller automatically selects the proper tap and antenna length for the selected frequency to give the best performance. When the frequency is greater than 6.9 MHz the coil is switched out and the BigIR operates as before.

## Things to Know when Using Your 80m Loading Coil:

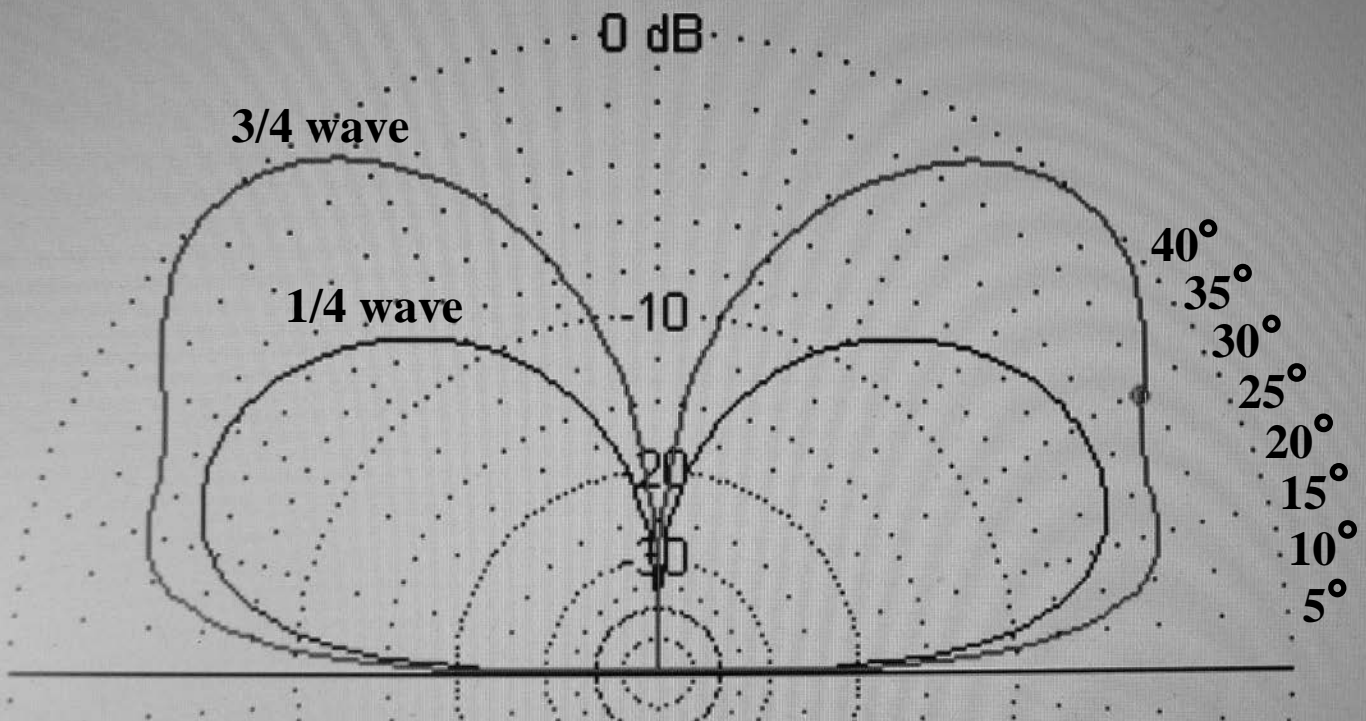
- **Always - Always** - unplug the control box and / or disconnect the 25 pin control cable from the control box before doing any work on the electrical system of the antenna. **Any short or crossed wires may permanently damage the controller circuit board**
- There are high RF voltages present at the coil output, they can burn you but not shock you.
- There are modifications required on the original BigIR and the BigIR MK II to operate the coil at its full power limit.
- The original BigIR (and the BigIR MK II) are limited to 500 watts (key down) when they are set to a frequency below 6.9 MHz. The BigIR MK II modifications are listed in these instructions. The original BigIR can be modified for the higher power limit at the factory. Call the factory for more information. The BigIR MK III operates with the coil at 1500 watts (key down) with no modifications.
- The power for the coil (below 6.9 MHz) is limited to 1500 watts (key down) .
- The loading coil, by design, adds extra length to the antenna electrically. As a result you may find that the BigIR and the BigIR MK II will not tune to the high end of the 10m band. This is not a problem on the MK III because the copper beryllium tape retracts completely into the element housing unit (motor box). For this reason and the following two, we recommend using the 3/4 wave mode on 15m and 6m.
  1. The SWR is higher on these bands when using the 80m coil because of the added electrical length that the coil introduces. The match is affected because this added length is not a straight vertical path.

- Modeling shows that  $3/4$  wave can provide greater gain than a  $1/4$  wave vertical at all angles above about 27 deg. The increase is 3 db to 4 db from about 27 deg to 45 deg elevation. Above 45 deg elevation take-off angle the gain is even greater, up to 8 db which can be good for closer in contacts. The only downside is you could potentially hear more close-in man made noise from high angles, but reports from the field indicate this hasn't been a problem.

The  $3/4$  wave vertical will also show gains at angles below 27 deg down to 8 deg of between 1 db to 3 db when ground quality is less than average and fewer than 25 radials are used. The length of the radials also affects this phenomenon. Twenty five one wave-length radials (which is what a  $1/8$  wave radial is on 80m) when used on 10m, makes the  $3/4$  wave and  $1/4$  wave vertical very close to equal at the low elevation angles and the  $3/4$  wave always has the advantage above 27 deg. With shorter and fewer radials the  $3/4$  wave vertical begins to have gain over the  $1/4$  wave vertical at low angles.

