SPRAT

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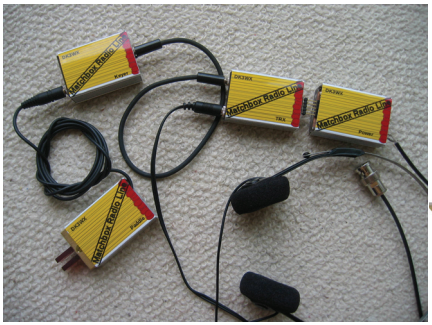

The Matchbox Line

F5LVG Regenerative receiver

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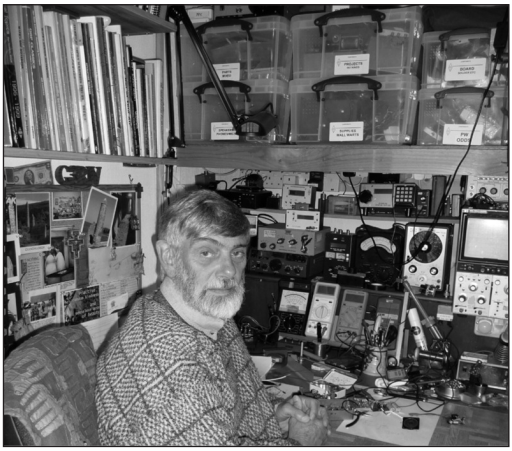

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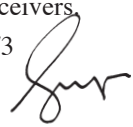
When the G QRP Club began, with about 30 members rather than the current 4,000, three people did the setting up and sorting out: Gus Taylor, G8PG, Gordon Bennett, G3DNF, and I. With the sad news of the passing of Gordon, only I remain … but I was the youngster of that trio.

I am pleased to announce a winner of the W1FB Trophy. In the end the entries we so good we had to have a pair of joint winners. These are Johnny, SM7UCZ, for his Mousetrap receiver and Peter Parker, VK3YE, for his Chopping Board receiver. Both will receive a plaque shortly for their novel receivers.

72/3



G3RJV

The W1FB Memorial Award 2014/2015

An easy topic this year - "My favourite weekend project". There are dozens of little construction projects laying around on member's work benches. So …. Describe your favourite little project for other members. It can be original work but I am happy to see existing projects that have been improved or updated.

Please supply circuit diagram(s), full component values and brief notes. A SPRAT formatted page (MS Word) can be supplied on request but any format including hand written may be used. A special plaque is presented for the best design.

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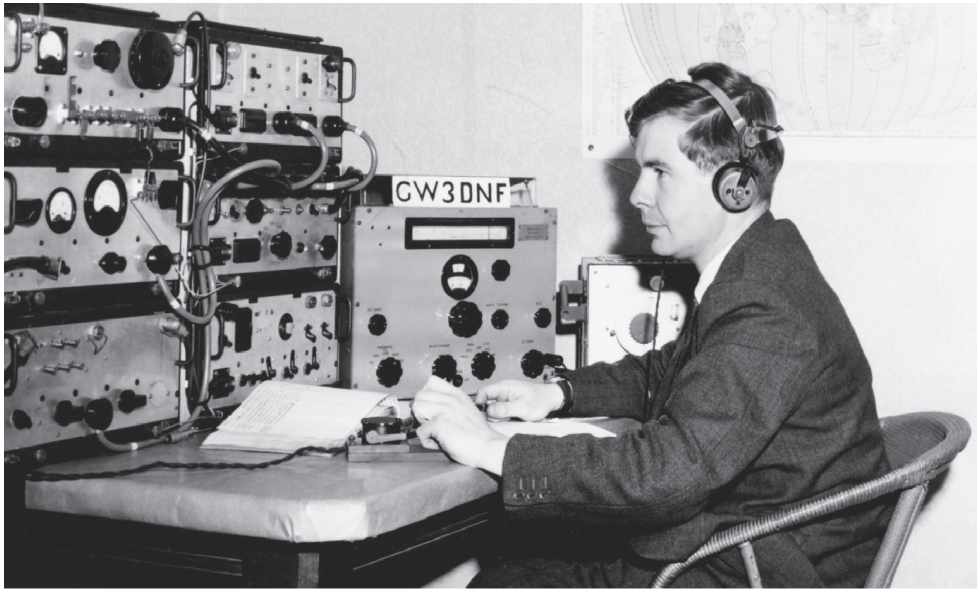

Dr Gordon John Bennett, G3DNF, (in the early 1950's)

We regret to announce the peaceful death, after a short illness, of Dr Gordon Bennett, G3DNF, Chairman of the G QRP Club, on 3rd February 2014.

Some 40 years ago, as the G QRP Club was being shaped, we saw the need for a Chairman; someone well-known and respected in amateur radio circles, who could "head-up" the club. In those days there were just over 30 members, compared with the current 4,000 plus. Gordon, G3DNF, was the third person to join the G QRP Club and, at the suggestion of Gus Taylor, G8PG, an ideal candidate for Chairman.

A chemist by training, Gordon worked in Chemistry becoming a Government Scientific Officer later in his working life. Gordon worked as GW3DNF and was, for some time active as GM3DNF. On returning to England, he retained the Scottish interest and was, until very recent times a teacher of Scottish dancing.

Over the intervening years, Gordon has proved to be a worthy chairman. He is a man of quiet ideals and wise council and I am pleased to have known him.
It was Gordon who named our club journal "SPRAT";

Small **P**owered **R**adio **A**mateur **T**ransmission.

George, G3RJV and Graham, G3MFJ, accompanied by Jo-Anna and Pat, represented the club at the funeral.

RF Generation for Superhets

Paul Darlington[1], mØxpd **Pete Juliano[2], n6qw**

Introduction

RF generation using Direct Digital Synthesis has been available to commercial radio manufacturers and amateur home-brewers for decades [1]. The DDS devices conveniently are operated under the supervision of a microcontroller, which also provides means to support a user interface. In a recent article [2], mØxpd argued that the introduction of simple "physical computing" platforms such as the Arduino and the appearance of DDS devices on inexpensive modules have transformed these methods from the preserve of specialists to a technology which is i) accessible to all G-QRP members and ii) attractive in terms of price, functionality, performance and simplicity. That argument was presented in the context of direct conversion radios for CW. The present article extends the argument to address applications in a superheterodyne architecture for SSB phone use.

A Practical RF Generation Scheme

A superhet radio involves two signal generators; one to mix the incoming radio signal to an "Intermediate" frequency and a second to mix this to audio baseband. The former generator we shall call the VFO and the latter the BFO. The VFO needs to be capable of frequency change to effect tuning (and, at a coarser scale, band change), whilst the BFO is essentially fixed, changing only to switch between upper and lower sideband operation. In conventional practice, this has seen the BFO implemented as a crystal oscillator, with two crystals providing the LSB and USB frequencies. The system proposed in this article takes the (apparently) extravagant approach of using Direct Digital Synthesis to generate both VFO and BFO signals. The very low price of current DDS modules (e.g. those based on the AD9850 device) makes what once would have been profligacy a rational choice – the second DDS module may easily cost less than a pair of sideband crystals and the resulting system will be very much more flexible.

Consider the system of Figure 1, in which an ordinary superhet receiver is provided with VFO and BFO signals from two DDS modules.

Signals from the antenna are selectively amplified before being passed to a mixer, where they are modulated by the VFO to produce a copy of the desired signal at intermediate frequency. The signal can be processed at this intermediate frequency – typically by a narrow filter, wide enough to pass only one sideband of narrow-band speech. Finally, the processed signal is applied to a second mixer, where the BFO modulates it down to audio frequency. Note that the transmitter uses the same architecture but with the signal flow reversed - literally, in the case of the BITX described below.

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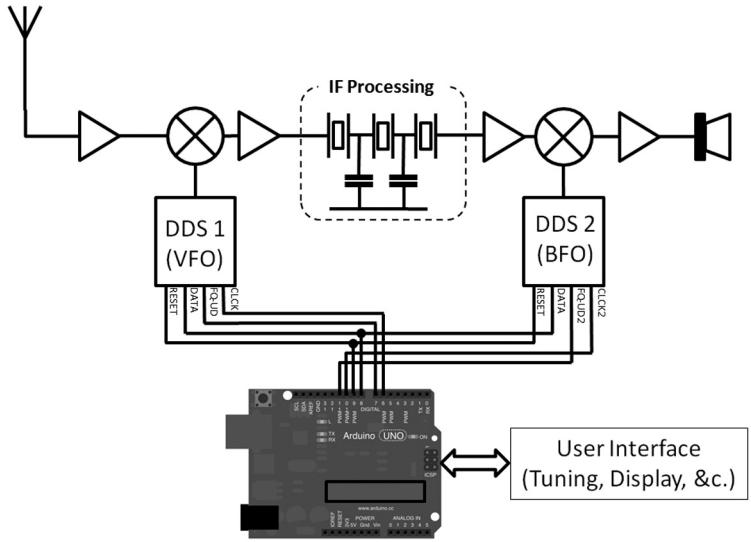


Figure 1RF Generator Scheme applied to Conventional Superhet Rx

The two DDS devices required to perform this task can be controlled by a simple microcontroller – in the case described here the "Arduino" platform is used (although any other microcontroller family could be substituted at the builder's discretion, if s/he is able to develop the necessary code). The DDS devices have a serial interface, in which serial data on one "DATA" line is defined at the instants of the transitions on a second "CLOCK" line, but there are two further control lines (a data latch command and a reset). Of these four lines, it is possible to share the DATA and RESET between the VFO and BFO, whilst the other two remain unique to allow each DDS to be individually "addressed" by the microcontroller. Thus, a total of six lines from the microcontroller are used to control the two DDS modules, as shown in Figure 1.

Operation of the pair of RF synthesizers is summarised by a single equation, relating VFO and BFO frequencies to what we might call "dial frequency"; that frequency displayed on the tuning indicator.

$$\textit{Dial frequency} = \textit{BFO frequency} + \textit{VFO frequency} \qquad (1)$$

BFO frequency is usefully interpreted as a constant, determined by a combination of band and mode. [In practice, for phone operation, it is only determined by band as LSB is used below 10 MHz by convention whilst USB is used above this frequency]. This means that the VFO expresses the variable component of the dial frequency, as is implied in the name Variable Frequency Oscillator. In use, the BFO is set only on band- or mode-change, whereas the VFO is adjusted every time a tuning change is made. It is seen that digital control traffic to the VFO has higher density than that to the BFO.

When the IF is at lower frequency than the carrier of the signal which the radio is intended to receive, equation 1 is interpreted without confusion. When, however, the IF is above this "target" frequency, equation 1 implies a negative VFO frequency. Although this has meaning as a mathematical abstraction, the DDS module cannot accept a negative frequency input – so the code replaces equation 1 with a pair:

$$Dial\ frequency = BFO\ frequency + VFO\ frequency \mid_{\text{Dial frequency > BFO frequency}} \quad (2a)$$

$$Dial\ frequency = BFO\ frequency - VFO\ frequency \mid_{\text{Dial frequency < BFO frequency}} \quad (2b)$$

The code compares the Dial and BFO frequencies (amounting to considering which band is in use) and selects one of equations 2a and 2b, with the result that the VFO always is instructed to generate positive frequencies!

