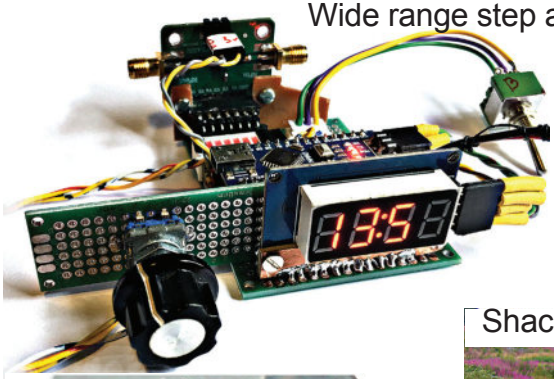
SPRAT

THE JOURNAL OF THE G-QRP CLUB

DEVOTED TO LOW POWER COMMUNICATION

Issue No. 180	© G-QRP CLUB	Autumn 2019

Wide range step attenuator



Valved receiver

Shack-on-a-pole

ZL2BMI's SSB transceiver

Other contents

Editorial – Members' News Extra – Measuring Toroids – Test Box Add-Ons – Deaf Aid Headphones – Solder Problems – Members' Pages – Comms & Contests – Chip Tune – AV&V – Special Offers – Adverts – Club Sales

Club officers & contact details + standing order form

Founding member George Dobbs G3RJV (SK)

Tel: +44(0)113 267 1070
Homepage: *www.gqrp.com*

As I write this, we are about to head off to our 2019 Convention, the 3rd hosted by the Telford Hamfest team. There has been some discussion on the G-QRP Club Yahoo Group about rally and convention locations. Finding affordable venues close to the main public transport routes is not easy, and finding a team of volunteers willing and able to make it happen is at least as difficult. The current arrangements work pretty well but, if members are unhappy, the Club Committee would be interested to hear of specific proposals for viable alternatives.

The previous *SPRAT* was produced in full colour. I have seen very little feedback about this. Was it welcomed? Was *SPRAT* better in mono? I did have some feedback about the size of the print and the clarity of circuit diagrams in SPRAT. Would members prefer larger print? If so, would more pages, and more cost, or less content be preferred? Please let me know your views.

There is a new 'Best of *SPRAT*' book in the pipeline. As with 'The Low Power *SPRAT* Book', the RSGB will be publishing the new book which looks like having 240 pages and will include a wide range of articles from 2013 to 2017. Seeing the projects afresh in a different format certainly reminds you how lucky we are to have our members share their ideas via this magazine.

You will see in this *SPRAT* that the call for a new Membership Secretary was successful. I am sure you will all welcome **Daphne Neal, G7ENA**, who is in the process of taking over from **Tony Fishpool, G4WIF**. Daphne is no stranger to the Club and has been staffing Club stalls at rallies for some time.

Looking forward, would you like to put the Club callsign, **G5LOW**, on the air during the Winter Sports? Full details on how to book the call are on the Club website, or just drop me an e-mail.

Steve Hartley, G0FUW
Chairman GQRP Club
g0fuw@gqrp.co.uk

Membership Secretary News

Tony G4WIF

In the previous Sprat I announced that after 13 years I wanted to retire as membership secretary and asked for volunteers. There were two - but first off the block was a member that for many years has been very active supporting the club locally and at our conventions.

We are delighted to appoint **Daphne Neal G7ENA** as your new Membership Secretary.

So how does this work? Daphne can be contacted by email at ***G7ENA@gqrp.co.uk*** and her postal address is **3*3 Swallow Drive, Louth, LN11 0DN.***

UK members that pay by standing order need take no alternative action. As is traditional, we include a standing order form in this issue should UK members wish to change to this method and need time to get it in place with their bank. The onus is on you to check in the Winter Sprat that rates have not increased (and to make adjustments if they have) in time for the payment date of January 15th 2020.

[There is a special reason that we set a later date for UK standing orders, otherwise the renewal date is 1st January for all members]. If you aren't sure that you have a standing order in place please check with your bank.

Members who pay by Paypal also need take no alternative action – payment will go to Daphne. Just as I have, Daphne will acknowledge all payments, but only to the email address that you provided Paypal.

DX representatives have already been notified, so you may continue to pay via them if that is your practice. I am indebted to this wonderful band of volunteers who have made my life far easier over the past 13 years.

Members who pay by post will need to make note of Daphne's address. It will be repeated in the Winter Sprat when she announces what the 2020 subscription rates will be.

You are reminded that you may not pay earlier than November 1st. The 2020 rates will be posted on the club website on that date and later in the Winter Sprat.

Thank you everyone. I have enjoyed being your membership secretary and your point of contact with the club. Over to you Daphne .....

Tony G4WIF

The S.O.A.P. – or Shack On A Pole!

Leslie Austin G0NMD, email: leslie.austin@btinternet.com

This is a somewhat eccentric attempt at making an item of utility 'furniture' which will allow the Shack to be small and transportable.

The original idea came from an unfortunate stay in hospital, where I was wired up to a heart monitor. The whole monitor was contained on a wheeled stand – the screen, the monitor electronics with spare leads, and a computer as well.

I could see a similarity in shape between the electronic boxes and some modern amateur radio equipment, but could imagine the high cost of such medical stands – which was confirmed by looking on the internet. This stand – called the S.O.A.P. (Shack On A Pole) was made to be as useful as the medical unit, but was constructed almost entirely from scrap and cost next to nothing.

Initial setup in the garden to allow any 'fine-tuning' that might be needed

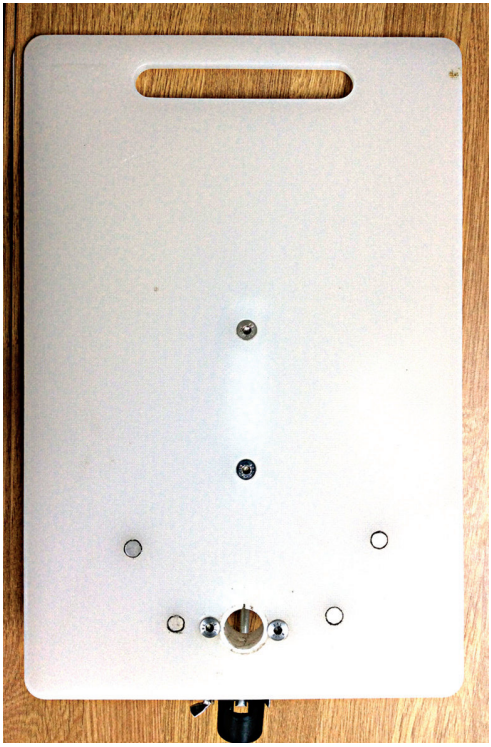
It is made with two uses in mind:
In a home with little room for 'radio stuff' it can be used from an armchair (or a bed), and needs only an aerial connection. It can also allow for convenient temporary operating if visitors need your Shack as a bedroom, and could be pushed into a cupboard out of the way when not in use, and uses the wheeled office chair base.

In the Great Outdoors – garden, field, beach or hilltop – it can be used to keep the radio kit off the ground, and even the kit plus operator out of the rain if a 'tarp' is added to the central pole and pegged out to the surrounding ground. Outdoors it uses the 'plate and nails'.

As an extra, the whole thing (as I constructed it) is made round a pole with 3/8-24 threaded ends (male and female), compatible with most aerial systems, such as Buddipole, Buddistick, mobile whips and similar variations on the theme, as well as my own home-brewed aerial stuff. Indeed, anything with a 3/8" x 24tpi UNF thread. These aerial attachments can screw onto the top of the pole.

I made a disc to fit on the pole-top allowing guy-lines to support the structure outdoors, and allowing a rain cover/sun shade to be supported. These being often needed outdoors (Wales and Malta respectively!).

The top is a nylon chopping board



The items used in the construction:

Long pole – domestic aluminium TV 'chimney-aerial pole' (out of a skip)

Shorter, smaller pole –Aluminium tent poles from the local tip
(All tubes have 3/8-24 male and female threaded ends turned to fit)

Clamps – armoured-cable clips (very cheap, from electrical wholesaler)

Collars – turned from scrap Acetal
(ask your local engineering-workshop)

Office chair base – local tip *(ask, and the operators at the tip will often oblige)*

'Ground base' – alloy plate screwed to bottom of pole with holes allowing 8" nails as 'pegs'

'Surfaces' – Tesco chopping boards, drilled for poles and magnets as required.

Shade/rain shield – I used an old shower curtain

Fasteners – all stainless steel via internet, I used 'M6' (= 6mm) bolts & nuts

Clip for iPad – cheap from internet.

Power supply – my usual 12V from either LiPo model battery or 10x AA NiMH battery pack.

The 'desk' is braced with a clamped aluminium rod

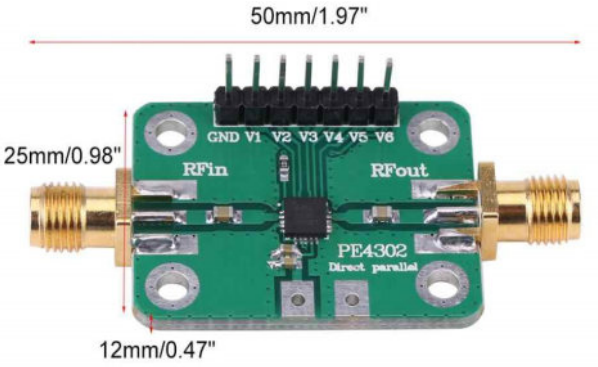
Of course few ideas are unique, and I have since found that **Alex PY1AHD** has a similar idea on his loop aerials website. This won't hold an RA17L, but it copes very well with KX3, or K1, plus an iPad and keyboard or writing pad for logging, and a Palm Paddle fixed to the writing surface by magnets.

I hope the pictures show my construction, but the idea is presented here so that if you have a need for something similar it might spark a few ideas.

A Digital Attenuator

Tony Fishpool G4WIF & Tony Jaques G3PTD

Tony G3PTD and I started to exchange emails about this back in March. We had both seen a video on Youtube that had piqued our interest about a cheap PE4302 module costing around ten pounds.



The module offered amazing performance. It promised 31.5 dB attenuation range in 0.5 dB steps. 50 ohm impedance. DC to 4GHz.

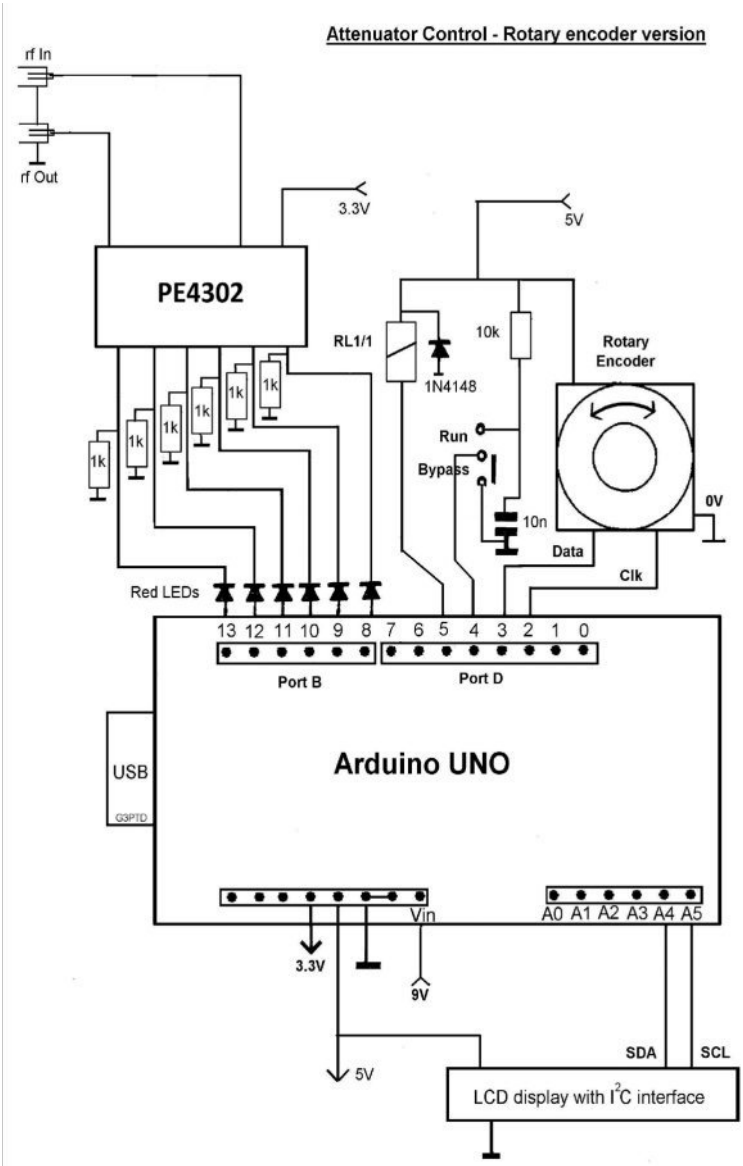
The attenuation is set by a combination of "highs" and "lows" placed on the V1 – V6 pins. You could simply use switches and consult a table - but we were attracted to a rotary control and digital display.