- The operating frequency ranges and power limits before modification are:
  - 3.4 - 6.8 MHz @ 500 watts
  - 6.9 - 27 MHz @ 3000 watts

## Gain of $3/4 \lambda$ over $1/4 \lambda$ Vertical



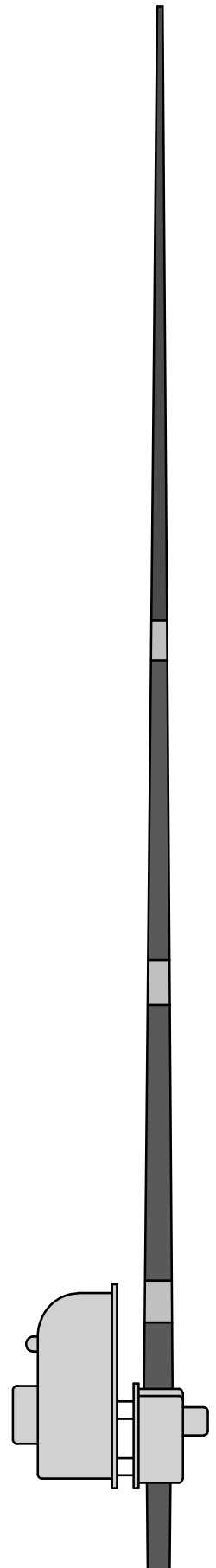
Over real, average ground with 12 one wavelength radials

BigIR MK III Procedure to add 80m Coil:

- \* • If you have purchased the MK III and the coil together at the same time, skip the \* steps.
- \* Mount coil housing to the element unit using 4 (10-32x1-3/4) screws (**Figure 9 & Figure 11**).
- \* Disconnect the coax feed line from the MK III element housing unit (**Figure 33**).
- \* Disconnect the radials from the MK III element housing unit (**Figure 33**).
- Connect the output lead of the coil to the coax connector on the MK III element housing unit.
- Connect the coax line from the transmitter to the coax connector on the 80m coil housing (**Figure 33**).
- Connect the radial system to the ground lug on the 80m coil housing (**Figure 33**).

## ::: Note :::

- Use ONLY the ground lug on the coil housing for ground and radial connections.
- Connect NOTHING to the ground lug on the element housing. The coax connector and the ground lug on the element housing are now “RF HOT”
- It’s a good idea to cover them with tape or RTV silicone or something similar to protect pets and children.
- Connect the four terminal lugs from the control cable to the appropriate four terminals on the coil housing (Figure 33). Apply tape or silicone to weatherproof the connections.
- \* The coil is now ready for use after you install the new controller firmware.

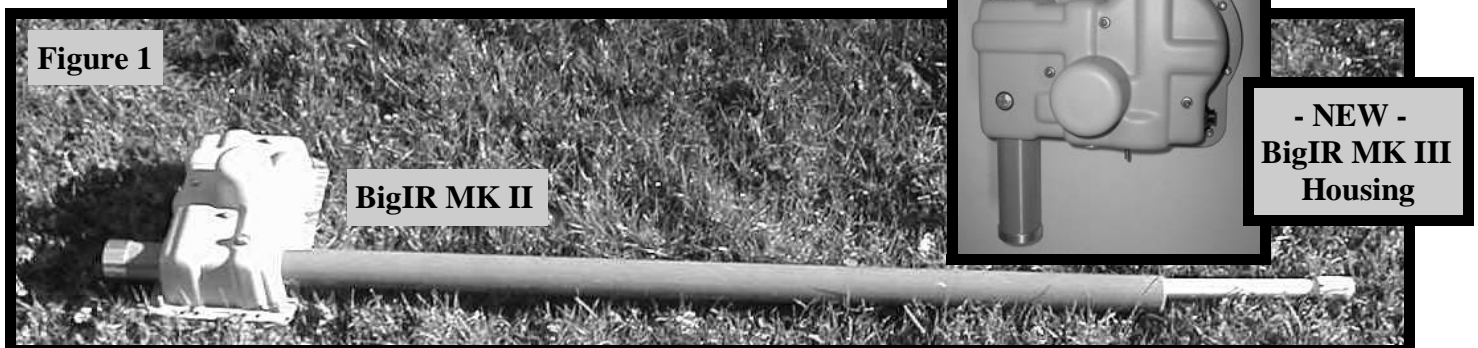


**The Following Modifications Need to be Made to the BigIR MK II to Operate the Coil at 1500 watts.**

- The coax connector must be bypassed internally on the element housing unit.
- The small screw in the inner element liner CPVC coupler must be removed.

## **Disassembling the Antenna:**

- Retract the copper element to the home position.
  - Press 'Mode' button until you see 'Setup Mode' (Setup light will also come on)
  - Press 'Select' button (within 4 seconds)
  - Press 'Up' or 'Dn' button to scroll to 'Retract Elements'
  - Press 'Select' button and 'Home Now ?' will display
  - Press 'Up' or 'Dn' button to select 'Yes' (flashing)
  - Press 'Select' button and the elements will retract (wait until the '\*' stops flashing)
- **Turn off the controller and unplug the power cord.**
- **Disconnect the 25 pin control cable connector from the back of the controller.**
- Disconnect the 4 pin control cable connector from the antenna element housing unit.
- Disconnect the coax and radials from the antenna element housing unit.
- Disconnect the guy wires (if used)
- Remove the antenna from its mast and lay it on the ground.
- Remove the 25 foot telescoping fiberglass element support tube (pole) and set it aside.
- Remove the 4 foot fiberglass extension section of the fiberglass element support tube and set it aside.
- The base assembly can now be modified (**Figure 1**).



**Note:** The BigIR MK I - The original BigIR vertical antenna, can only handle 500w with the coil

The BigIR MK II - Identical to the MK I except:

- Longer copper tape guide inside the fiberglass pole
- It can safely run 1500 watts output using the SteppIR 80m coil

The BigIR MK III - Internal and structural modifications

- Moved the coax connector to a more convenient location
- Unlike the MK II no internal jumpers are required to use the 80m coil
- Easier to take portable and/or ship
- Improved wind survivability
  - Un-Guyed 70 mph
  - One Set of Guys 90 mph
  - Two Set of Guys 110 mph
  - High Wind Guy Set 125 mph

## Bypassing the Coax Connector on the Element Control Unit:

This procedure bypasses the coax connector on your BigIR MK II allowing you to use the ground stud on your BigIR MK II to connect your high voltage line from your 80m loading coil so it can handle 1500 watts. The coax connector no longer serves any function after this modification.

