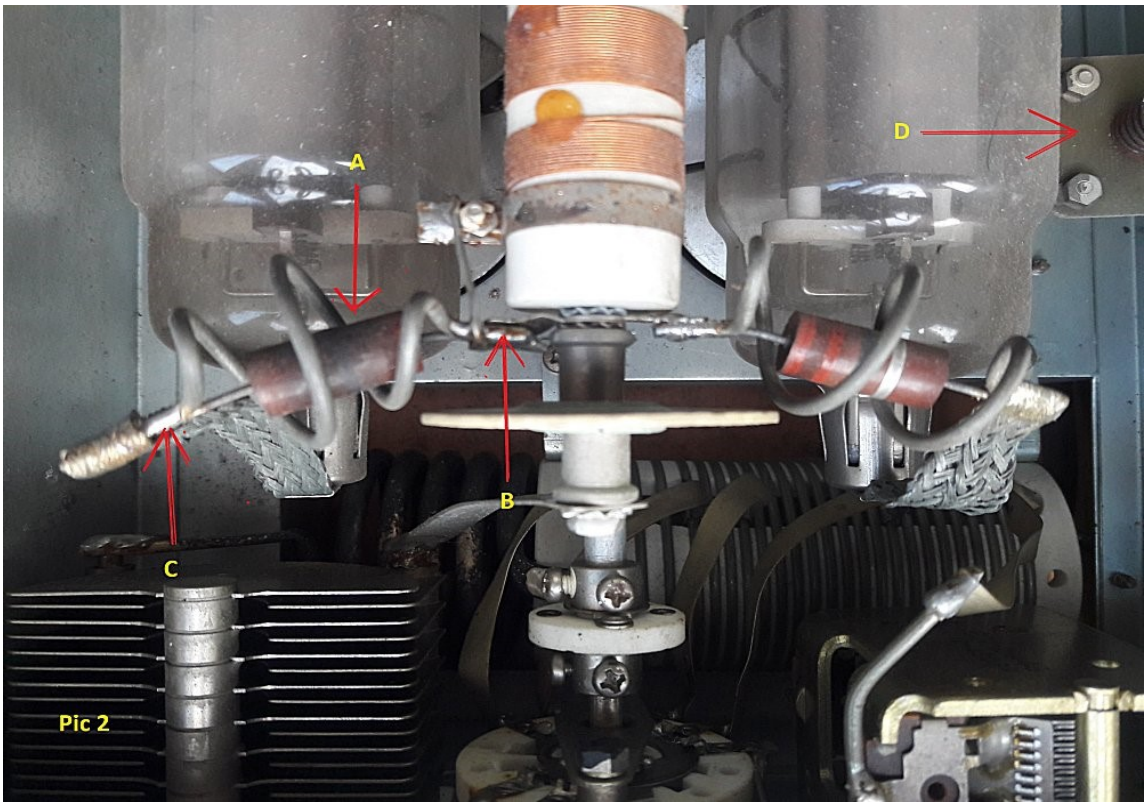
Mid Sussex Amateur Radio Society

NEWSLETTER

June 2020

Mid Sussex Matters



Yaesu FL-2000B Linear Amplifier Problems - Refurbished by Adrian M0TCD

In this issue

Meetings are held on Friday evenings starting 7.45pm at the rear of Cyprus Hall, Millfield Suite, Cyprus Road, Burgess Hill, West Sussex

Visitors are always Welcome

Mid Sussex Amateur Radio Society

NEWSLETTER

June 2020

From the President's Corner

Hello, it's good to be back amongst you once again. I have noted reading the many emails that have circulated amongst members over the past few weeks, the tremendous efforts led by Bernie and others, to keep MSARS members in touch via computer radio, and the success that this has been on the nets. My personal thanks go to all those involved.

Zoom seems to be the way to go these days if you want to keep in touch, but please remember, that MSARS have two HF nets, which have been running very successfully for around 40 years, and are much simpler than Zoom with it's passwords and Logins.

New members and even a few of the older members, should understand, that it is not necessary to be able to work all bands. Very simple antennas, and a basic transceiver are all that is needed to get onto the HF nets.

For example, a dipole with 17 feet legs and coax feedline of any length, plugged straight into the back of your transceiver, will enable you to work into the MSARS lunchtime net on 14.330 Mhz.

You won't need a balun or an ATU. This simple antenna will work fine. If you've more room and want to get onto the 80m net, the dipole leg lengths will need to be 65 feet 9 inch each, and again a simple coax feedline will plug straight into your rig. If you don't understand how to do this, ring me and I'll help you.

Of course, introducing an ATU or 300 or 400 ohm feedline, will enable both antennas to work on other bands, but these things are not necessary for single band working.

Long experience has convinced me that many newly licenced amateurs (and quite a lot of those who have been on the air for years) would benefit from working one band properly rather than be too ambitious.

To summarise, keep it simple and dare I say it, read the manual that comes with your transceiver, that's why it came in the box!

While you are enjoying the mysteries of Zoom, consider taking a moment to install a dipole for 20m and join us every lunchtime.

Perhaps you'll get your first overseas report from Bob, N4XAT who listens every day from New Jersey and sends his reports on our signals to Ron, G0WGP to relay onto us.

