



GATEWAY

**The Official Magazine of the Gippsland
Gate Radio & Electronics Club Inc.**

April 2022



How does my radio sound?

Computer Resurrection

Open Day at the GGREC

And More

Cover photo, 13th April, coffee and brunch at the Main Café in Berwick, see below presidents msg, p3.
(If you have any good photos, please send them in)

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Note: - club meeting minutes are now via a link in club emails sent out by the secretary.

Event Queue

April:

1 st	7:30	Prac/Squid Pole Antenna project
29 th	8:00	General Meeting / Annual General Meeting

May:

6 th	7:30	Prac Night - TBA
20 th	8:00	General Meeting - Buy Swap and Sell night

June:

3 rd	7:30	Prac Night - TBA
17 th	8:00	General Meeting - FLEX RADIO Live stream presentation.
18 th	12:00	Mid-Year Lunch - La Porchetta Pakenham (To be confirmed).

**Club run events are only possible with the involvement of ALL members.
Without volunteers to coordinate and participate in club events the club will fail to prosper**

GGREC President's Message

This will be my final message for the 2021 – 2022 Club year. I feel that the current Committee has succeeded in keeping the Club functioning during the last 12 months of the Covid pandemic. I'm sure you will all join me in thanking the current Committee at the April GM/AGM.

Not only has the Club remained open, we have been able to provide interesting and informative guest speakers covering a good range of subjects. Bruce Williams VK3BRW has done a fantastic job with the Prac nights and construction projects. Even with the uncertainty of the last 12 months, GGREC has welcomed eight new members and one returned Club member. I hope our Club continues to grow during the next 12 months and beyond.

If you have been to a recent Club meeting or tuned in to the 10:00 am Morning Coffee Group, you may have spoken to the following new members. Alex Knapic, Trevor Haines VK3DCQ, Stephen Alger VK3PTT, Peter Holiday VK3JMP, Mike Pearton, VK3TDK, Fred Reid VK3FWR, John Cheeseman VK3XM, Paul Starkey VK3PCS and returned member Yarn Onken VK3NOV. These new members have already contributed to the advancement of our Club.

I would also like to thank our GGREC Editor, Paul Stubbs VK3TGX, who has produced interesting newsletters for us with minimal Club material while we were locked down. Please consider writing articles for the Club newsletter as it is your newsletter about GGREC and member activity.

I encourage all GGREC members to attend the April GM/AGM and consider a position in the new Committee, and thank you to all GGREC members for supporting the Club during the last 12 months.

Kind regards,
Bruno Tonizzo VK3BFT
GGREC Inc.

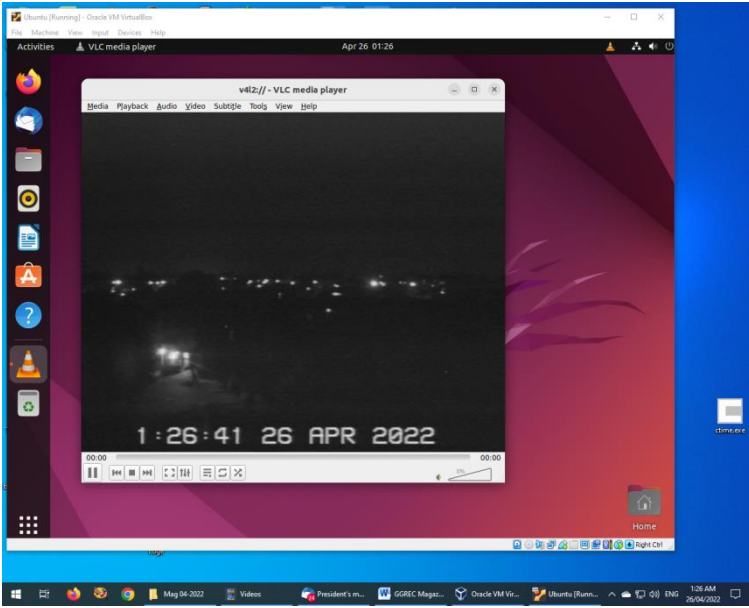
Mid-Week Coffee Outing. (pic on front cover)

On Wednesday the 13th of April, we had morning coffee and brunch at the Main Café in Berwick. It was great to see so many members come along for great conversation and to meet some of our new members, Francis D'Mello VK3FDM and Fred Reid VK3FWR. After talking together most mornings on VK3RGW at 10:00 am, we were finally able to get together with Fred and Francis in person to talk about their experiences with amateur radio. Once again, I think we were the noisiest group in the café but things quietened down once the huge meals arrived. The next day, most of us reported that they skipped lunch and waited for dinner before eating again. Thanks to Francis for taking the photo of the group. The mid-week coffee meetings cater for our retired members and anyone else that has time off work, so the next coffee morning will be on a weekend for all Club members that can make it along. I look forward to seeing you there.

Bruno Tonizzo

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From The Editor



Windows 10, 11,

Time for my 'grumpy old man' comments for the month

The other day I saw that Ubuntu had just released the next 'LTS', or 'Long Term Support', version of Ubuntu Linux. I have been using Ubuntu as a secondary OS for a while now, having only recently loaded a previous version onto my Raspberry Pi 400 computer.

This time I was installing it into 'VirtualBox', this is a nice bit of free software that allows you to set up virtual

machines inside your current machine (computer). For example, if you have some old software that you still want to use, but it only runs on Windows XP, and you don't want to have a secondary PC just to run Windows XP and this program, then VirtualBox may be your answer. Another one is to be able to dabble into an alternative OS, ala Linux, without using another PC.

In my study, I have a video feed from a camera at the top of my Nally radio tower, and I wanted to feed that into my PC, trouble is Windows 10 does not recognise my quite old video digitiser. Older 32 bit versions of Ubuntu have, so I was curious if I could do some shenanigans via VirtualBox and the latest Ubuntu release

Crazy, it works. Windows 10 steadfastly refuses to talk to my digitizer; however this latest and greatest (64 bit) version of Ubuntu works just fine. Microsoft says it's too old, go away, however here we have an OS, later than Microsoft's latest, Windows 11, that can use it (admittedly, not in the supplied 'Cheese' camera app) either in their 'Video player', or as I have done, in VLC media player. So Ubuntu is quite happy to pass that onto VLC as a video source, why not Microsoft.

For some extra torture, I then ran OBS studio, a freebie video 'processing' software package, frequently used by online video streamers, and was able to capture the screen from VLC on Ubuntu. This was then trimmed to be just the Nally tower camera, and pass it onto Windows as a virtual webcam. Then ontop of all this I brought up 'Zoom' videoconferencing software, and I can now use the tower cam as a Zoom image....

What a lot of carry on, that is bordering on not practical, given all the steps required, but it was fun seeing if I could get it to work. Maybe when I have the next Zoom meeting with a group of regulars from church, I can put up a live magpie on my radio tower, as a picture, instead of my ugly mug. (One of our members has lots of health issues, and has decided to more or less permanently self-isolate at home). Admittedly I wouldn't like to have to set all this up every time I 'Zoom' but as a one-off, hopefully good for a laugh/side distraction.



Paul VK3TGX

Computer Resurrection



A bit ago I described my wire-wrapped version of a SWTPC 6800 system that I built whilst I worked at Telstra (my time, not theirs). Anyway a YouTube channel, [Adrian's Digital Basement](#), did a second article on the system that my



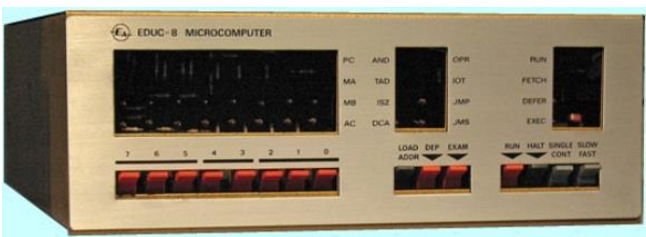
Computer was cloned from, so it seemed a perfect time to get my old box out and actually see if I could get it going, 30 years later.

A Quick History of Personal/Home Computers



In the early days – 1971, most of what we now associate with computers didn't exist, they had some form of memory, and a processor made from discreet components – valves or relays in the earliest pre home examples. (Leaving mechanical Babbage style machines alone for now)

First off, you need to be able to access the memory in order to load/enter some code for the processor to execute. The first home machines used a bank of switches to enter a memory address, and then the data you wanted to put there. To read a memory location, you entered an address, but instead read the contents as binary on a row of LED's. This was a massive step forward from the first (non-home) machines that used either plug boards, or later punched cards, ala IBM, borrowed from their earlier business machines that stored company records on the same cards, using very heavy and expensive mechanical punches/readers, that were totally impractical for home use. (\$\$\$)



By 1975 things had advanced somewhat, and it was now possible to connect a 'terminal' to these machines. These terminals were originally just mechanical telex machines, however CRT screen based units followed shortly after, that and the availability of ROM's (Read only memory) meant that a computer could be switched on with code already in place for it to execute, and start talking to the user at his newfangled terminal, no more switch flipping.

This lead to cheaper machines, like the SWTPC 6800, cheaper, as no control panel was needed.