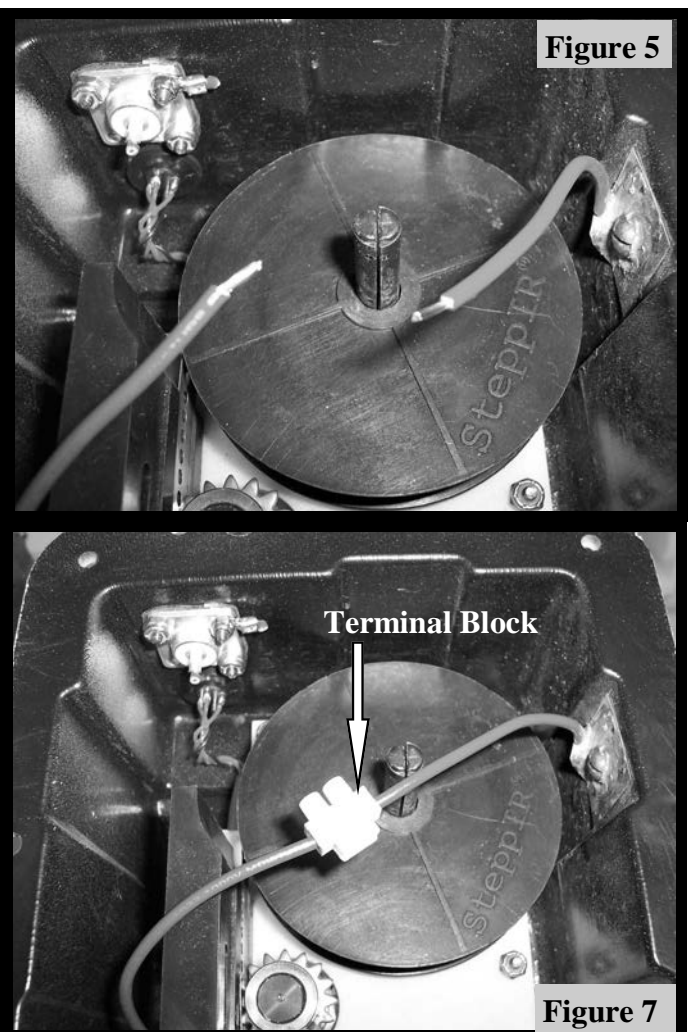
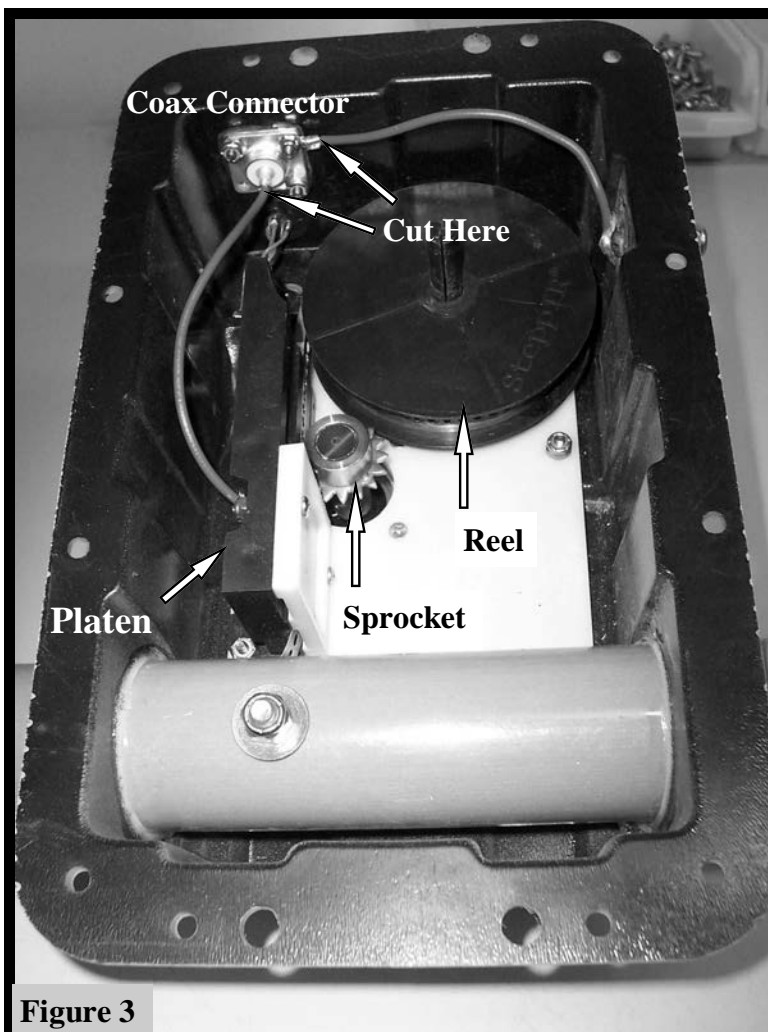
**!!!!!!!!!! CAUTION !!!!!!!!!!**

**UNPLUG ALL WIRES AND COAX LINES FROM THE BIGIR BEFORE DOING ANY MODIFICATIONS.**

## BigIR MK I (original model) & MK II Modification Procedure:

- Remove the 10 (10x32) screws that hold the lid to the BigIR element housing unit.
- Remove the lid and the housing gasket. We have supplied you with new hardware and a new gasket for reassembly at the end of the 80m rewiring upgrade.
- Locate the coax connector from the inside of the housing. You will notice two green wires that are connected to the connector. **One**, the center line, that is connected to the brush assembly on the platen. **Two**, the ground wire, that is connecting the ground stud to the coax connector (**Figure 3**).
- Cut both wires at the connector then trim them each to about 3" long. Strip 1/4" of insulation off of each end of the two wires (**Figure 5**).
- The wire connected to the brush must be moved on top of the **platen** so that it will reach the other wire connected to the ground terminal. The splice will be located above the reel and sprocket as it sits inside the housing. Also make sure that the wires are not touching the sprocket or reel inside the housing (**Figure 5**).