However you join in, remember how lucky we are as amateur radio enthusiasts to be able to keep in touch with our friends in such difficult times.

Take care all of you, es 73,

Ken G3WYN.

Mid Sussex Amateur Radio Society
NEWSLETTER
June 2020

From The Chair June 2020

Once again I don't have a lot to report, and certainly no reports on our activities as none have taken place, and like me you all look forward to the time when we can resume our normal activities.

I know you will all join with me in sending our heartfelt thoughts to Ken G3WYN on the recent passing of his wife Stella, and hope you and your family Ken are bearing up in this very sad time.

Talking to Tony G3XQM on the 2mt net he mentioned this issue of Mid Sussex Matters will have a couple of interesting articles which you will enjoy reading.

As we have missed a lot of the programme already this year, I thought it might be an idea if you the members, would like to let the Committee know which of these you would like to see fitted in before the end of the year (of course depending on when normal service resumes).

Heard on the news, the government announced lifting some more of the restrictions, which have kept a lot of you in lockdown, but please take extra care when venturing out for the first time since March.

Till next month
Stay Safe
Russell M Nelson G7TMR
Hon Chairman
MSARS

Mid Sussex Amateur Radio Society
NEWSLETTER
June 2020

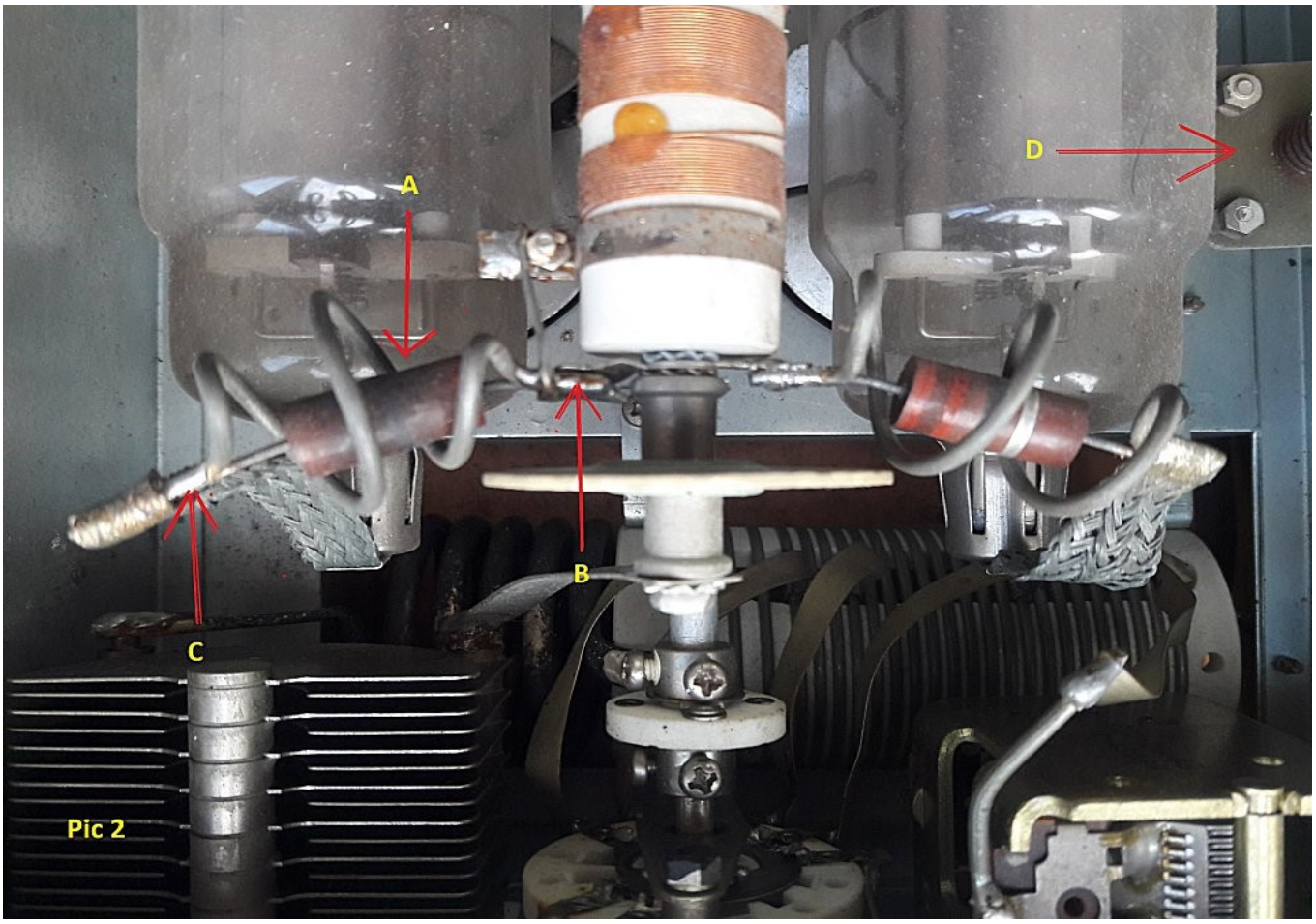
Yaesu FL-2000B Linear Amplifier Problems, Refurbishment & Upgrade
By Adrian M0TCD

This linear amplifier was purchased as working, but me being me, I wanted to check it out inside first before use (it's about 40 odd years old) and I'm glad I did!!!