As the object code was available, we each constructed the design from the youtube video– but we had discovered some bugs which we couldn't therefore fix because the source code was not made available. Tony G3PTD decided to code his own.

I've built switched attenuators from various designs and the problem has always been the inaccuracies due to inadequate screening and preferred resistor values - which tend to wander a bit at higher frequencies because they also have reactance. Later, Tony and I were to measure the module attenuation to be within 0.3 dB of the value that was stated on our displays - virtually flat over 100 MHz (and beyond). Not bad for around £10.

Most of the following is the design of Tony G3PTD with some very elegant code using an Arduino Uno (or Nano) to control an LCD Display. Some batting back and forth of ideas between us bought about some changes and we probably spent quite a lot of time on the project. But this kind of thing can become an obsession!

The circuit diagram of (one of) the final design(s) is shown on the following page.
The red LED's provide two functions. Because the attenuator module is a 3.3v device, they drop the voltage out of the 5v Arduino to an acceptable level. With the addition of the 1k grounding resistors they provide a perfect visual diagnostic that shows when turning the rotary encoder that the binary output is advancing.
Resistors are also provided built into the attenuator module - but then it would need to be connected and this addition allows the building and testing in stages. With the values chosen it all works together with both sets in parallel when finished.



I should explain the "run/bypass" switch. We had read that the module was specified on the data sheet with 1.5dB insertion loss. Tony's original circuit and code allowed the operation of an inexpensive relay which would take the attenuator out of circuit. When the switch was operated the display would show "bypassed".

We both have pretty respectable Vector Network Analysers and the 1.5dB insertion loss was confirmed. What we also confirmed was that the relays made rather a mess of the flat

performance that I mentioned above. If you have some decent (usually expensive) coaxial relays you may see a different result. So we've left that in the code.

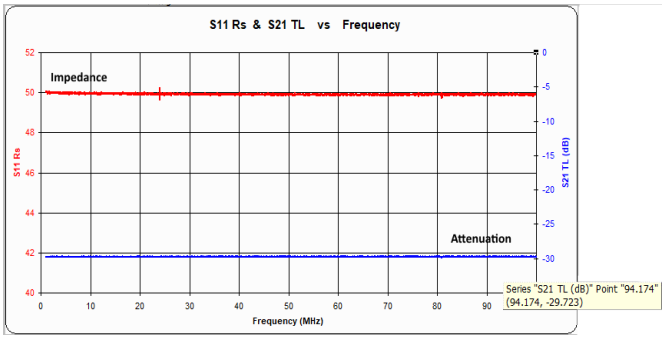
So ultimately, we decided that a device that provided attenuation from 1.5dB – 33db (including the insertion loss) wasn't a bad thing and if we wanted 0dB attenuation, then we could replace the unit with a short cable!

I will explain now why there was more than one final design.
Tony G3PTD liked the LCD display but I had discovered the wonderfully cheap 4 digit TM1637 display and ordered a few to play with. It seemed to me that the LCD was rather a waste when you only need three digits – and getting the TM1637 working it was both fun - and at times frustrating!

These displays are not brilliantly documented and you have to search around a bit to understand how to program them. It even took me three hours to get the centre colon LED's to light - and if you actually just want a decimal point a blob of paint over the top LED seemed to be the accepted solution!

TM1637	Arduino
VCC	+5v
GND	GND
DIO	D7
CLK	D6

Tony G3PTD and I ran loads of tests over the months, but here is a scan of 1 – 100MHz showing pretty flat performance.
With my display showing 30dB. The attenuation measured here (at 94MHz) was 29.723dB and pretty much the same result over the whole 100MHz scan.



We both feel that some good additional screening around the PE4302 module would be advisable. The code for both versions (and more photos) will be available from the Sprat page of the club website.

ZL2BMI SSB Transceiver 160 – 40m or more

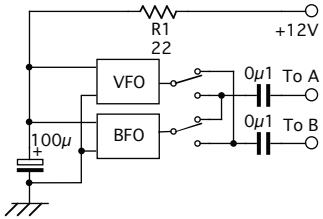
Eric Sears ZL2BMI (email: sears@xtra.co.nz)

How it happened

For more than 30 years I have built DSB transceivers for "tramping" in New Zealand (backpacking, hiking, depending on your country!) – and two of these have appeared in *Sprat*.

Recently I wanted to build another one using the new DDS from OzQrp, which is the smallest DDS I have been able to find. But having bought it, I wondered how hard it would be to do SSB instead, so I drew up a block diagram. It turned out that I needed to add just one NE602, a homemade filter and a DPDT relay to my DSB rig to achieve SSB. How hard can that be!? While I did it from a block diagram – others have done similar designs.

The circuit

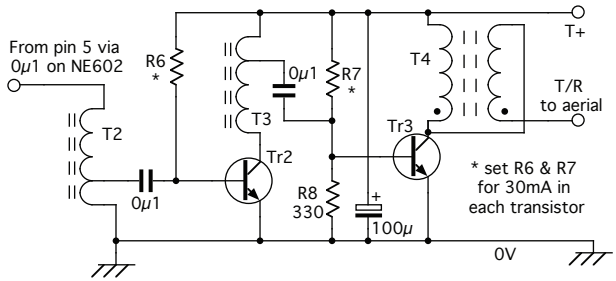


The heart of this radio is the DDS from **OzQrp** – capable of both a variable frequency output (vfo) and a single fixed frequency (bfo), both in the range 100kHz to 100MHz. Rather than trying to switch the inputs and outputs of the mixers as some have done, it is easier to switch the bfo and vfo frequencies with a simple relay. Solid state switching (eg 4066) can be used but turns out to be a bit more complicated and only saves a few mA.

In essence, on receive the first '602 mixes with the incoming signal to produce the IF. This passes through the filter and is demodulated by the bfo frequency to produce the audio.

On transmit the bfo and vfo are swapped so that the first '602 produces the DSB signal which is passed through the filter, then mixed in the second '602 to produce the wanted frequency.

The rf and af amps are basically the same as in my previous DSB rigs, as shown below.



Purists will immediately want to question the lack of filtering in the rig, and I understand this. I have done some tests with other close hams, to check particularly on image or mixer frequencies, and they could hear none (but read on!).

Let's just consider the

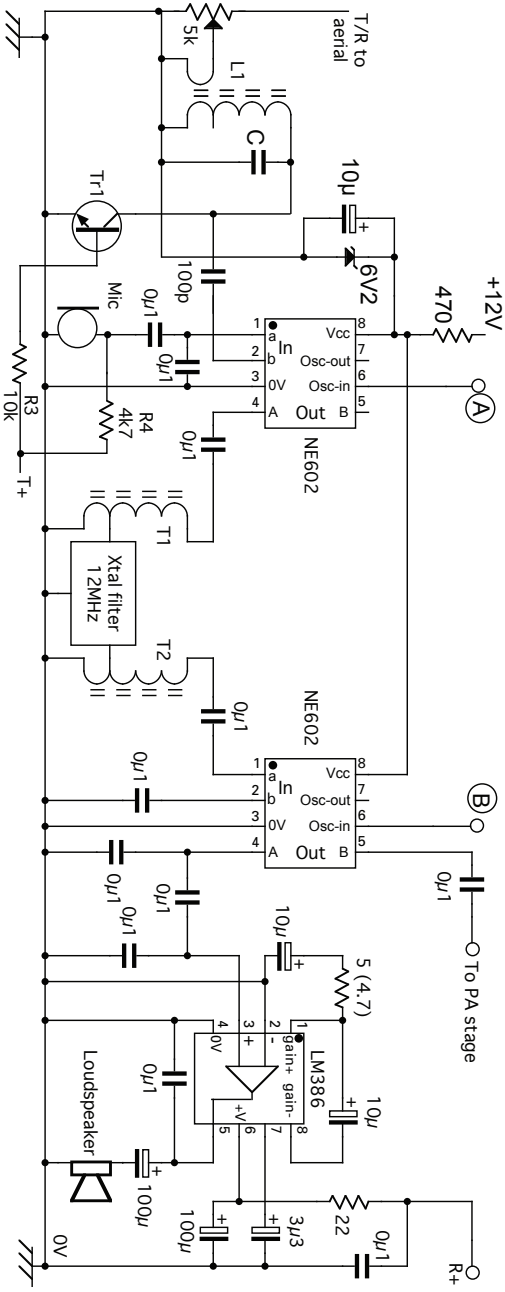
transmit path. The NE602 is a balanced mixer (although not double balanced the way I use it). But whatever is injected into pin 6 is very reduced at the output.

For the first '602 all that comes out of pin 4 are two sidebands (12MHz in my case). Any audio present is unimportant – and would be shunted to ground by T1. One sideband is removed by the filter. To produce an 80m signal, the 12MHz sideband is mixed with 15.5MHz (in the second '602) to produce 3.5MHz for example. The 15.5MHz is balanced out.

Presumably this leaves 3.5MHz, 12MHz and 27.5 MHz. Because I am using a tuned aerial, and the amplifier does not work well above about 15MHz, very little signal above this frequency would get out. Tests done with a simple plug-in external LP filter for 80m (just one inductor and two caps) shows that it reduces the 12MHz IF signal from 20dB down, to about 40dB down with the filter. The 27MHz frequency, already very low, is further reduced. An aerial tuner further reduces any unwanted signals

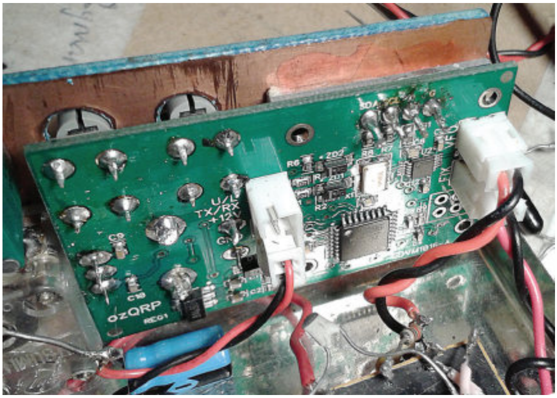
At the times when the band is open for QRP on 80m, its usually not really open at the higher frequencies anyway. Using such a rig in the bush with a simple filter, five watts and a dipole cut for 80m is unlikely to cause any problems with mixer products or harmonics.

Shortly after finishing the prototype I had a '5&9' report from Eastern Australia on 80m (about 2000km path), so I have been pleased with it. But its not really for rag-chewing, its a communicator for when I am away in the bush!



Extra switched or plug-in filtering before the rf amp might be desirable in busier locations

than NZ, and a better filter on the end would be useful. This is just a bare bones circuit.



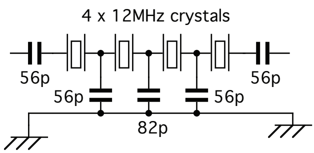
Notes:

The DDS modules are available from **Leon**, who I have found good to deal with. Extremely simple to assemble – basically just adding hardware. If a future version enables another fixed output – it could have selectable LSB/USB. (More further on). The 22Ω resistor in the power supply can be lowered to about 10Ω, but there is some 'noise' from the DDS which comes back along this line. A larger cap also helps – or larger on the NE602 power supply.

The coil L1 – about 40t with 6t link winding for the aerial is as used in DSB. Combined with C it is the front end tuning. If you only want 80 or 40m, just switch capacitors. With 50 turns and a plastic broadcast cap I cover about 3 – 10MHz as a preselector.

Tr1 is any NPN transistor (eg BC338 etc.), which shorts the input of the receiver to ground during transmit.

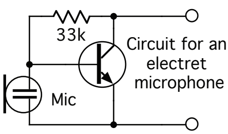
Mic – Originally a carbon microphone (simplicity!!), but now superseded by a simple electret mic circuit. Some electret insert don't work well. I found the slightly dearer ones sold in lots of 10 or more, from China are very good.