Having and using a terminal to access machines in this era was totally normal, as that was what you used at a university or business to access their mini/mainframe computer. In a way we have come full circle, as so much of modern computing consists of sitting at a web browser (a terminal) talking to some remote data centre. More and more is going on-line, even writing a letter/email for many people means Google docs etc. Kids are being brought up in schools using Chromebooks, a glorified graphical terminal, with little to no local 'computing'.

It has been many years since I last powered up my SWTPC clone, however after watching that YouTube video from [Adrian's Digital Basement](#) I got inspired. Would it ever run again, is wire wrap that good, can a truckload of non-soldered connections survive 30 plus years and still work. Anyway when I finally got it on the floor from its hiding hole (quite a task!) and started looking at it I realised how poor my memory was. I knew I needed a serial terminal to talk to it, but which of the three serial ports on its back panel do I use, and what was the serial speed?

I have mentioned my serial 'time' setup I have that I use to sync my clocks etc., it runs at 1200 bps, so I started there – nothing. I added an RS232 breakout box that had LED's that show the serial ports status, with blinking LED's for the Tx & Rx lines, this proved almost useless. I was about to get the screwdriver out and lid the computer, surely some of the wire wrap has failed, or I have a bad socket or two. Trouble was I had no idea where the circuit diagrams etc. had ended up, I'd be flying blind – not good. Eventually I tried 9600 bps data, and success, it was talking. The reason the breakout box was not helping was at 9600, the simple '\$' prompt caused such a short blink on the LED's, that it was all but invisible to my eyes.

So before I forget again, I better label those back panel ports.