Advantages

The benefits accompanying use of DDS in the VFO have long been recognised. Most importantly, the radio will offer a level of stability which is hard to achieve with analog VFOs. It will deliver this stability – at high resolution – from below VLF to above HF, which is very hard to achieve with a single analog VFO. There are, however, interesting collateral benefits of DDS available to the home-brewer, especially when using SSB. It will be found that many amateur stations transmit at integer multiples of 1 kHz – due to the digital RF generators in their commercial rigs. Tuning to these stations is suddenly quick and easy when the home-brewer also enjoys digital frequency synthesis and control in their VFO, though the ability to tune continuously between the kiloHertz points remains. The authors note (and, to some extent, share) the reaction of some readers in seeing this "channelisation" as something to lament, rather than as a benefit!

The benefits accompanying use of DDS in the BFO are less familiar; this article's digital, programmable BFO is itself something of a novelty. The ability to tune the BFO will be found of great benefit in the alignment phase of the development of a new scratch-built rig (which usually will feature a homebrewed crystal IF filter of uncertain passband). It allows the BFO frequency to be precisely optimised for the filter and leaves the builder totally free to set IF frequency to any value suggested by available crystals etc.. It even is simple to arrange BFO support for multiple IF frequencies to suit different bands / modes. The benefits available to the home-brew "scratchbuilder" are matched by those which can be accessed by the builder who retro-fits the RF generator scheme here described into an existing rig.

Implementation

Code has been produced to allow readers to experiment with the "Double DDS" RF generation scheme described in these notes. The code, which takes the form of Arduino "sketches", implements both a basic control example and a more elaborated example with conventional "VFO" features (multi-band, RIT, etc).

The overall RF Generator hardware can be assembled using DDS shields, but it is almost as easy to work directly with the DDS modules themselves. The code has been tested on

various Arduino boards and more experienced users can easily run the code in a stand-alone AVR microcontroller chip. The code and schematics for various hardware configurations are available by following the links on http://www.gqrp.com/sprat.htm .

The authors' experiments with this RF generation scheme have been reported on their respective websites / blogs [3, 4], but key application examples from the contexts of scratch-building and retro-fitting are presented below.

Application: Using the RF Generator in a Scratch-built Rig

mØxpd has been using the RF generator scheme in an SSB rig following the popular "BITX" design [5], allowing multi-band and multi-mode operation. The DDS module produces approximately 1V pk-pk output from 100 Ohms source impedance. This is inadequate to drive the two diode balanced modulator used as detector (Rx) / modulator (Tx) in the original BITX, although the DDS output has been found sufficient to drive the diode ring mixer, which has a driver stage.

mØxpd uses a single buffer / driver to couple the output of the DDS BFO source to the detector/modulator, as shown in Figure 2.

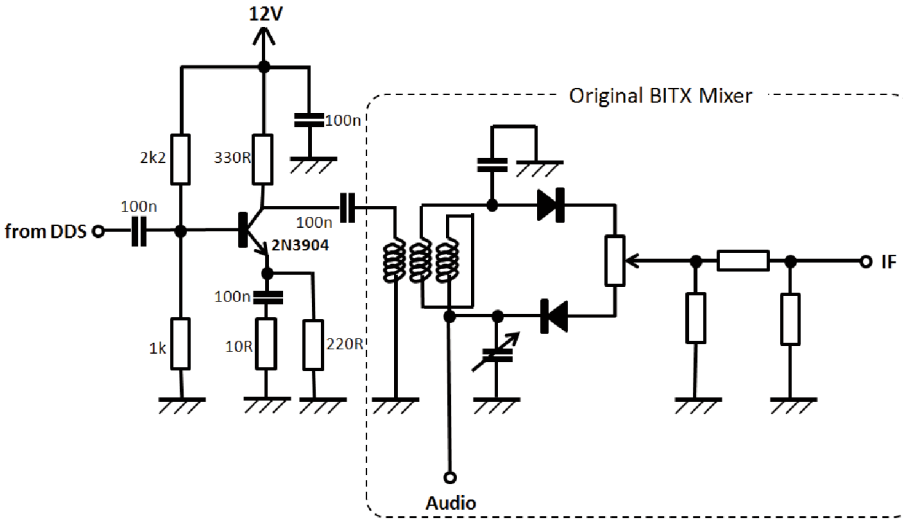


Figure 2 mØxpd's interface between DDS and the BITX detector / modulator

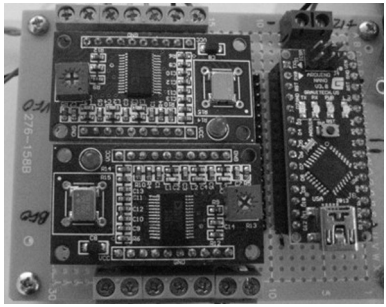
Application: Retrofitting the RF Generator to Existing Rigs

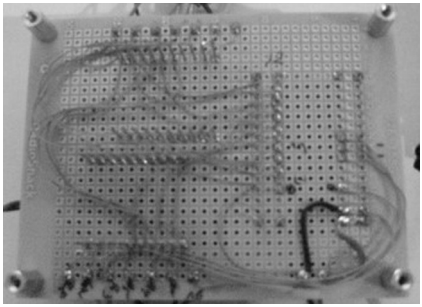
At n6qw there are many homebrew radios and some suffer the general weakness of the lack of an accurate, stable signal source for the LO. With mØxpd's design that is no longer a concern, as several of these radios have been tested with the Arduino/Dual DDS combo and it is like coming out of the dark ages. The first retrofit "proof of concept" application was for the single DDS in a 20m QRP SSB transceiver shown below in Figure 3.

Figure 3 20m SSB Transceiver with Single DDS VFO

The IF is at 9.0 MHz using the GQRP Crystal Filter and two bilateral amps from G4GXO [6]. The Tx and Rx mixer stage is a TUF-1. (Some cosmetics need to be added to front panel as the 20X4 LCD is larger than the original cut-out.) For good measure I followed the RF generator with a LPF that has a 30 MHz Fc. I do note that the drive is a wee bit shy to the TUF-1 which is a 7 dBm device where you need 1.414 Volts Peak to Peak. As mØxpd noted, the output of the DDS is about 1 Volt pk-pk. A suitable "booster amp" is described below.

This same radio was been tested with the dual DDS RF Generator which is being controlled by an Arduino "Nano". Truly it is a compact package and the underside wiring is done using wire wrap technique, as seen in Figures 4. What a treat to swing down to 40m and automatically be on LSB. Previously, with only the USB crystal available for this radio, going to 40m would be problematic.





Figures 4 RF Generator implemented using wire wrapping and the Arduino "Nano"

Figure 5 is gain adjustable amp which can be used with a TUF-1 or AE1-L (the latter is a 4dBm device (1.0 V pk-pk)). The BFO requires a similar amplifier.

Another homebrew radio of mine which I dubbed JABOM (Just A Bunch Of Modules) [7] originally used a 4 pole 4.9152 MHz homebrew filter which was replaced by the GQRP 9.0 MHz filter. The JABOM was tested using the dual DDS unit and is a future candidate for a permanent dual system installation for operation on 40 and 20m. Again, the lack of a LSB crystal previously had limited this radio to USB. The total cost, including the Arduino Nano, two DDS modules and 20X4 LCD was under $35, making the price point highly cost effective.

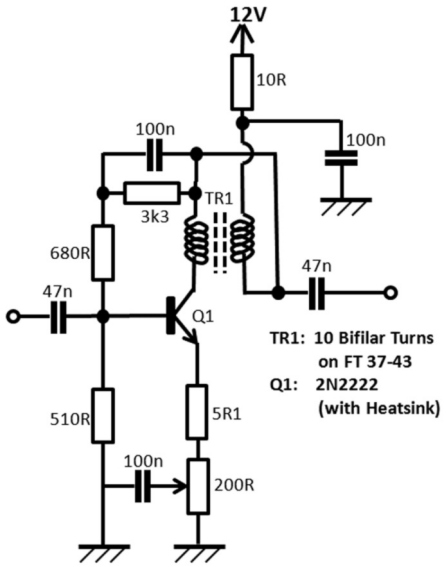


Figure 5 Gain-adjustable amplifier
(after a circuit on the ei9gq website)

One dual unit is slated for installation in a radio that is yet to be built but will use a 3.180 MHz filter from of an early Yaesu FT-101 for which I do not have the matching crystals. Frequently the FT-101 crystal oscillator board is listed on one of the auction sites at a price exceeding the cost of a dual DDS system. Based on the capability of the Dual DDS, I recently bought a FT-101SSB filter for $7.50 USD and now I am ready to proceed with that project.

The dual unit adds a whole new dimension of what is possible with many commercial and homebrew filters. A very exciting opportunity for the dual system is the installation in the boat anchor commercial radios that aside from drifting and the lack of a digital display are otherwise really great sounding radios (valves you know). The dual system also solves another problem frequently encountered with the older radios; their USB and LSB crystals have drifted with age and are no longer useable. The bonus of the dual system is not only a RF generator but the generation of the BFO/CIO frequencies to match the filter.

Using the RF generator in tube type radios must be done with care. A booster amp is definitely needed as is some isolation between the DDS and the radio. I also built an isolated power supply which is fed from the filament string, shown in Figure 6. Avoid powering the Arduino from the plug-in type switching regulators ("wall warts") as the hash generated is noticeable.

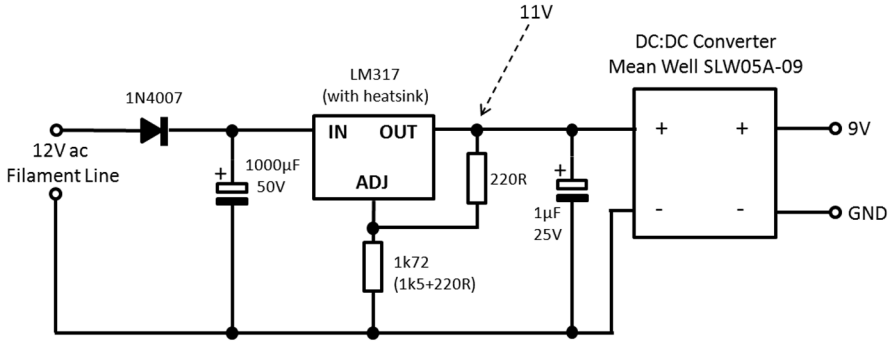


Figure 6Isolated PSU for Powering the Arduino from a filament string

The other isolation is the LO RF signal is fed via a ferrite transformer of about 12 turns on the winding to the radio and 4 turns on the DDS side. A FT-50-43 core is used for the windings to better match the radio/DDS. On the radio side one end of the 12 turn winding is grounded and the other end injects the signal through a 10 nF 500 VDC cap. The side of the transformer connected to the DDS is not grounded but acts much like link coupling.

One valve radio used as a test bed was a 1960's Heathkit 40m Single Band SSB transceiver which uses a 2.305 MHz four pole crystal filter in the IF. The Arduino/Dual DDS essentially replaces two valves.

The Heathkit uses a low frequency VFO just above the broadcast band and mixes that signal with an 11.190 MHz fixed crystal oscillator. The resultant difference frequency is now in the 9.5 to 9.8 MHz beating against an incoming signal frequency of 7.0 to 7.3 MHz. Thus the sidebands are reversed but I designated the offsets to accommodate this arrangement. [The IF is 2.305 MHz, the BFO is on 2.303300 MHz and the 'VFO' tunes in the 9 MHz range.] The point of insertion of the VFO was done essentially where the plate of the mixer valve would be connected. The 10nF 500 VDC cap is needed to prevent shorting the LV supply to ground.