First a word of warning:- If you do not know what you are doing inside this type of equipment, PLEASE do NOT attempt any repairs yourself, as lethal voltages are inside and will KILL. This linear has 2.4kV on the High voltage side, and even on the low voltage side, the cooling fans run from a 100V supply.

Ok let's get started, the first problem noticed, was one of the parasitic resistors had blackened, see Pic 2 (A) and with closer inspection the solder joints had problems. The solder joint to the right, looks like it's no longer connected to its connector to the plate RFC see Pic 2 (B). And to the left, the solder joint had got so hot it melted the solder, and the braid to the valve has started to slip off see Pic 2 (C).

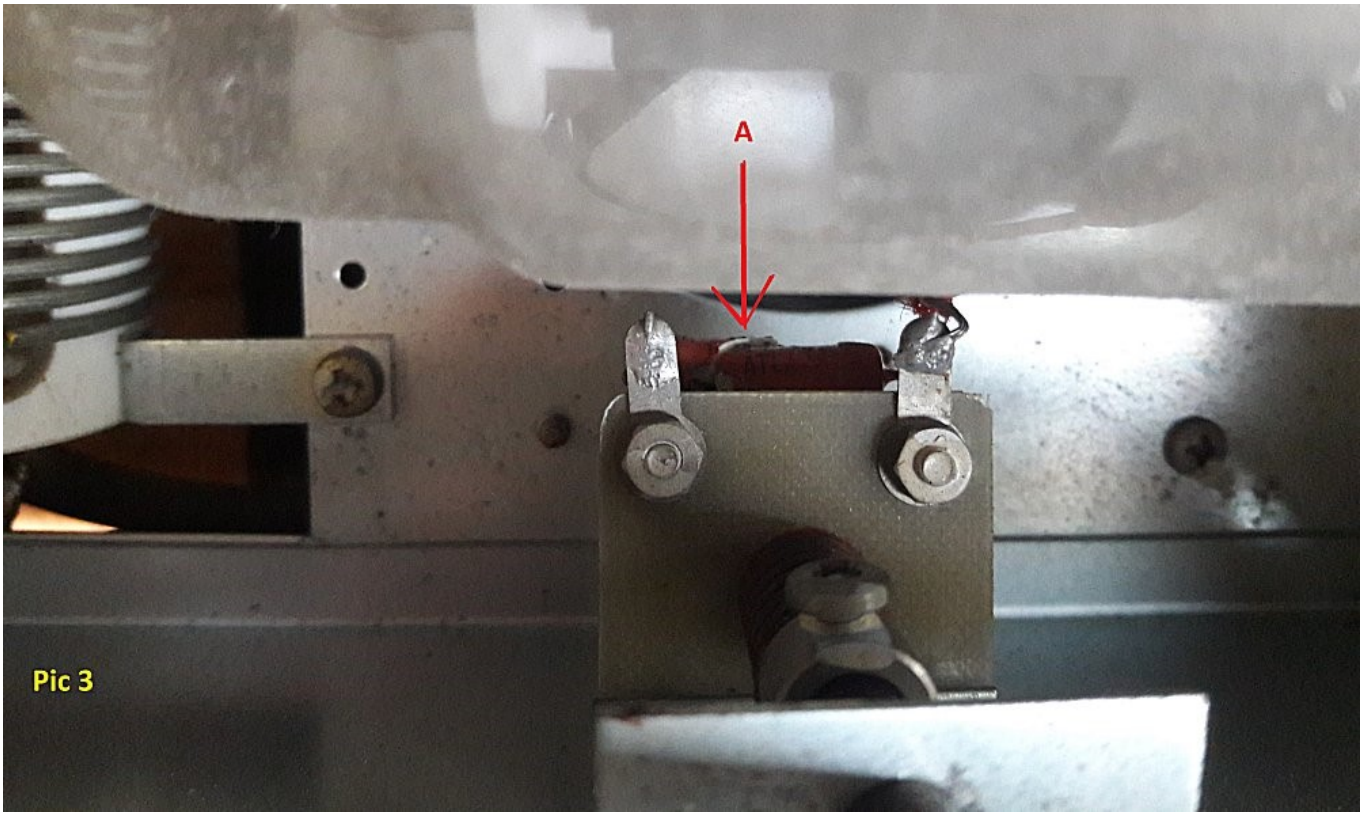
To the right of the PA Valves in Pic 2, you can just about see one of the safety devices, Pic 2 (D). This one is intended to short to ground the high voltage if the power is still on, and the PA top cover is removed, but look at the photos on the next page, Pic 3&4 (A)



Continued on next page

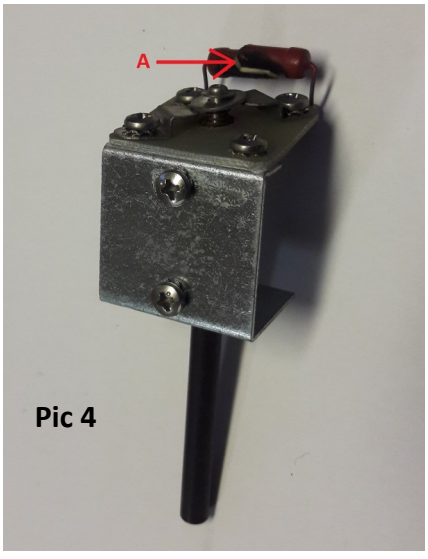
Mid Sussex Amateur Radio Society
NEWSLETTER
June 2020

Yaesu FL-2000B Linear Amplifier Problems, Refurbishment & Upgrade
By Adrian M0TCD Cont...