The filter – this took many hours of measurements to achieve. The DDS was used to check the passband. If the filter does not match the impedance reasonably, the passband will suffer. I ended up using the low profile 12MHz crystals from Aliexpress suppliers. It started as a Cohn filter, but needed extra capacitance in the middle to reduce the passband (about 2.7kHz at 3dB). Matching with resistors seemed rather lossy, so the small transformers are tiny ferrite beads with fine wire and 10 turns tapped at 4t. Suppression of the unwanted sideband is about 35dB – which is fine for me. To listen to USB (for mountain radio forecasts in NZ), I have a switch which shorts the output and input of the filter – DSB! Simple! Or just change the bfo freq in the DDS. The books say the crystals should be within about 50Hz of each other - but other info was that it is not all that critical. ±100Hz will probably do.

For the audio Amp – note that I have replaced the 3V9 zener previously used with 22Ω, resistor, though changing it to 10Ω may be better. Note also that the 4.7Ω on pin 1 adjusts the gain, and sometimes needs a higher value to prevent oscillation. Some cheap Chinese 386s need a much higher value! This circuit has about 70dB gain.

The RF Amp – is as used in the revised circuit for the DSB rigs. T2 is about 18 turns of fine (34-38swg) wire tapped at 4 turns on a small ferrite bead. T3 and T4 are wound on a larger



Modfication to use an electret microphone capsule

ferrite bead (these also from China and very good), about 6mmx4mm with 3mm hole. Transformer T3 is 24 turns tapped at 8. While T4 is 8 turns bifilliar. For transistor TR2 - the best I have found is MSP6531 but 2N2222 works reasonably or some other transistor with high Ft. TR3 -this is the hard part! I use some good 2SC1971 from China (these were original parts – some were ex-equipment with short leads). You will need to find the best RF transistor you can get. Others like 2SC2166, or some of the good MRF types will be ok. I get 5 watts or more with the 1971. Or you can use your best version of an IRF510 amp. I left some of the beads with Graham G3MFJ when I visited UK recently.

There are various other small addenda - eg there are 100Ω load resistors from output to 0V for the two DDS outputs. Also there is a 470µF bypass across the power supply at the T/R switch.

This circuit will be "too simple" for some – and I know improvements can be made – but my needs are for small, lightweight (140gm) rig for backpacking. Plug-in filters are needed for each band and I have not actually tried it much above 40m. I know it does about 2 watts at 20m – except that the filtering is then more of a problem. Note also that with the mixing arrangement I am using here, you will have to consider sideband reversal. You will need to experiment for other bands.

The final outcome was:

Case size - 80mm x 80mm x 37mm

5 watts PEP

Transmit - 160, 80, 40 metres

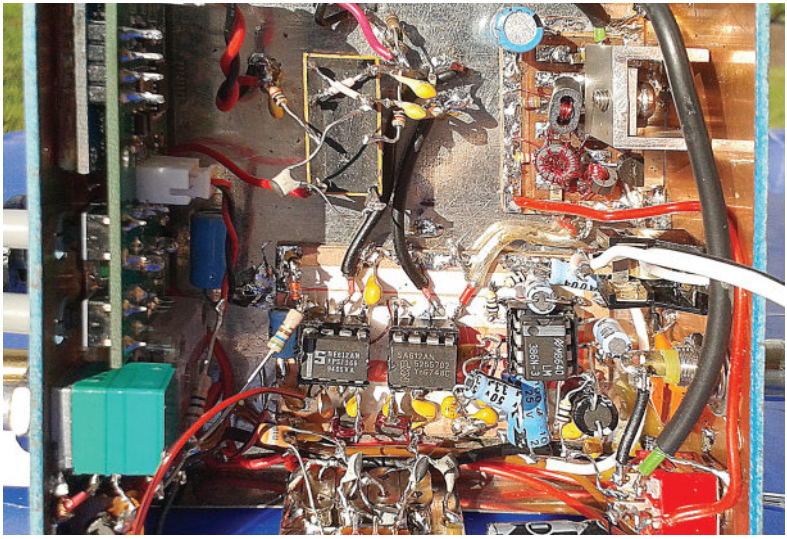
Receive – continuous from broadcast to above 15 MHz (needs better front end tuning).

Also receives AM broadcast band for weather forecasts (but only 10Hz tuning steps!)

Could be easily adapted to your own vfo/bfo arrangement.

12MHz IF was used as an attempt to separate the image – it could go higher. I have built a 16MHz filter from low profile crystals that seems fine. With the DDS its a doddle to change filters.

A lower IF frequency would make it easier to use a straight LC vfo – but probably best just for 80m – though with the current sunspot cycle that's mostly fine.



All best wishes with the building.

Measuring toroidal rings

Phil Stevens (philg3ses@gmail.com

Some years ago, at the Rochdale QRP Convention, I came across two tobacco tins labelled Plain Ferrites. They contained well over 100 ferromagnetic large beads and as the price was one pound for the lot I bought them.

On getting the home I decided to investigate and by suitable measurements determined the beads were not ferrite and had excellent properties for resonant circuits in the 1 to 20 MHz frequency range.

Two properties were determined, the inductance factor **Al** and the relative permeability **μr** and to achieve these values, two instruments are needed. Some type of instrument is necessary to measure inductance accurately from less than 1μH to over 100μH. I use a Peak LCR 45, but other devices such as a *Q* meter or a GDO may be used.

The second instrument is a micrometer or vernier/dial callipers calibrated in mm.

Inductance Factor Al

The following formula is used to calculate the number of turns required for a given inductance. The formula is as follows.

$$Al = L/N^2 \quad \text{or} \quad N = \sqrt{(L/Al)}$$

Where the units are Al is the inductance factor in **nH/turn**
L is the inductance in nH
N is the number of turns

A known number of turns were wound on a 'Rochdale Bead', and in my case, I used 10 turns for mathematical convenience and also to get an reasonably measurable inductance. The inductance measured, in this case was 3.4μH or 3400nH which gave a value of :

Al = (3400/100)nH/turn – equating to 34 nH/turn.

Once the inductance factor for a given core material has been found, the second formula above will give the required number of turns.

For example suppose we wish to use a Rochdale Bead to make a 4μH or 4000nH inductor. Then:

N = √(4000 / 34) = 10.8 turns

As we cannot wind a part turn then 11 turns would be used

Relative Permeabilty μr

The relative permeability of a ferromagnetic material indicates by what factor the inductance is increased over an identical coil with an air core. It enables one to make a much smaller inductance for a given number of turns. For example, if we wound identical coils on a plastic toroid and a ferromagnetic toroid then the second would have μr times the inductance of the first.

We need to measure three physical dimensions of the toroid. These are

Outer Diameter D - metres
Inner Diameter d - metres
Thickness T - metres

The measurements are made to one tenth of a millimetre.

The following formula is used.

$$\mu r = (L*10^7)/(2*T*N^2*\ln(D/d))$$

where μr is the permeability and it is dimensionless
L is the inductance in Henries
T is the thickness in metres
D is the outer diameter in metres
d is the inner diameter in metres
T is the thickness in metres
N is the number of turns

The symbol 'ln' defines the natural logarithm and can be found on any scientific calculator and computer program. I used GNU Octave (MATLAB) to write a short program to find Al and μr. The value of μr for the 'Rochdale Beads' was 10.8.

There are two types of magnetic materials used in radio applications, iron-dust and ferrites. Iron-dust cores have low permeability, low inductance factor but a high Q factor. They are used in frequency selective resonant circuit.

The ferrite cores have high permeability, inductance factor but a low Q factor with a wide range in property values. They are used in impedance-matching broadband transformers and baluns.

As a rough guide any core measurements giving an Al of less than 50 and μr less than 20 will be iron-dust material although there are some ferrites with low values but these are rare.

The manufacturers only give minimum values of Al and μr as it is impossible to manufacture cores to exact properties. I found a number of FT50-61 cores in my collection which are certainly not the correct material, giving much too low a value of μr. They were probably bought from a rally.

There is much more to toroids than the brief description above, including frequency response and power handling capabilities. Wrong characteristics can lead to low transmitter output powers and poor filter response so measuring beforehand is well worth it.

I hope this article has been useful to you and if you wish to reply please do so but this is not an academic paper.

So please take this into consideration in your response – thank you.

G1CXE's Test Add-ons

continued from issues 175/176

G1CXE John Palmer G1CXE 11180

Having described my variation 8 system (SPRAT 175/176) I now present the first instalment and rather than repeat many things, it would be better to refer back to those issues.

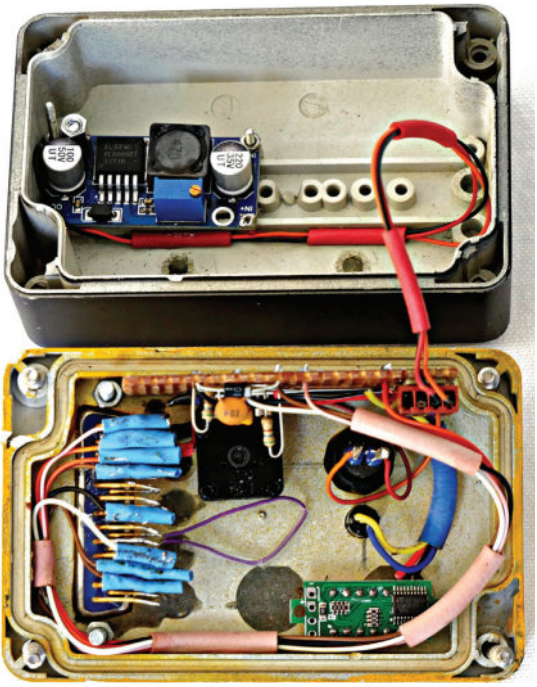
VARIATION 14

Box one (left-hand one above) is basically an expanded version of the one for the Variation 8 system. (sprat 175) but with 14 pins wired (plus 24/25 as power) and the blanking plastic on the ZIF sockets is adjusted to suit. Parts as before.

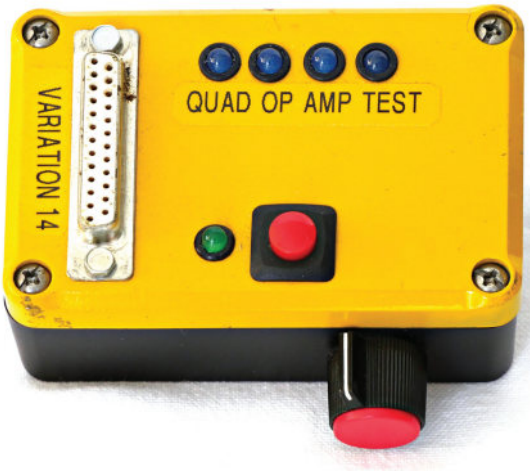
The first part of the Box 2 (above right and below) is a '723 voltage controller test box. This is slightly more complex than some, in that it will run off the 9 volt battery. So, this test circuit starts with a small inverter (in the base of box) producing about 24volts, which then feeds into a basic '723 circuit.

No attempt has been made to prove any overload capability or other clever bits. The '723 output drives the voltmeter. The proof of volts LED is across the output of the inverter to prove power feed to the i.c. under test.

Construction is any you prefer since nothing has, so far, appeared critical. Parts Mostly the usual collection of suspects from rallies many and varied including:- The inverter is available from the likes of Bowood, The LED voltmeter from, Kevin G3AAF or John Dosher both seen at many rallies. The rest as previous notes, or whatever you have in stock or find at your local rallies



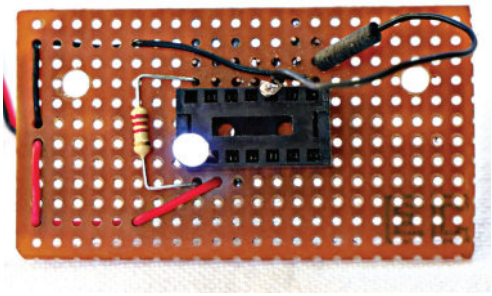
Next on the list is a quad opamp tester for, LM324s or similar. Basically an augmented version of the dual. The interesting bit to find will undoubtedly be the four pole pot. I was lucky and spotted one on

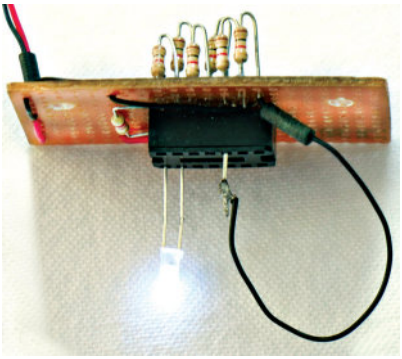


Tony's, TK Electronics, stand at yet another rally. As in the dual unit the values each side of the pot, to plus Volts or 0 Volts are varied so that each LED comes on in sequence. I used a piece of veroboard which fitted the pot. neatly, and with tracks broken as required, then using surface mount resistors to the +9 and zero volt lines.

