



END FED TUNER ASSEMBLY INSTRUCTIONS

Revision History

09 December 2015

First issued

5 March 2018

Added tips about capacitor trimmers

End Fed Tuner Packing List

It's a good idea to check that you have all the parts before you get started:

Item	Number	Comments
Front panel	1	
Black ABS box	1	Self tapping screws inside box (4 off black)
4mm binding post (red)	1	
4mm binding post (black)	1	
BNC bulkhead socket	1	
Variable capacitor	1	
M2.5 x 6	2	Mounting screws
M2.5 x 8	1	Spacer mounting screw
Plastic spacer	1	
knob	1	
Toroid T50-6	1	YELLOW
Tinned copper wire	15cm	for general wiring
Wire enamelled	60cm	cm for winding toroids
Instruction slip	1	web link to download full instructions

The variable capacitor and associated hardware are together in a plastic bag.

If anything is missing, just get in touch for help.

End Fed Tuner Instructions

The End Fed tuner kit is easy to make and you will end up with a very useful antenna tuner. The tuner will match the impedance of a typical end fed antenna (around 4,700 Ohms) to 50 Ohms.

Step by step instructions together with lots of photographs will make it easy to build your tuner. It will take around 90 minutes work. As with any construction project, as soon as you feel tired, stop. If you don't mistakes will follow!

For all the assembly work, find a light place to work with plenty of room. A tea tray is useful to work on as the raised sides stop small parts rolling away.

Spotted a mistake or need help?

Please let me know if you need help!

Email Richard@sotabeams.co.uk, telephone +44 (0) 1625 501643

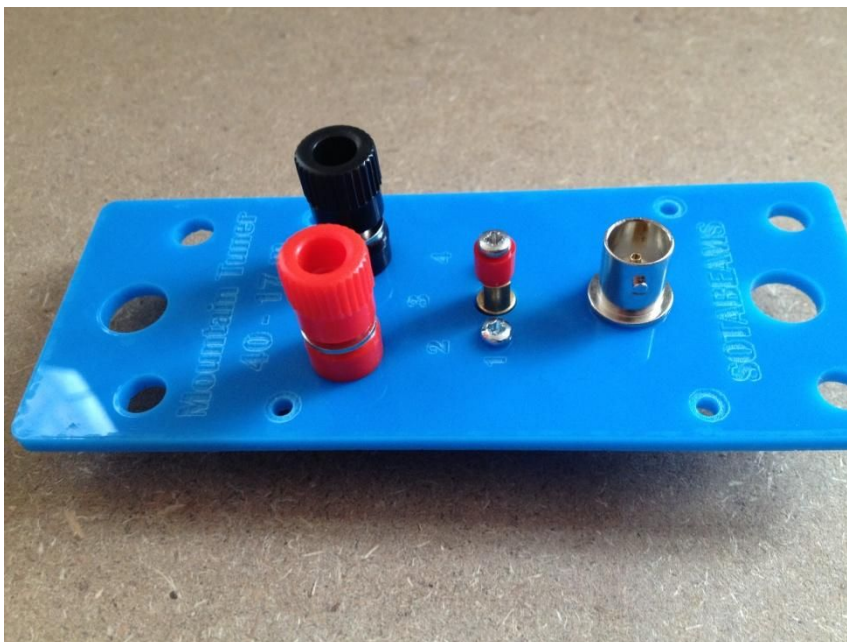
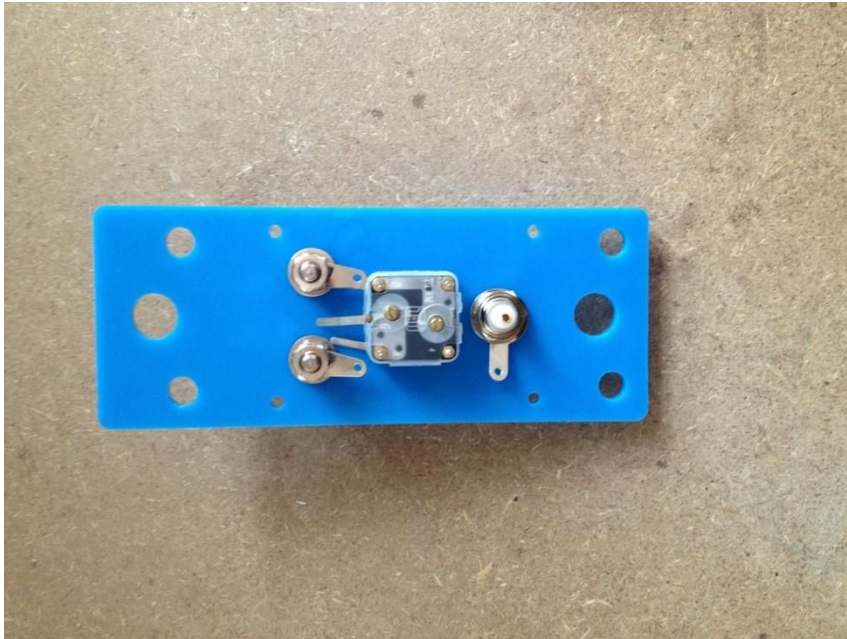
Tools needed

