MFJ-971 Portable Antenna Tuner Modifications

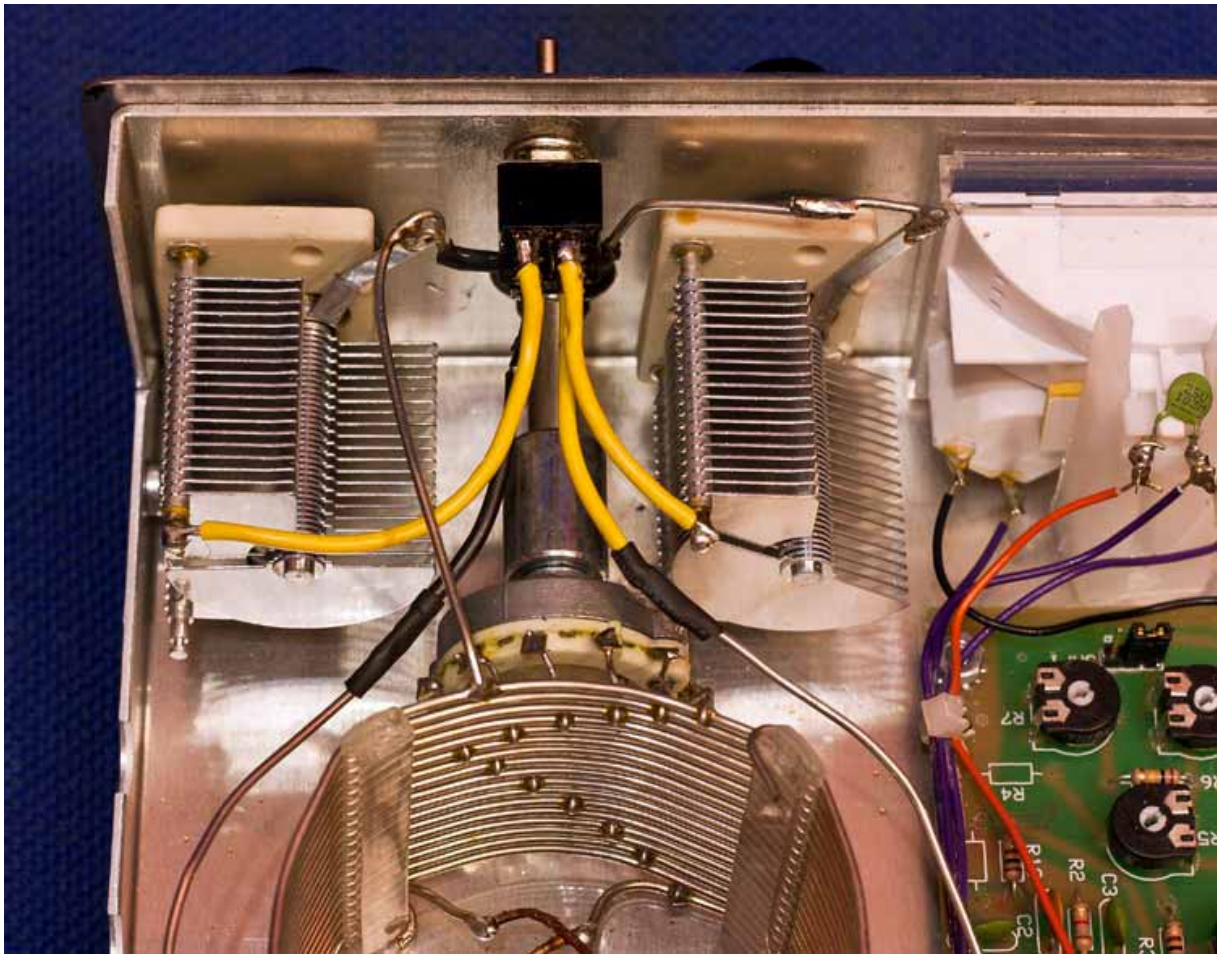
The MFJ-971 has the potential to be a great portable tuner. It is a small, compact tuner that has a sensitive SWR circuit allowing precise tuning with low power thanks to its 6w FSD setting and it has outputs for coax, wire and balanced feeder (although I won't talk about the MFJ 'heavy duty' 1:4 voltage baluns here!). To make it the almost perfect portable / QRP tuner, there were a couple of things that needed to be solved...