At that point little Miss Serendipity reared her beautiful head, as I realised that a pair of recently salvaged SIL five way 10k resistor packs would fit neatly into the plus volts and ground rails and give me the fixed pin voltages. In the absence of a four pole unit, two seperate pots would be the easiest answer I feel.

Inevitably a Push To Test button and power on LED. complete the ensemble. Being silly I made the LEDs come on in sequence left to right.





PARTS

The usual rally collection, the only odd bit being the four pole pot. but as above two dual should work.

Some bits for the tribal knowledge!.

When dealing with the mechanics of an enclosure or panels, taking them apart to modify some part before re-assembling them, perhaps doing this several times.

- Try using spacers instead of nuts. I find them much easier during trial and adjustment. Then replace these by real nuts, washers etc. once everything fits neatly and is ready to be wired up.
- Having an almost all aluminium de-soldering pump I found that a turn or two of plumbers' PTFE tape round the threads made removing and replacing the nozzle much smoother.

John G1CXE 11180

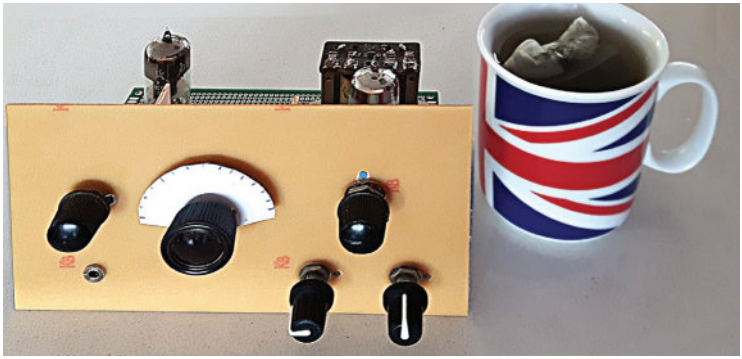
Re:Si:Va

Re:Si:Va = Receiver, Simple, Valve

Philip, G4HOJ@yahoo.co.uk

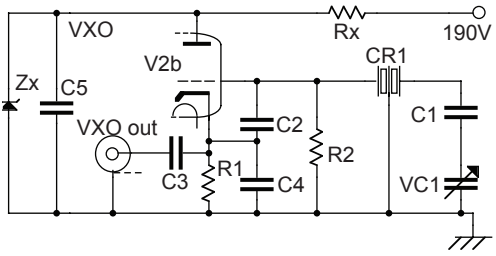
Background

I have been looking for an old valve RX for more than a year - to help me get back on HF after a very, very long time, particularly 80m CW....prepared to consider anything affordable….a "doer-upper", old homebrew, whatever...but every lead proved to be a dead-end. So, I boldly thought, even with my somewhat reduced sight and dexterity, "maybe I can make something".....not-too-difficult build, using bigger components, not so daunting that I would never start….that would do the job?



Advice used to be; build a one-valve battery regen, then a mains-powered regen and then perhaps a simple superhet receiver. My first attempt was a two-valve, mains-powered regen…but, while it had reasonable sensitivity, it wasn't particularly easy to use (particularly when oscillating for CW/SSB and especially with my 'birds nest' test-bed!). I certainly wasn't convinced that the approach could give routinely usable service with a transmitter, although I am aware there are people happily using regens!

So, I looked at a few superhet ideas, although parts seemed difficult to find and I wasn't at all confident to start what seemed like a more challenging project. So after some considerable prevarication, and in spite of some saying that I'd be disappointed, I decided to try a 'direct conversion' (DC Rx) approach. With limited quantity/choice of components to hand, my first idea used three 12AT7s….one as grounded grid r.f. amp plus a.f. stage; another as a Pullen-type product detector; and a third as headphone stage plus VXO. I even tested primitive audio-derived a.v.c. on the r.f. stage…and even reflexing audio back through the r.f. stage at one point! This approach did work and I listened to it on high impedance phones for a week or so, hopefully improving my CW reading skills, before deciding that I must either go for more complexity for better performance, or try to find a simpler way of achieving



Circuit used for the simple VXO

the same or a better outcome. I couldn't help thinking that if I was to battle with more complexity, I should perhaps start looking again at a simple superhet, IF I could ever find suitable components and IF the idea didn't become so daunting that it never happened!

I decided (I think sensibly for me) to go minimalist. Much thinking and testing resulted in a relatively simple design using reasonably readily available components because of the audio market, and providing surprisingly good performance. Idea testing eventually led to a two-diode mixer, giving better strong signal performance and broadcast immunity and, eventually, adding two more diodes, which gave noticeably less conversion loss, and actually also provided greater output with a single triode a.f. stage than the two-triode Pullen mixer with its relatively low conversion gain.

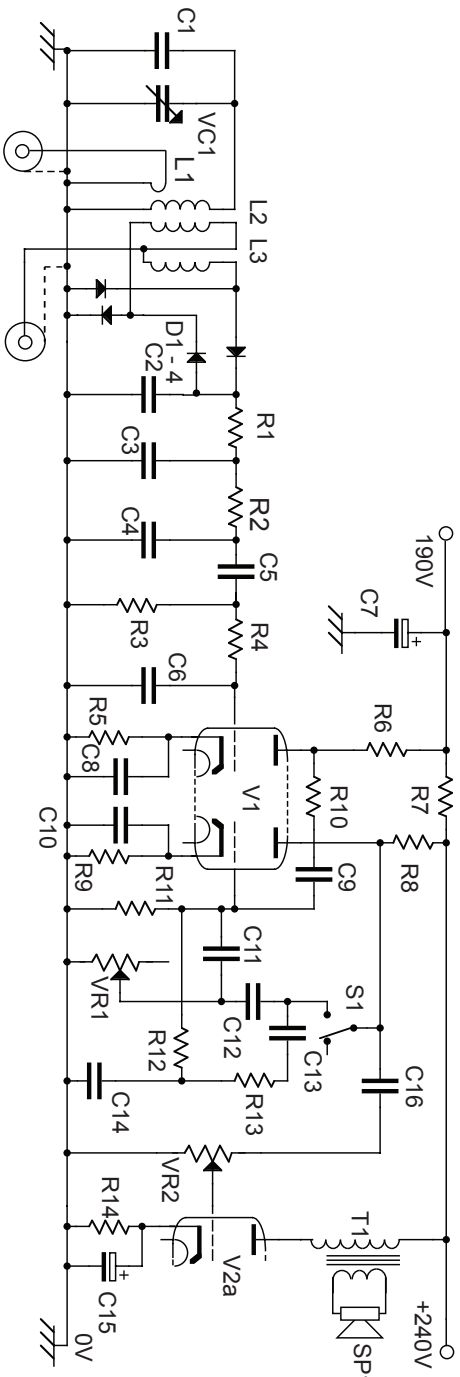
Initial Assessment

I found that an r.f. stage wasn't needed, certainly not on 80m and tests suggest not even on 40m. With the Pullen mixer, I had used two tuned circuits with light coupling and still occasionally heard broadcast breakthrough but, so far, just using a single tuned circuit as part of the diode mixer input circuit, breakthrough does not seem an issue.

I then managed to get a 12AX7, so calculated, tested and refined a two-stage amplifier to arrive at around 75dB of voltage gain with low noise. In fact, the diode mixer with just one 12AX7 gave similar output into high imp. phones as the first iteration described above. However, I felt speaker output would be an improvement as, while I might prefer phones when operating, I don't want to wear them when I am casually listening as I work on a project at the other end of the bench. So, I used a half 12AT7, an output transformer, a resistor and capacitor and achieved quite good speaker volume.

Variation:

If only headphone use required (and especial-



Main receiver circuit

ly if no output transformer is to hand), wire the output triode as a cathode follower. This is simply done by connecting the anode directly to B+, placing a 10k resistor to ground and providing output from the cathode to 32 Ohm (600 Ohm works good too) phones, via a 10uF capacitor of suitable voltage rating (the cathode is elevated to around 45v or so).

Selectivity

I knew that narrowing the audio response significantly would be a challenge. First, I tried using inductive filters after the diode mixer (relatively low impedance area) but there was too much hum pick up. I kept some initial filtering there but changed to a 2nd order R/C low-pass filter and also calculated cathode bypass and coupling capacitors to limit low frequencies, with values shown calculated for SSB bandwidth. I also tried a simple variable 'treble-cut' control across the volume pot for CW.

I know some use a capacitor to 'resonate' with the inductance of their output transformer but I couldn't get good performance, although something like a 1000pF capacitor to ground from the output stage anode can reduce high frequency response and if you do this, together with the initial low-pass filter, you have a quiet receiver with little hum, offering that tremendous 'presence' to be enjoyed when there is so little 'gubbins' between the listener and the ether!

However, I wanted better! I tried several iterations of filter but the main challenge is the high impedances required to achieve good gain with valves. Generally, most approaches tried don't give effective filtering and introduce too much loss for a minimalist design.

I feel that my final version, as per schematic shown, was the result of calculations and empirical testing. The idea utilises tuned negative feedback with a little change of phase. It seems to be the simplest way to achieve stronger, 'tuneable', low pass filtering, plus peaking for CW and does give quite good performance. The 'full fat' version provides a peaked, low-pass response, with a tuneable 'knee' covering most people's preferred CW tones. The switch may not be required by everyone (see text) but I put it in to experience the receiver with and without 'full fat' mode in operation!

Variations:

If 'full fat' not required, the simplest approach for SSB/general listening with just 'top cut' can connect a 470pF capacitor from the junction of C13 and VR2 to the slider of VR1 - with S1, C11, 12, 14 and R12, 13 left out completely (R10 can be omitted and C9 connected directly to the anode if this is the only variation to be used). If good low-pass filtering is always desired, with optional CW peaking, keep C11, 12 tuned via VR1 permanently in circuit and just switch the R12, 13 and C14 loop with S1. If 'full fat' is preferred all the time, omit S1 and permanently hard-wire!

Band Coverage

I used a signal generator as a VFO initially and, as the input tuned circuit covers 80m, 60m and 40m, I tested the RX on the three bands. Builders may already have an analogue or synthesiser VFO, or VXO, they would choose to use. For my own curiosity, on one build, I developed the simplest VXO possible to provide a self-contained receiver. It uses ceramic resonators switched for 80m (3.78MHz) and 40m (7.1MHz) and a polyvaricon to cover the CW segments of those bands. I did have a 5.35MHz resonator, which would cover the 60m

CW segment but I find that they are not now commonly available. Variation: Use a three position switch to choose between two VXO resonators and an external VFO source. The half 12AT7 triode seems to provide sufficient, stable, drive for the diode mixer on its own but could also a buffer external inputs, so only grid circuitry would need to be switched. A series resistor from the 190v point and a 100 volt Zener steady the voltage to the VXO triode and stability is good. The circuit works without a Zener but, without one, frequency would slowly drift up and down a few Hz as my mains voltage is continually on the move!

Variation:
Obviously, if building for a single band, another variation would be to dispense with the varicon on the front-end tuned circuit and use a fixed value – or even a bandpass filter approach if preferred.

Construction
Experienced constructors will have their preferred methods of building this type of receiver. My final version is quite small, built using a small prototyping board with holes made for valve holders – and with pcb front and rear panels and chassis stability sides. Obviously, be careful with voltages and whatever build method used, keep signal leads short and direct and try to avoid audio earth loops. I use a centre-tap 6.3v heater supply and have not had a problem with hum on my versions. If there is trouble, a simple rectifier circuit to provide DC to the heaters should eliminate all.

Conclusion
So, an 80m CW/SSB, two double-triode, DC RX, with reasonable 'selectivity', easy to use, and with loudspeaker output. While not able to give the ultimate performance of a narrow-band crystal filter or SDR receiver, I feel that the RX gives a good performance (especially in view of its simple implementation) and gives pleasant listening in most band conditions, especially as one can tune a CW note for least interference. I use a very low inverted L antenna but I think the RX front end would cope with a full size dipole at good height and give even better overall performance.