1. Small screwdriver (flat blade)
2. Small screwdriver (cross head)
3. Soldering iron and solder
4. Long nosed pliers
5. Epoxy glue
6. Small spanner
7. Ruler (cm)
8. Wire cutters

Mounting the hardware (estimated 15 minutes)

- ☐ Mount the BNC socket. The serrated washer goes on first, then the solder tag and finally the nut. Do not over tighten the nut as you could crack the front panel.
- ☐ Mount the two 4mm binding posts (one red, one black). They mount with the larger washer first, then the small washer, one nut, the solder tag and the other nut. The red ones should be on the left when viewed from the front.
- ☐ Make sure that you can unscrew the plastic tops of the binding posts. When new they are usually very stiff but they ease off after a couple of uses.
- ☐ The variable capacitor is mounted using the hardware in its bag. Mount the variable capacitor with its connections towards the top of the panel. The two short M2.5 screws hold the capacitor to the panel. Tighten these screws evenly. Check that you can turn the capacitor shaft with your fingers. It should be tight but smooth.
- ☐ The small plastic tubular spacer screws onto the end of the brass shaft of the capacitor to act as an extension. It's attached with the longer (8mm) M2.5 screw. It's a good idea to use a small amount of **epoxy glue** to hold the extension screw and spacer firmly in place. This will stop the spacer spinning on the screw and stop the assembly from unscrewing. Make sure

no glue is visible as this will stop you putting on the knob later. Allow the glue to set completely before mounting the knob on the shaft of the variable capacitor.





- ☐ Attach the knob. Make sure that it turns smoothly and is correctly orientated.

Winding the toroid (estimated 15 minutes)

In this session you will wind the toroid. It's not hard but must be done carefully. Firstly, Google "winding toroids" for lots of good advice on the web.

Mountain Tuner Toroid T50-6 YELLOW

The toroid will be wound with enamelled copper wire. This is a brown/bronzed colour.

- ☐ To wind the toroid thread 3cm of the wire through the core and start winding. Each time the wire passes through the core it counts as a "turn". Pull each turn tight and don't overlap the turns.
- ☐ After the third pass through the core (= 3 turns), twist with wire to form a tap about 4 cm long.



Photo shows 3 turns, the twisted tap and a fourth turn.

- ☐ After the tap, wind a further 20 turns (so you have a total of 23 turn (3-TAP-20)).
- ☐ Once the core is wound, space the turns so that they cover about 80% of the circumference of the core. If you loose track while winding the turns always count the turns on the inside of the toroid.
- ☐ Cut the long end to 3cm length.

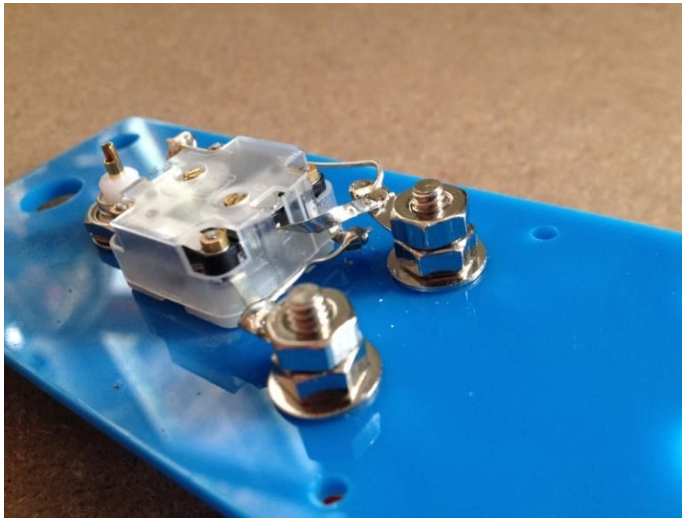


The completed toroid

Session 3: the final assembly (estimated 30 minutes)