The bleed off resistor has a crack through it, rendering this safety device inoperative, and makes this linear dangerous to say the least, if you did remove the cover with the linear on!

It turns out this is quite a common occurrence for the resistor to crack. If the PA top cover is removed, when the power is on, this can damage the high voltage transformer and associated components (let's hope not).

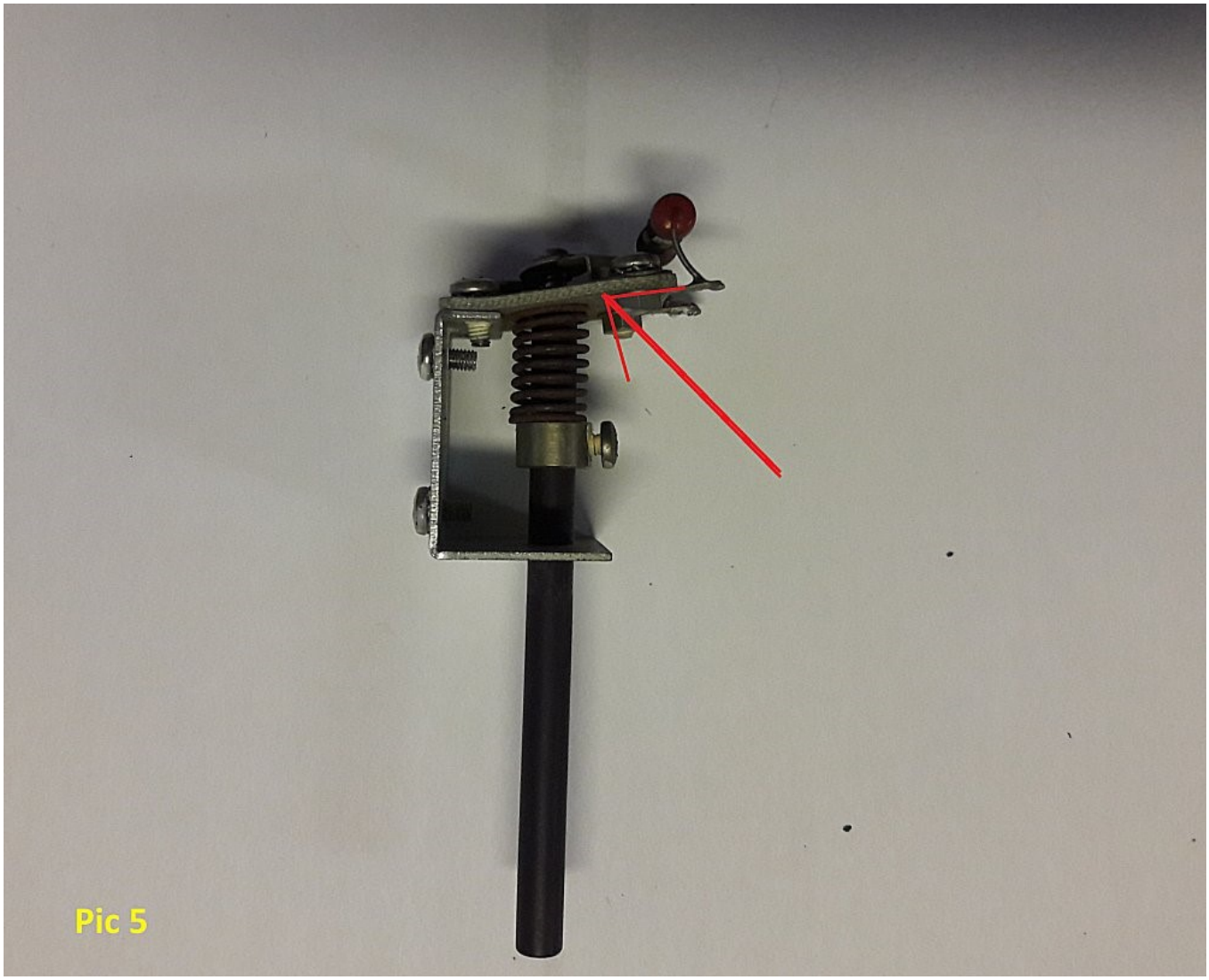


Continued next page

Mid Sussex Amateur Radio Society
NEWSLETTER
June 2020

Yaesu FL-2000B Linear Amplifier Problems, Refurbishment & Upgrade By Adrian M0TCD Cont...