The n6qw homebrew radios/commercial radio modifications use a variety of filter frequencies. A few seconds at the computer and these various filters and their offsets can be easily programmed into the Dual DDS code and that is a capability previously unavailable. But that also addresses an issue of how to manage the interfaces and that is the reason for my using the small terminal blocks shown in Figure 2 so that insertion into any project is not a monumental task. Figure 7 shows the Dual DDS Board "al fresco" on the work bench.

Closing remarks

Generation of stable, flexible RF signals for a superhet system can be achieved using DDS modules under the control of computing platforms such as the Arduino. The microcontroller retains the capacity to perform other tasks, such as switching band-specific filters and managing other modes (both of which are planned developments for the code).

Recent "open-source" radio platforms (such as the TenTec "Rebel") attest to the flexibility of and contemporary interest in these methods. We have sought to demonstrate how simple digital methods bring formerly unavailable flexibility to modify our radios literally on the fly. This flexibility is applicable to older "boat anchors" – every bit as much as to modern platforms. The cost of the DDS modules, the accessibility of the microcontroller systems and the performance and flexibility of the resulting system make this technique an attractive choice for those building or retro-fitting radio systems, extending the "Occam's Microcontroller" thesis to phone applications.

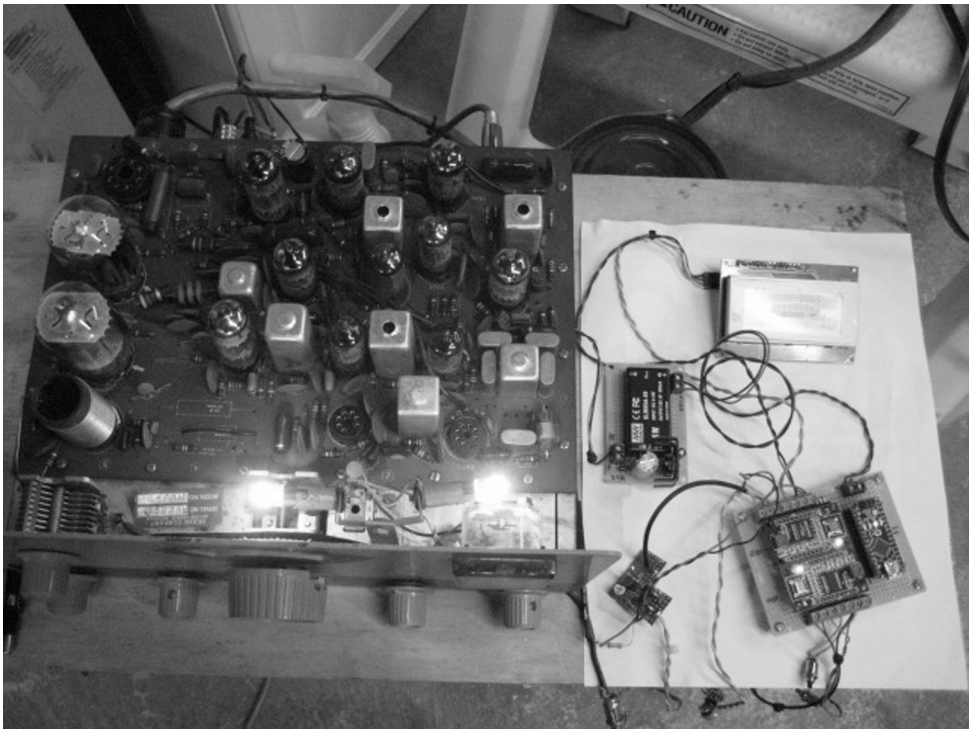


Figure 7 HW-22 & the Dual DDS RF Generator

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[1] "Pic 'n' Mix Digital Injection System" P. Rhodes, g3xjp , RadCom, January 1999 *et seq*

[2] "Occam's Microcontroller", P. Darlington, mØxpd, SPRAT 156, p13, Autumn 2013

[3] see mØxpd's blog "Shack Nasties" at m0xpd.blogspot.co.uk

[4] see n6qw's website at www.jessystems.com

[5] "BITX - An easy to build 6 watts SSB transceiver for 14MHz", A. Farhan, vu2ese, downloaded from: http://kambing.ui.ac.id/onnopurbo/orari-diklat/teknik/homebrew/bitx20/bitx.htm

[6] "A 19dB Bi-Lateral Amplifier with 37dB Gain Control Range", R. Taylor, g4gxo, SPRAT 128, p 6, Autumn 2006

[7] "JABOM – A 17m SSB QRP Transceiver", P. Juliano, n6qw, QRP Quarterly, Fall 2011, p 40

Matchbox Radio Line

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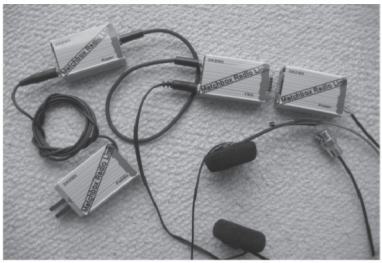
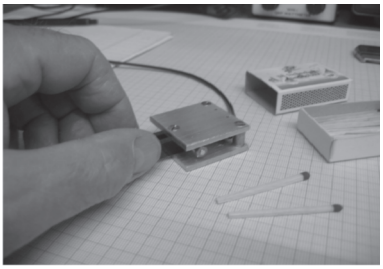
Years ago I heard that many big guns used a "... Line", whatever it meant. In these days I built my first QRP All-mode TRX. Now I have become a pensioner and it's time to have a "Line",too. Not such a big boat anchor, a little bit smaller, and even qrp like. So I started building my own "Line in Matchbox Size".

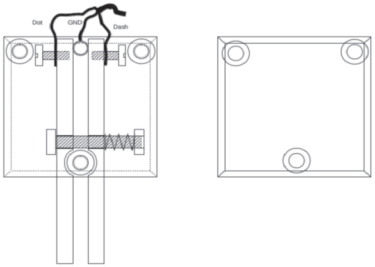
The Line: paddle – keyer – TRX – power supply - all in their covers …

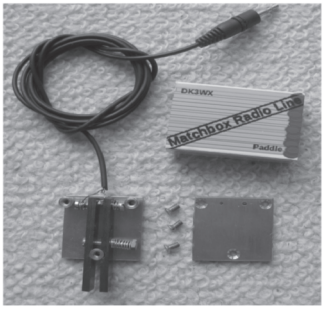


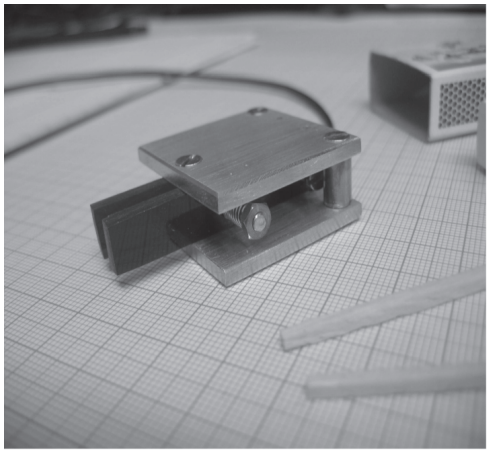


…and in operation connection

First thing I made was a paddle. A fine looking item in golden brass. As I was going to be a mechanic in a BC transmitter station, I had to learn to rasp, saw, drill and so on, not really what I thought would be good for a teenager such as soldering fine things. But it was a good lesson. Now I love it :-)

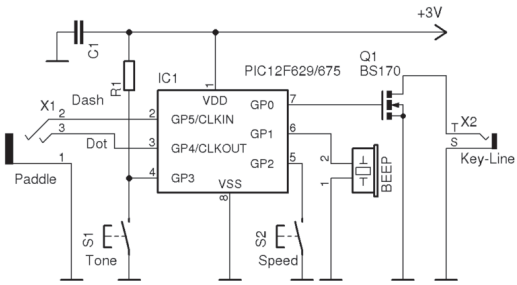


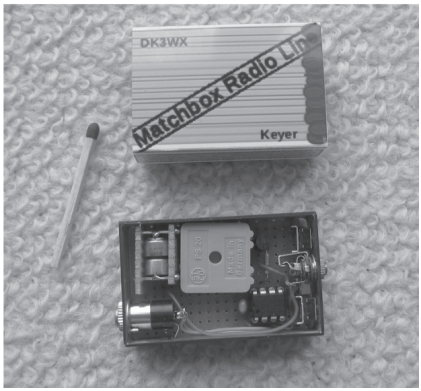




Two brass plates 34x34x3 mm give the base and the top (and the weight, too) kept together with 3 brass spacers which have M3 screw thread. The paddles are made from a piece of red plastic. They are squeezed together by a longer M3 screw and a spring. With an M3 nut you can change the pressure. Two little screws at the end are the dot and dash contacts, since they are fairly tough in their hole they offer a sensitive adjustment within a fraction of movement for a fine CW feeling. The complete paddle with its 54 mm length fits into a matchbox cover.

After that I needed a keyer. The code I wrote is in assembler and I used it in many older projects with different controllers. Here is a small 8-Pin device with an internal clock. Look at my web page for the source code or assembling hex-file. R1 is a pull up resistor, this pin has no internal one. The side tone on pin 6 leads to a piezo element. Pin 7 keys the transmitter via the Mosfet Q1 .

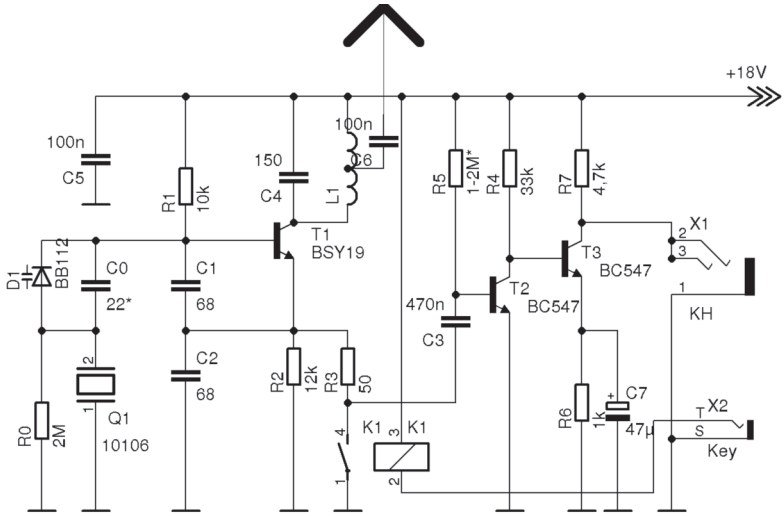




Change the CW speed by pressing the speed button and than use the paddle as up/down keys, in the same manner you can change the side tone. If you hold the speed button and switch the keyer on, the cq machine will start. If a call is done – break in with the paddle or wait for a next call. A simple text input routine on the other button is in progress. Wait for news in due time.

All the parts include the battery, and an ON switch is placed in the second match-box.

The TRX was the hardest work. Less than 25 parts but difficult to find the right dimension. The idea comes from G3XBM in SPRAT 151. I built this little TRX for the 30 m band. The parts around the transistor T1 is the XO and the self mixing stage for the RX. Because of the very high resistor on the emitter the stage produces a very small RF amplitude. Via C3 the AF is coupled to a 2 stage AF amplifier. Set the value R5* that the collector T3 shows about the half of the value of the power supply. The AF gain is more than enough so you can attenuate the antenna line, that avoids RF break through.