- ☐ Cut 3.5 cm of the tinned copper wire.
- ☐ Solder this wire from the tag on the red binding post to the two tags on the variable capacitor that lie closes to the front panel. Long nosed pliers can be used the bend the capacitor tags around the tinned copper wire. Cut off any surplus.
- ☐ Solder 5 cm tinned copper wire from the tag on the black binding post to the top centre tag on the variable capacitor. Ensure that it does not touch any of the small brass screws on the variable capacitor. Cut off any surplus.
- ☐ Solder the remaining tinned copper wire from the solder tag on the BNC connector to the top centre tag on the variable capacitor (the same tag referred to in the previous instruction.). Cut off any surplus.





Installing the toroid

The toroid will sit on top of the variable capacitor.

- ☐ The wire used for the toroid is enamelled. This is an insulator and must be removed to allow the wire to be soldered. The easiest way is to get a blob of solder on the tip of your soldering iron and heat the two ends of the wire in the blob. This will burn off the enamelling and tin the wire ready for soldering. Do this in a well ventilated area. We use a small fan to blow the fumes away from us here at SOTABEAMS.
- ☐ The tap will need tinning too. Cut off the loop at the end of the tap and tin both the wires. Make sure that they are well tinned and that they are soldered together.
- ☐ Tin the centre connector of the BNC plug and solder the tap into it.
- ☐ Lay the toroid onto the top of the variable capacitor so that the two connections are in the right places for the next two stages..
- ☐ Solder the end of the wire nearest the tap (3 turns) to the solder tag on the black binding post.

- ☐ Solder the other end to the solder tag on the red binding post.



Final assembly

Take a few minutes to look closely at your soldered joints. Try to compare the circuit diagram (at the end of this document) to what you have constructed. If any connections look too close to others, gently move them apart.

Your tuner is now good to go.

Testing and using the End Fed Tuner

DC tests:

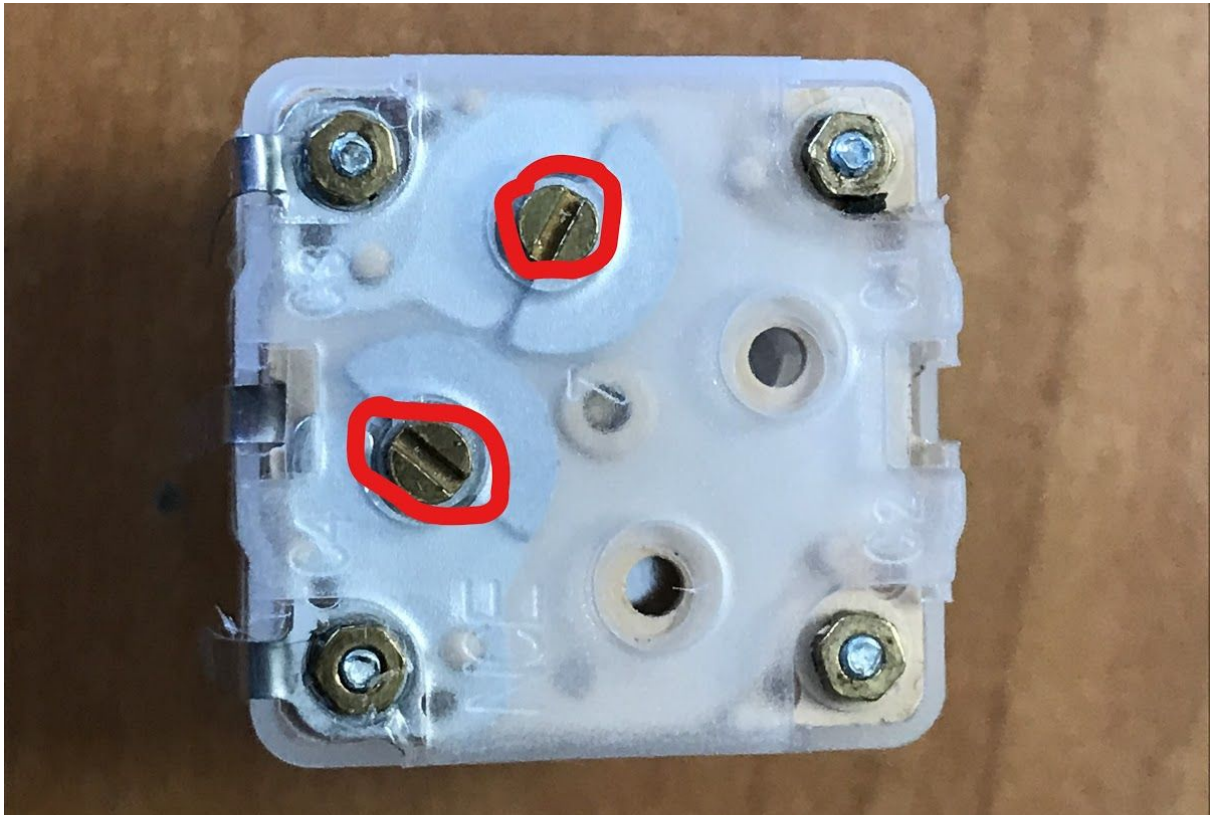
Measure the resistance between the red and black binding posts: **should be less than 3 Ohms**