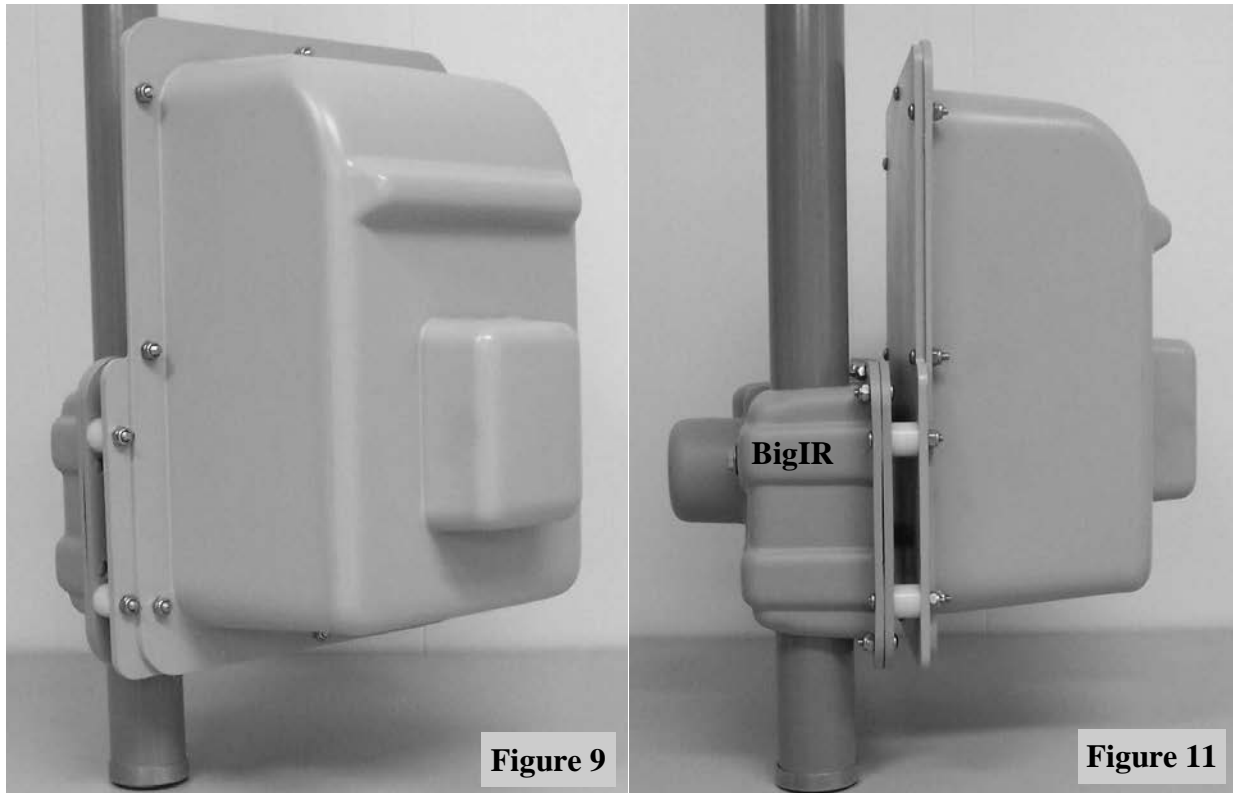
- These two wires will be connected using the provided single wire terminal block. Be sure that the wires fit snug inside the block then tighten the screws firmly. If you decide to solder these wires together, be sure to insulate the joint adequately (such as heat shrink). Also, make sure if you use tape for insulation, it does not touch the reel or sprocket after the lid has been placed back on the unit (**Figure 7**).
- Do not remove the old coax connector. It must stay in the unit to seal the hole.
- Locate the new housing gasket and stainless steel hardware we have provided to secure the lid back onto the element housing. Simply align the holes of the gasket to the holes on the housing and drop the screws through. When the screws are properly tightened the gasket will be flat. Do be careful not to over tighten the screws for it can cause the housing to crack. The 80m coil will have the mounting hardware for attaching your BigIR.



## Mounting the Coil Housing:

- Mount the coil housing to the element housing unit using (4) 10-32x1-1/4 in. screws and (4) 1/2 in. standoffs with the terminals at the bottom (**Figure 9** & **Figure 11**).

Note: For the BigIR MK III it is recommended that you insert the (4) 10-32x1-1/4 in. screws from the coil side (opposite of **Figure 9** & **Figure 11**) to allow clearance for the nuts.



- Connect the output lead of the coil to the ground lug on the bottom of the element housing unit.
- Use plenty of silicone to protect the high voltage RF connection (ground lug) on the bottom of the element housing unit.
- Reconnect the coax feed line along with the 1:1 balun (if used).

## Removing the Small Screw in the CPVC Element Liner Coupler.

- At the end of the first section of 3/4" CPVC liner there is a coupling held in place with a small screw (**Figure 13**). **Remove** this screw, it could potentially react to the high voltage RF present when using the coil.
- Carefully remove the coupling, apply PVC glue (supplied) and reinstall the coupling making sure that it is seated firmly (**Figure 15**).



Figure 13

Remove this Screw

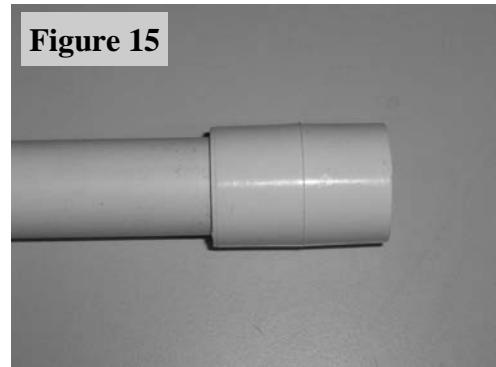


Figure 15

## Reassembling the Antenna:

- Reinstall the second and third sections of 3/4" CPVC liner gluing them firmly in place (**Figure 17**).

**NOTE:** If you need to take the antenna apart in the future you can cut the 3/4" diameter plastic pipe (after homing the copper) a minimum of 1 in. above the coupler and when you are ready to reinstall the plastic pipe glue in a new cupper.