Speaker variation
When I want to listen casually to CW while working on something on the bench, I often utilise a small homebrew resonant speaker which helps sharpen things up even more. I never cease to be amazed at the affect it has. It is simply a 36mm speaker from one of those miniature rechargeable add-on portable amplifiers for a mobile phone (the one I cannibalised was a 50mm sphere looking like a small owl). That is glued into a suitable hole cut in the base of an upturned tablet pot (50mm dia. x 62mm tall).

The speaker wires pass through the side of the pot (just above the lid) and then a few small holes are drilled evenly around the circumference, just below the base. The volume of the pot, and the number of holes determines the resonant frequency. If you drill too many and want a slightly higher frequency, blocking a couple up (like a penny whistle) has the required effect. I have 16 holes, spaced about 10mm apart, around mine and its centre frequency is about 760Hz. Very easy to make but perhaps more difficult to describe! They say a picture paints a thousand words: So, see below!

Cautions:

Remember there are high voltages in the ReSiVa so do take the usual care.

Use appropriately-rated high voltage capacitors where relevant. Whilst the audio output stage probably only delivers about 250mW or so, the ReSiVa can provide too much audio for comfortable headphone listening on strong stations so don't start with volume control at max.!

A 'tuned' speaker, mounted in an old vitamin suppliment container

Components: Main ReSiVa:

L1 – 4 turns at earthy end
L2 – 36 turns on small toroid (T68-2?)
L3 – 7 turns bifiliar wound over L2
C1 – 22pF (perhaps not required)
C2 – 470pF
C3 – 47nF
C4, C5, C9 – 4.7nF
C6, C11, C12 - 220pF
C7 – 10uF 450v
C8, C10 – 220nF
C13 – 1000pF
C14, C16 – 2.2nF
C15 – 4.7uF
D1-D4 – 1N4148
VC1 – 160pF + 65pF Varicon (//)
V1 – 12AX7
V2 – half 12AT7 or 6C4R1 – 1.5k
R2 – 15K
R3, R10 – 150K
R4 – 6.8K
R5, R9 – 4.7K
R6, R8 – 470K
R7 – 22k
R11, R12, R13 – 1MΩ
R14 - 560 Ohm (c. 5mA)
VR1 – 470K Lin? (Log in mine)
VR2 – 1Meg Log
T1 – Valve output transformer
SP1 – 8 Ohm

Components: Simple VXO:

C1 - To suit coverage
C2, C4 – 47pF
C3 – 100pF
C5 – 1000pF (high voltage)
VC1 – 280pF + 280pF Polyvaricon (//)
Valve is half 12AT7 or 6C4
R1 – 2.2k
R2 – 220K
Rx – to suit Zener (mine is 27k)
Zx – to suit voltage from RX
CR1 – 3.58MHz 3-terminal
(and/or 7.1MHz)
(If use 7.2MHz, will need small inductor in series to pull to 7MHz)
(see main schematic)

Deaf-aid Headphones

Harry GM3RVL email: harry.brash@gmail.com

I was particularly interested in the article in the winter 18/19 *Sprat* by **Peter G4UMB** entitled 'New High Impedance Headphones'. I have used exactly the same Poundland headphones, but for a very different purpose.

I use hearing aids, and I rely a lot on inductive loops to hear what is going on including with amateur radio. These cheap headphones are easily converted to provide independent left and right inductive loops for most suitable hearing aids. I've used two different ways to convert the Poundland headphones.

The first (**Figure 1**) is to remove the original 'loudspeakers' as in Peter's article and replace them with the biggest coil you can fit in the empty space. I use about 140 turns. If you can use about SWG 42 wire, then the resistance will be about 20Ω which is fine but if you use thicker wire (there is plenty of room) then pad the resistance out to more than 20Ω with a series resistor so you don't upset the signal source.

Figure 1: Remove the original 'loudspeakers' as in Peter's article and replace them with the biggest coil you can fit in the empty space.

The alternative way to modify the headphones is to carefully remove the magnet from each 'loudspeaker' and leave the coil still connected and use it as an inductive loop. **Figure 2** shows this before and after removing the magnet. The central field of the above coils is at right angles to the required magnetic field for the hearing aid loop pickup.

However, it is easy to locate the inductive headphones beside the ear for excellent sound reception using the surrounding magnetic field. I never use these headphones directly over my ears but usually nearby against my head which is much more comfortable for long term listening.

I have made many of these inductive headphones for friends and relatives who are deaf. The stereo is good if you want to listen to music but don't use them when walking among traffic because when a deaf person is listening in inductive mode they are even more deaf than without the hearing aid. There are few advantages of being deaf but loop headphones are one possibility in my experience. You can usually use them without disturbing others in the room.

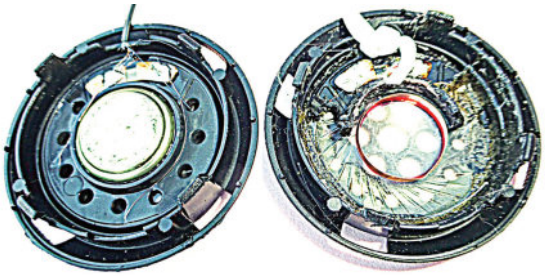


Figure2: On the left the 'loudspeaker' still in place. On the right, after careully removing the frame and magnet, leaving only the coil and 'cone'.

Pixie 2 Repair Tip

David Tarrant, M0GUJ, Dorset, dtarrant@assoc.prestel.co.uk

Here's a simple tip on how to change a transistor. Sounds trivial, but wasn't.

I bought a Pixie 2 kit from an on-line sales site, after the item caught my eye. The assembly was without real problems as the quality of the board was excellent, and all the components were supplied.

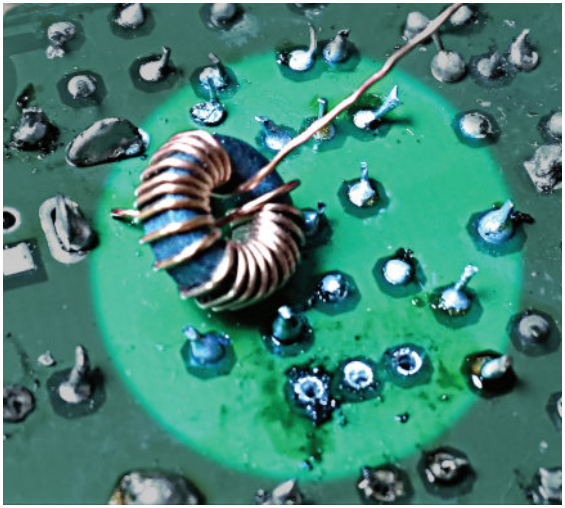
In use, the rig performed as the original Pixie 2 should, and I had some fun operating it. However, a problem arose, and I'm not sure what actually caused it, but I managed to 'blow-up' the PA transistor.

Removing the offending component was quite easy, but the problem was that, after removing the defective transistor, I couldn't clear the solder from the tiny plated through holes in the PCB of my Chinese Pixie QRP Transceiver.

I tried several times using a solder sucker, but without success. So I decided to try to poke the molten solder out with a piece of wire. However I needed some thin wire that the molten solder would not stick to.

Eventually, I hit upon the idea of using a piece of enamelled copper 'magnet' wire partially unwound from a ferrite toroid. I only unwound a couple of turns as the toroid provided a useful 'handle' and, working from the underside of the board, it was a simple matter to push the molten solder out of the hole.

With the through plated holes cleared out it was then a simple job to solder in a suitable replacement transistor and the Pixie 2 was up and running again, and performing as it had previously. But I looked up the specification of the supplied transistor, and noted that it was running close to its maximum current and dissipation values, I will have to take rather more care in the future to minimise this happening again.



The three plated through holes are visible below right of toroid in the highlighted portion of the picture.

In emails with with David I mentioned that I've used propelling pencils with the 'lead' pushed out a little. They are available with 0.5 or 0.7mm 'leads'.

G1TEX

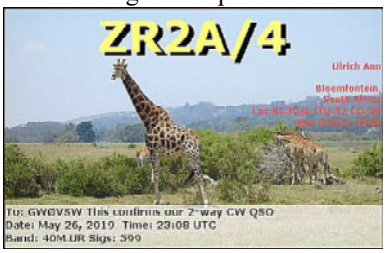
MEMBERS' NEWS

by Chris Page, G4BUE

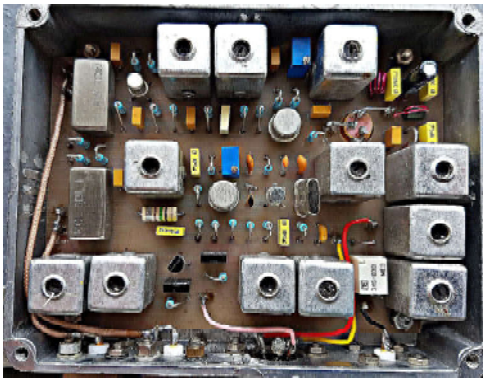
E-mail: chris@g4bue.com
gc4bue@gmail.com

GØFUW reports **GØRQQ** was the first member to activate the Club callsign **G5LOW** on VHF (picture left). Keith made 26 QSOs in six squares in the PW QRP Contest with his FT-847 and 8el yagi. Steve says any member who would like to activate the call should contact him or check details on the Club web-site. **MMØHQD** updates the CQ Scotland Project, a group of amateurs, electronics enthusiasts, shedders' and parents, introducing electronics and amateur radio across the generations by holding electronic kit building events and the distribution of electronic kits, tools and equipment. Dave says weekly sessions are now held on Wednesday afternoons at their new base in Hamilton, and several members have sent donations of parts (including from France!) that has been a great help.

"What a difference a contest makes!" says **GWØVSW** referring to the WPX CW Contest at the end of March. Carl says there was activity on all bands and some strong signals. He worked lots of Europeans on all bands and "a string of US stations on 40m" for 367 QRP QSOs with his Xiegu G90, 5W and inverted **G5RV** for 160-20m (tuning one leg on 160m), and indoor Crown loop for 10-15m. **K1LZ** and **VY2TT** on 80m, and **ZR2A/4** on 40m (QSL right) for his best miles per watt for a long time. Carl said, "When the contest closed the bands went dead. In fact, Monday morning I heard no stations on any band. Interesting what a contest can produce when propagation is not that great!".



As I mentioned in the last *Members' News*, **G3TYB** ran a short test on 160m for a week operating from 2100 to 2200 local and worked seven different stations, five QRP and **EI5HJ** the furthest. John says, "It demonstrated the band is not completely dead for QRP and is worthy of more activity. I would like to suggest a scheduled activity period on 1836kHz CW 2100-2200z Wednesdays from mid-October to April. The choice of time means a good chance of sky-wave to give a helping hand". **F5NZY** will be QRV 11/17 May 2020 as **OH/F5NZY** from Savolinna with 5W CW.



GM4YLN has built transverters to go with **GM3OXX**'s TCVR that George left to him, (15m pictured left). Chris only needs two more and will be QRV on all HF bands.

VK5TM has another DDS project on his website <https://www.vk5tm.com/homebrew/simple_sweep/simple_sweep.php>. Terry says, "It is a very simple down and dirty circuit to sweep an AD9850 or '51 module continuously between two frequencies. The only downside at this stage is you need some programming experience to change the frequencies". **G3OOU** says, "Following more bench work I have updated the valve pages (both directly and indirectly heated types) on my technical web-site <www.qsl.net/g3oou> with the results".

GM4FZH says it was good to meet **ZL2BMI** (pictured right) when he gave an 'off the cuff' talk to the Wigtownshire ARS about his QRP activities, during his recent UK visit. Eric showed two TCVRs he had built for his tramping expeditions in New Zealand and the associated antennas. Clive had two, "somewhat scratchy QSOs" with him on 80m during his sojourn, initially running about 85W and Eric using his QRP equipment but suffering heavy QRM. Clive reduced power to 5W and made a contact. He said it was also good to host Eric at his QTH for lunch and give him some RF power transistors.

Congratulations to **G4GIR** for his first ever *Members' News* microwave QRP report. Ian says, "I have been collecting the relevant equipment to get active on the new geostationary QO-100 satellite to complete Satellite DXCC, five new DXCC worked to date. With 2W into a 14 turn helix RHCP made from junk box bits (drain pipe, 2.5mm^2 PVC wire and scrap aluminium plate) resulted in a 12dB above background noise signal returned from the satellite. Best QSO is member **IZ2CPS** on 2 April - is this the first two-way G-QRP QSO through QO-100? For those wanting QRM, QSB, QRN, contestv free QSOs, this is nirvana". Congratulations also to **ON4BCA** on his silver award in the URE AM70 Challenge with his 5W CW and Chameleon Hybrid antenna in a vertical configuration. Patrick has worked 50 squares with 5W CW on 6m this year, including **OHØZ**, and 43 DXCC all bands since 28 December.