The problems I had with this tuner are:

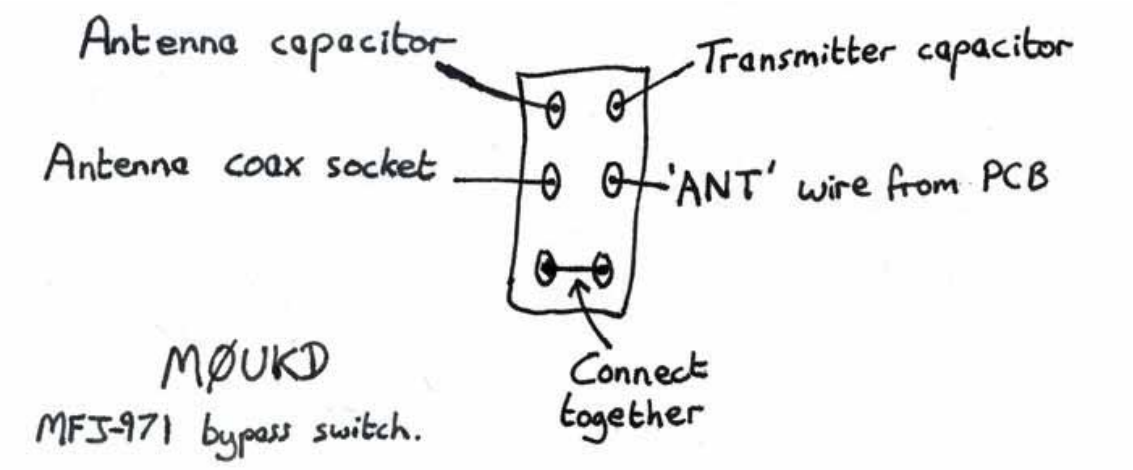
1) No bypass switch

2) Not enough inductance to tune on 1.8MHz

The first thing that I would want in any tuner, is a bypass switch. Its nice to flick a switch and be able to receive on all bands and the lack of a bypass switch is frustrating. This was easily added by mounting a DPDT switch to the front panel, and connecting it appropriately, as seen in the pictures below.