On removal of the safety device, I noticed the board that holds the switch components and resistor, has been distorted as can be seen in Pic 5 (arrowed). This has probably been caused by the pressure of the switch spring, and heat over time, and will need replacing.



Ok, so things are mounting up with this linear, and it does not stop. I decided to carry out some 'in circuit tests' on the low voltage side eletrolytcs, see pic 6 (A&B) on the next page.
The results were not encouraging, so I removed them from circuit for further testing.

Continued next page

Mid Sussex Amateur Radio Society

NEWSLETTER

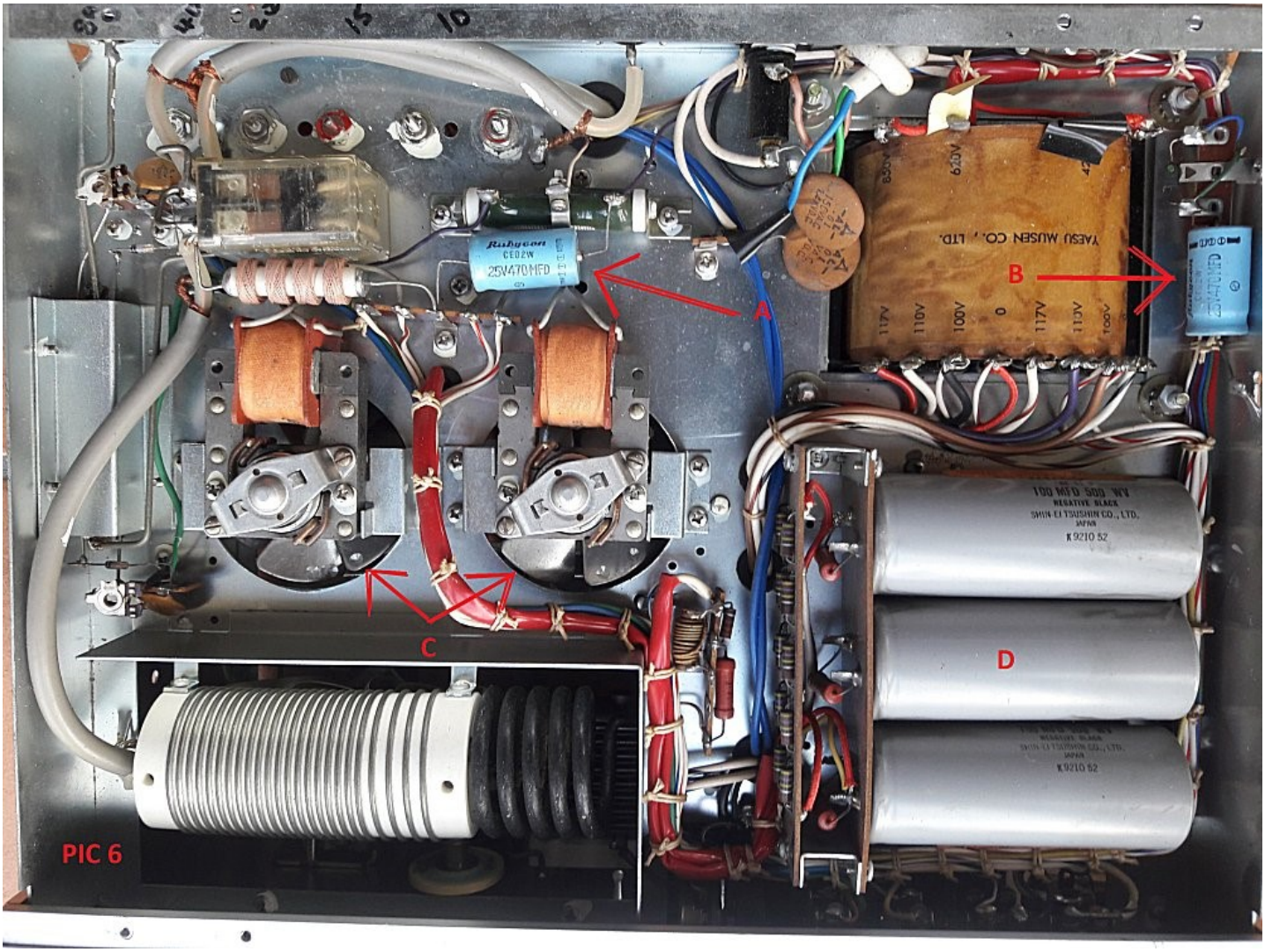
June 2020

Yaesu FL-2000B Linear Amplifier Problems, Refurbishment & Upgrade

By Adrian M0TCD Cont...

Test results are as follows: Capacitor A was 704uF, and capacitor B was 818uF. Both should be 470uF.

Because of these findings, I have now decided to do a full re-cap of all the electrolytic capacitors, including the high voltage capacitors Pic 6 (D). And carry out cleaning and repairs as I go, starting with the low voltage side, and including testing and cleaning of the cooling fans Pic 6 (C).



Low voltage electrolytics replaced including a 2.2uf electrolytic Pic 7 (A) (**next page**) that was found to be 4.4uf. At this point I was starting to doubt my LCR meter, with all the readings being around twice the value they should be. Luckily, I already had received in the post, some of the new capacitors for the linear, and after testing these, the LCR meter was found to be fine.