G4EDX sent the picture below of **G3MFJ** (left) and **G4HVC** manning the Club stand at the Junction 28 Rally in June. John says he, Graham and Andrew took turns to watch the stall. **GM4VKI** and **GM3WIL** took the Club stand to Crianlarich run by a new club, Lomand Radio Club, and 23 members signed in. Roy says, "Kanga's new range of morse tutors was well received and we sold quite a few, mainly to clubs who couple two back-to-back to teach basic morse and enable members to send to each other via a wired link. If you are into morse, these tutors are well worth a look on Kanga's web site. We were delighted to think morse isn't dead and, especially up here in Scotland, is thriving. The gang, including **G3MFJ**, will be at the Galashiels Rally in October, and the Lomand club also hinted they might run a rally in January in Renton Helenburgh. If so we will also be there". **GØFUW** and **G4YTN** had the Club stand at the Flight Refuelling Hamfest on 11 August.

2EØNTV has completed his first 'scratch-built' SSB TCVR (pictured right), **N6QW**'s 40m Sudden from *SPRAT* 176 and 177 last year. Nick says details are on his QRZ page at <https://www.qrz.com/db/2E0NTV>. The rig gives 5-7W PEP and he made his first QSO with it on 7 August with **MØMNG** using the special call **GX1WOR** for the 70th anniversary of the Worthing & District ARC. Nick says, "I was a weak signal (33) and soon faded into the noise, but apparently my audio was very nice. I'll certainly take that!".

During February and March **GØHUZ** and his wife's, **GØLUZ**, nautical meandering took them round Africa and into the Indian Ocean. Tony says although conditions were extremely unstable, they made over 400 QSOs on 30, 20 and 17m from the open deck of their cruise ship with their KX3 and G-Whip centre loaded mobile whip. "One of the most notable", says Tony, "was working member **G4AKC** on 20m SSB QRP, who was operating 'man-pack portable' from the beach at Blackpool whilst we were off the Gambian coast". In December they will cross the Atlantic to New York via the Caribbean and Florida, and return in the New Year to Southampton via the Bahamas. Again they will be totally reliant in gaining the Captain's permission to operate once they on board.

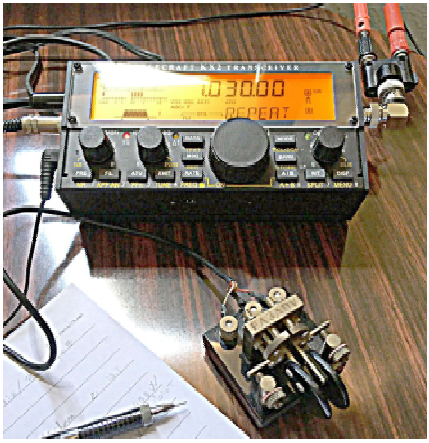
In an effort to get back to his QRP roots, **N2CQR** recently 'transceived' a Hearing Aid 5 DC receiver and a Tuna Tin 2 transmitter (pictured right). He needed three more transistors to make a stable VFO, so the result is what he calls 'The Fish Soup 10'. He is running 500mW on 40 CW. Bill says the hardest part was getting the TX offset right. He has made many contacts with the rig using a straight key from India given to him by **VU2ESE** and reports CW QRP makes him feel virtuous and vaguely superior.

With the warmer weather, **G4TGJ**'s home-brewing has been two antennas - 2m and 20m dipoles, both for portable operation, especially SOTA. Richard activated Rombalds Moor (G/NP-028) with the 20m dipole contacting "the usual European chasers" on CW and says, for a change, tried SSB when a surprise was **GIØAZA** who was very strong. He was QRV in the CQ WPX CW contest with his homebrew 40m TCVR and was pleased to QSO two US stations with 4W. He discovered the FISTS' 'Down Under 5 Day CW QSO Award' that requires one QRP QSO every day for five consecutive days, and achieved it with a '40m Homebrew' endorsement.

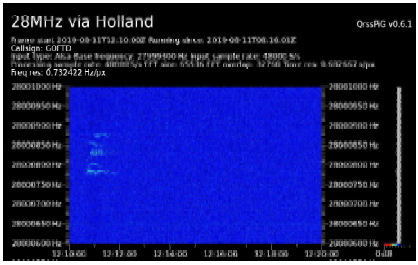
MØJGH recently returned from hiking in the Dolomites, where he enjoyed testing his new homebrew portable magnetic loop for 40-10m based on **OH8STN**'s design (pictured right). Jonathan says the inspiration for many of its parts came after browsing his local plumbing shop. The driven inner loop is 8mm copper pipe bent to size with a saucepan and drilled onto a BNC-binding post splitter. The vertical support is 21.5mm plastic over-

flow pipe cut to size, then halved for easy portability, with a channel cut in the pipe connector at the top for a consistent and secure coupling point, on a camera tripod thread drilled into the bottom of the capacitor's enclosure. He will use WSPR to benchmark its performance against an end-fed half-wave. **DDØVR** has received his licence for Western Samoa and will be QRV as **5WØVR**.

K5NT (with who I stayed in Texas duringmy first visit to the USA in 1983) is restricted to an attic dipole due to a Homeowners Association (HOA) restriction on outside antennas, but after seeing a *YouTube* video, is going to erect a MFJ-1866 receiving loop on a mast behind his house (with HOA approval). Dave says the loop is supposed to be to be less susceptible to atmospheric noise. **GØIAX** purchased a Begali key and is very pleased with the smoothness of operating, but says he still makes too many mistakes! Richard had a QSO with a 9H station running 500mW, then reduced power to 100mW but had no copy.



Between 28 July and 14 August **EA3ADV** was QRV as **EA6/EA3ADV/P** with an Elecraft KX2 at 4W and 52ft wire from a 33ft fiberglass pole. Vicenç used his **G4ZPY** miniature paddle and was QRV mostly on 20, 30 and 40m. He says, "Besides the fact that condx were not good, I managed plenty of contacts around Europe and very happy with **N3RS** on 20m, as well as **K4DY** with whom I had a QSO on 17m on exactly the same date in 2014. I also worked **C37NL**, **7X4AN**, **RM4W** and **R3GO**, but the only two-way QRP contacts were **HB9CNV** and **IK5WOB**". **G6UZT** planned to be QRV as **GD6UZT**, and his son as **MD6UZT**, with 10W SSB in the middle of August while camping. **MØLVR** planned being QRV on 2m and 70cms as **F/MØLVR** from his uncle's farmhouse in Creuse in the middle of August. Oliver says he will be, "ground testing a high altitude balloon payload. This is a 'Pi In The Sky' board broadcasting RTTY at 10mW on the licence free ISM 70cm band on 434.25 Mhz".



GØFTD often has a Tecsun PL365 with him and listens down the beach around the QRP frequencies, and says 20m still has some good activity. Andy has been concentrating on other forms of QRP, namely milliwatting on 10m and trying to see if he can be received via meteor scatter. "A sort of extreme version of QRP!", he says, "Most of us use a typical power of 500mw and run low power beacons. On 11 August I plugged myself in to a remote Kiwi receiver based in Holland to do the monitoring throughout the Perseids meteor shower, and saw a cluster of stations based around the Thames Estuary area" (pictured above).

Thanks to all the contributors of this column. Please tell me how your autumn goes for the Winter 2019 edition of *SPRAT*; what you have been building, who you have been working, and any other information about QRP, by 12 November. Also, interesting pictures please, don't be shy in letting members see what you have been building and/or where you have been operating from, your antennas, who you have been meeting, and even a shack picture to let other members know what you and your equipment look like. Let me know if you intend operating from somewhere other than home during the winter and spring months, especially in the Winter Sports, so I can let members know to listen out for you.

COMMUNICATIONS AND CONTESTS

Dom Baines, M1KTA, 34 Bury Road, Stapleford, Cambridge CB22 5BP email: m1kta@gqrp.co.uk

Hi all, thanks for the comments (please keep them coming) I will pass these on to other sections in GQRP for their attention. Don't forget there are loads of large and small contests as the evenings start to close in. Just a few I know about…(lots more listed in places like *http://www.hornucopia.com/contestcal/contestcal.html*) you might want to take a look at:

RSGB Autumn Series Contests. SSB, CW and Data:
http://www.rsgbcc.org/hf/rules/2019/rautumn.shtml
Just a few hours and there is a slow CW 'coral' for the slower ops 3555-3560 kHz 15wpm maximum speed for 'running' stations. There is a special category for the station that always sends <15wpm too!

RSGB DX contest in October has always had 21 and 28MHz now it will include 80, 40 and 20m *http://www.rsgbcc.org/hf/rules/2019/rOctoberDX.shtml*

UKEICC 80m contest
http://www.ukeicc.com/which-contest/which-contest-ukeicc-80m-contests-rules

CQWW contests this Autumn/Winter SSB: October 26-27, 2019 CW: November 23-24, 2019 Starts: 0000 UTC Saturday Ends: 2359 UTC Sunday might give a few an option to try for the WAC challenge in an evening or morning.

Scandinavian Activity Contest,
CW: 3rd full weekend of September each year. **SSB:** 2nd full weekend of October each year. Starts 12:00 UTC Saturday and ends 11:59 UTC Sunday.
http://www.sactest.net/blog/rules/
I have noted that the LF bands have definitely started to see some more activity and as mentioned the same time last year the twilight hours will be closer to the centre of the day again.

I hope everyone had fun in the summer operating from base and portable both home and away. There is no planned GQRP activity during this quarter however if you are looking for other QRP ops then the usual International QRP Centre of Activity Frequencies are always there.

CW: 1836, 3560, 5262, 7030 , 10116, 14060, 18096, 21060, 24906, 28060 KHz
SSB: 3690, 7090, 14285, 21285, 18130, 24950, 28360 kHz

Please if there are a few stations on frequency spread out a bit if you can.
It is usual for operators to exchange their G QRP Club membership number when making QSO but it is not essential.

The annual RSGB Spectrum Forum is in October. I'll report back afterwards.

Dom

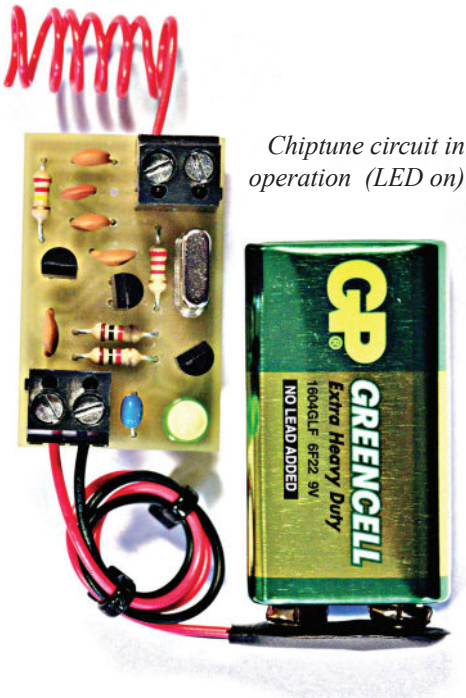
Multiple test tone generator

M3NGS email: m3ngs@me.com

Introduction

Trying to tune up a receiver live on air is a well-known path to madness, so we normally use some kind of test signal source – often a simple carrier, with or without a modulating tone.

But sometimes the wanted test signal may be one of many floating around and it can be hard to work out what's what. So here we show an answer to the problem: a test signal generator that provides sequential tones of varying durations, otherwise known as 'cheesy' music.

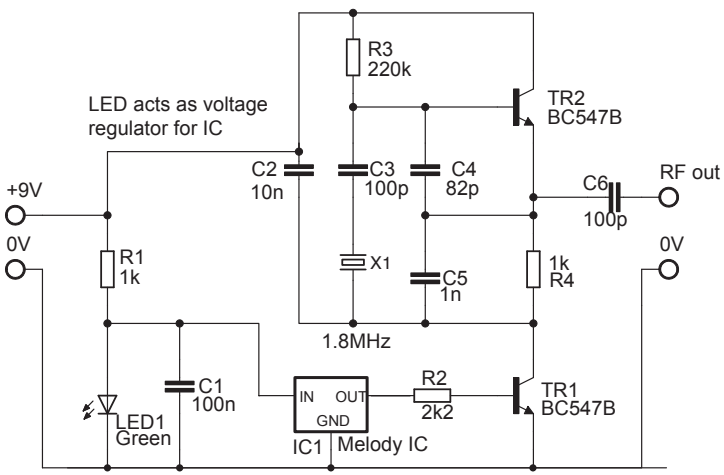


Chiptune circuit in operation (LED on)

Circuit description

All of the hard work is done in IC1, a cheap greetings card musical IC that plays 'It's A Small World'. I got mine from Rapid, type M66T-68L, for about 50p. At the last check they had over 1000 in stock.