If the key line is grounded the resistor R3 changes the operating point T1 and it runs with about 300 mW output. The AF stage is nearly shorted and the headphone is rather quiet.

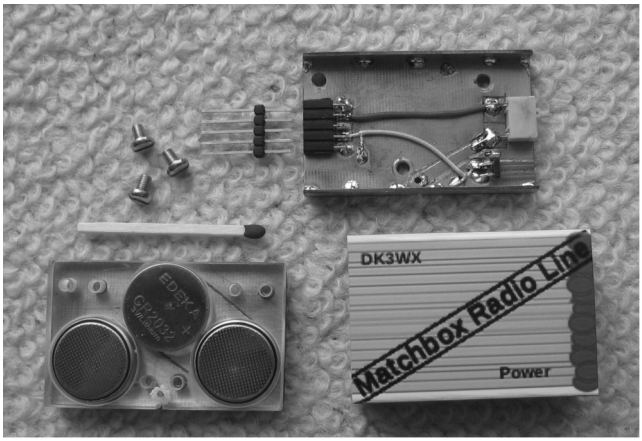
The problem was the RIT. The crystal frequency shifts only a few Hertz between RX and TX mode. So I reduced C0 and added a varicap D1 from the junk box. The DC level on the base T1 changes a few volts between RX and TX and D1 gives more C or less C parallel to C0. I searched a varicap and changed C0 so that it gives me about 1 kHz RIT.

Keying via a reed relay offers more stability than a keyer with a long cable. I made a high impedance headphone from two piezo

modules and an old walkman headphone. The impedance is about 5 kOhm and no output capacitor is needed. Only a little more selectivity around the 1kHz could be desirable.

It was no problem to put all the parts in a third matchbox.

The forth matchbox houses the power supply. At the moment 6 Li Cells deliver 18 V but they have a high internal loss (and a high electrolytic capacitor is needed). I will replace this with another solution in the future.

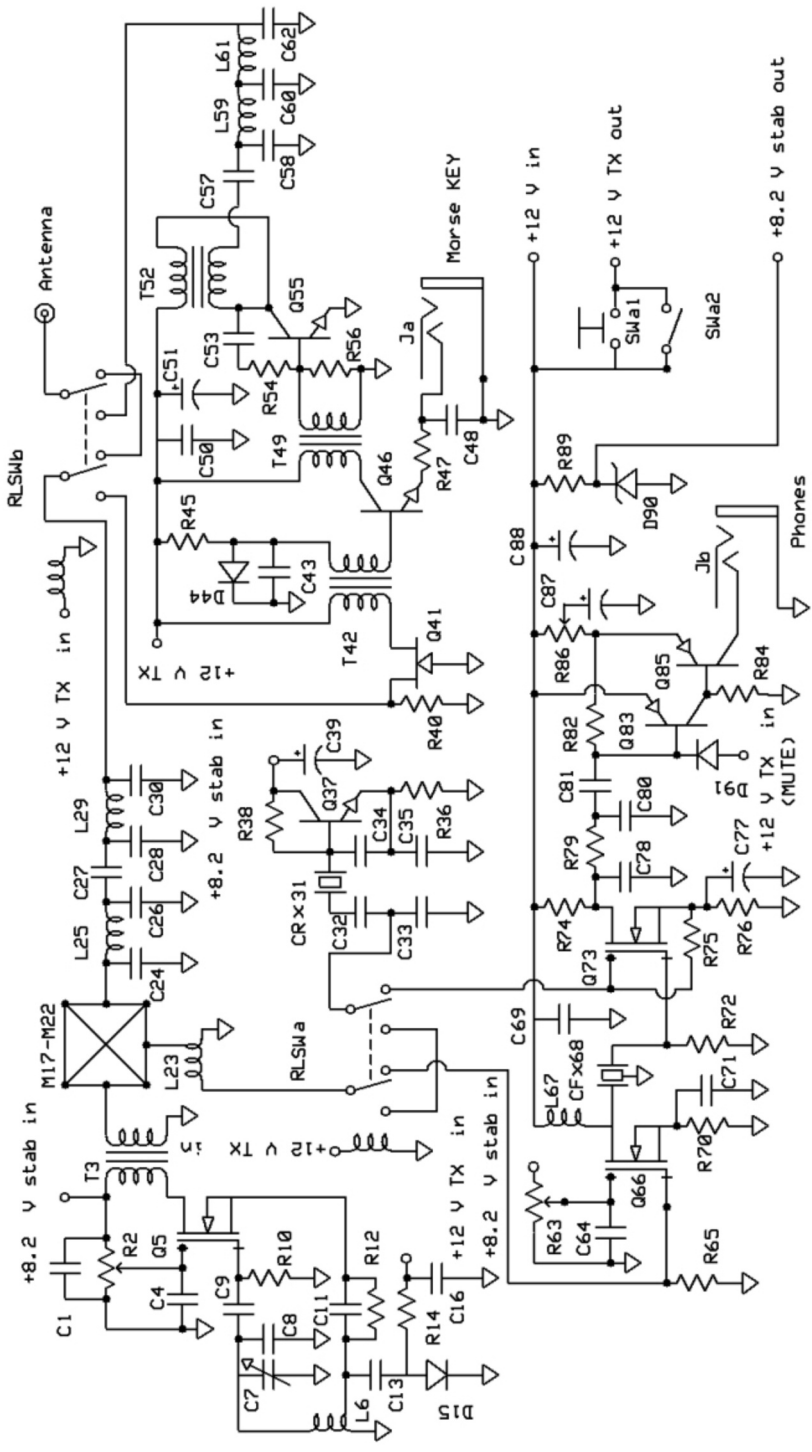


And the results: Without the RIT I had no QSO, I only saw my signal Europe wide on Reverse Beacon Network. On the very day I included the RIT, I worked SM5, he gave me 569, and LZ, a 599 station no real rprt but he heard me fairly well,… all in a few minutes.

The mechanical art, programming, circuit design, soldering, measuring and testing, cw-ing and
above all to find good company and friends to talk with
– that is what I like, what HAM radio is for me.
DK3WX GQRP # 6080

MEMBERS ADS - MEMBERS ADS - MEMBERS ADS - MEMBERS ADS - MEMBERS ADS

30m MFJ CUB Transceiver VXO modified, 12 KHz coverage centred on 10.116MHz, 2 watts out. £35 including UK postage. **17m MFJ CUB** Transceiver, standard build, 1.5 Watts out. £35 including UK postage. Ken, GM4JMU. Tel: 0141 6395854


Antenna
RLSWb
+12 V TX in
+8.2 V stab in
+12 V TX in
+8.2 V stab in
RLSWa
+12 V TX in
+8.2 V stab in
Morse KEY
+12 V in
+12 V TX out
+8.2 V stab out
SWa1
SWa2
Phones
M17-M22
CRx31
CFx68
T3
T42
T49
T52
Q5
Q41
Q46
Q55
Q66
Q73
Q83
Q85
D15
D44
D90
D91
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R45
R47
R54
R56
R63
R65
R70
R72
R74
R75
R76
R79
R82
R84
R86
R89
Ja
Jb

yu1rkMAS Transceiver

Dusko Kostic, YU1RK, dusko.kostic@ratel.rs

The first time I heard about the MAS project http://www.qrpcc.de/contestrules/mas/index.htm) I got an idea to build my own transceiver for later contests, as soon as possibe. My first MAS transceiver was superheterodyne, with a commercial ceramic filter and a total of 99 elements. It was published in the Serbian magazine “Radioamater”, nr. 4/2007.: http://www.qsl.net/yu1bbv/ra_medija/ra_casopisi/Casopis_Radio-amater/2007/Radio-amater_4_2007.pdf.

After a few contests I started to think about its disadvantages and, eventually, building a new transceiver with better characteristic.

The idea was to follow a similar concept, but with less components.

Receiver

For the front end I chose an excellent BPF (EI9GQ), followed by a SBL-1 DBM. At the mixer IF output there are a 1:4 step up transformer and the FET IF amplifier with a manual gain possibility (R63). After the IF amplifier there is a ceramic Murata IF SSB filter, then the FET product detector, simple AF filter and, finaly, two stage AF amplifier. The audio level can be regulated by R86; together with R63 a comfortable reception can be adjusted in accordance with the used phones. The impedance of the phones is approximately 90 ohms. Too low impedance would be loud at the Q85 and too high would be disturb the DC relationships. At this point we suggest the use of the step down audio transformer from the old AM transistor radio. As the receiver line is permanently connected to the 12 V supply, during the transmitting it creates strong noise in the phones. While, on one hand, it serves as some kind of monitor without extra elements, on the other hand it is too hard for hearing. We suggest the use of another element, D91, for the MUTE purposes. The MUTE characteristic if very useful, but Q85 is fully on and 90 mA current passes through.

BFO

The frequency of BFO should be 453,5 kHz and adjusted with the C32. The BFO signal, monitored on C33, is a good sine, 2 Vp-p level, unlike the signal of the Q37 emitter, which is usually used.

VFO

VFO is designed with one dual gate FET and delivers more than enough signal level for supplying DBM. Before putting the DBM on the PCB, the level of VFO is to be adjusted to +7 dBm by R2, measured at the secondary of T3. Adjust the value of C13 for TX offset, approximately 1kHz down, during transmitting, for normal CW work. It is not necessary for the maximum capacity of the variable capacitor C7 to be 14 pF. It is important to adjust the VFO frequency to approximately 3945 kHz by L6, with closed C7. In that case the maximum VFO frequency must be 4065 kHz or more.

The stability of the VFO frequency is not ideal but, 30 or 60 minutes after switch on it is more than satisfactory for short QSO in the contest.

Transmitter

There is nothing special about the transmitter, except that the output power can be regulated by the adjusting the R47. It is important for the electronic keyer not to have any resistance (it must be 0 ohm) in the keying stage, otherwise it can decrease the output power. The 5-pole LPF, at the end of the transmitter, is sufficient for suppressing the second harmonic by nearly 40 dB, but still a 7-pole or eliptic filter is suggested. The Q55, and even Q46, must have proper heatsinks. The changeover is realised by a three-position switch which has the following positions: neutral, push SWa1 (for short contest QSO) and switch SWa2 (for long transmittions).

The total consumption during the reception is 45 mA, while during the 5 W transmitting it is approximately 1.2 A.

The total number of transceiver elements is 90 (91 with D91), but according to the MAS definition (every BPF and LPF have 3 elements) that number is lower, 84 (85).

Further inprovements

As mentioned earlier, at the front end of the receiver there is a fine bandpass filter published by EI9GQ. While it has a low passband insertion loss with a relatively low Q of TOKO 10 K inductors, it does not enough suppression of unwanted mixer products for IF=455 kHz. The signal measured at Flo±2xFif was only 35 dB down with respect to the output signal. Therefore, we suggest the use of a three-resonator BPF, but with low insertion loss, too, in order to keep a low noise figure.