The next part was to boot the 'Flex' OS from floppy disk, by typing 'D' at the '\$' debug prompt. Boy was I surprised when it just booted straight up on the first attempt.

```
$
$D
FLEX 2.0

DATE (MM,DD,YY)? 04,17,22

+++FILES

FILES OF DRIVE NUMBER 0

DISK: FLEX #0

ERRORS.SVS      FLEX2.SVS      PRINT.SVS      PG2716.ASM      LIST.CMD
COPY.CMD        TTYSET.CMD      RENAME.CMD    DELETE.CMD      ASN.CMD
APPEND.CMD      EDIT.CMD        ASMB.CMD      BUILD.CMD      PG2716.BAK
PG2716.CMD      SAVE.CMD        PG2716.HEX    PG2716.BIN      STARTUP.TXT
LINK.CMD        colour.bas      QCHECK.CMD    VERIFY.CMD      VERSION.CMD
XOUT.CMD        NEWDISK.CMD     PRINT.CMD     DEBUG.CMD      FLEX.COR
MOVEMENTI.CMD   MOVE.CMD        EXAMPLE.BAS   MAKEDISK.TXT    PR.CMD
SRTRMG.SVS      SORT.CMD        PSORT.CMD     CSORT.CMD      MERGE.CMD
PWERGE.CMD      FIND.CMD        WORDS.CMD     DUMP.CMD       OLOAD.CMD
CHECK.CMD       CMPMEM.CMD      DUP.CMD       MAP.CMD        DIR.CMD
FREE.CMD        TEST.CMD        FILES.CMD     FLIST.CMD      PDEL.CMD
REMSPC.CMD      CONCAT.CMD      CONTIN.CMD    INTEG.CMD      RECOVER.CMD
MENTEST.CMD     MEMDUMP.CMD     MEMOVE.CMD    MEMFILL.CMD    SPLIT.CMD
LOW-UP.CMD      UP-LOW.CMD      PRUL.CMD      RPT.CMD        STARTUP.BAK
BASIC.CMD       RENUMBER.CMD    scan.BAS

+++BASIC colour.bas
TEST The quick brown fox jumps over the lazy dog's tail 0123456789 --
TEST The quick brown fox jumps over the lazy dog's tail 0123456789 --
TEST The quick brown fox jumps over the lazy dog's tail 0123456789 --
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```

I made a short video of this, and uploaded it to YouTube, so I could post it (via a link) to Adrien's channel, as a comment to him on getting his up and running.

<https://youtu.be/QR2o-VbBqJk>

On YouTube, you can post comments on most video's, however these are text only, no photo's or video's etc. Your best solution it to make a quick video, upload it to a free YouTube account, then share that link in the YouTube video you are replying to. One hint, add plenty of text in your comment, less the YouTube algorithm thinks it's 'spam' and deletes your post. With a plain text YouTube post, even a one

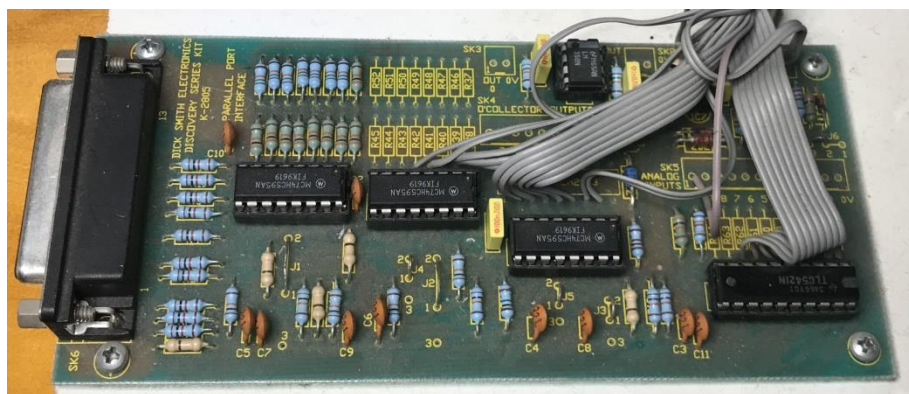
word message will be accepted. However, if there is a video link etc. in there, you better get a-typing, less your entry gets automatically deleted.

Anyway, this exercise has rekindled my interest in this old box. I had not forgotten about it, and an ongoing quest for me has been to source a 'proper' serial terminal to talk to this type of system. For this test I just used my regular i5 Windows 10 PC that I edit the club's magazines on. In this case all the extra horsepower came in handy as I also had OBS studio running to capture the terminal text and create the video that I linked in above.

I would rather have something more appropriate to the job, as using an i5 is kind of like using a F1 race car engine to start a Ford model 'A' car, yes it will work but....