The LED acts as a voltage regulator for the IC (it works from 1.3 to 3.3V and current consumption is <50µA) and its output drives TR1, which (very crudely) amplitude modulates the Colpitts oscillator based on X1 and

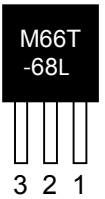


Chiptune IC gates Colpitts oscillator via TR1

The circuit is really a very low power AM signal generator modulated by the Chiptune IC

transisor TR2. The output is taken via C6.

I haven't measured the output power – using a few inches of wire on the output pin and a similar length on a receiver's aerial socket it's good enough to be heard across the shack, but it's unlikely to be heard by anyone else. As there's no output filtering, the harmonics extend usefully up several bands. *The 'helical antenna' seen in the photo is, of course, a joke.*



Chiptune IC pinout (adapted from Rapid datasheet 82-0042e)

Pin No.	Symbol	Description
3	Vss	Negative supply
2	Vdd	Positive Supply
1	O/P	Melody

Power is from a 9V battery, though it would probably work OK from 6V to 14V (albeit changing the output power a bit, ranging from 'small flea' to 'medium-size flea').

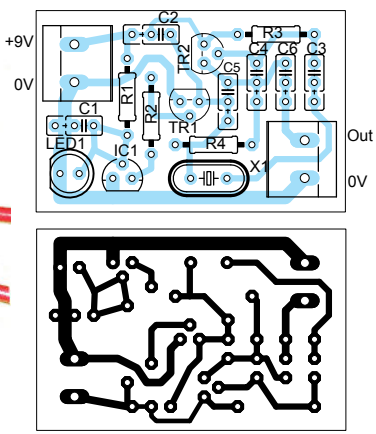
None of the components are critical and substitutions can be made as required. As shown it's intended for 'Top Band' but a change of crystal and possibly a few value tweaks will make it work anywhere you might reasonably want.

Construction

Construction isn't remotely critical. Veroboard or dead-bug approaches are fine and there are no layout constraints. I chose to design a PCB, largely because I wanted to test out an inexpensive isolation milling service (it worked very well, but then suddenly closed). I have made small adjustments to the board since the prototype was made: specifically, I moved R2 a bit because I didn't need to worry about ground connections with isolation milling, whereas the version shown here has specific ground tracks.

Warning

Please consider your mental health very carefully before using this circuit. Listening to 'It's A Small World' for extended periods of time may have serious repercussions on your sanity – and that of those around you.



Track pattern from the trackside of the board (shown at full size), and the overlay as if seeing an 'X-ray' track pattern. Compare that with the photograph above left.

Antennas Valve and Vintage

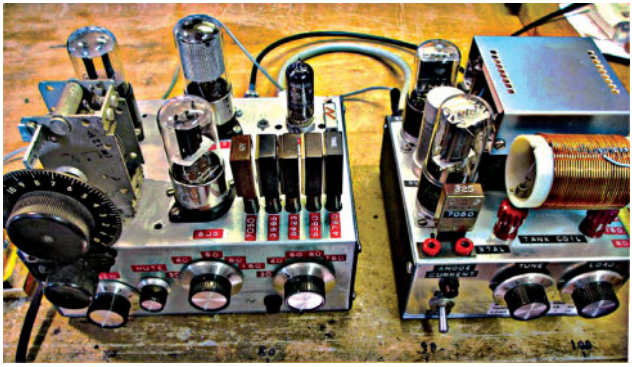
Valve QRP Day 6th July and 7th July 2019 reports

Colin Turner G3VTT 182 Station Road Rainham Kent ME8 7PR
g3vtt@aol.com

Welcome to the Autumn Valve and Vintage. Whenever I met George G3RJV at an exhibition the first words he often used were 'Hello and what are you building?' I ask the same question of you, what are you building and what did you work or do with that item? The Valve QRP gang have been busy building again and using rigs on air despite the poor conditions. The following reports have been received for the new summer activity period.

'Another pleasant weekend of activity! I operated on 80m using my W9SCH 1 valve 12AX7 transceiver with 1.5 Watts output and the AT5/AR88. I made 10 QSOs all on 80m of which nine were valved to valved contacts. I tried the other bands with the AT5 but no luck. Glad to report this time I caught G5LOW! Along with F5NZY, G4AQS, G4FGJ, G4ZXN, G3XIZ, G3MCK, 2E0ADR. I must try harder in the next round! 72/73 **Ian G4GIR**

Wim wrote: Dear Colin, this time I had more luck than during my first Valve QRP Weekend in April. Conditions were quite good and my 6V6 CO/PA TX with built in power supply and three-valved Regenerodyne RX with 6SJ7 (mixer), 6J5 (xtal osc) and 6SN7 (detector and audio) gave me much pleasure. Later on, I added a neon stabilizer in the receiver. The receiver (left) is powered by the TX (right).



The setup used by Wim PAØWDW – Regererodyne Rx and a 6V6 CO/PA Tx

The setup is full break-in. My antenna is a 2 x 25m doublet, some 9m above the street. I have friendly neighbours! Originally I made the transmitter for 40, 80 and 160m, but with a cheap 5355 kHz crystal from the GQRP Club Sales I am active on 60m also. Next time I will add 30m with another cheap 10111 kHz crystal from the Club Sales. The tank coil is overly large, a much smaller one would be sufficient for QRP. But it looks nice! My Regenerodyne receiver is surprisingly sensitive despite its simplicity. In fact it is a crystal controlled converter (with WW2 surplus crystals) followed by a conventional 0-V-1 receiver with regen control. If someone is interested I can write a short article for Sprat but perhaps this type of receiver has been published already in the past? Internet gives also much info about this type of receiver. The stations I worked during this Valve QRP weekend were: G4FGJ (80 m), DH7AMF (60 m), DL5ZP, DL8ABH, DH3JQ, PAØIKE, DJ3KK (all 40 m). Sprat is a fine magazine for the home brewer.72 **Wim PAØWDW**

That's the idea Wim – 'Build and Operate!'

Hi Colin, I was going to use the now remodified Minimitter on 80m but decided that its frequency stability was too wobbly so I set up my co/pa 40m with the KW77 receiver. On the Saturday 40m seemed to be a little lifeless as my only contact was with Ian G4GIR. I don't think that counts as DX, unless of course my signal skipped all around the world until it arrived back into the same road it was sent from.

I did get and then lose Glen G4DUC on the Sunday morning but then I gave up on 40m. I realized that if I removed the 80m crystal from my Paraset it would plug straight into the Minimitter - no more worries about frequency stability! On 80m I had valve to valve contacts with Derek G4FGJ (who said he hadn't heard a Minimitter for donkey's years) and Martin G4ZXN with his Paraset.

Since then I have stabilized the voltage to the VFO of the Minimitter using 3x 30 Volt bolt down Zener diodes used by Grundig to stabilize the voltage to the tuner units of their early colour sets. **Mike G4AQS**

Derek G3NKS writes: Another very enjoyable session with my 5W CO/PA TX and Drake R4C receiver even though I was unable to get on the air until mid-morning on the Sunday. Activity seemed down a bit on previous Valve Weekends but perhaps being a late starter I missed some of the regulars. My tally was 10 QSOs, three on 60m and the rest on 80m. Those declaring valve transmitters were G4ZXN, G3XIZ, G5LOW (G3VTT), G3TYB, and G4AQS.

My plan to build a VFO transmitter is progressing, I have all the bits needed – now I just need the time! I acquired an Eddystone EA12 earlier this year; it worked but is now away undergoing TLC. I'm hoping it will be back in time for the next Valve Weekend. Thanks Colin for organising another fun weekend. I'm looking forward to the next one.

72 Derek G3NKS.

Hello Colin, trade was steady but not brisk over the July activity weekend and I had 21 QSOs using my valve transceiver and all contacts except 3 were QRP to QRP and 15 QSOs were with other valve stations. Conditions were indifferent with signals ranging from S9 down to zero during some overs. I worked most of the regular valve stations, those logged being: G3INZ, G3NKS, G3MCK, G3TYB, G4FGJ, G4GIR, G4XRV, G4ZXN and G5LOW (G3VTT).

I again called CQ on top band (1836 kHz) for quite a while on Saturday and Sunday evenings and despite having the CW end of the band to myself had only a single QSO - with John G3TYB. I wonder why no one uses that band? I had an excellent QSO on 80m with QRP member Paul F3ET near Paris who was running 5W from a K2.

Conditions were very good with solid copy both ways for our 20 minute chat. I've mentioned it before but suggest that we allocate an additional QRP calling frequency on 80m 3560 kHz is often quite busy and has an annoying carrier sitting on it. Maybe the club could source some crystals around 3563 kHz or thereabouts. If these were made available for a few pounds each I'd buy a dozen and send them to the regular valve operatots72 / 73 **Chris G3XIZ**

Thanks Chris. Club sales are looking into supplying other frequencies around 3560kHz and we already have 1836kHz available from Club Sales. We are hoping to start 160m activity periods later this year as you will read below. (G3VTT)

Colin I had a great time during the above event and was nice to catch you early on Saturday

morning under the call G5LOW. I was out most of Saturday but managed to work you on 80m, you were using your co/pa 12BY7 and LS50 then Gerald G3MCK using his CO/PA and valve receiver. On 60m I worked Chris G3XIZ using EL84 transmitter and regenerative receiver. Back on 80m it was Ian G4GIR with his 1 valve transceiver and finally John G3TYB using his old spy set transmitter MK119 and Eddystone 830 receiver. On Sunday, 80m G3XIZ, G5LOW, G3NKS and on 60m Derek G3NKS using his 6V6 and Drake R4C receiver. On 80m again I found Mike G4AQS using his Minimitter and KW77 Rx and finally Ian G4GIR using his Codar AT5 and AR88 receiver. All the above were worked with the various transmitters shown in photograph and a Drake 2B Rx. **Martin G4ZXN**

Hi Colin, a new entrant! I had a second go at the valve weekend just a week ago using the breadboard transmitter pictured in G4BUE column in Sprat 179, running 3W to a 50 foot vertical and my original Sommerkamp FR100B receiver. I had contacts with Chris G3XIZ, Ian G4GIR and Wim PA0WDW with his 6V6 at 5 watts. The major disadvantage was being rock bound especially on 3560 as it was a busy frequency and 7030 was monopolised by the 'CQ TEST' brigade. I heard G5LOW many times but couldn't raise him.73 **Gordon G4FGJ.**

Hi Colin, Regarding the last valve weekend I worked a total of nine stations, three on 40m, one on Top Band (thank you Chris G3XIZ!), and the remainder on 80m, Initially I used my CO/PA transmitter and regen receiver latterly changing to a home built VFO transmitter with a 807 in the pa producing 5 watt output and my Eddystone 830 receiver. The combination of a frequency agile transmitter and a reasonably selective receiver markedly improving the success rate! QRP stations worked were G5LOW, G3XIZ, G4ZXN, I1PJK (10w), F5NZY, and G3NKS.