Table 1. Inductors/Transformers data

Component	Turns		Form	Inductivity (μH)	Wire Φ (mm)	Note
	Primary	Secondary / tap				
T3	18	3	Siemens toroid, RIK6, 6.3x4x2.5 Material N30, Al=1000	350	0.3	Possible equivalent FT-37-43
L6	20	3 (tap)	TOKO 10K Al=15	6	0.2	
L23	20	5(tap)	Same as T3	500	0.3	Possible equivalent FT-37-43
L25	30	-	Same as L6	13	0.2	

L29	30	-	Same as L6	13	0.2	
T42	6	1(isolated wire)	Siemens double aperture core 6.2x7.25x 4.7 Material N30, Al=7350	270	0.2	DC conductive ,
T49	5	1(isolated wire)	Same as T42	180	0.2	
T52	8, bifilar	-	Amidon FT-37-61		0.4	
L59	22	-	Amidon T-50-2	2.9	0.4	
L61	22	-	Same as L59	2.9	0.4	
L67	-	-	Fixed inductor	1000	-	

Table 2. Parts list

COMPO-NENT	VALUE	NOTE
C1	100 nF	multilayer
R2	10 kΩ	trimmer
T3	18:3	RIK6,N30
C4	100 nF	multilayer
Q5	BF963	or similar
L6	6 μH, 20:3	Toko 10K
C7	2.5-14 pF	variable
C8	220 pF	silver mica
C9	15 pF	silver mica
R10	100 kΩ	¼ W
C11	10 nF	mylar
R12	330 Ω	¼ W
C13	20 pF*	silver mica
R14	10 kΩ	¼ W
D15	1N4148	

COMPO-NENT	VALUE	NOTE
C50	100 nF	multilayer
C51	10 μF/25 V	tantalum
T52	2x8 t	FT-37-61
C53	100 nF	multilayer
R54	390 Ω	¼ W
Q55	2SC1969	
R56	68 Ω	¼ W
C57	100 nF	100 V WIMA
C58	750 pF	silver mica
L59	2.9 μH,22 t	T-50-2
C60	1500 pF	silver mica
L61	2.9 μH,22 t	T-50-2
C62	750 pF	silver mica
R63	10 kΩ	trimmer
C64	100 nF	multilayer

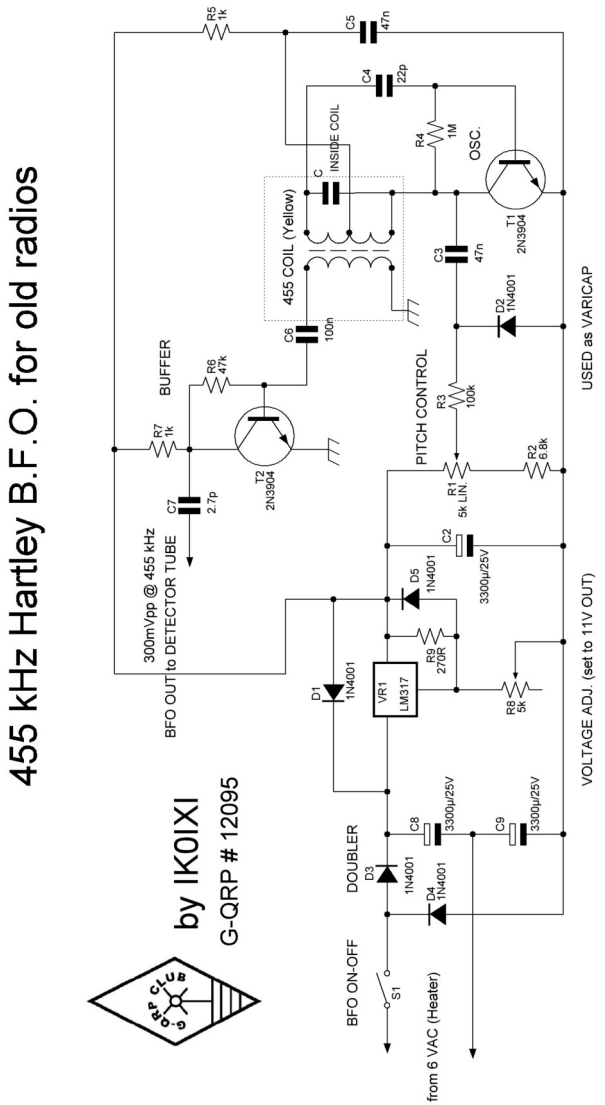
C16	100 nF	multilayer
M17-M22	SBL-1	6 parts, DBM
L23	20:5	RIK6,N30
C24	1 nF	silver mica
L25	13 μH,30 t	Toko 10K
C26	180 pF	silver mica
C27	22 pF	silver mica
C28	180 pF	silver mica
L29	13 μH,30 t	Toko 10K
C30	1 nF	silver mica
RLSWa	DPDT	Relais, 12 V
CRx31	455 kHz	ceramic
C32	100 pF*	silver mica
C33	2.2 nF	WIMA
C34	1 nF	WIMA
C35	4.7 nF	WIMA
R36	1 kΩ	¼ W
Q37	BC550	
R38	100 kΩ	¼ W
C39	1 μF/35 V	tantalum
RLSWb	DPDT	Relais, 12 V
R40	270 Ω	¼ W
Q41	J310	
T42	6:1	2 holes mini
C43	100 nF	multilayer
D44	1N4148	
R45	1.2 kΩ	¼ W
Q46	2N3724	
R47	8.2 Ω*	¼ W
C48	100 nF	multilayer
Ja	Jack	Morse key
T49	5:1	2 holes mini

R65	820 Ω	¼ W
Q66	BF963	or similar
L67	1mH	fixed
CFx68	CFJ455K	Murata
C69	100 nF	multilayer
R70	100 Ω	¼ W
C71	100 nF	multilayer
R72	2 kΩ	¼ W
Q73	BF963	or similar
R74	1.5 kΩ	¼ W
R75	10 kΩ	¼ W
R76	100 Ω	¼ W
C77	1 μF/35 V	tantalum
C78	47 nF	WIMA
R79	1 kΩ	¼ W
C80	47 nF	WIMA
C81	470 nF	WIMA
R82	47 kΩ	¼ W
C83	100 μF/10 V	tantalum
R84	4.7 kΩ	¼ W
Q85	BC560	
R86	50 Ω	trimmer
Q87	BD140	
C88	470 μF/25 V	electrolytic
Jb	Jack	Phones
R89	220 Ω	¼ W
D90	1N5237B	8.2 V
SWa1/2	SPDT	toggle
D91	1N4148	Optional

455 kHz BFO for older receivers

Fabio Bonucci, IKØIXI - KF1B, gqrp-italy@ik0ixi.it
G-QRP Representative for Italy

This is a simple 455 kHz BFO I made for an old Hallicrafters pre-WWII receiver, model S-20R. Its original BFO coil (PTO) was broken, so I made a solid state circuit to restore this old receiver. Now it works fine also in CW and SSB.



New High Performance Regenerative Receiver

Olivier Ernst, F5LVG, 2 rue de la Philanthropie, 59700 Marcq en Baroeul, France

I made this regenerative receiver for 5 amateur bands : 80 40 20 17 15m. With this Rx and a home-made transmitter, I made several SSB QSO between North America and France. It is possible to listen, without noticeable detuning, SSB QSO on 15m during 15 minutes. There is no hand effect, no common hum and no mains hum.

I will focus on the following points:

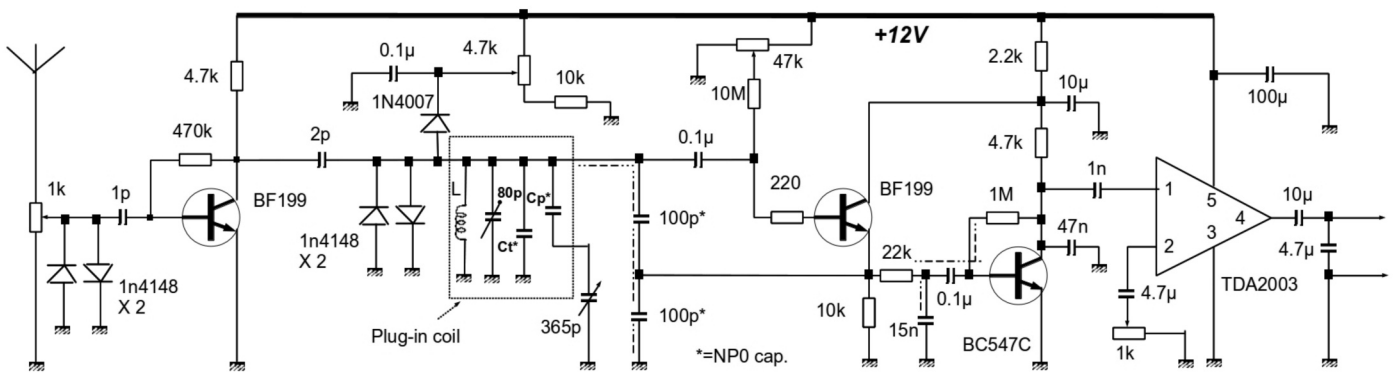
1 RF attenuator, mandatory for all regenerative receiver.
2 Very small coupling capacitor between the antenna, the RF transistor and the tuned circuit to avoid overloading (I use my transmitting antenna).
3 Plug-in coils without coil forms to obtain very high Q. The coils are easy to make : only one coil without tap for each band. I use 4 pins DIN connectors.
4 High C "oscillator" with NP0 capacitors to obtain a high frequency stability.
5 Band spreading with small capacitors in series with the variable capacitor.
6 High capacitor value between the tuned circuit and the detector to avoid mains hum.
7 Very short connection for the dot and dash lines.
8 Fine tuning with a 1N4007 diode.
9 1N4148 : transistor protection during transmission.

Diameter for the coils : 22mm

80m, L=11 turns, Ct=470pF, Cp=122pF
40m, L=5 turns, Ct=552pF, Cp=55pF
20m, L=3 turns, Ct=320pF, Cp=25pF
17m, L=2 turns, Ct=440pF, Cp=16pF
15m, L=2 turns, Ct=253pF, Cp=16pF

Wire for 80 40m : diameter 0.5mm.
Wire for 20 17 and 15m : 2.5mm2 installation cable.

The picture on the front page shows the layout. The size is 15x20 cm. I used 10M ohm resistors for the connection points isolated from ground !!! (stand-offs) 10M ohm is nearly infinite....


+12V
4.7k
0.1µ
4.7k
10k
1N4007
47k
10M
2.2k
10µ
100µ
470k
2p
0.1µ
4.7k
1k
1p
BF199
1n4148
X 2
L
80p
Cp*
Ct*
220
BF199
1M
1n
10µ
1n4148
X 2
100p*
47n
22k
0.1µ
4.7µ
TDA2003
Plug-in coil
365p
100p*
10k
15n
BC547C
1k
*=NP0 cap.
RF ampli.
Regenerative detector
AF preampli.
AF ampli.
SW regenerative receiver
F5LVG
2013

A New Way of Constructing RF Circuits

Peter Thornton, G6NGR equieng@gmail.com

It's very easy to make prototypes and trial designs on copper strip-board ("Vero board") – you have a matrix of holes to mount the components and copper strips to make connections. Copper tracks can be cut in moments with a twist drill, and the boards can be snapped easily along a line of holes with nothing more than fingers, not even a saw is needed. All very convenient and very neat results too!

But... if you construct high frequency (RF or digital) circuits on strip-board, the copper tracks create stray capacitances and series inductance that causes feedback and instability; you need an "earth plane" of copper directly below the components to screen off undesired signals from the tracks. "Manhattan" style construction addresses this by using stand-off insulators (high value resistors, decoupling capacitors, or small "islands" of pcb material) on the copper surface of un-etched pcb material – the copper provides the earth plane, and the components are assembled on top of the stand-off supports.

The Manhattan method is simple, practical and easily achieved, but the results are far from neat, mechanically stable or repeatable; the size of the final circuit is far larger than a pcb built with leaded components. And, believe me, in a tight packed Manhattan circuit, replacing a blown component is NOT easy!