- Reinstall the 4 foot fiberglass extension section of the fiberglass element support tub
- Tape the joint as done during your original assembly.
- Reinstall the third section of 3/4" CPVC liner gluing it firmly place (**Figure 17**).
- Reinstall the 25' telescoping fiberglass element support tube (pole).
- Tape the joint as done during your original assembly.
- Mount the antenna back on its mast.
- Reconnect the guy wires (if used).
- For retrofit installations only - solder the new 4 conductor control cable leads (for the coil) to the existing 25 pin control cable connector per **Drawing 1**. (**Watch for solder bridges !!!**)
- Connect the control cable 4 pin plug to the antenna element housing unit.
- Connect the control cable's 4 terminal lugs to the 4 terminals on the coil housing (**Figure 33**).
- Connect the coax cable to the coax connector on the coil housing (**Figure 33**).
- Reconnect the 25 pin control cable connector to the back of the controller.
- Reconnect your ground cable and radials to the radial/ground stud on the coil housing (**Figure 33**).
- Use tape or silicone to protect all exposed outdoor connections.



Figure 17

## Installing the New Firmware Chip (retrofit kit only):

- If you have purchased the BigIR MK III and the 80m coil together at the same time this installation has already been done at the factory.

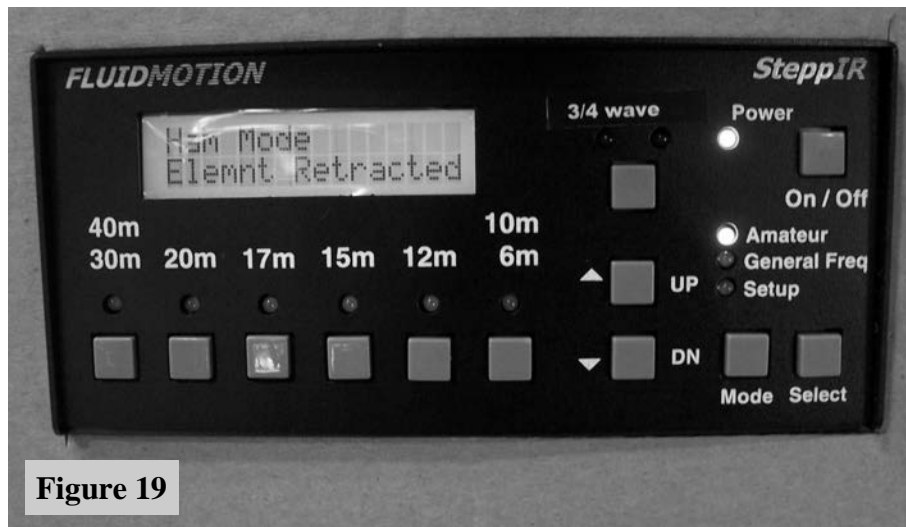


Figure 19

- Remove the controller top cover (**Figure 21**)
  - Remove four Phillips head screws (two on each side)
  - Remove the 2 jack screws from the 25 pin D sub connector (and 4 jack screws from the (2) 9 pin D-sub connectors if you have the interface option on your controller)
  - Remove nut and washer from the ground stud
  - Lift the top cover off