On a different subject I would like to suggest that we promote a QRP activity period on top band, say on a Monday evening between 2100 and 2200 local on 1836kHz CW. We could start in October round about when the clocks change and we can get some sky wave and try to run it until the Spring. I know Top Band is difficult for people nowadays but it is not completely dead -YET and it would fill a propagation gap for short range QSO's between 60m (daytime), 80m in the evenings. All the best **John G3TYB**

I agree John. Crystals are available from Club Sales for 1836kHz and we have had a successful activity period on 5262 kHz on Monday evenings. I suggest from October we start the Monday evening activity period again staring on 60m from around 1900 local UK time and then switch to 160m from dusk onwards. We may have to juggle times as the autumn progresses into winter

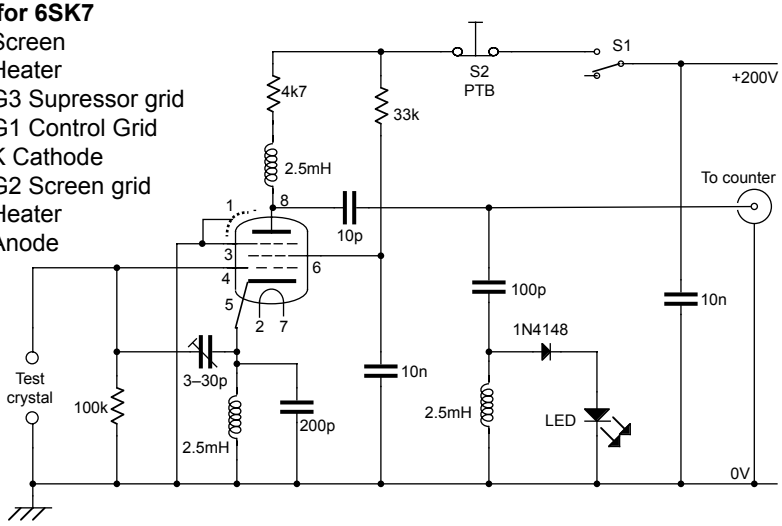
George G3RJV used to carry a crystal checker with him at the various rallies to test the

odd surplus crystals he came across. It was a simple affair often seen in publications and on the internet these days consisting of a transistor oscillator, usually a Colpitts circuit, driving a couple of detector diodes and an LED indicator which gave an instant go or no go indication. Gerald G3MCK has an oscillator which works with about any crystal you place across its terminals and uses a 6SK7.

I decided to make a test oscillator, just one more Eddystone diecast box for the shack, driving an oversized LED with the relative brightness giving some idea of crystal activity. You could also substitute a meter to give a more scientific reading if you wanted and a socket for a frequency counter has been included. It also works with the with the Class D wave meter to read frequency if you want to keep the use in vogue with the 1940s and 50s.

Pinout for 6SK7

1	Screen
2	Heater
3	G3 Supressor grid
4	G1 Control Grid
5	K Cathode
6	G2 Screen grid
7	Heater
8	Anode



A valved crystal checker, with valve details for the 6SK7, other signal pentodes may be used, but check the valve pinout for each type.

The next Valve QRP Weekend is November 9th and 10th 2019 where I will be operating G5LOW again. Please be active with your old time valve (tube) equipment on the usual QRP frequencies. Please send your reports to me not more than a week after the event with details of your equipment. If you don't have anything to use why not make something simple and get on the air.

Don't forget from October the GQRP activity night listening on 60m and 160m on Monday evenings. Make a start in the late afternoon if you can and at dusk switch to 160m. Our usual frequencies, available from GQRP sales, are 1836kHz and 5262kHz. Hopefully next time I will have news of other crystals available from the club. Christmas is fast approaching so my best wishes to you all for a happy and healthy New Year. Finally I am very sorry to report the passing of Graham G4VUX who supported the valve QRP events.

72 Colin G3VTT

Special offers

Graham Firth - G-QRP Club Sales - sales@gqrp.co.uk

The Special offers have been very successful, but I don't think that they should stay in Sprat – they take up too much room. So, I have put them on the website – they are about half way down the sales page, and I have added a few more items, and I will keep updating this as items come in.

Again, the pricing will be cheap, for members only of course, and the postage will be as cheap as we can manage. Anything particularly exciting, I will announce on the club mailing list. Thanks to everyone for their interest – we all have stuff that we obtained "just in case", and if you are not going to use them, then this might just find a better home for them.

For normal sales, then I have a number of extra parts, mainly transistors that I have obtained. At the moment there are:- BC109B, BC178, BC213, BC548 & BC549. Also, I now have 2N4091 NIFET. There is no room for these on the back of Sprat, so I have added them to the sales sheet on the website. So keep checking there please if these may interest you.

A holiday home to combat stress *and help Combat Stress*

John, F5VLF/G3PAI, 19 rte des etangs, Mare le Bas 58800 Cervon
Tel +33 386 202550

G3PAI's cottage in rural Burgundy.

There's no charge - just donate what you feel able to either:
Combat Stress:

www.combatstress.org.uk

or Help for Heroes:

Bandofbrothers@helpforheroes.org.uk

or the Alzheimer's Society:

www.alzheimers.org.uk

See www.charity-cottage.org.uk for details.

Plenty of space for antennas including 136 kHz. We've recently added Wifi

GQRP Club Sales

Graham Firth, G3MFJ, 13 Wynmore Drive, Bramhope, LEEDS. LS16 9DQ

Antenna Handbook – 2nd edition – **members price £6.00 plus post** } **£2.00 (UK) or £5.50 EU**

Radio Projects volumes 1, 2, 3 & 4 – **by Drew Diamond – members price - £6 each book + post}** } or **£8.00 DX per book**

6 pole 9MHz SSB crystal filter (2.2kHz) £12 plus post (max of one) } **£3.50 (UK); or**

Polyvaricon capacitors – 2 gang (A = 8 to 140pF + O = 6 to 60pF) c/w shaft extension & mtg screws - **£1.75 each** } **£3.80p (EU); or**

– 2 gang – (both 8 to 285pF) c/w shaft extension & mounting screws - **£1.75 each** } **£4.50p (DX)**

A Pair of LSB/USB carrier crystals HC49U wires - [9MHz ± 1.5kHz] **£4 pair** } **All components**

HC49U (wire) crystals for all **CW** calling freqs – 1.836, 3,560*, 7.015, 7.028, 7.030* 7.040, 7.045 7.122, 10.106, 10.116*, 14,060*, 18.086, 21.060, 24.906 & 28.060 all are **£2 each** } plus **postage** } **(ANY quantity)**

HC49U crystals- 1.8432, 3.5, 5.262, 5.355, 7.0, 10.006, 10.111, 11.5, 14.0, 22.0, 29.0MHz – **50p each** }

HC49U crystals – 2.00, 3.00, 3.20, 3.579, 3.58, 3.60, 3.6864, 4.0, 4.096, 4.1943, 4.433, 4.5MHz 5.00, 6.00, 7.2, 7.6. 8.0, 9.0, 10.0, 10.70, 11.0, 12.0, 13.50, 15.0, 16.0, 18.0, 20.0, 24.0, 25.0MHz 26.0, 27.0, 28.0, 28.224, 30.0, 32.0, 33, 40, 48MHz – **all 35p each** (Some of these are low profile) } £1.20p (UK), or } £3.50p (EU) or } £4.00 (DX)

Ceramic resonators – 455, 480kHz, 2.0, 3.58, 3.68, 4.00, 7.37, 14.32 & 20.00MHz **– 50p ea.** }

Diodes - Shottky signal diode – 1N5711- 20p each; 1N4148 GP Si – 10 for 10p } Post free

Varicap diodes - MVAM109 – 40pF @ 9v, 500pF @ 1v. **50p each** } if ordered

- BB204 – twin diodes, common cathode, 15pF @ 20v, 50pF @ 1v **50p** } with heavier

SA602AN - £1.50 (note – I may supply NE or SA, 602 or 612 as available. SA612AD – SMD SOIC-8 £1.40 } things

MC1350 - £2.00 These are getting in short supply now so max of 2 per member } like binders,

LM386N-1 - 4 to 15v, 300mW, 8pin **DIL - £0.45, LM386M-1 SMD SOIC-8 – 35p** } toroids,

TDA7052A - 4.5 to 18v, 1W 8pin **DIL** low noise & DC volume control – **£0.60 each** } polyvaricons,

TDA2003 - 10w audio amp – 5 pin **£0.25 each** } or filters

TDA2822 - 1.8 to 5v stereo amp – can be bridged. 0.5WAudio amp 8pin DIL – **£0.20 each** } Use just

TA-7642 Radio IC – direct equivalent of **MK484** (& ZN414) – **75p each** } that postage

2SC536 transistors (npn) fT - 100MHz, hFE-320, VCBO +40V **- 5 for 50p** }

MPSH10 transistors (npn) fT - 650MHz, hFE 60, VCEO 25V **- 10p each, 10 for 80p** } If parts are

2N3904 transistors (npn) fT - 300MHz, hFE-150, VCBO +40V **- 10 for 50p** } ordered

2N3906 transistors (pnp) fT - 250MHz, hFE-150, VCBO -40V **- 10 for 50p** } with books

BC517 Darlington (npn) fT - 200MHz, hFE-30,000, VCBO +40V **- 13p each, 10 for £1.10** } or DVDs

FETs - IRF510 – 50p; 2N3819 - 24p; 2N7000 - 10p; BS170 – 8p - all each } add this

BF981 – dual gate MOSFET – 40p each } postage

Pad cutter - 2mm shaft: 7mm o/s, 5mm i/s diam, gives a 5mm pad with 1mm gap **£6.00** } as books

10K 10mm coils – 0.6uH, 1u2H, 1u7L, 2u6L, 5u3L, 11u0L, 45u0L, 90u0L, 125uL – all 80p each } or DVDs

Magnet Wire – 18SWG – 2 metres – 60p; 20 & 22 SWG – 3 metres - 60p; } do not

24, 25 & 27SWG – 4 metres - 40p; 30, 33 & 35SWG – 5 metres - 30p. } travel well

Bifilar wire – 2 strands - red & green bonded together. Solderable enamel. } with parts.

21SWG (0.8mm dia) – 2metres - £1; 26SWG (0.45mm dia) – 3metres – 70p }

Litz wire – double silk covered multi-strand wire 7/.04mm -12p, 14/.04mm. 25p. Both for 3 metres. }

All our wire is solderable enamel insulated. Max of 3 sizes per member per order }

QRP heatsinks - TO92 – 30p; TO39/TO5 – 40p; TO18/TO72 – 60p (pics in Sprat 148) }

Axial lead inductors (they look like fat ¼W resistors) these are low current }

3.3, 4.7, 6.8, 10, 15, 18, 22, 33, 39, 47, 56, 100, 150, 220, 470 and 1000 - all uH, all 20p each. }

Toroid Cores – priced per pack of 5 – max of 2 packs of each per member

T25-2 – 50p, T25-6 – 60p, T30-2 – 70p; T30-6 – 80p ; T37-2 – 80p; T37-6 – 80p; T50-1 - £1.00; T50-2 – 90p; T50-6 – £1.10; T50-7 - £1.20; T50-10 - £1.20 ; T68-2 - £1.80 ; T68-6 - £2.50; T130-6** - £2.60ea. FT37-43 – 90p FT50-43 - £1.20 ; FT37-61 - £1.20 ; FT50-61 - £2.40; Ferrite beads – FB43-101 (3.5mm dia x 3.2mm long, 1.2mm dia hole) – 40p for 5: BN43-2402 - £1.20; BN43-202 - £2.00; BN43-302 - £2.40; BN61-202 - £3.40. } **Postage for toroids includes postage for all small parts**

All toroids are plus postage – up to 5 packs = £1.20 (UK), £3.50 (EU), £4.50 (DX). Each additional 5 packs, please add 50%

**** Except ** item** – these are heavy and each counts as a pack (ask for quote if you want more than 2 of the large toroids)

MeSquares & MePads * - £6.50 each plus post (UK & EU as parts for up to 4) : will DX please order direct from Rex)

STIX board * – 3" x 1", 80 x 0.15 square pads plus 2 x SOIC pads. £3.75 each. Will post with parts for no extra postage.

*** these items from Rex's stock are pictured on the website.**

Limerick Sudden kits RX & TX both single band (160 through 20m); **ATU** (80 through 10m) **£40.00 each plus post** UK - £3.50, EU - £5.40, DX - £8.00

Sprat-on-DVD – 1 to 172. Only £5 each to members plus postage, UK - £1, EU - £3, DX - £4.00

Sprat Binders – nylon string type – Black with club logo on spine -16 issues per binder – **new stock** - £6.00 each plus postage (one: UK - £2.00, EU – £4.00, DX - £5.00. More - add £1.10, £1.50, £2.50 each)

Cheques (UK) and payable to G-QRP Club. MINIMUM ORDER for cheque or PayPal payments is £5

You can also pay by BACS. The numbers you will need to do that are - sort: 01-07-44 and a/c: 54738210

I can accept cash in GBPounds, or US$/ €uros (at the current exchange rates) – but please send securely! You can order via e-mail and pay by PayPal - use sales@gqrp.co.uk – and pay us in GBPounds and you MUST include your membership number and address please. PayPal charge us about 4% so a contribution towards that is always welcome, or, send as a gift to friends/family - thanks