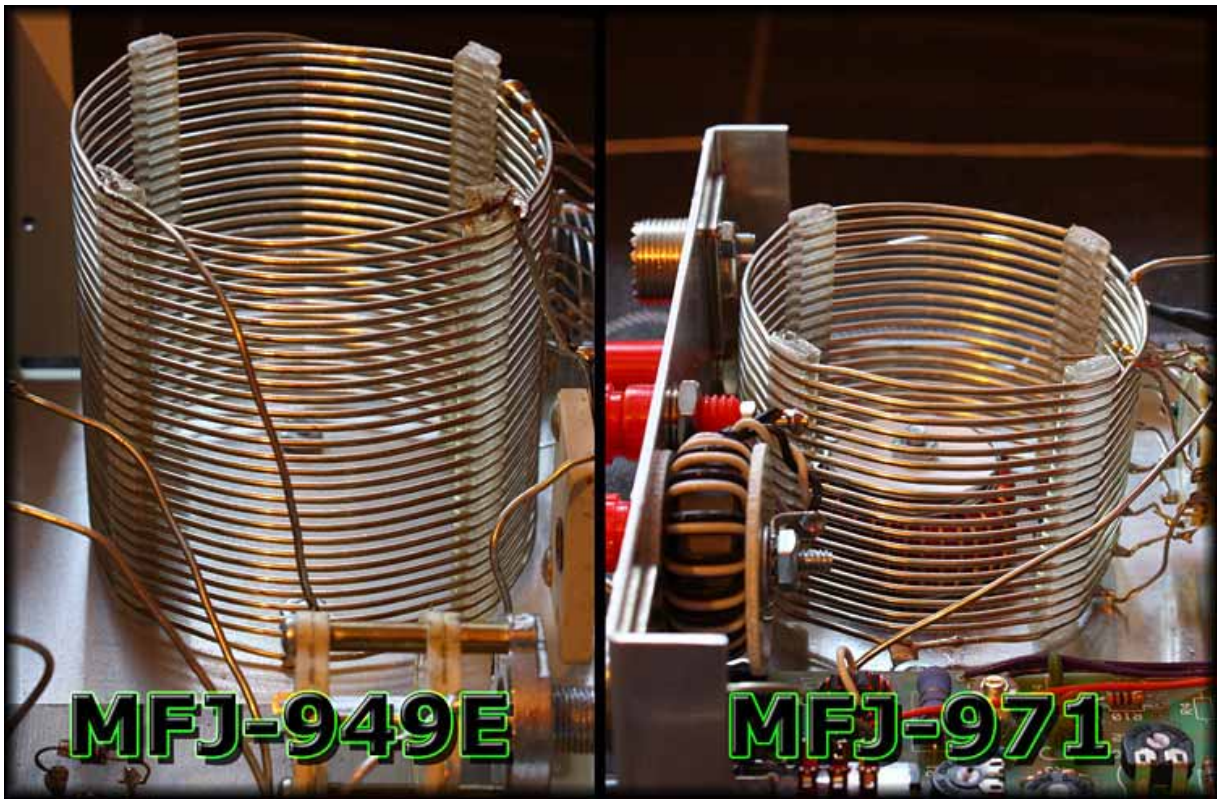
Usually, the signal comes off the PCB and straight into the 'transmitter' capacitor and the output of the 'antenna' capacitor goes to the coax/wire connection on the rear. The switch has been added to provide a way to bypass the tuner section. A drawing of the DPDT switch wiring is below.



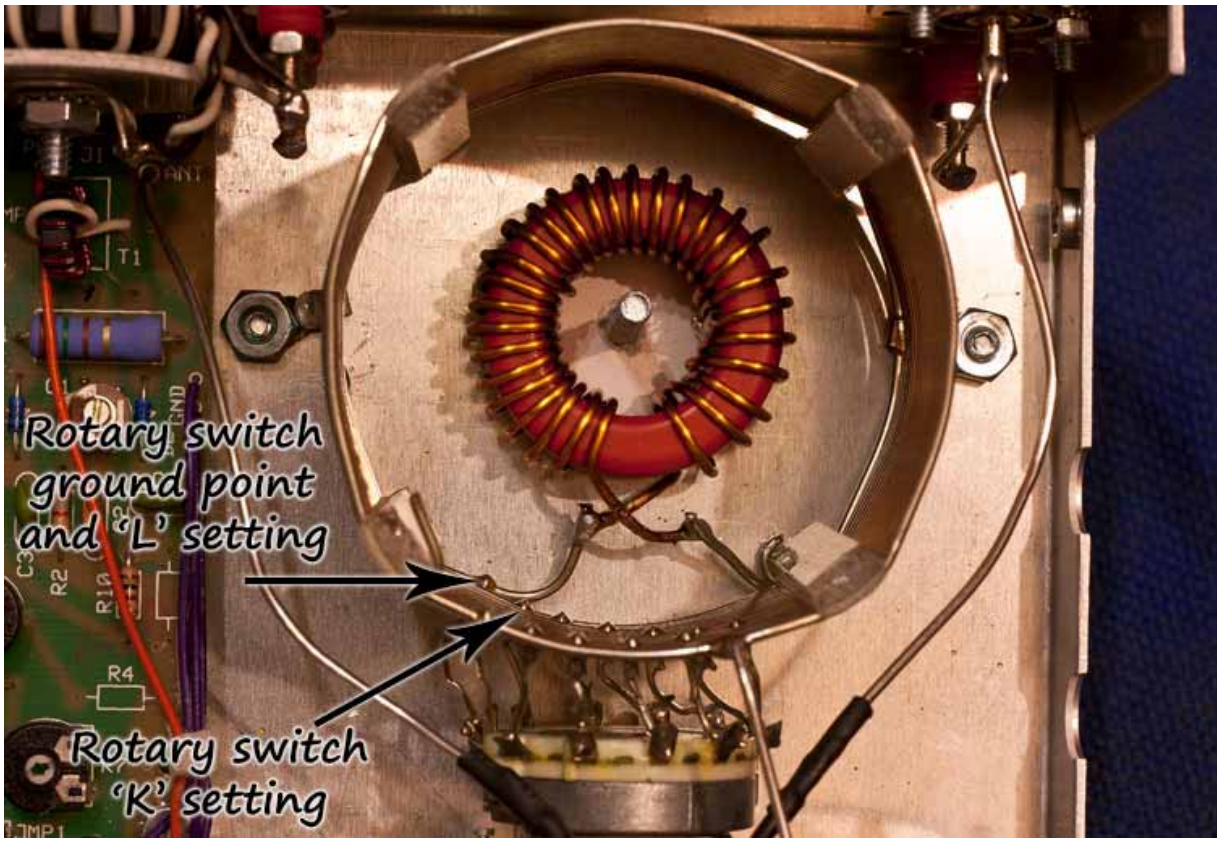
OK, now that annoyance is out of the way, lets fix the top band issue. MFJ say *'The [MFJ-971] T-match tuner covers*