So now I'm looking for some peripherals to use with it. All its IO (input/output) is serial. There is no parallel at all. I did provide an extra buss connector inside, however parallel IO on 6800's is usually done using a 6821 PIA chip, something not exactly available from Jaycar etc.

So I've decided to stick to serial, that way these add-ons will be a lot more universally usable, and not tied to one machine only – heck, with a USB to serial adapter, even usable on a modern Windows 11 box. Good old RS232 serial is quite rugged, it usually runs on +- 12V, so accidentally blowing the crap out of your peripheral using your radio shacks 12V supply is highly unlikely to get past the serial port and bother your PC, unlike USB whereas anything over 5V is a problem. Early RS232 specs mentioned 25V rails, so plenty of safety margin.



One of the first things I grabbed was this old Dick Smith universal IO board, but something was not quite right, yes it has the right connector, however it's actually for an IBM PC's parallel port. It needs a UART IC, a big 40pin IC before I can use it here.

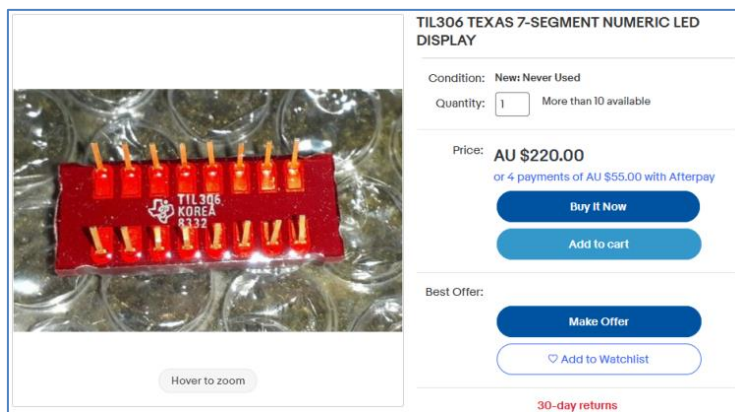


Another item that struck me as usable is this 'display box', it would allow the computer to measure things etc. and inform me without having a full-on terminal running the whole time.

Back in the really early days of home computers, EA magazine 'EDUC 8' machine, had one as an add-on, A 3 digit 'octal' only display, meaning two of the digits only go to '8', and the third stops at 3, very limiting indeed.

This display, assuming I can do it, gives me 5 full range digits, now all it needs is a serial interface. Yes I could use an Arduino, however I want to be 'period correct', these intelligent Ti chips, and the box are quite close, time wise. (Well a WAY lot closer than an Arduino!)

(The EA EDUC-8 display was intended to display memory contents etc. in octal, rather than general data, like wind speed, dwell angle etc., like my display box hopefully can)



When researching the displays, boy did I get a shock when I found this eBay ad from a bloke wanting \$220 each for them, I have two of the display boards shown in that yellow box, so 10 displays total, glad I'm not buying them from him. Maybe I should sell mine...

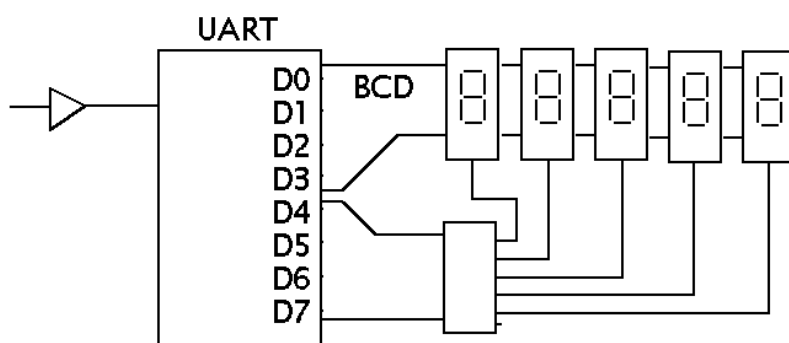
The main problem with these is that they are actually decade counters, so anything

that needs displaying will first need converting from RS232 serial, to a 'count' value that has to be clocked into them – quite messy if done with discreet logic IC's. I do have a small collection of Hitachi 6303 CPU's, a 6800 alternative, that has everything on one IC, including a serial port. They came out several years later, and are 8 bit, so kind of appropriate.

Maybe I should build two 6303 based 'adapters', one for this display & one for that IO board