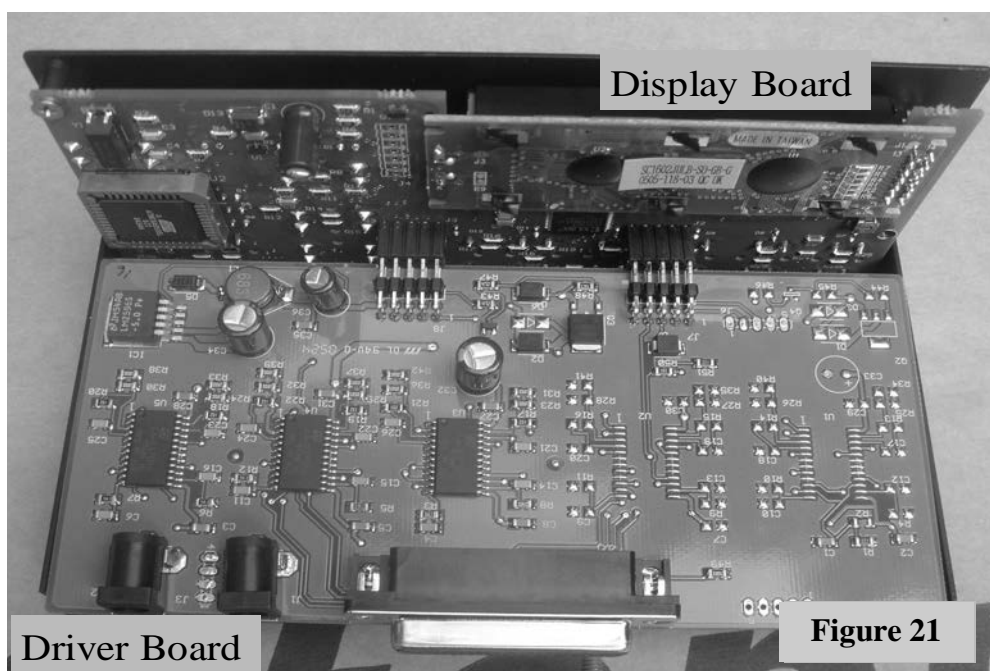
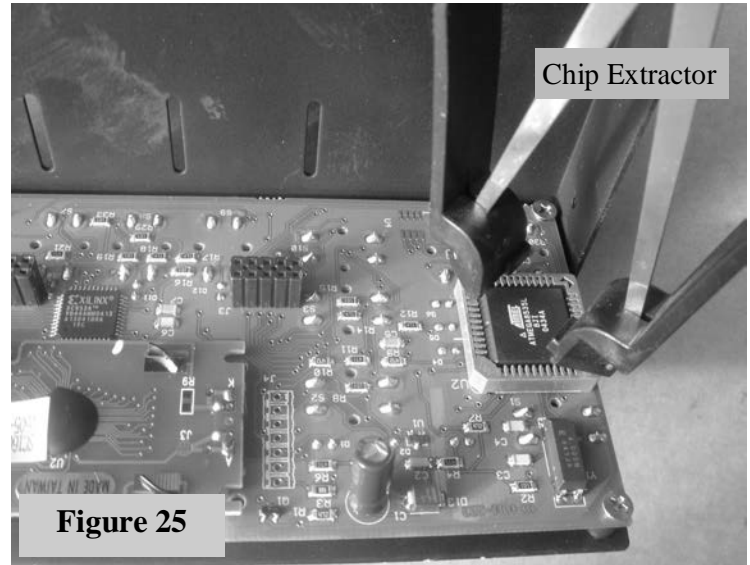
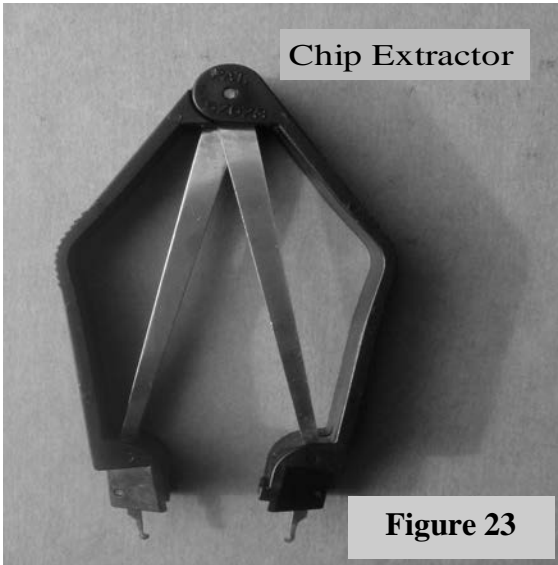
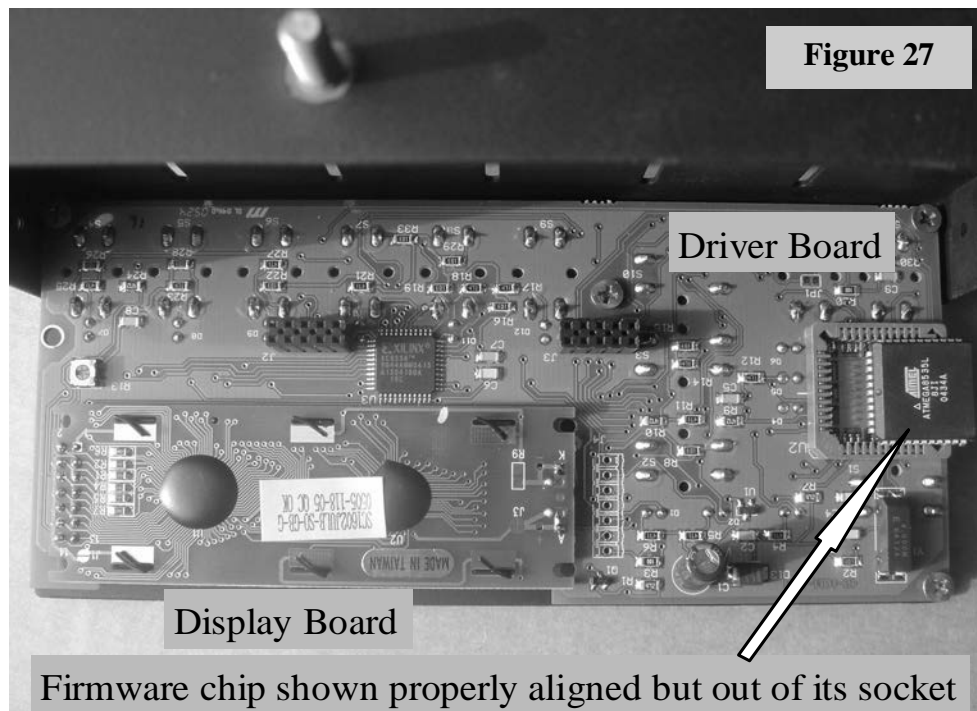


Figure 21

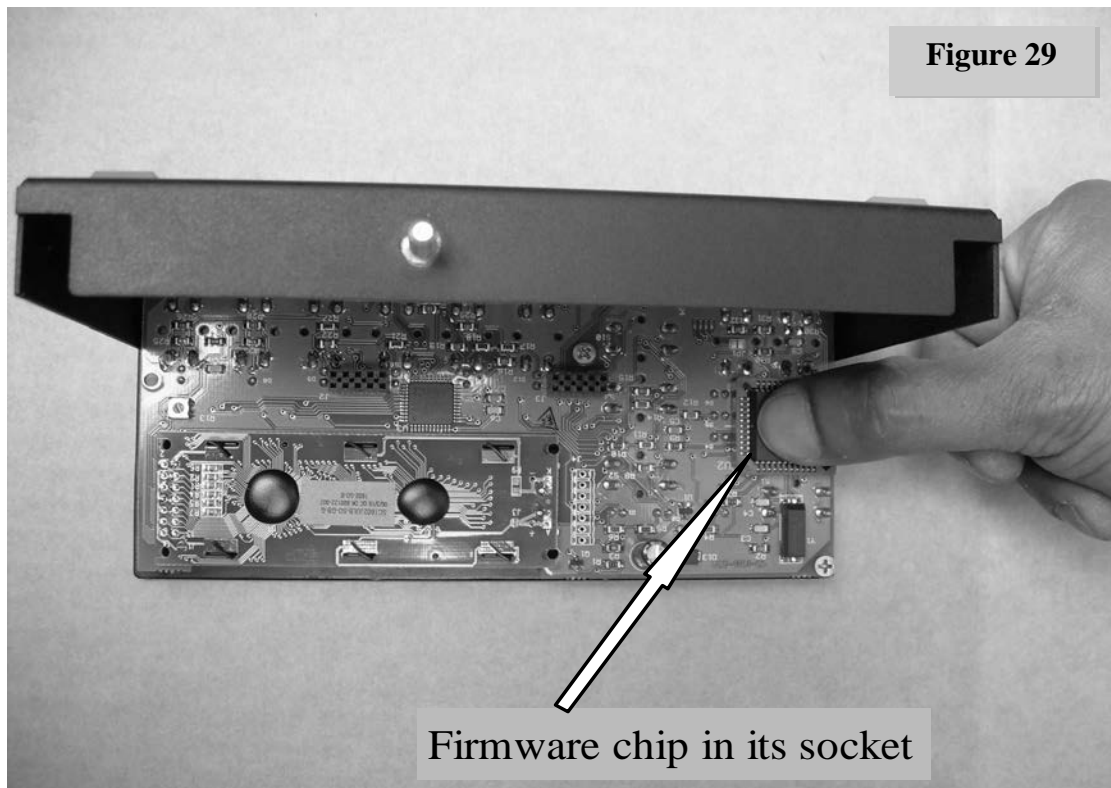
- Unplug the driver board from the display board (**Figure 21**)