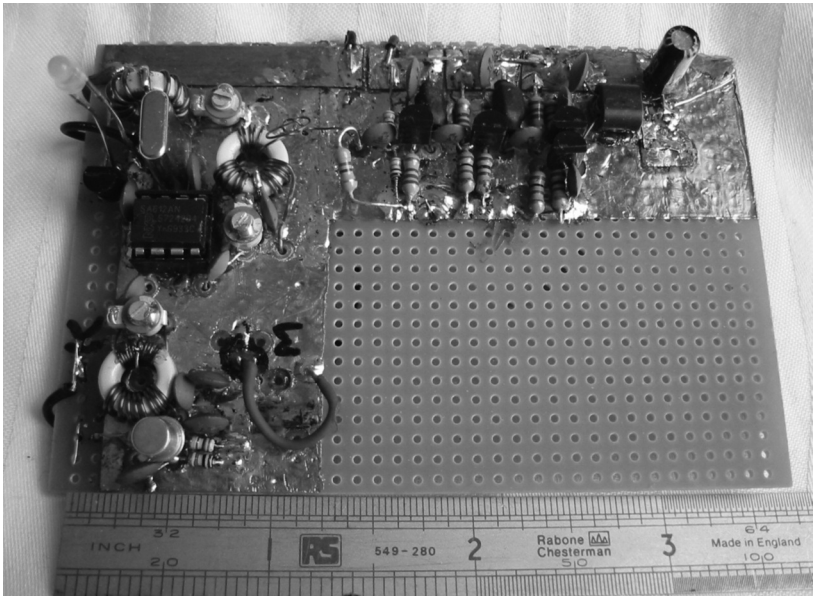
The ideal solution is a pcb with components close above an earth plane, and the interconnects, power rails, etc., beneath the earth plane. This method produces repeatable, reliable results; as the suppliers of Amateur Radio kits, and industrial and commercial manufacturers know.

Many different "homebrew" pcb etch resist techniques and copper etching solutions exist; but all are useless for prototyping, as well as dangerous, dirty and downright inconvenient. What's needed is some method that combines the ease of use of strip board, provides a continuous earth plane top side and allows infinitely flexible wiring below, with no etching, mask making, etc. I have developed a method for one-off designs and prototypes, that costs pennies and is as easy to use as strip board, combined with the vital earth screen.

Many years ago, as an apprentice learning my trade, I had to construct many prototypes using "matrix board" - perforated pcb substrate with no copper tracks. I was taught how to lay out HF/VHF circuits on these boards for digital systems fast approaching 1nS edge speeds, LED drivers for pS avalanche pulse circuits and so on. Part of this construction was built above thin copper sheet (22swg) that I glued to the top side of matrix board to create the earth plane. Where components leads had to go through for interconnect, I used a countersink drill to cut back the copper from the hole, to avoid a short circuit to earth.

Here's how I do it nowadays – 8' x 4' sheets of copper aren't cheap (or acceptable household items) - I draw out the circuit on graph paper, at large scale (free Internet download). Then, knowing the size of the board I need, I break a piece of plain matrix board (Rapid Electronics #34-0585 or similar from other electronics suppliers) to suit and

stick on copper tape to the topside (self adhesive, 1” wide, sold in Garden Centres to stick round plant pots as “slug and snail deterrent”) to cover the area the circuit requires.

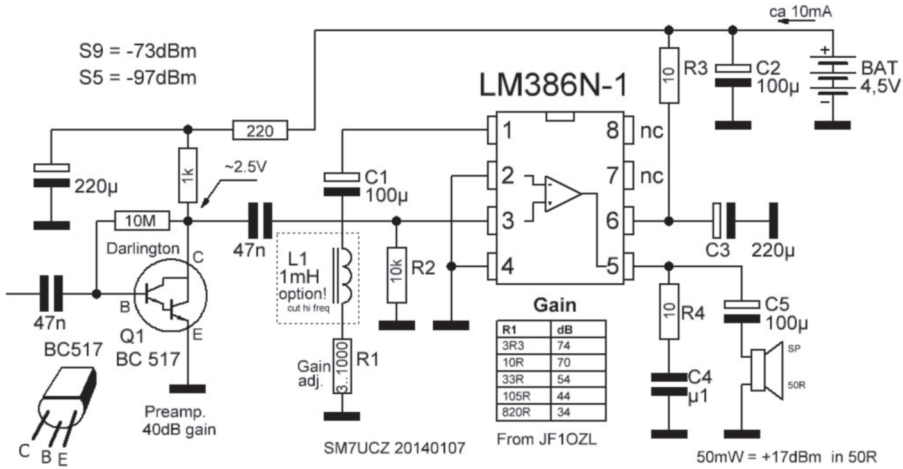


If I need wider copper than 1”, butt together two strips of copper tape and solder a seam along the joint. I use my finger to gently smooth out the copper as it is laid; this clearly highlights the holes below, too. To make the holes, I use a brad pointed drill, 3mm diameter (from DIY and engineering suppliers, typically Screwfix part #73365) but.... turn it anti-clockwise! The copper tape is fully annealed and very soft; the drill bit is a bit aggressive turned clockwise and tends to tear the copper. The brad point drill centres in the matrix board hole and the wings of the drill neatly remove a 3mm circle of copper. You don’t need to press on; light pressure is fine, you don’t cut into the matrix board below the copper. To make earth connections, just solder the lead directly to the earth plane; the copper tape solders very readily. The component leads below the matrix board are bent over to the appropriate connections and soldered; you can use tinned copper wire for power rails and easily decouple by mounting 0.1μF ceramic capacitors through to the earth plane above. Any other wiring can be done very easily with insulated wire; edge connectors, etc., similarly fitted and wired.

I plan out my circuit using the brad point drill to cut the clearance holes, and then mount the components, stage by stage, testing each stage as I go (a good idea..!). Before I connect power, I test all the nodes of the stage for short circuits to earth with a multimeter set on “ohms”, after I have brushed thoroughly with a soft 1/2” paint brush to remove any shards of copper. This method is completely stable and reproducible should you want to make several copies of a circuit. It’s as cheap as chips, infinitely adaptable, easy as Vero board and works VLF to UHF. No messy chemicals, photo-resist or drilling; dead easy and stable. An example, running at 50MHz, is shown in the photo.

High Gain LM386

Johnny Apell, SM7UCZ <johnny.apell@telia.com>



From notes by SM7UCZ.

When building simple receivers like my Mousetrap receiver (SPRAT 156) the audio amplifier needs about 100dB of gain (too much for an LM386) to get a reasonable signal in a loudspeaker. JF1OZL experimented with various methods of feedback. Sverre, LA3ZA, had an article in SPRAT 116 called "Unleashing the LM386". Gain can be adjusted using R1 up to about 74 dB – see the chart from JF1OZL. With the Darlington pre-amplifier it is possible to achieve 100 dB. For this version I use a 4.5 volt supply.

Looking for Fahnestock Clips?

Laurie Booth G4XEC lauriebooth@dowsetrack.org.uk

The classic, long established, Fahnestock clip is useful in QRP construction for quick connection of, for example, low voltages, key and audio.

A web search revealed many sites quoting high cost and postage rates for the clips. www.modernradiolabs.com deal with amateur radio construction and offer them at a realistic price. They actioned and posted my order for the clips immediately.

G-QRP Club Sales News

Graham Firth G3MFJ

Firstly, the items from the last few issues are all still available.
This month's new offerings:

If you have seen Johnny (SM7UCZ)'s circuit on page 26 (opposite), I am now stocking the BC517 transistors (13p each) and the 1mH axial inductor (as an addition to the existing range – 18p each). I also stock the 100uF and 220uF electrolytic capacitors if you need them – they are 11p each.

If you fancy putting your hand to a surface mount Sudden, then I now have the SMD version of the SA602 to go with the LM386 which I have had for a while. The SMD 602 is the same price as the DIL version - £1.50. I have also found a few of the SA604 which was the companion to the 602 in cell phones – these are also surface mount and are £2 each. These SMD versions are the largest size and not difficult to use.

Those of you who have been members for a while will remember the first volume of Projects that Drew Diamond wrote – Drew gave us permission to reprint it here and we sold it for many years (it had an orange cover). Well, we ran out a few years ago, but I have kept being asked if we could reprint it again. So we have done! They are available now and we have changed the cover to match the other 3 volumes that we are selling. The book is £5 each plus postage (UK - £1.80, Europe - £5.50, DX - £7.50). Don't forget, if you have the orange cover version – the text in this is exactly the same! The edition that was sold in Australia had a pale yellow cover, again, this is the same text.

Finally, again, many thanks to all who order through PayPal, and who make their remittance a gift. PayPal take 20p plus 3.4% from all orders, and this makes small & medium orders close to loss making for us as the club has low profit margins. If you send the money as a gift, then you pay their charges and we get the full amount.

18th RED ROSE QRP FESTIVAL.

Sunday 6th July, 2014. 11am to 3pm. Formby Hall, Alder Street (off High Street), Atherton, Manchester. M46 9EY. Admission £2.00 Children under 14 free.
Easy access from all directions. M6, M61, M60, A580
Features: Trade and individual stalls. Club stands, including RSGB, GQRP. Very low cost "Bring & Buy. (No sell, no pay!) Sales of new and surplus equipment /components. Hassle free. Large spacious halls at ground level. Huge, free car park, disabled facilities. Delicious refreshments at QRP prices! Comfortable, well stocked lounge bar.
Some tables available at £8 but please book early. Ideal opportunity to sell those unused items. Contact Les Jackson, G4HZJ g4hzj@ntlworld.com 01942 870634

Membership News

Tony G4WIF, PO Box 298, Dartford Kent. DA1 9DQ

This Spring I would appreciate your help if you know the following members: GM3LBX, G1KNU, G4DUC, G4EEO, GW4CWG, G3RLS.

These UK members are automatically paying by banking standing order - even though their Sprats are being returned to me by Royal Mail - meaning that they have probably moved or are perhaps silent key. If they are silent key I would like to contact their family to have them cancel future payments. Otherwise, I would like to be notified of their new address. Please write to the above postal address or email g4wif@gqrp.co.uk - or ask the members family to do so.

For some members reading this, it will be your last Sprat through either failure to renew or some other issue. All you have to do to put your mind at rest is find the wrapper it came in and check your membership expiry date. Please everyone, check the wrapper now.

If the date says “expires end of 2013” or “membership expired” then there will be no more Sprats unless you contact me or your DX representative. (see the club website at www.gqrp.com for the latest information). If you have an email address then why not create an entry on QRZ.COM so that either your DX representative or I can reach you.

As with past years, this could be your last Sprat for UK members who believe they have paid by banking standing order. I have updated the records with every identifiable standing order payment. All standing order payments must have your membership number correctly quoted.

A few members are still trying to add extra years that would cause their membership to expire after “end of 2015”. You may not exceed this two year limit and I have written in previous Sprats that any such payments will not be accepted. You may request a refund (less any costs), otherwise the over payment will be regarded as a donation. Your Sprat wrapper will carry a message if that’s you. You should consider cancelling your standing order payment (for a few years) if you are accumulating years thorough extra payments.

Members also need to check the wrapper for a message about under payment. In 2014 you will only receive this Sprat with an underpayment warning - and then there will be no further magazines until you send the balance.

If you have a DX representative you can pay them, otherwise you will need to pay me in pounds sterling. If you send cash it is at your own risk.