In days gone by, you would buy a UART IC, this would take in the serial data from the computer and output it as a parallel word, i.e. two 8 bit ports, one for Rx, the other for Tx. Searching on Google it appears these are now long gone, most hits were for USB to serial converters, or IC's that need a microprocessor of some sort to talk to them, as they have many registers etc. that all need setting for it to function. These days if you want to do this kind of thing you would be best off using an Arduino, they are dirt cheap, and can also handle USB, making your peripheral directly compatible with a modern computer (or phone), so maybe I'll just cheat a little – I have most of the code already in place, courtesy of my various clock projects.

One BIG problem, I was thinking of getting my 6800 computer to process some data – probably from several temperature sensors around my house (that is fed 'everywhere' at 1200bps) and display the results. Normally I'd use an Arduino – as in my clock projects (all data is actually on that 'loop' that carries the time) but to get the 6800 box to do it, then pass it onto an Arduino, that has greater processing power seems kind of crazy/stupid.



Instead, this is what I was thinking of doing using a UART and a few latching BCD displays.

The serial is converted to 8 bits parallel by a UART, the lower 4 bits, as BCD data goes directly to all displays, however the upper 4 bits go to a 74LS154, 4 to 16 decoder, so when you send a serial byte to this box, the lower 4

bits determine what is displayed, while the upper 4 bits determine which digit that number is shown on. The displays I have in mind have built in BCD to 7 segment decoder/drivers & also a latch, so that anything sent to a particular display stays put until you write something else to it.

Another idea is to take the 8 parallel bits from the UART, feed them into a simple R2R ladder DAC, then into a panel meter. This would give 256 possible needle positions, probably enough to look linear – and a UART usually holds its output until the next received byte, so as in the digital display example above, the meter will stay put, holding its reading until updated.

Pity I only have one UART.

Paul VK3TGX



Open Day at the GGREC Clubrooms

The Club will try and open up our Clubrooms on weekends when possible, for GGREC members to use. On Saturday the 23rd, Mike Ide VK3KTO and I went to the Clubrooms and were joined by John, VK3XM Dave Rolf VK3JL with his son Jason, and Fred Reid VK3FWR.

Mike had contacts on 10m while Dave and John shared their experiences about Flex Radio and remote operation. I had a go at trying to localise the source of noise on VK3RDD our 6 metre repeater, which seemed to be successful but time will tell.



On Anzac day Mike Ide and I were at the Clubrooms again for the afternoon. We had organised a contact on 40m with Ian and Di Jackson, who was camping in Hay NSW. Ian had set up a 40m Dipole and was keen to make a contact with the Club. The contact was a bit scratchy but we were able to have a good chat. Mike and I were joined in the shack by John VK3XM and Fred VK3FWR and after a while we welcomed Fred VK3ZAQ, Robbie Xin XK3XIN and Klaus VK3IU. Klaus showed off his CW skills on HF while Robbie and I terminated some of Robbie's DC power cables with 60 amp Anderson connectors.