Continued next page

Mid Sussex Amateur Radio Society

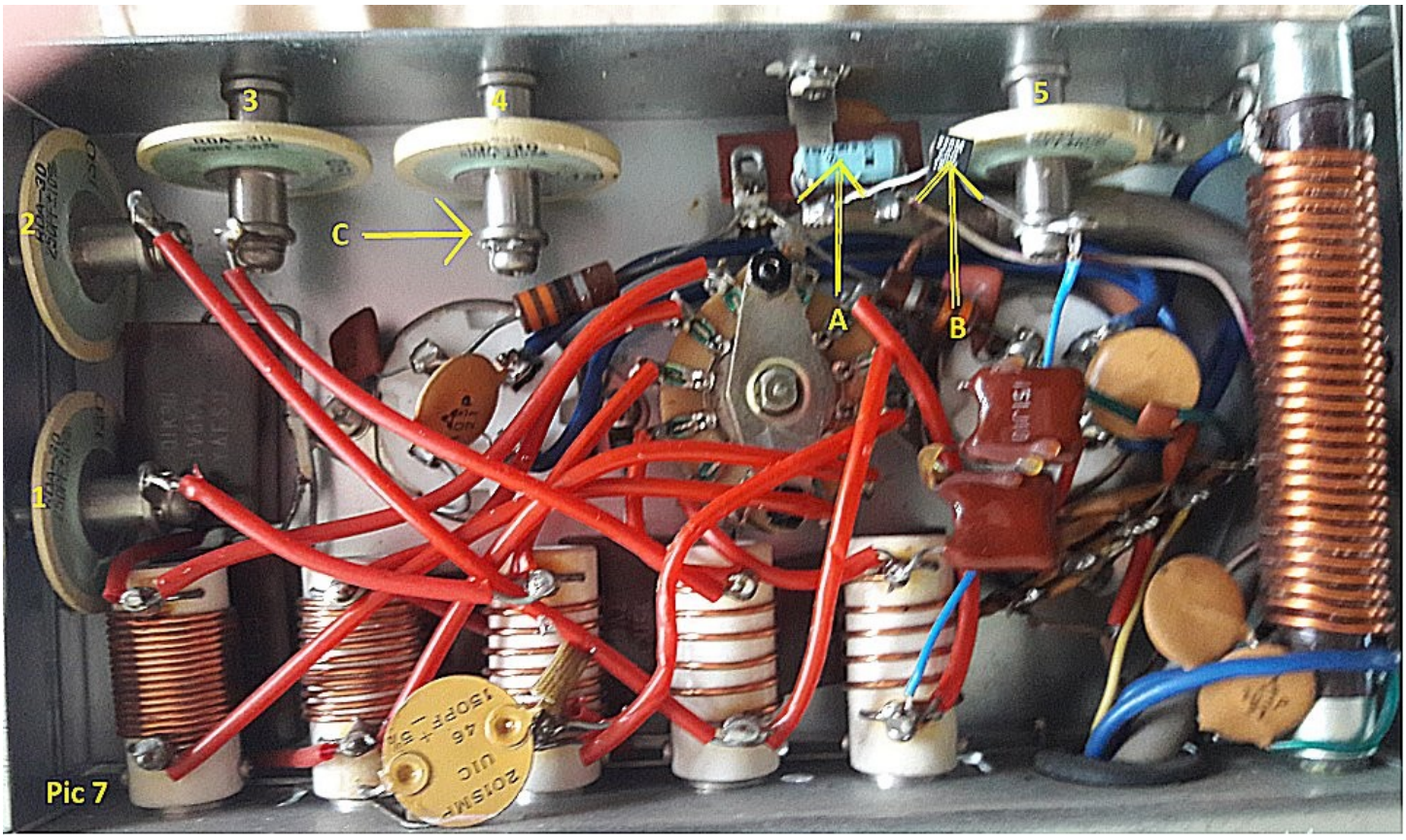
NEWSLETTER

June 2020

Yaesu FL-2000B Linear Amplifier Problems, Refurbishment & Upgrade

By Adrian M0TCD Cont...

I also noted that the input tuning circuits had been altered from the original. With a capacitor added Pic 7 (B) and one disconnected Pic 7 (C). Now this does not mean to say there is anything wrong with this, However the input coil alignment will be checked later, so we will see.



Pic 7

Next I checked all the ceramic disc capacitors (doorknob) Pic 7 (1 to 5) for value and cracking as cracking of these is quite common (see Pic 8 next page). (Note: this disc capacitor is in a FL-2100B waiting for repair). And also the ones in the PA compartment were checked, all were found to be fine.

In the end, I decided to completely strip the two cooling fans, to allow thorough cleaning and lubrication as there was quite a lot of build-up of gunge between the fans and the fan top bearings, and one fan did not rotate as free as the other. See Pic 10.

Next I disconnected the secondary side of the high voltage transformer, so I could check its output voltage and test the low voltage side of the linear, without the rest of the high voltage components. I'm pleased to tell you that the high voltage transformer seems fine, and a reading of 850VAC as marked.

