

# M1ABK's Ham Radio Blog

Saturday, 23 March 2019

## Collins 516F-2 Upgrade

As part of my ongoing Collins work I recently decided that I would install a farm projects power supply board for the 516F-2, these are designed by W0IY and provide a solid state conversion including a relay which takes the load of the switch on the equipment, this is a known weak point on Collins equipment that uses a rather lightweight switch in the equipment to switch the 516F-2 on and off.

Whilst this work is straightforward it is worth noting, depending on the age of the 516F-2 colours of cable will vary and of course others may have been their first and changed colours or even components !

It is vital that you can read a circuit diagram and sometimes interpolate instructions vs what you are seeing in the power supply you have, also of course - voltages in this area are lethal so please make sure you know what your doing and if not get someone else who does. **This post is to let you know what I did / information and if you do choose to do this yourself you do this entirely at your own risk - be warned !**

I ordered two kits - which arrived very quickly from Barry Buelow, W0IY in the states, these are of excellent quality and come recommended from me

Next (after reading and understanding the changes) was to check the actual power supply VS the instructions. now I'm very familiar with the 516F-2, but still took this vital step to check and ensure that the colours in the instructions matched my power supply, most did but some didn't (mine is a later version). I marked up the instructions as it applied to my supply so I didn't get confused.

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### About Me

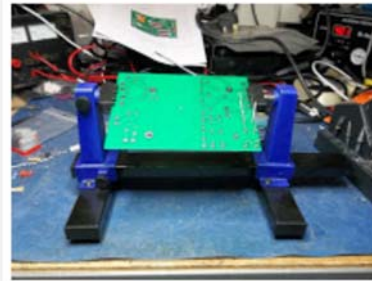
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The Kit can be used in many ways, keep the rectifier tubes, keep parallel resonant circuit of C1 or change it one on the PCB, use the relay on the PCB to switch on the power supply to reduce the stress on the radio's on off switch. I made the decision to do all of the mods on this particular power supply but you may decide otherwise. So to get started - build the PCB - not difficult, watch the orientation of all polarity sensitive components such as electrolytics, diodes etc. - I also like to align all resistors colour banding - it looks nice,

but also helps should you need to read a value in a hurry!





After an hour so of pleasant assembly work, and checking - I had finished the replacement PCB.



So now onto the main event !

Follow the removal of components for the options you have decided to use, for me it was everything - although take care to label the transformer (T1) leads carefully and also to not remove anything you don't need to (obvious I know but when you get going with the side cutters and soldering iron it might get tempting !!).



Before



After

The really observant will notice that C1 is not removed in the final picture above, simply I forgot to take a picture after I removed it !

You then need to use a drill a drill out the capacitor mounting hardware - take care not to drill through the chassis just remove the rivet and the brackets. Some of these holes are used to mount the hex standoffs





You then need to slightly loosen the main transformer to enable you to mount the hex stand off's which the PCB mounts to - this can be a little tricky as a number of them are under the transformer (hence slightly loosening the transformer to get access) - using a small piece of card to hold the flat head works really well so it can fit into the holes left by removing the capacitor mounting hardware (picture left)

What you then need to do is follow the wiring instructions provide with the kit, I took the trouble to take the list and carefully (in word) annotate the table with my own power supplies colours of cable together with a box to allow me to tick off when I had completed that element of wiring. Take your time and check / recheck connections, colours and new wires that are needed. It is pretty straightforward but I suggest you have both the old circuit and the new one in front of you as sometimes it can be a little confusing, as it says in the instructions if you are not competent in reading circuit diagrams and applying it in the real world then don't attempt this !

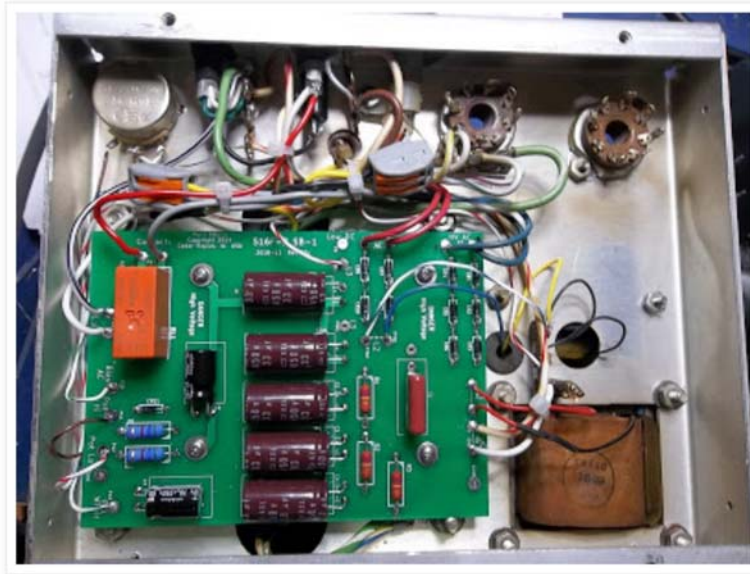
When completed it will look something like this below