Fred, VK3ZAQ was happy to finally meet GGREC Club members in person, after speaking to them during our morning coffee group catch ups on VK3RGW. Fred spent some time working at the RACV depot in Noble Park before retiring and Mike Ide had also worked there, so they spent some time reminiscing about their time with the RACV.

It was great to finally open up the Clubrooms for members to use and meet for a hot drink and a biscuit. More Club openings will be scheduled in the coming months.

Kind regards,
Bruno Tonizzo VK3BFT

Enter the Communications Analyser. Most amateurs are aware of these instruments and their functions but how many have had the opportunity to use one? Hopefully this article will give you a little insight into the Communications Analyser and how to keep them going with a fair amount of confidence in their measurements.



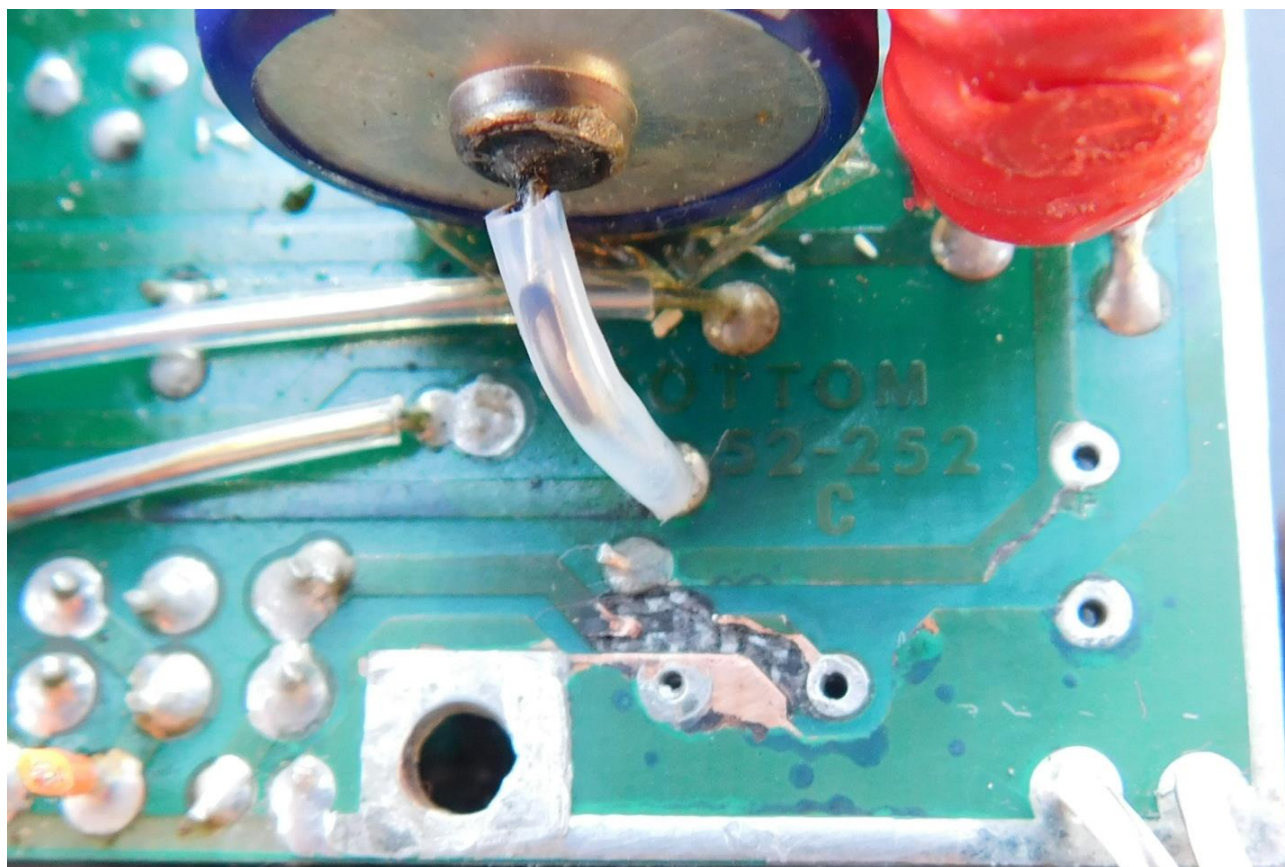
corner of the shack for when I was ready to start work on mine. A second donor IFR became available (for less than the price of a good second hand dual band radio) which was “working” albeit with a few small issues so I purchased that one as well. These test sets are over 30 years old and parts are getting harder to come by now.

Now I had 3 IFR 500A's, my good one that wasn't working, a 2nd working one with some issues and a third that wasn't working and was going to be a donor for the other 2.

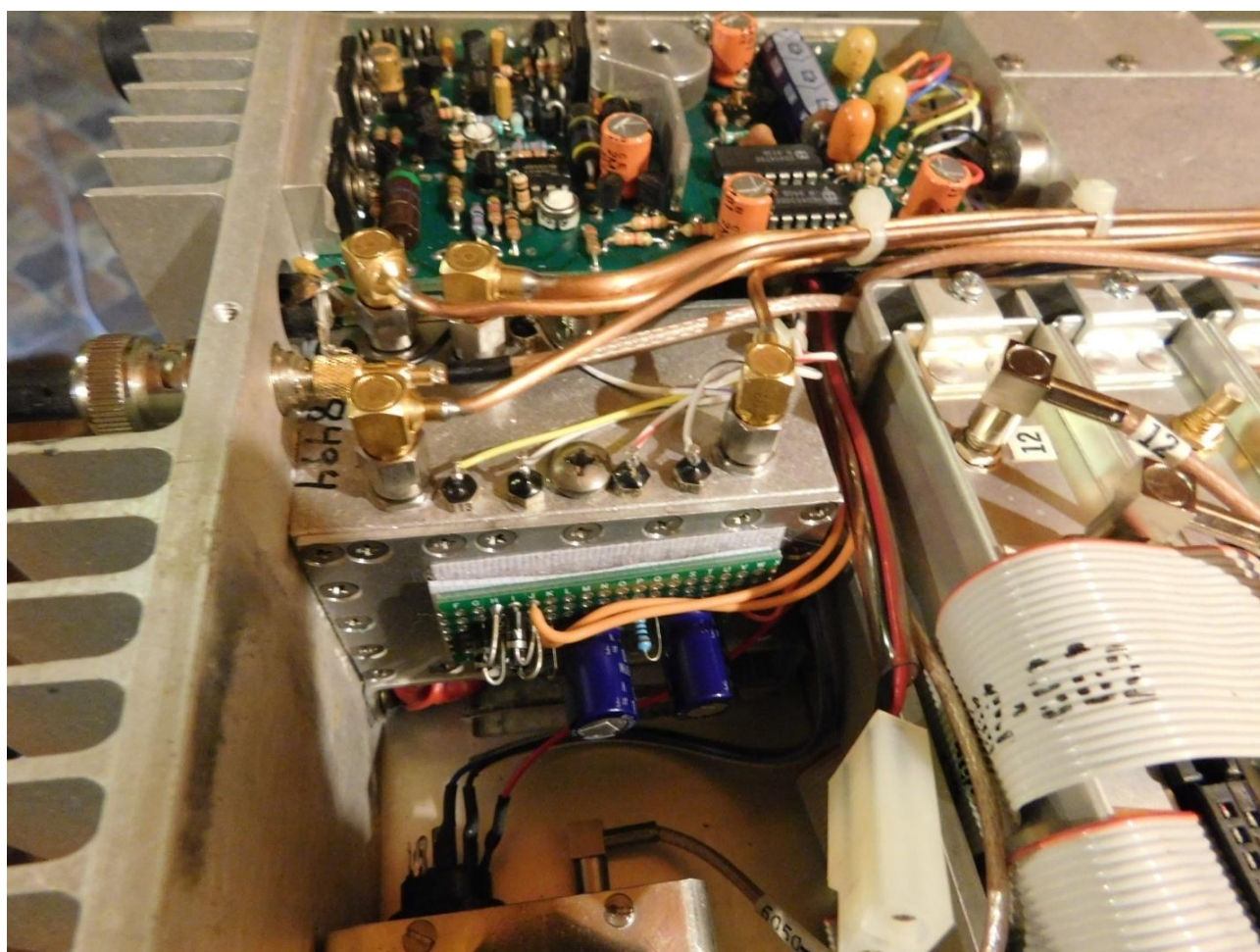


Yes, by this stage Carol was starting to complain about the lack of bench space....

After some testing my good IFR had lost its 40 Volt DC rail out of the power supply, measuring about 12 volts instead of 40 V. The filtering capacitors (2 x 100uF 50 V electrolytic) on this rail are known to fail “short circuit” so they were replaced and, no joy. Still 12 volts out... Hmm ok lets disconnect the output of this rail from where it goes out to the rest of the set and test, Hmm still 12 Volts... ok the only other components in this circuit are 4 diodes and 2 resistors.. Checked the resistors, they were ok, it had to be the diodes (they formed a bridge rectifier for the 40 V rail) Instead of lifting one leg of the diode to test I just changed them all and what do you know, the 40 Volt rail was still 12 Volts DC... Arrrg, what am I missing ? I bit the bullet and cut over 25 wires mounted on the power supply board for a closer inspection and this is what I found.



I checked the 3rd donor IFR and the power supply board was worse... The second IFR was worth fixing so I didn't want to rat that one for parts so I made a little circuit on some vero board that replicated the circuit of the 40 V rail.



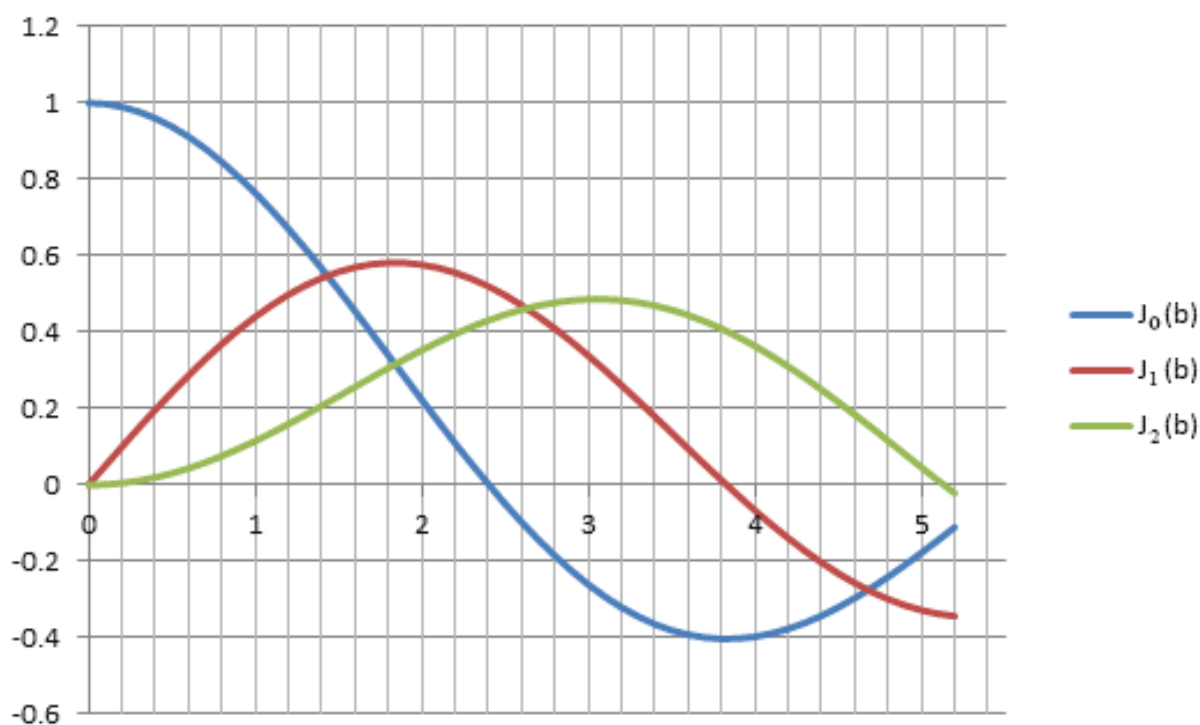