Continued on next Page

Mid Sussex Amateur Radio Society
NEWSLETTER
June 2020

Yaesu FL-2000B Linear Amplifier Problems, Refurbishment & Upgrade By Adrian M0TCD Cont...

Now for a bit of a controversial item. I could not source any 2W carbon composite resisters for the parasitic suppressor's, including from my own stock (typical as I have most other values).

Rightly or wrongly, I read in several articles that it is important to have exactly the same size resistor as the original. I found that today's carbon metal oxide resistors were either too small 2W or too big 3W. Some say the coil needs to be altered to match the resister size, and others say it's best to put the resister on the outside of the coil, and not through the coil.

I cannot see how the resister size is critical with the resister on the outside of the coil, I also remember seeing an article for upgrading a FL-2100 to Hairpin type parasitic suppressor's and found them readily available on the internet, so I purchased a pair for this linear.

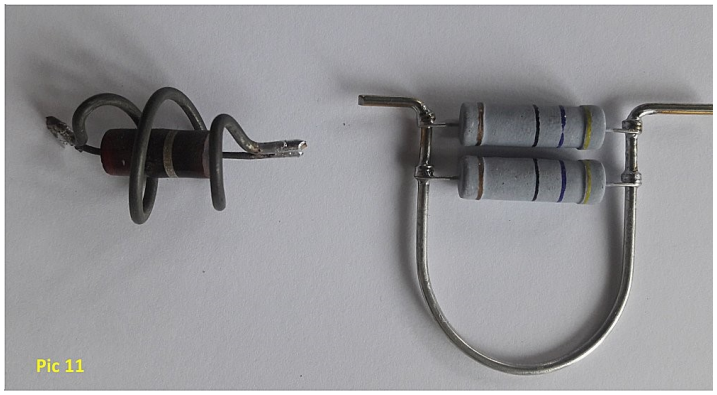
The Hairpin type parasitic suppressors, also have a lot of controversy surrounding them, with many saying they are better than the original type, and an equal number saying they are not any good.

See Pic 11 below. The hairpin type is on the right, these have now been fitted. See Pic 12 (A&B) you pay your money and take your chance!!

I will leave it up to individual readers to decide what is right and what is not, as I have lost the will to live with this subject.

I do hope you all like the warming glow from the two valves in Pic 12 as I did. More on the valves themselves later. (*Looking forward to that - Ed*)

Just out of interest I paid particular attention to the value and for any cracking of the ceramic capacitor marked 'C' in Pic 12 as this capacitor is the only thing stopping the 2.4kV from being fed the antenna jack.



Pic 11

Pic 12

Specifications with blown up image of the glowing PA Valves on the final page overleave.

Mid Sussex Amateur Radio Society

NEWSLETTER

June 2020

Yaesu FL-2000B Linear Amplifier Problems, Refurbishment & Upgrade

By Adrian M0TCD.

SPECIFICATIONS

Circuit : Grounded Grid Class B

Plate Input : 1200 Watts PEP, 1000 Watts CW and 600 Watts AM

Plate Voltage : 2400 Volts DC

Third Order Distortion : 30db or Better at 1000 Watts PEP

Tube Complement : 2 x 572B

Cooling : Forced Air

Power Requirements : AC 230 Volts 50/60 Hz 9 Amps

Weight : 44 lbs / 20Kg

Mid Sussex Amateur Radio Society
NEWSLETTER
June 2020

Something Old, Something New….

….Something borrowed, something Seized!

By Steve GJ6WRI

As previously penned in this newsletter, I rejuvenated my Amateur Radio Station some years back, by the implementation of software.

I started by transferring my paper logs to ASCII, followed by Rig Control for my 1980s radios, and then the implementation of Digital Modes.

At the time, Ham Radio Deluxe was freely available, and it offered all of the functionality I have mentioned above, and more. Although this software is now chargeable, I still use it, but accompanied by some additional programs which command only a small fee to keep the software author in 1s and 0s.

I made my first attempt at amateur satellite around 1986, with my Yaesu FT726 which had 2m and 70cm with the duplex board fitted.
I probably had a ten or twelve element beam for 2m, and nearly the same boom length 70cm beam.

The aerials were rotated by a Kenpro KR-400 RC although I didn't have any means to elevate them. Not surprisingly, I only heard myself coming back from an Oscar satellite on one occasion!

Some unusually strong winds in 1987 put pay to any further satellite attempts when the "array" came loose from the chimney, and started thumping holes in the roof!

Circa 2006, my wife Heather and I built our own house, and as a house warming present, a fellow amateur kindly serviced my original 1980s Kenpro for me, and then it was erected with a three-element beam for 6m.

Some years later I think, I must have read an advert in RADCOM for a rotator controller kit which was small enough to be housed inside the Kenpro controller. I ordered one, and it duly arrived, and I carefully stowed it in a safe place…..for about 6 years or more!

I suffered a head injury in 2010 which left me unable to work, and while going through the treasures in my shack, I came across said kit. Because I am not restricted by the confines of time, I assembled the kit when my mobility allowed.