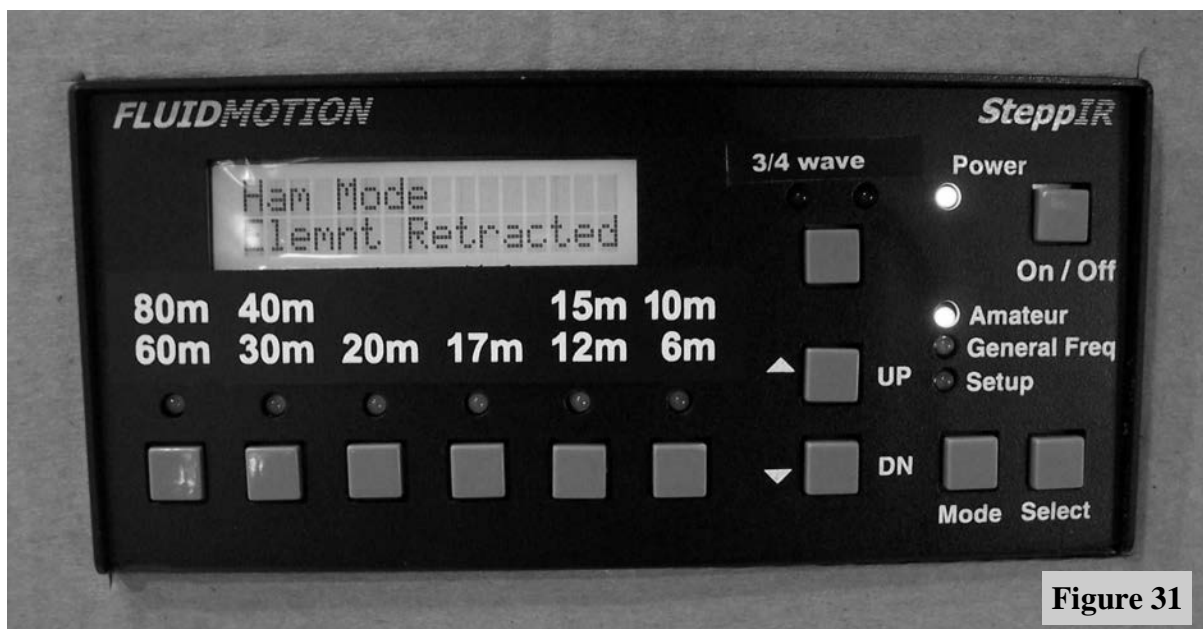
- Use a chip extractor (**Figure 23 & 25**) to carefully pull the chip out of its socket. The tiny “claws” on the extractor fit at the chip corners, and hook under the chip. Gently pull the chip upwards, rocking slightly as necessary until it is free.



- **Caution:** Using any other tool to remove the chip may damage the pins on the chip
- Align the arrow on the replacement chip to the arrow in the chip socket (**Figure 27**)