After some tests I installed the board into the IFR and yes, that was the problem, we now had a stable 40 volt rail and the IFR sprung back into life again, I was very happy, I had my old workhorse back 😊

So, what to do with the other 2 IFR's ? Let's see if we have enough parts to get a second one going.

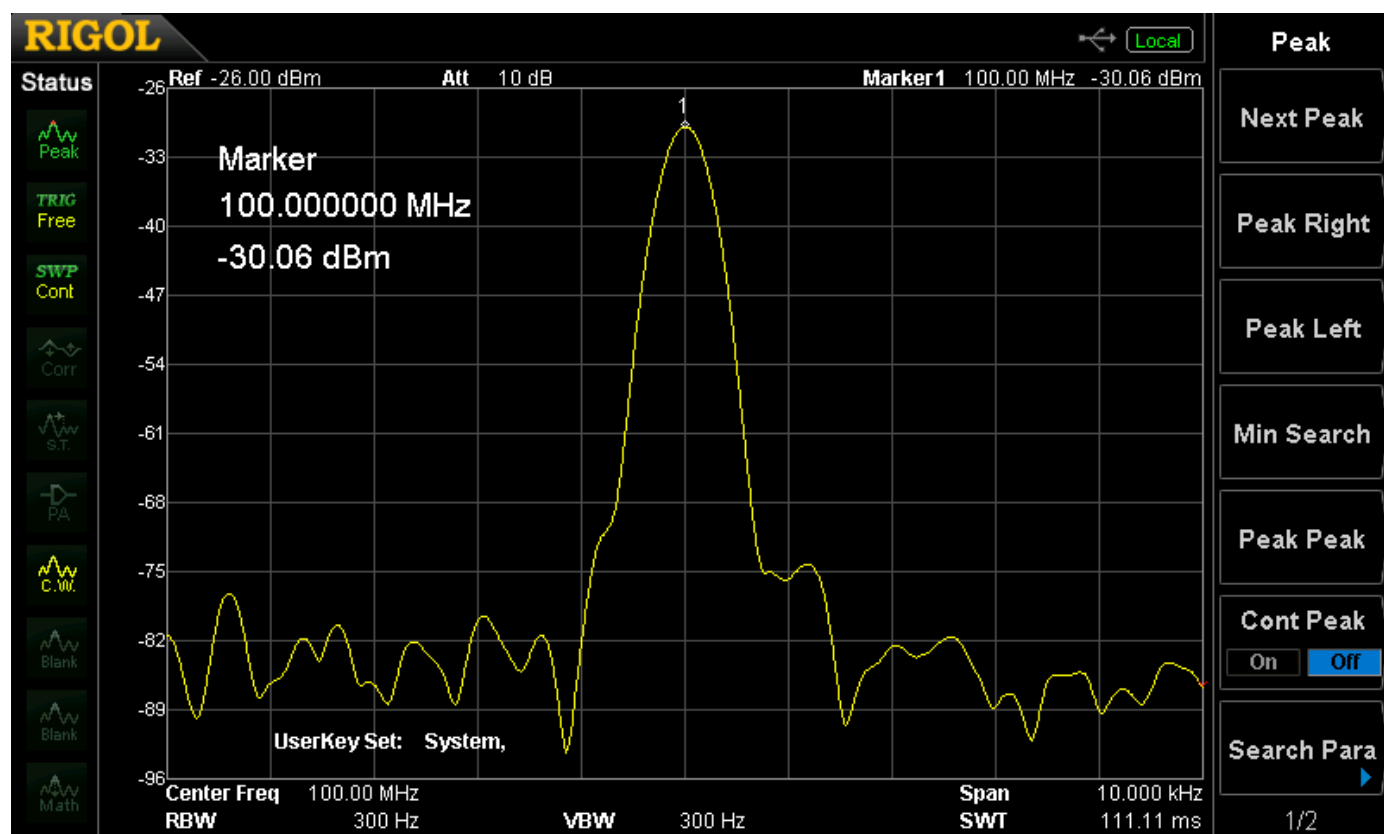
After some tests I found the better one of the 2 wasn't driving the frequency error meter and the output of the set when generating a signal was around 3 dBm down on what the attenuator was showing. A quick study of the 358 page service manual showed the first place to check was the digital counter module that drives the meter. A quick swap of the module from the donor IFR and beauty, now the frequency error meter was working.

Now that I had my good IFR working I used that to "check" the second IFR (as well as a RIGOL spectrum analyser, HP 432 power meter, a HP 8903B audio analyser and a Trimble 10 MHz GPSDO reference) to see if it was worth continuing with. Yes the output was down 3dBm but everything else was "in the pocket". After some calibrations the second IFR came in very well, just as good as my good IFR and is now stable and reliable.

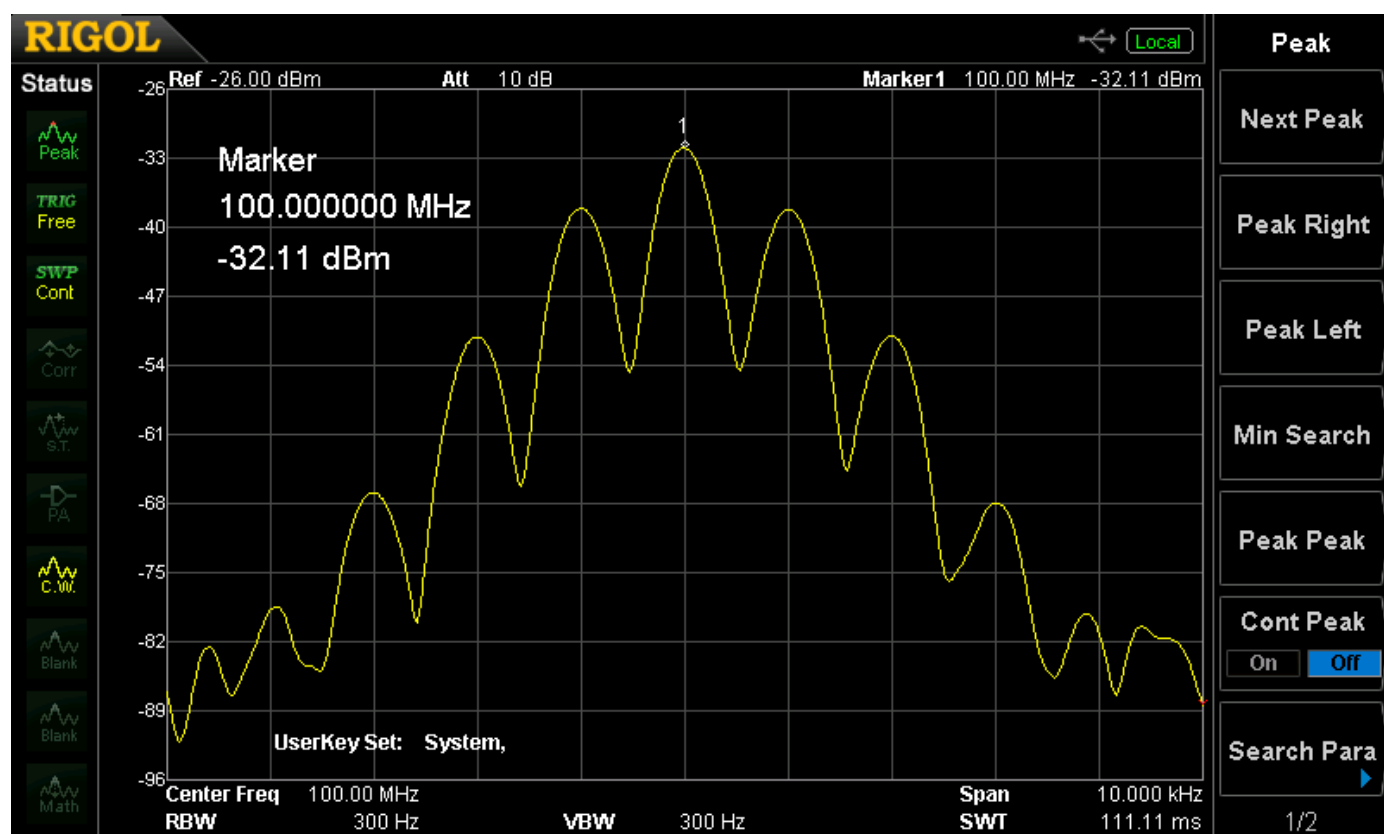
An interesting method for testing the generated Deviation that I use is the "Bessel Null" method. A spectrum analyser is required for this test and it pretty well guarantees the accuracy of the deviated signal being generated. The carrier frequency will disappear at certain levels of deviation. When generating a one KHz tone you will get a null at 2.41 KHz deviation and again at 5.53 KHz deviation, see the blue line (J_0 carrier frequency) on the graph and note where it passes through "zero". This also rings true for the other sidebands (J_1 , J_2 and so on) at different frequencies as well.



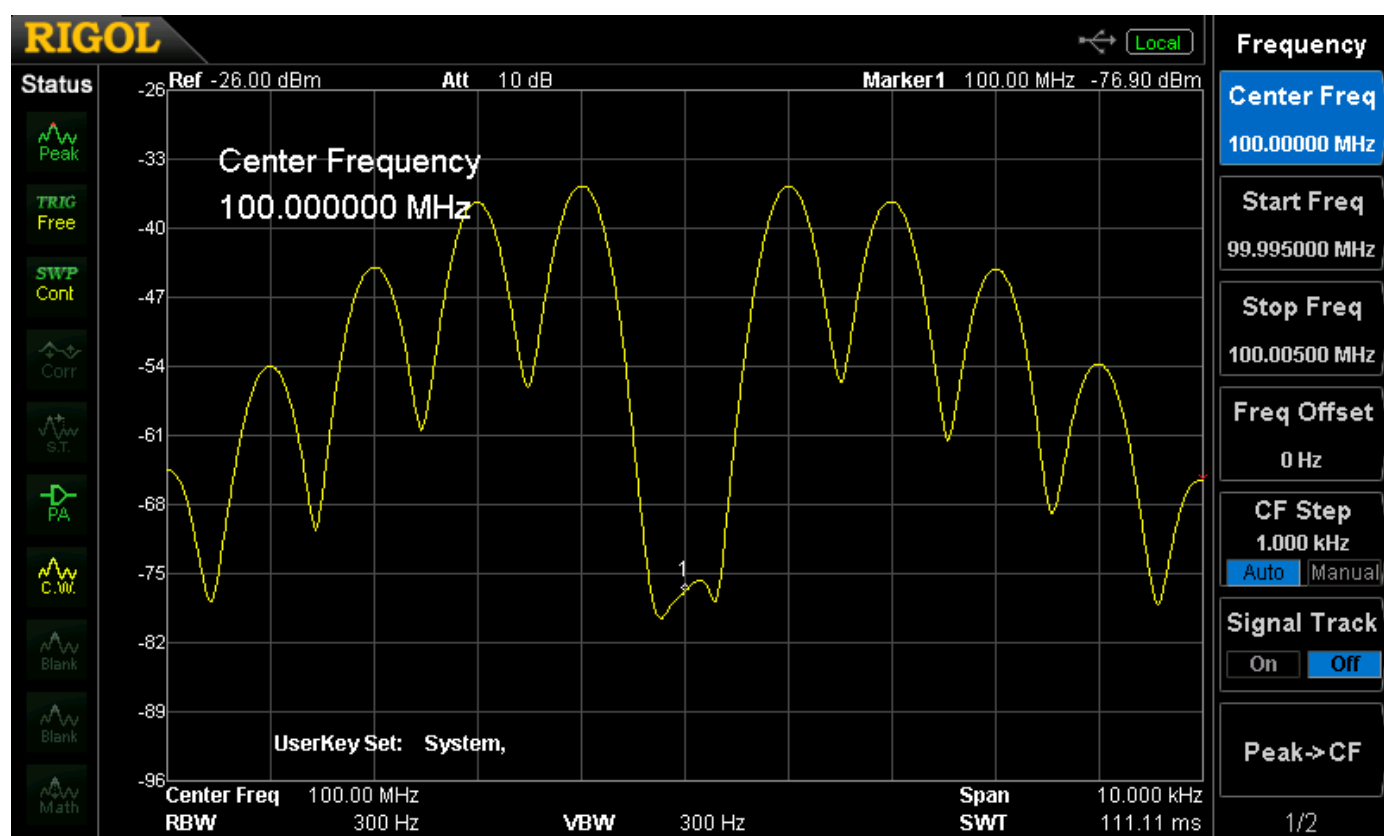
And what this looks like on a spectrum analyser. Firstly an unmodulated FM carrier,



Secondly a 1 KHz tone being deviated at 2 KHz,



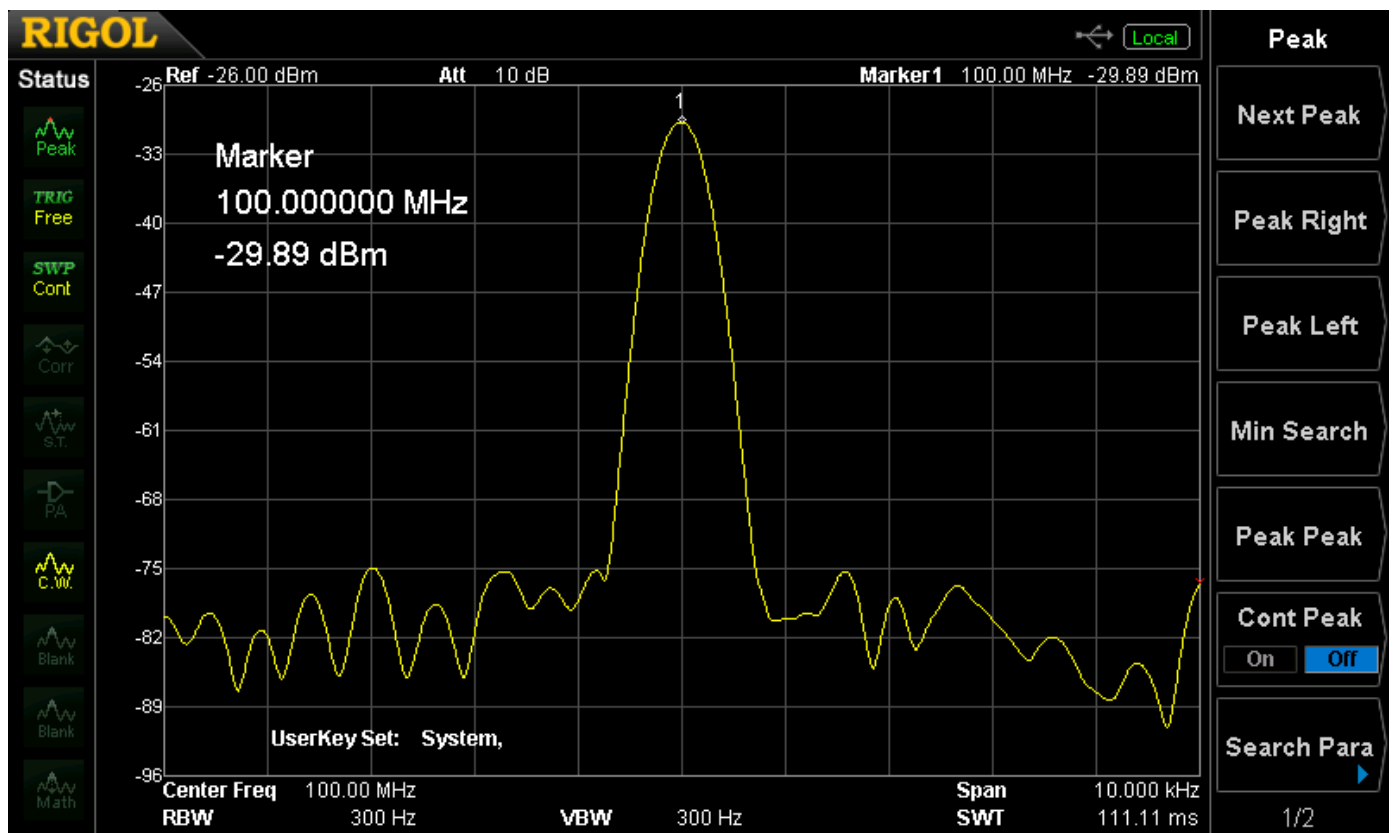
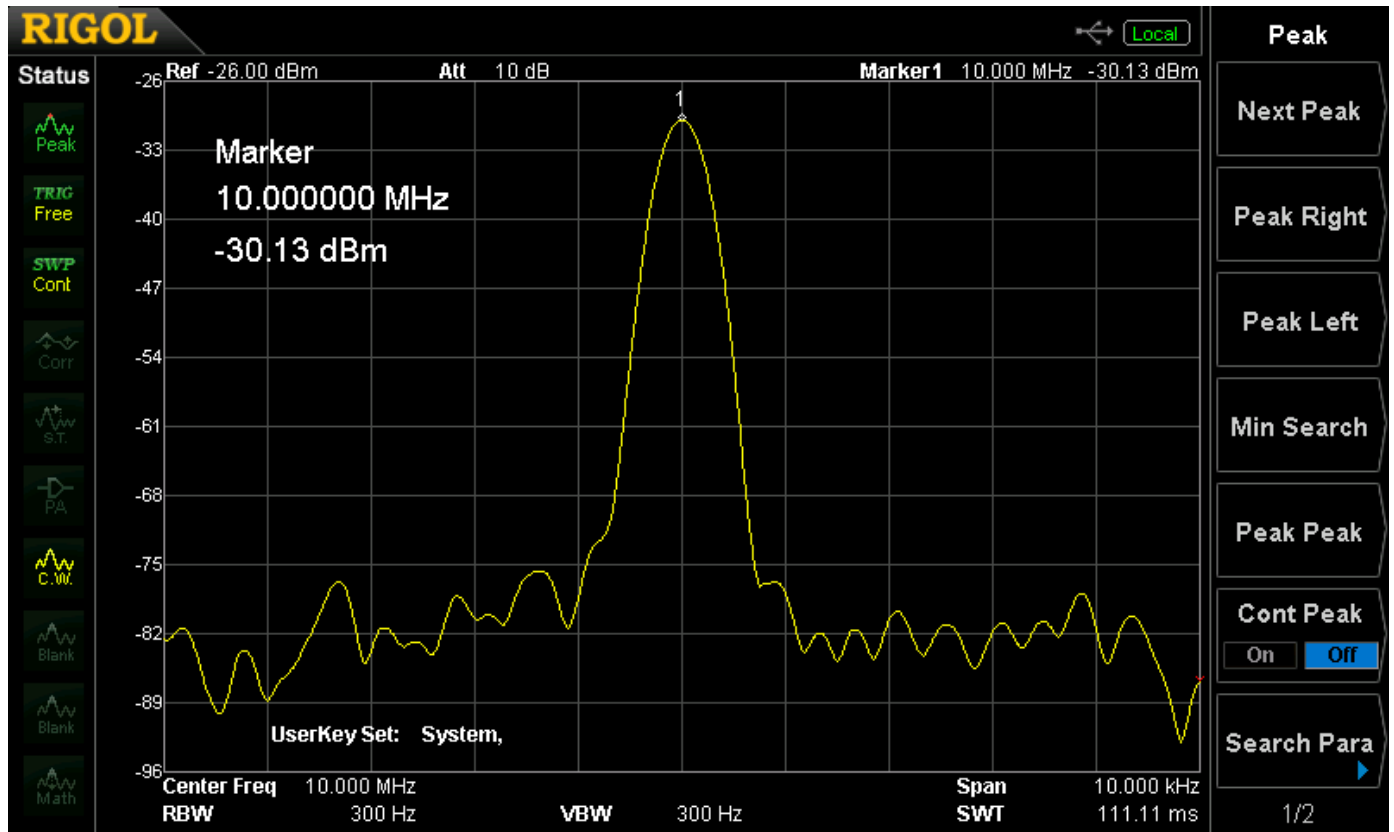
And thirdly, a 1 KHz tone generated at 2.4 KHz deviation, the first Bessel null.

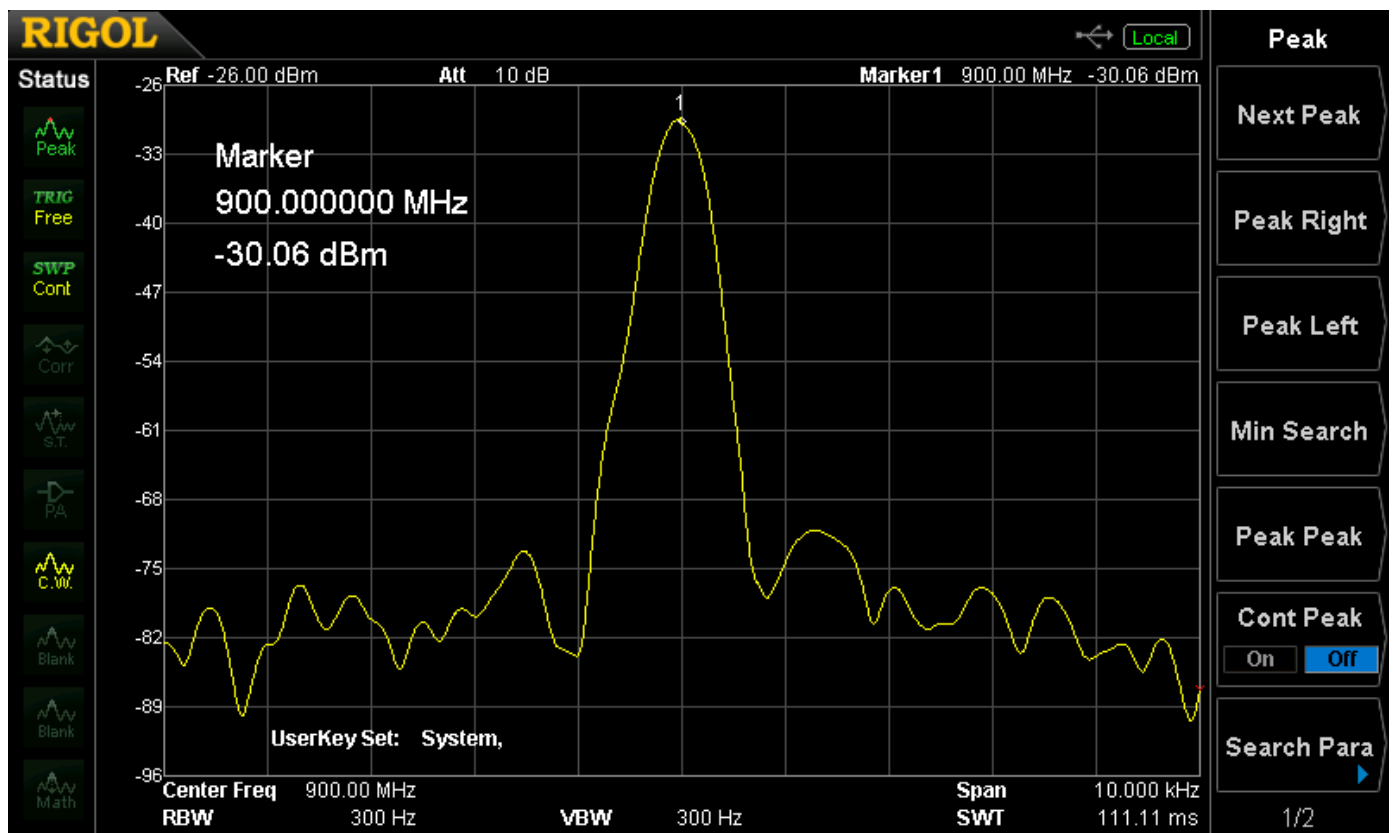
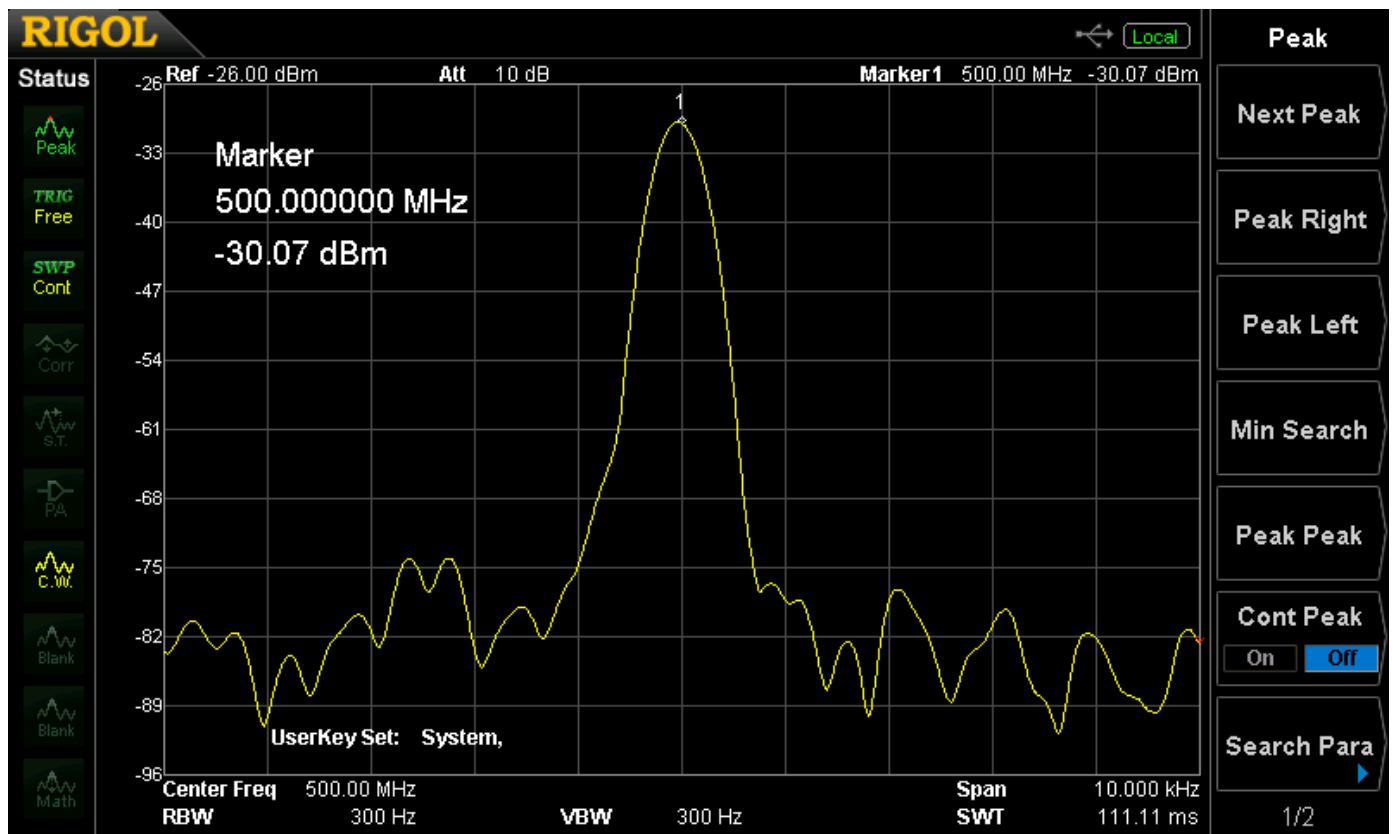


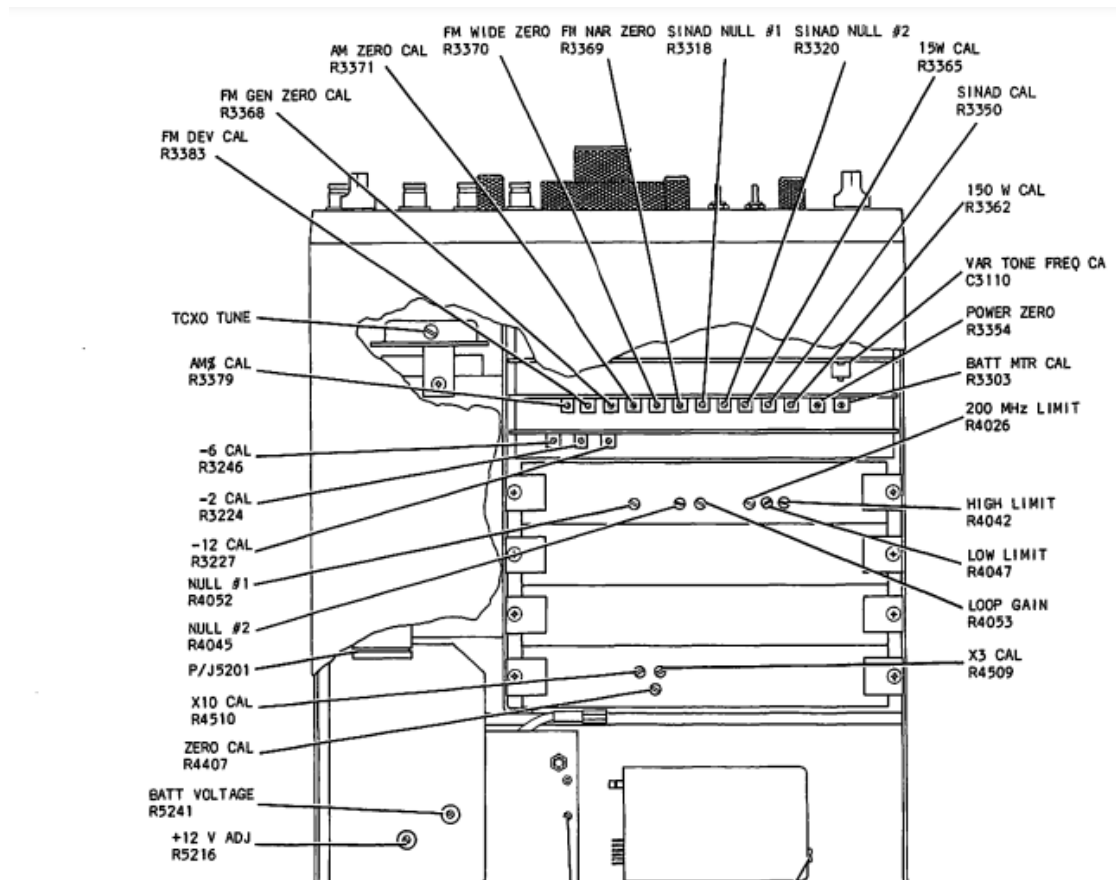
As you can see the fundamental carrier “disappears” on the spectrum analyser as dictated by the graph (3 pictures above). A simple way of testing your deviation if you have access to a specy.

Other tests were done and the 2nd unit was adjusted against a few pieces of test gear, I’m very happy with the way it came up as well, now I have 2 IFR’s to play with.

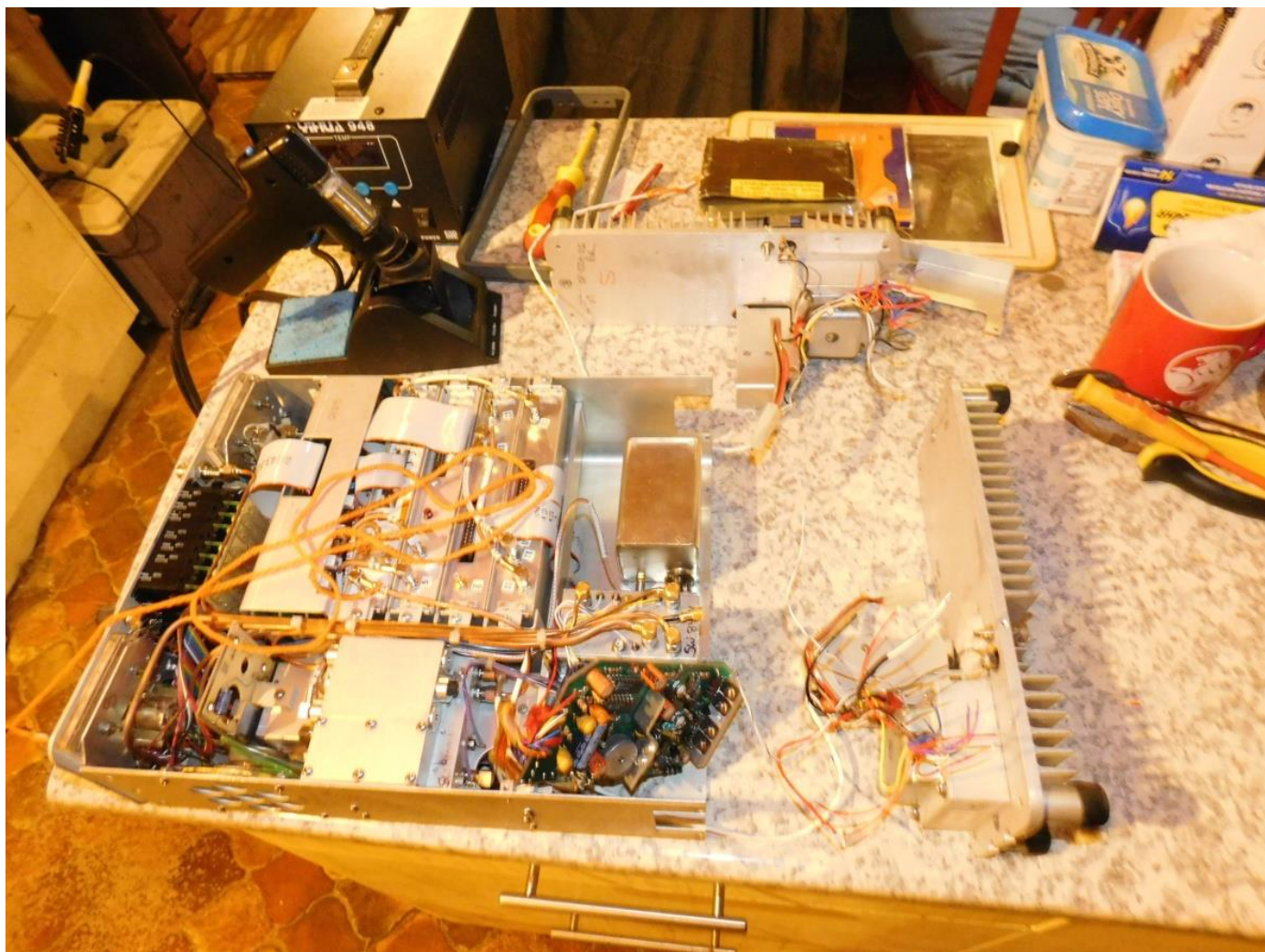