Continued on next page

Mid Sussex Amateur Radio Society
NEWSLETTER
June 2020

Something Old, Something New….

….Something borrowed, something Seized!

By Steve GJ6WRI Cont...

Initially I set it up for azimuth control, but when I acquired some additional second hand equipment, it became redundant and was replaced by a Green Herron RT-21 which is all singing & all dancing.

At this time, I had a Yaesu G-550 elevation rotator, and I was pleasantly surprised that I could repurpose my azimuth kit controller to automate elevation without anything more than a tick-box in some widely used software.

Now having computer control, I thought it time to revisit the Amateur Satellites. I joined Amsat UK and started learning from other people's experiences. It's your choice how deep you go in this aspect of the hobby. By comparison to others, I merely "dabble"!

So, still using the Ham Radio Deluxe program, I was able to track satellites but with a serious limitation. It transpires that many software "solutions" will only allow control of antenna rotation with one serial or USB port. Hmmm.

I had inherited a Parallel controller from an SK, so I set about utilising that. The software was/is still available, but it does have serious limitations, and it actually caused the failure of the motor in the 1980s Kenpro. Initially I thought the unit had simply seized, but a check over in the shack proved a winding had failed.

It's my understanding that the parallel interface provided no feedback from the rotator thus it kept supplying voltage to the motor even though it had reached its limit.

A search of the internet suggested that replacement motors for the Kenpro 400 were no longer available, but I did find one seller on the web, but he was asking a ridiculous price.

Local (UK) dealers advised that the current range of Yaesu rotators employ DC motors now, and given the age of my Kenpro, would I not be better replacing it?

Not unreasonable I suppose in the long run, but Radio World UK came back to me saying "6 to 8-week delivery and £59.95 including VAT" (which we don't pay here on Millionaire's Row in Jersey).

True to their word, the replacement motor turned up as scheduled, but I had decided to service the Kenpro and my "spare" Yaesu 450, and I was pleasantly surprised that most of the parts I requested were stock items at Yaesu UK.

The main components were sets of bearings, and brake parts. I paid the Proforma invoice, and sat back waiting for the postman to deliver.

Covid 19 had established itself by this time, and after 3 weeks or so without taking delivery, Yaesu UK declared them lost, and said they would send the order again, but…. some of the parts were now on back order.

Continued on next page

Mid Sussex Amateur Radio Society
NEWSLETTER
June 2020

Something Old, Something New….

….Something borrowed, something Seized!

By Steve GJ6WRI Cont...

Because of the impending delay of the spares, I looked to updating the automation of the rotators.

Asking one of the Amsat UK groups, they pointed me in the direction of PstRotator software. It is thought that this is the only software in the world that will use standard rotator protocol commands, and direct them to separate rotators on individual serial ports.

The software is extremely functional and also caters for the likes of EME and Telescope tracking for Celestial objects.

A very strong ability of the PstRotator software is its ability to integrate to almost any other amateur rig control program.

In my case, I just let Ham Radio Deluxe think I am using a Yaesu combined Az/El rotator, and it sends the commands via UTP on a port that PstRotator is listening on, and it then takes over and points the aluminium in the appropriate direction.

The story could end here, but I was also looking for a way to free up bench space in the shack. I like the idea of keeping the Yaesu Controllers on the desk for visual representation of Az & El, but didn't want the spaghetti associated behind the desk.

I googled the company that originally supplied my rotator kit, and I was just going to buy a second kit of the same variety.

I entered correspondence with Rene, DF9GR who designed the kits, and he actually suggested a better and cheaper solution than I had proposed. I accepted his proposal, and while waiting for the postman once more, I read some articles about the "Easy-Rotator-Control" by DF9GR. It was instantly apparent that this was one of the best, if not the best solution available.

The kit components arrived on time, and I must say that everything from the packing, to the presentation of each component and the instructions were superb.

The solution I went for was for a small relay board mounted in each controller, which is wired back to the new master controller, which in turn is connected to the PC via a single USB port in my case, but connection is also possible with RS232 or LAN options.

The controller is powered by the USB, and there is a separate connector for 12 volts to power the relays so not to overload the PC.

Continued on next page

Mid Sussex Amateur Radio Society
NEWSLETTER
June 2020

Something Old, Something New….

….Something borrowed, something Seized!

By Steve GJ6WRI Cont...

Calibration is quick and easy, using the supplied utility which allows for bi-directional communications, and it even caters for non-linear rotators by adding a second level of calibration broken down in to twelve segments of 30 degrees.

The display on the controller is crisp and shows the current heading and elevation numerically, and when in use, the target heading and elevation. Up/Down, CW and CCW buttons are also present.

My main satisfaction gained from this project is that it has got me building again. I worked at a pace to accommodate my disabilities, and basically, it has given new life to some very old equipment.

Mid Sussex Amateur Radio Society

NEWSLETTER

June 2020

Home of the Mid Sussex Amateur Radio Society

All contributions of copy for the newsletter please send to:

Copy into your email account:

tonyfinch@talktalk.net

(Tel: 01444 254511)

Details of club events etc go to:-

MSARS Web Site

General enquires about The Mid Sussex Amateur Radio Society Tel Sue 01273 845103