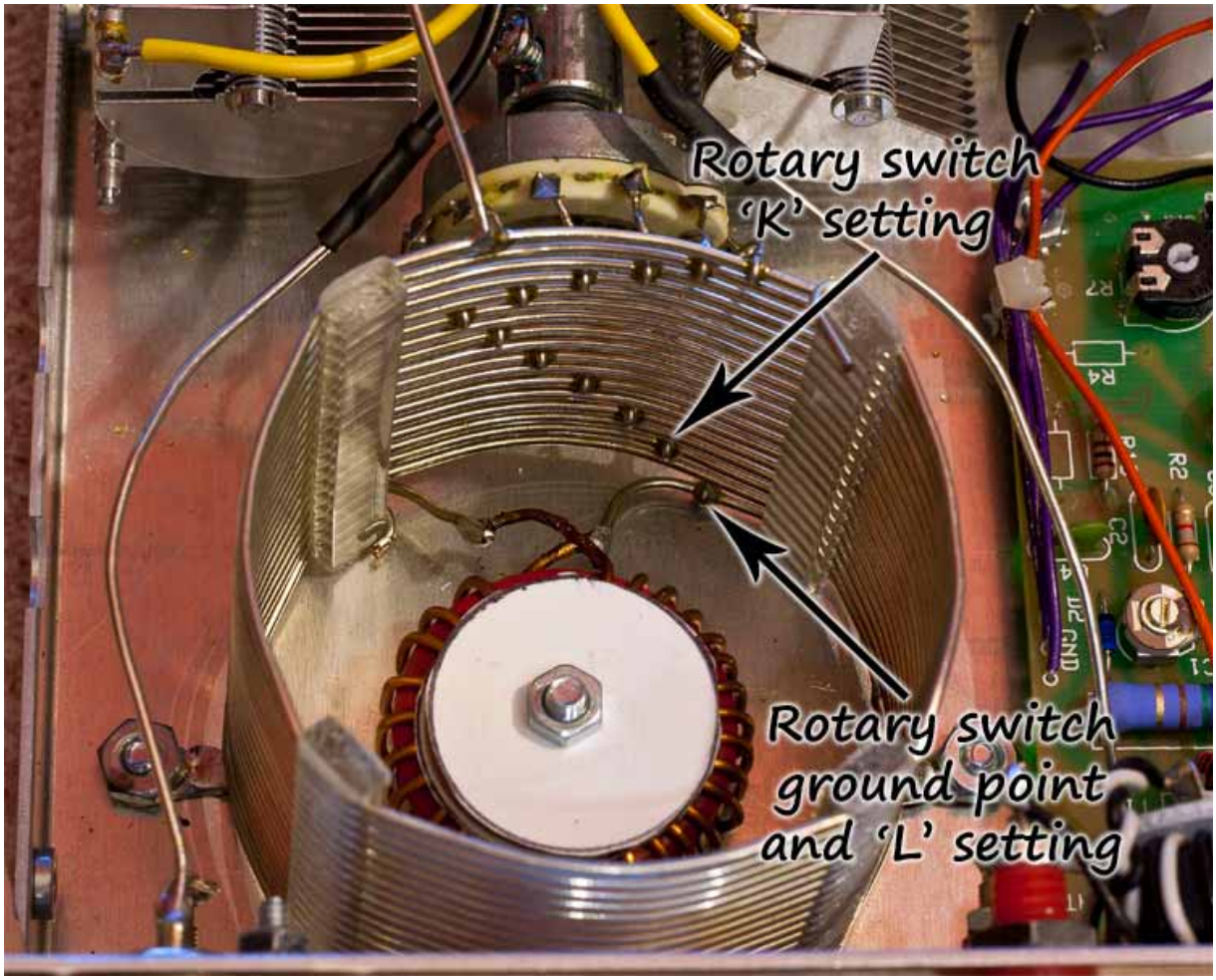
1.8-30 MHz'. It may well do, if you want to match a perfect 50Ω load on 1.8MHz! The inductor inside this tuner, although adequate for 80-10m, does not have enough inductance to be useful on 160m.