Note; My good IFR stays on the workbench because it has a 0.02ppm OCXO as a reference which takes about 15 to 20 minutes to stabilize after turn on when running on 240V AC. The second working IFR will be my portable set for taking out to site to check repeaters etc. Why do you ask ? The second IFR has a 0.2ppm TCXO which only takes about 5 minutes to stabilize, very handy whilst running on batteries because the IFR has an automatic shutdown at 10 minutes when running on batteries to conserve them.... Below are some shots showing the accuracy of the attenuator at different frequencies and the finished sets. I’ve ordered a new 12 position switch to replace the broken one which I am still waiting for. That will be replaced in due course.







Now, what to do with the left over parts ? <grin>



I'm happy that I have kept 2 older analogue test sets working and have also ended up with a few spare parts as well to keep them going for a while longer.

73,

Rob, de VK3BRS

P.S. I also realize that I am not a NATA certified test laboratory so I am not going to be "spot on" with my calibrations. For the work I do these instruments will be close enough for me 😊

Interesting YouTube Videos



It missed us by 9 days - Physics Girl

<https://youtu.be/85-p9EIEVUA>



In glorious 4:3 aspect ratio

1989 thought houses would look like this by 2020 | BBC Archive

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The GGREC is an affiliated club of the WIA

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We also give Thanks to



For their generous support over the years



Club Information



Meetings 20:00hrs on third Friday of the month at the
Cranbourne Guide hall, Grant Street Cranbourne
Prac/Natter nights first Friday in the Peter Pavey Clubrooms Cranbourne 19:30hrs
Visitors are always welcome.

Office bearers

President	Bruno Tonizzo	VK3BFT	Web Master	Mark Clohesy	VK3PKT
Admin Sec	Miguel Vaca	VK3CPU	Magazine Editor	Paul Stubbs	VK3TGX
Treasurer	Klaus Illhardt	VK3IU	Property Officer	'committee'	
General 1	Bruce Williams	VK3BRW	Assoc. Secretary	Miguel Vaca	VK3CPU
General 2	Leigh Findlay	VK3FACB			

Call in Frequencies, Beacons and Repeaters

The Club Station VK3BJA operates from the Cranbourne Clubrooms.

6m Repeater Cranbourne VK3RDD, In 52.575 Out 53.575 CTCSS none

70cm Repeater Cranbourne VK3RGW, In 431.425MHz Out 438.425MHz CTCSS 91.5Hz

VK3RGW Repeater supports Remote Internet access (IRLP), Node 6794 **offline**.

70cm Repeater Seaview VK3RWD, In 431.575MHz Out 438.575MHz CTCSS 91.5Hz **'Testing'**

Simplex VHF - 145.450MHz FM, Simplex UHF - TBA

VK3RLP Beacons 1296.532MHz & 2403.532MHz (**currently offline**)

Membership Fee Schedule

Pensioner member rate \$40.00, Extra family member \$20.00

Standard member rate \$50.00, Junior member rate \$25.00

Fees can be paid by EFT to BSB 633000 - Account 146016746

• Always identify your EFT payments

• Membership fees are due by each April Annual General Meeting (AGM)

Magazine Articles to editor@ggrec.org.au Cut off, 10th of the month

All other Club correspondence to: secretary@ggrec.org.au

or via post : GGREC, 408 Old Sale Rd, Drouin West 3818

GGREC Web Site & Archive may be viewed at: www.ggrec.org.au

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