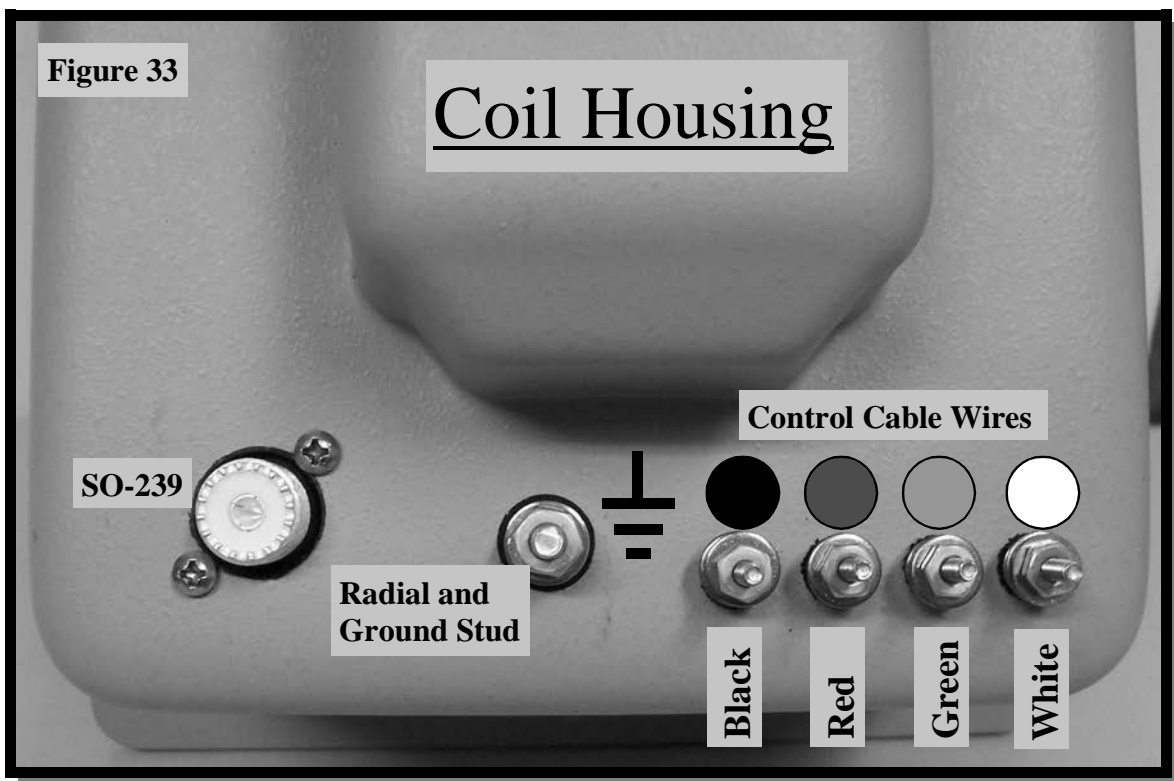


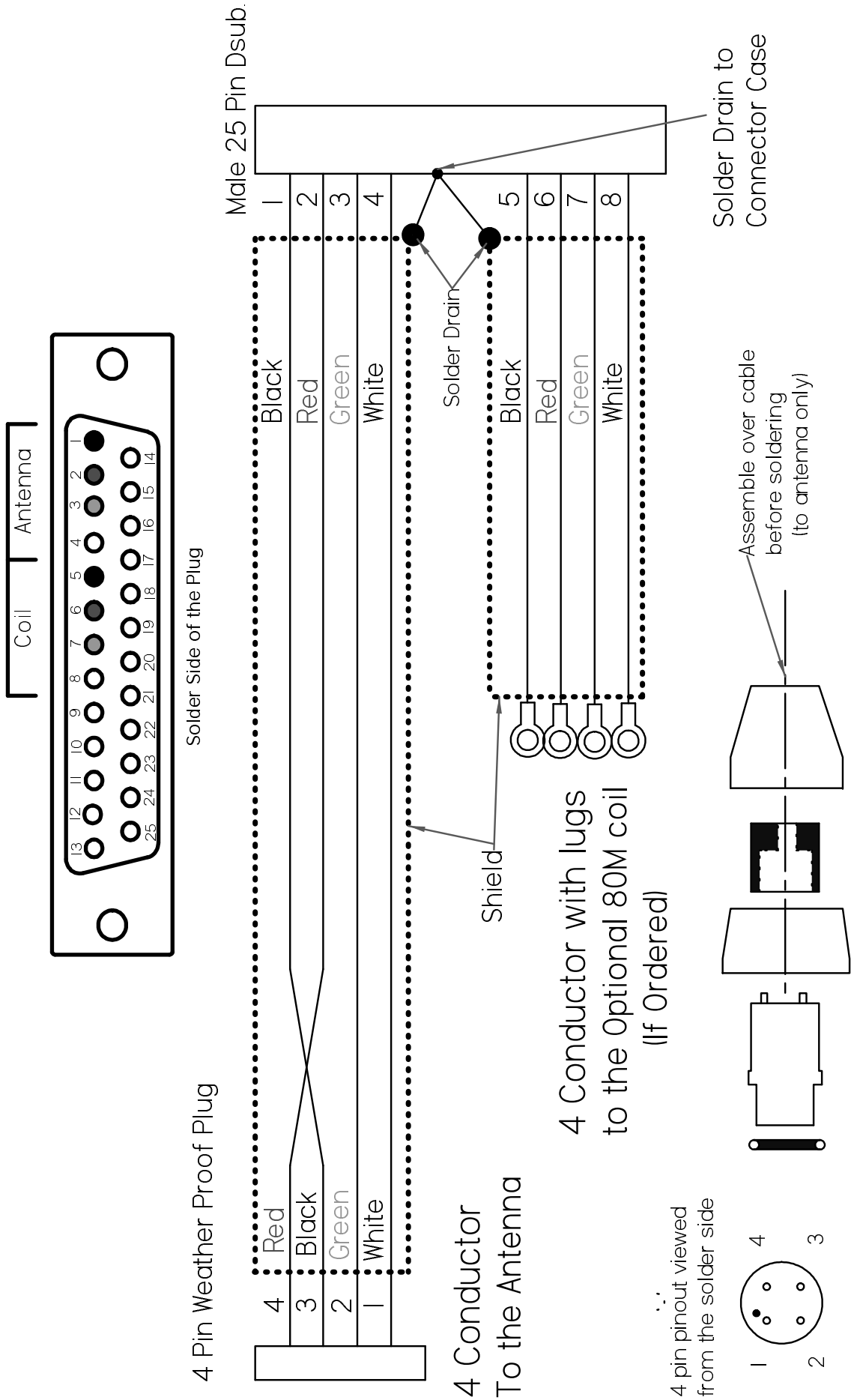
- Center the chip in the socket and press the chip down vertically with your thumb (**Figure 29**). Press evenly until the chip is firmly seated on all sides.
- Reinstall the driver board to the display board (**Figure 21**)
- Reassemble the controller cover
- Install the new overlay sticker to properly identify the controller buttons (**Figure 31**).



## Powering up and Enabling the Coil:

- Plug in the controller power cord.
- Turn on the controller and select the “General Frequency” mode.
- Press and hold the select key until some of the band LED’s light up (more than one band LED will light) then release the select key. You are now in the Options Menu.
- Turn on the 4th from the left band LED by pressing the corresponding band button. This enables the 80m coil.
- Exit the Options Menu by pressing the “Mode” button and go to the “Setup” mode and perform a “Calibrate”.
- Select the “Amateur Mode” and set the controller to the 20m band. Check the SWR to make sure the antenna is functioning properly. The SWR center will most likely be off a bit. This is because a vertical is very sensitive to its surroundings. If you desire you can use the setup menu to fine tune the SWR.
- You should be ready to go.





(2) - 4 Conductor Cables  
(BigIR + 80m Coil to Controller)



### **Limited Warranty**

These products have a limited warranty against manufacturer's defects in materials or construction for two (2) years from date of sale. Do not modify this product or change physical construction without the written permission of SteppIR Antennas Inc. This limited warranty is automatically void if the following occurs: improper installation, unauthorized modifications, physical abuse or damage from severe weather, beyond the manufacturer's control. Manufacturer's responsibility is strictly limited to repair, or replacement of defective components. The shipping instructions will be issued to the buyer for defective components, and shipping charges will be paid for by the buyer to the manufacturer. The manufacturer assumes no further liability.

# *Thank you for choosing SteppIR!!*



# *SteppIR* <sup>TM</sup> *Antenna Systems*

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[www.steppir.com](http://www.steppir.com)

SteppIR Antenna Information Web Sites(as of 4/09/07)

<http://steppir.com/>

<http://groups.yahoo.com/group/steppir/>