To overcome this problem, I included extra inductance by winding 29 turns of enamelled copper wire (any suitable insulated wire will do) on a T130-2 iron powder toroid, so when the tuner is on the 'L' inductance setting, the whole original inductor is used *plus* the extra inductance provided by the toroid. This does not affect any of the other settings from A-K.



The MFJ-949E inductor has 27 turns, 75mm long and 75mm diameter which is about 37µH.
The MFJ-971 inductor has 17 turns, 43mm long and 66mm diameter which is about 17µH.
Adding on the extra inductance means we have a max inductance of around 27µH which allows matching on 1.8MHz.
Air inductance coils can be calculated **here** and the T130-2 toroid **here**.





The inductor switch picks up its ground from the bottom of the inductor and this is also the 'L' setting, meaning the whole coil is in use when 'L' is selected. The 'K' inductance setting is 2 turns up from this point. I cut the wire just after the 'L' tap and inserted the extra inductance. Now, when 'L' is selected, the whole original inductor is in use, plus the extra inductance of the toroid, making it suitable for use on 160m! Of course, the 'K' setting still uses the whole original coil (less 2 turns) so nothing is really lost. The wires cross to keep any magnetic fields circulating the same way between the 2 inductors. The toroid is then fixed with a nut & bolt and suitable insulation washers either side of the toroid.

The completed, modified, much improved MFJ-971 is seen below. Please let me know if you perform any of these modifications, I'd be interested to know what you think.

There is one small problem remaining and that is RF BURNS! The nuts that hold the variable capacitors in place on many MFJ tuners are at RF potential. Most of the time they are hard to come into contact with being tucked away behind the control knobs, however, on the MFJ-971 the knobs must be pulled forward a little otherwise the metal inside the knob comes into contact with the metal shaft causing the grub screws that hold the two control knobs on to be at a high RF voltage. This can give you RF burns whilst you are tuning, even at 5 watts. I hate to imagine what the result would be if you put the 'rated' 200w into this thing and touched a control! One problem with pulling the knobs forward a little is that then the nuts themselves are more visible, although anything is better than an RF burn! 73 de M0UKD.