Measure the resistance between the centre of the BNC plug and the red binding post: **should be less than 3 Ohms.**

The best way to test your end-fed tuner is to use an antenna analyser. Simply connect a 4700 Ohm resistor between the binding posts and check that you can get a good match (better than VSWR 2:1) from 7 - 18.1 MHz.

If the tuner does not cover the lower end of the range (7MHz), squeeze the turns on the toroid closer together.

If the tuner does not cover the upper end of the range (18.1 MHz), space the turns the turns on the toroid further apart or adjust the trimmers on the tuning capacitor for minimum capacitance (vanes unmeshed).



Once you are happy that the tuner is working. Lightly glue the toroid to the top of the variable capacitor.

Finally attach the box to the rear of the front panel using the four screws supplied.

If you wish you could run a bead of silicone bathroom sealants around the joint between the box and the front panel for improved waterproofing; this is not essential however.

Useful additional information

Not sure what cm means? Cm stands for centimetre. This is a measure of length used in most parts of the World. The following table gives conversions.

Centimeters To Inches Conversion Table

Cm	Inch	Cm	Inch	Cm	Inch	Cm	Inch
1	0.393700787	26	10.23622046	51	20.07874014	76	29.92125981
2	0.787401574	27	10.62992125	52	20.47244092	77	30.3149606
3	1.181102361	28	11.02362204	53	20.86614171	78	30.70866139
4	1.574803148	29	11.41732282	54	21.2598425	79	31.10236217
5	1.968503935	30	11.81102361	55	21.65354329	80	31.49606296
6	2.362204722	31	12.2047244	56	22.04724407	81	31.88976375
7	2.755905509	32	12.59842518	57	22.44094486	82	32.28346453
8	3.149606296	33	12.99212597	58	22.83464565	83	32.67716532
9	3.543307083	34	13.38582676	59	23.22834643	84	33.07086611
10	3.93700787	35	13.77952755	60	23.62204722	85	33.4645669
11	4.330708657	36	14.17322833	61	24.01574801	86	33.85826768
12	4.724409444	37	14.56692912	62	24.40944879	87	34.25196847
13	5.118110231	38	14.96062991	63	24.80314958	88	34.64566926
14	5.511811018	39	15.35433069	64	25.19685037	89	35.03937004
15	5.905511805	40	15.74803148	65	25.59055116	90	35.43307083
16	6.299212592	41	16.14173227	66	25.98425194	100	39.3700787
17	6.692913379	42	16.53543305	67	26.37795273	125	49.21259838
18	7.086614166	43	16.92913384	68	26.77165352	150	59.05511805
19	7.480314953	44	17.32283463	69	27.1653543	175	68.89763773
20	7.87401574	45	17.71653542	70	27.55905509	200	78.7401574
21	8.267716527	46	18.1102362	71	27.95275588	250	98.42519675
22	8.661417314	47	18.50393699	72	28.34645666	300	118.1102361
23	9.055118101	48	18.89763778	73	28.74015745	500	196.8503935
24	9.448818888	49	19.29133856	74	29.13385824	750	295.2755903
25	9.842519675	50	19.68503935	75	29.52755903	1000	393.700787

Circuit diagram