Valve QRP Day November 2013

Colin Turner G3VTT 17 Century Rd. Rainham Gillingham Kent ME8 0BG
g3vtt@aol.com

It was a nice experience to hear the usual valve QRP gang on the bands plus one or two new call signs. I had an e-mail from Eddie GM4EWM who used a 6L6 Colpitts oscillator with just 2 watts output. Although hindered by a contest on 40m he did manage to work ON4MB. Operation here at G3VTT was only on 80m early in the day with the one valve 12A6 transmitter working all of the usual gang. Peter G3JFS had even more luck and tells me *'I cleared the cobwebs from an old single valve crystal controlled transmitter with the intention of making a lot of contacts on Valve Day. Unfortunately fate interfered and I couldn't find my 80m crystal. Luckily I had a plug-in coil and a crystal for 5.262 MHz where I made a couple of enjoyable 2-way QRP contacts with club members. The first contact after sending several CQ calls was with David G0OOG/P located in NW London. David was peaking just over S9 on my S-meter with some slight QSB at times. We had a solid contact lasting from 1541 to 1559 GMT. Some more CQ calls led to a QSO with Allen G0AGC from Market Drayton in Shropshire. Although Allen's signal was not quite so strong at S8 on peaks and suffered somewhat more QSB we had a solid contact from 1600 to 1620 GMT. What a great band this is for inter-G QRP operation. I have had many contacts on 5262 and my 'one-lung' transmitter uses a 5B/254M valve (commonly called a miniature 807) which produces 4 watts output with a 230 volt supply. . It works well on the LF bands but is a bit 'chirpy' on 40m.My very inefficient antenna for 5 MHz was a sloping end fed bit of wire about 50 ft. long fed via a remote Smart Tuner. Not ideal for NVIS and noisy on reception but the stations worked were well over the average noise level of around S6 with a 250 Hz filter in circuit.73Peter G3JFS'*. Peter makes a good point about 5 MHz, no contests, fairly quiet conditions; good inter G propagation and an easy band to get on with simple equipment. In short a QRPers construction heaven. Anybody fancy joining a working group on 5262 KHz? Peter G0KOK said *'I fired up my Drake TR 4CW on Valve Day Sunday in between other duties including making ready radio kit to take to Barbados shortly, first contact was Laurent F5AKI near Reims 439 report, he was thrilled to bits running his home brew TX at 500mW, he sent me an email with a picture of his TX*. Also active was Gerald G3MCK with his co/pa 5 watts transmitter and a letter from G3MYM at the Yeovil Amateur Radio Club tells me they had their usual display of valve equipment. The display included a working FT101ZD, a TS530, Eddystone 888, a KW2000 an R209 and an O-V-2 receiver. From G3TYB, '*I worked seven stations in total one on 60m, and the others on 80m over a day of very spasmodic operating. I did try and listen on 40 but it was too boisterous for the regen receiver so I moved back to quieter regions! The gear was the same as last time but with the 'bulb box' EL91 RX and QQV03/10 TX modified to cover 60m as well as 40 and 80. I also used my vfo TX and supergainer Rx setup on 80 with the 300 ft. long wire antenna. I had high hopes for 60m and there were some good signals there on 5260 but they didn't hear me 2 Kc/s higher however I did work G4ZEN. Skip seemed long to me and the stations I normally hear on 80m at a 100 mile range or so were very weak.'* 73 G3VTT
Next Valve QRP Day SATURDAY April 19th 2014.

Antennas Anecdotes and Awards

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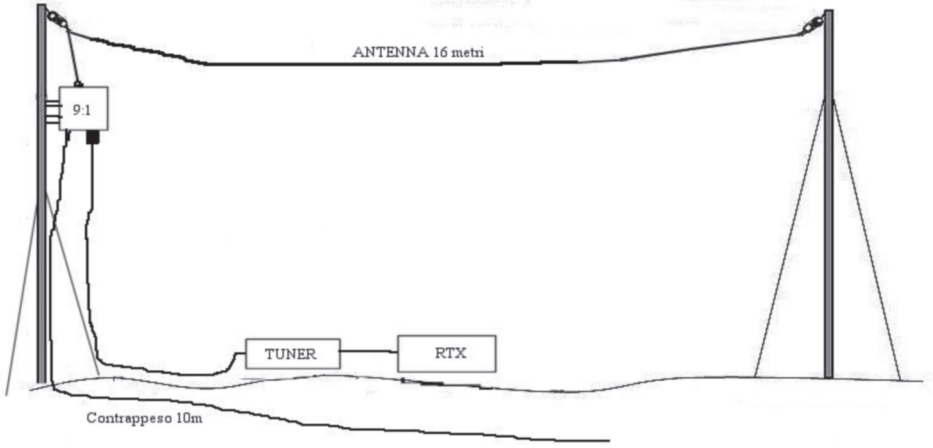
Welcome to the Spring edition of Sprat and AAA. It was a real pleasure to work so many of you on 80 and 40m CW over the Winter Sports period. The main thing I noticed was that each and every QRP operator gave a real meaningful and sensible signal report for each contact and passed actual 'intelligence' about location, name, working conditions and antennas coupled with correct operating procedures and often concluding with a local weather report. Such a change from the usual HF QSO's you hear these days with their split second meaningless '5NN'! See you in the 'Summer Sizzler'? Now on to this seasons topic.

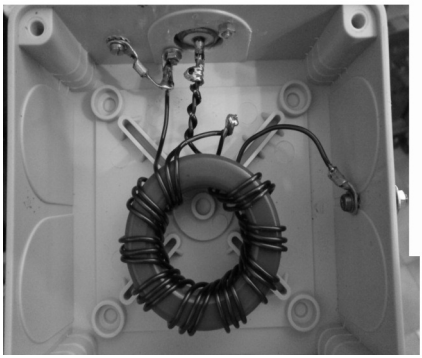
AN END FED HF ANTENNA
by Fabio Bonucci, IK0IXI GQRP # 12095

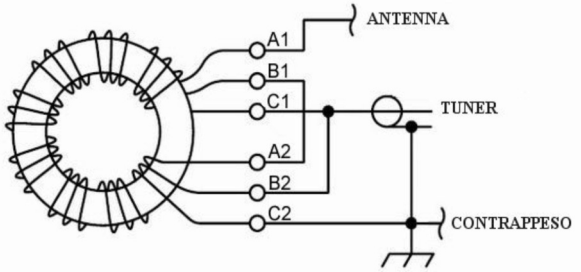
Fabio is our GQRP representative in Italy and is a member of the First Class CW Operators club and has been working portable with this simple arrangement. The overheating of the toroid is mentioned on higher powers (!) no doubt due to the Un-un transformer not being able to convert complex impedance and reactive components but nevertheless Fabio has produced a workable design.……

Last summer I took advantage of the holiday to experience a new antenna. This time I wanted to try an end fed wire antenna 16.2 meters long and coupled by a toroidal transformer using an Un-un 9:1 balun. Reading on the web about its interesting features I wanted to try it on the field. I built the matching transformer in a box used for electrical systems employing the usual T200-2 and an enamelled wire coil consisting of 9 trifilar turns of .8mm copper wire. I then prepared the antenna conductor using 1.5 sq. mm of copper wire of the required length (16.2 m) and two insulators. I made an RF choke consisting of 10 turns of RG58 coax 30cm diameter to prevent any backflow of RF. The principle of operation of this antenna consists of a conductor of appropriate length brought towards resonance and matched to some extent by the broadband lower impedance transformation of the Un-un and with final fine antenna tuning accomplished by the ATU. A conductor of the length above in fact presents a medium impedance of about 450 - 1000 ohms on many amateur radio bands and the 9:1 transformer can lower it by a factor of 9 times. The tuner allows you to find the exact match at the frequency of interest. Thanks to the low losses this radiator is able to maintain an excellent efficiency over a broad spectrum and provides an antenna efficiently performing on a number of different bands. For small spaces or for "stealth" activities I think there are a few antennas better than this. In fact I have to say that the antenna worked so well when installed it immediately giving the feeling of being fairly efficient. Using a Tuner MFJ 971 I found many match points on all bands with a SWR that never exceeds 1: 1.5. The antenna is able to operate well on 40m/30m/20m and 17m where I made several QRP QSOs. Unlike some articles found on the web I found the need to connect a counterpoise when using QRO. In fact I noticed that after a few minutes of CW transmission at about 50W the SWR increase significantly but adding a counterpoise connected to the ground of the toroid, about 10m long, the SWR

remained stable even after long periods of transmission. Probably if you use the antenna for DX or for short QSOs this effect is not evident but since I am a "talker" in CW things change. I came to the conclusion that the toroid cannot manage high continuous RF which leads him to overheating while adding the counterpoise allows the removal of such stray RF preventing this problem. The presence of an RF choke avoids that RF finding its way back to the transmitter so that the counterpoise is needed as an escape route. If there were no RF choke the RF would find the shield of the RG58 cable as low impedance path thus creating interference or further malfunction. Thanks to the RF choke I have not suffered any return of RF interference and no TVI. I always get good signal reception and formidable reports on transmit despite the antenna having been installed no more than 3 meters above the ground and under dense vegetation consisting of tall trees. The usual contacts with friends on 40m CW are always received well and I have had long QSOs with excellent stability at all hours. Even on 20m DX I cannot complain with several overseas stations on the log including CO2IR from Cuba. I found it a very viable antenna both for national traffic on 40m and that international DX 72 **Fabio IK0IXI**







Thanks to Fabio for such a useful antenna for both field and home use. The G6RV antenna from G3ORP was featured last quarter and I finally got

around to producing the antenna change over arrangements converting it from doublet to a tee arrangement for 160m. You could use three poles, check out the right hand capacitor, but with four pole changeover this is a neat and fool proof arrangement.

The G6RV LF/HF Antenna Change Over System from G3ORP

As promised last issue here is the changeover system for the G6RV antenna when switching from HF operation to LF operation on 160m or 472 KHz. The switchbox uses a four pole heavy duty relay and in the diagram all four poles are used. The diagram shows the system in the energised position with the series feed line capacitors in circuit and the coax directly connected to the 300 ohm ribbon feeder. When the relay is de-energised the feed line is shorted together converting the G6RV to a Tee antenna and the coax braid is connected to the ground system, (*try and make it a decent system using radial wires and earth stakes and not a toasting fork in a bucket*!), and the 330 pfd capacitors shorted out. You can of course wire the relay so it works in reverse and is on HF when de-energised. So here is yet another project for a rainy Saturday afternoon you can make in a plastic box. A couple of wires or even a single wire and the coax braid as return feed will permit the relay to be switch from the shack.

Loop Antenna Notes by G4XEC

Laurie has written to me about using regular domestic radio double gang tuning capacitors for resonating transmitting loop antennas. I can testify to Laurie's suggestion having used the same arrangement for loop as a beach antenna with a dual 500 pfd variable. Take a look at the first AAA I produced.

Having become aware of an important detail relating to magnetic loop antenna construction and have since implemented it perhaps you might consider it a useful item for the antenna section of Sprat. Magnetic loop antennas generate high voltages at the variable capacitor which, if a single gang, pass through the greased ball-bearings thus causing a

high resistance loss. The loss would not occur with a differential (or butterfly) capacitor although these are not easily available. The same effect can be achieved, certainly at QRP power levels, by using a standard twin-gang metal capacitor such as in a domestic radio receiver and connecting each end of the loop to the stator connections. Matching, as with a differential capacitor, occurs by turning the electrically isolated rotor thus avoiding losses in an otherwise effective antenna.**G4XEC.**

Awards

Congratulations to Karolj YU7AE for obtaining the 'QRP Masters QRP Award' No 151. This is a fine result after many years of hard work.