what remains is to make the connections to the mains power supply and ensure that some of the old windings are used to buck (reduce) the mains voltage to help with the higher mains supply voltages that are present in most homes now.

The way to do this is detailed in the new instructions - it essentially means applying a small dc voltage (9v) from a battery to the primary and monitoring the output of secondaries to work out which phase needs connecting in order to reduce the voltage.

once completed you use the supplied WAGO connectors (very good!) to wire the relevant wires in series with the mains input to reduce the voltage - when complete you should have something like below you can see the great egg shaped WAKO connector in the middle a left of the picture - also note that there are no connections to the old valve bases at all (and of course no C1!!)



This (unsurprisingly!!) looked very much like the kits instruction pictures and so I was ready to test it out.

Now I have a modern electronic variac which allows me to raise the mains voltage and monitor the current very carefully - I use it a lot with old equipment I'm repairing as you do not wish to apply mains voltage - it can result in major power supply / capacitor failure - and that makes a bang, smells bad and results in more work usually !! - so I decided to use that to check that I'd not made any major errors or mistakes - i could also use it to check that I had got the phasing right on

my WAKO connectors to reduce not increase the mains voltage !

This is where I diverged (Slightly) from the instructions - I decide not to use a radio to test it with (primarily this is to trigger the relay which turns the power supply on remotely). All this does is to switch the incoming mains voltage which is supplied by the power supply through the front panel switch on the radio (which causes problems as it carries all the inrush current generated by the transformer and why this modification changes that and uses it to switch a mains relay on the board instead - much lighter current - much longer switch life!).

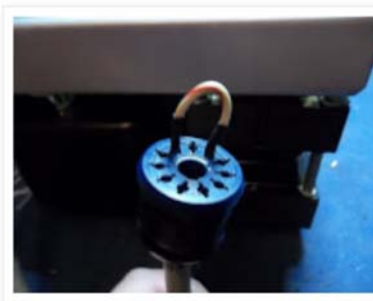
This connection is in pin 5 and pin 7 of the P1 plug - and so if these are shorted together instead of having to use a radio - you can test the power supply on its own. What I actually did was to apply mains directly to the board and not use the relay at all initially as at low voltage (< approx 145v) the 240v mains relay buzzes and will not pull in - which means you can't test it at lower voltages - which I wanted to do check that my wiring or PCB wasn't wrong.

So I started to apply mains voltage slowly going to 50 v an monitoring the HV output and noticing that it was climbing rapidly (~190V) then on through 125V (~450V) and finally at full mains where the HT was at just over 970v - obviously with no load.

Once other voltages were test (-75 line etc) and the heater voltages which were all present I used the shorting link to check that the relay part worked properly.



The link (left) was made using some small connector pins that fitted the P1 plug nicely - together with some shrink sleeving) and is used as per the picture right - take care though there is



mains voltages on this link and I took very great pains to ensure that it was properly insulated, and I know what I'm doing - if you do anything like this you **do so at your own risk entirely** - this is just my way of doing it - I' experienced **and** very careful!!

I'm very glad to report that all worked as expected and the power supply is now doing sterling service in my collins collection :) - now I have another one to do when I get around to it.

**Summary** - a truly excellent kit and strongly recommend it - not for the beginner as the wiring and testing techniques require good knowledge and ability but for the 'average' collins

enthusiast that does his / her own repairs testing etc. it is pretty straightforward to be honest - took me about 8 hours over two days to complete from start to finish with plenty of breaks and time to take photo's (!) - I would be able to do it more quickly now though.

73s and good DX - Chris M1ABK

Posted by [Rutland Boy - M1ABK](#) at [04:24](#)

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## 2 comments:



**Independent** 13 December 2019 at 08:32

Very nice article. I have just acquired (12/10/2019) a clean 32S-1 Collins Tx. As soon as I acquire a decent 516F-2 PS, will use this upgrade guide. Can't wait.

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**Independent** 13 December 2019 at 08:33

Posted by WA2AKV

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