Just give it a try!

Hopefully by the time you read this the weather will have started to warm up and there will be improved conditions on the LF and HF bands. I've been experimenting with coax fed Windom antennas using a 4: 1 balun and a half wave on 80m with the coax fed off centre. The antenna, as predicted, gave a reasonable match on all of the regular HF bands and a match of sorts easily tuned by the antenna tuner on 30m. This antenna was at 30 feet. I then tried a half wave on 160m with the ends bent around the fence at the same height just to make it cover one extra band and got a reasonable match, 2:1 on 160m. I know the antenna is too low and I am 'listening to the sky', as somebody once said, but at least I have some operational capability on 160 and will be able to work around Europe and locally. What is the point of telling you this? Well I wanted to encourage just getting out there and experimenting. Although the theory may point to failure you may be surprised with acceptable results.

Valve QRP Day April 19th 2014

The next Valve QRP Day will be on Easter Saturday 2014, (gracious me, almost exactly 50 years after Radio Caroline first came on the air in 1964 so the better the day the better the deed), and will last all day on all QRP frequencies. Use any valve (tube) equipment you have at QRP levels on any mode and let me have a short report as soon as possible after the event. I can accept some photographs by e-mail. There are plenty of designs available for this old style equipment both in recent and forthcoming issues of Sprat and the internet provides both circuits and components. Most activity tends to be on 80 and 40m although I have worked one or two of the QRP gang on 60m using single valve transmitters. Reach out for the safe reality of the past and have some fun with us but watch out for the high voltages! Nothing beats communication across a country or two or even an ocean with a transmitter or receiver you made with your own hands.

I have a number of articles waiting for publishing or artwork in the pipeline but I'm always pleased to hear from you with your ideas. **72 Colin G3VTT**

'Doris' the black cat has been helping me hang up a Windom antenna for 160m!

COMMUNICATIONS AND CONTESTS

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G QRP Club Winter Sports

The G QRP Club Winter Sports is one of the most popular QRP operating events. Each year between Boxing Day (December 26th) and New Year's Day (January 1st) the club invites any operators to join in a QRP "QSO Party" using 5 watts of RF output or less. The operating takes place on and around the International QRP Calling Frequencies.
These are : CW: 1843, 3560, 7030, 10116, 14060, 18096, 21060, 24906, 28060
SSB: 3690, 7090, 14285, 21285, 18130, 24950, 28360 kHz

Thanks to all for all of the entries both online (especially some DX like W3TS, OK2BMA, PA9RZ and DM4EA) and post entries DM4EA (nice postcard/qsl card tnx), G3JFS, G3MCK, GM0NTR, G3JNB. I'll return these to you shortly. Please let me know if you think I have missed you.

Quite a few of you worked W1AW/4. There were 34 DXCC worked by everyone not bad for a week's part time operating. The total was just over 2,500 qso altogether, those that were active on 3 or more bands averaged 9 DXCC, I quickly counted about 400 unique calls in all. Some said activity was down on last year but it seems that activity was spread across the bands. I might do some further analysis. No data mode entries. I didn't see any 4m qso, plenty on 2m FM (No 2m or 10mAM).

The entrant that wins the G4DQP Trophy is Victor G3JNB with a truly amazing effort this year working all bands 80m to 10m and had a lot of 2xqrp and some nice DX in there too. Well done Victor. In his entry he let me know he worked with 5 watts of CW with his FT817 to a 25' high , 97' half sloper, right angled doublet (so it really was a case of fitting a compromise antenna into a tiny plot, M1KTA).

I noted that the bands were very busy especially on the 27th December and this year I heard a lot of familiar stations every day during the winter contest. The advice that if the qrp CoA frequency is busy spread out a bit seems to have worked and most said it worked well but meant crystal bound operators might have been a little restricted. I note G3VTT was chirping away with his crystal TX and appeared in a few logs. It was nice to see some 160m, 17m, 12m and 10m qso in the logs as well and generally most entrants managed qso on 3 or 4 bands, the most popular bands were 40m and 80m. The most favourite antenna amongst entrants seems to be the EFHW, I note that SotaBeams (G3CWI) recently published a survey about popular antennas used /P by qrp enthusiasts where this also came out on top. About 60% of recorded qso this time were with other G-QRP members.

A general comment was made that the majority of QSO were 'proper contacts' not 599 rubber stamp with the exchange of real information: name, qth, rig, antenna type etc. some went a lot further and logged local weather reports and station details.

CHEMLESLY TROPHY
As you might expect there was a very high calibre of entry to this award. Everyone that entered said condition on 12m and 10m improved a lot towards the end of the year Thanks for all the entries. The winner with the most DXCC in 2013 was Dave G3YMC who managed 150 QRP DXCC in 2013, quite an accomplishment Dave. His antennas were Butternut HF2V used as base loaded 160m vertical (January) and 15m ¾ wave, 30m sloping dipole, a 75ft long wire and a 10m vertical dipole he operates with 5W so it shows what is possible all from an inland site.

Summary:

Band 160m, 80m, 40m, 30m, 20m, 17m, 15m, 12m, 10m, All bands

DXCC 25, 52, 86, 67, 75, 78, 117, 76, 84, 681

Total qualifying QSOs: 3601

Total DXCC countries worked: 150

RSGB Spectrum Forum
Nothing to report.

New Prizes
Towards the end of 2013 George (G3RJV) was sent a couple of EGV-40 kits from Javier Solans EA3GCY from the EA QRP club, these he sent over in memory of his friend Miguel Montilla EA3EGV and these will be awarded to G-QRP members at Rishworth. (You do not have to be there to win one). George talked about these in his RadCom column recently.
There are two of them so that means two possible prizes, and so there will be two contests:

1. Those G-QRP members that manage the most contacts within the EA DXCC in the period 1st March to 30th September.
2. Those G-QRP members that manage the most contacts with DXCC outside EA in the period 1st March to 30th September.

General rules similar to the G-QRP Winter sports, basically any band or mode my be used as long as it is radio and 5W or less. Members from inside EA can only enter for the second category. Please submit logs to me BEFORE 1st October 2014.

Poll 2014
I will send a link to the G-QRP email list shortly.

MEMBERS' NEWS

by Chris Page, G4BUE

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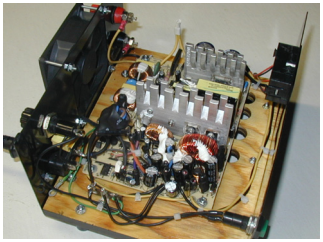
Contests are a great way to increase your DXCC and band slots and the CQWW CW Contest at the end of November is one of my favourites with its QRP sections. Using his 1W into a 33.5 inches loop on 15m, **GØUCP** reached five continents in the contest, the best DX being **FY5FY**, and **CO2JR** entered the QRP Section but doesn't give his score, etc. **G3YMC** made a "fairly serious" entry with 965 QSOs in 77 DXCC, just failing to miss his target of 1k QSOs! Dave says, "Although conditions were good they were far down on what they had been earlier in the week as a solar stream passed the earth and the K index was up to 3 on Saturday, as well as the sunspot count, and hence solar flux dropping significantly from what it had been. I had been looking forward to spending most of my time on 10m but that was disappointing with only 107 QSOs. Lots of Caribbean DXpeditions and the best DX was probably the JA on 20m, although a few W6 and VE7 stations may qualify. My all-time QRP DXCC is now 249". **GW4EVX** also took part with 5W from his IC-7000 and a homebrew rotary dipole at 27ft for a 15m non-assisted entry. Ron made 179 QSOs and 57 DXCC, including PJ4, PY, 4Z, JA and 22 USA States. He says, "Very enjoyable but I wish some of the stations calling CQ would slow down a little, my hearing/brain can't cope very well with machine gun morse!". Ron also entered the CQ 160 Meter CW Contest in January and doubled his 2013 score to make 120 QSOs for 32 DXCC (best DX **VY2ZM**) with 5W from an IC-7000 into an inverted L. Ron's antenna is based on the design of **G4ERZ/G3YCC** and has a helically wound vertical section of about 70 feet of wire and about 60 feet in the horizontal part to resonate it. The vertical part is about 24 feet high and should ideally be much higher, but he says it works in a fashion! Ron gets a useable bandwidth of about 70kHz but needs to improve on the earth/radial system. It is not a permanent antenna; he just puts it up for the 160m contests in the winter. **M1KTA** made 56 QRP QSOs in the first two hours of the AFS Contest in January with an inverted vee and vertical.

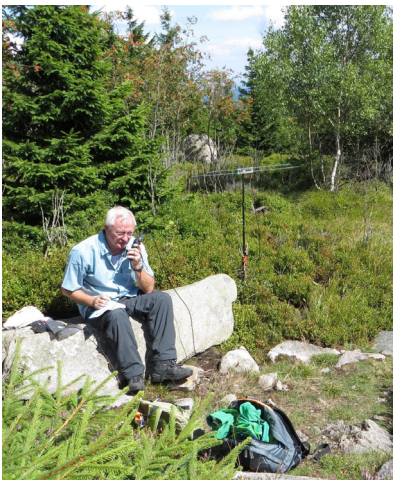


Right is the power supply completed by **AA2JZ** in November, a re-used ATX computer power supply, 14A at 12VDC. Carl made the cabinet and bought the meter for $5 from eBay (an automotive battery charge indicator) and says it works just great with his IC-7000. **G4YVM** has been repairing an early FT101 that has been in store for 20 years. He eventually got it working and it runs 10W CW very pleasantly, although it will run about 120W. Chris has also been building the protoype Andover Radio Club's kit multi-band HF TCVR and helping (or hindering!) his son **M6YVM** build his JJJ Electronics 40m TCVR, which he has made a cracking job of and hopes to be QRV on CW when it is boxed. Chris has just filled his first log book after 21 years and noted the first entry in it was a CW ragchew with **GØTBJ** running 1W with a homebrew Lake.

The front cover of the February 2014 edition of *Radioaficionados* (right), the magazine of URE, the national club of Spain, featuring the presentation on QRP and kit building that **EA2SN** made to over 100 people at the Spanish National Convention on 7 December. The cover shows a Genesis G59 SDR, a Japanese SDR, the ATS and a glimpse of the MBDC transceiver from **KD1JV**, information on the Retex kits and a picture of a Buildathon. **IKØIXI** sometimes uses old equipment and on 5 January he made two QRP QSOs using a homemade 5W crystal TX on 7030kHz, receiving with a Hallicrafters S-39 Sky Ranger. Fabio says the receiver is an old 'portable' receiver made in 1944 for the US Army (military code R-80) and works fine after being

restored, especially receiving AM. He says, "I use a Hallicrafters S-20R as well. I have just purchased a Collins 75A-2 and a Hallicrafters SX-25, both shipped from USA".

Top right is **G4AFU** on the beach at Spurn Head on the east coast on 4 September running 5W with his KX3 to a SOTA band hopper, inverted vee fashion, and 20ft fishing pole support. Paul had the beach to himself and between 1820 and 1920z made CW QSOs with **2EØHVA**, **SM4BNZ**, **GMØHKS**, **SM5BOH**, **PA3HK** and **G4LFU** on 40m and **EIØCZ** on 30m. The following day he QSOd **EI5IX** and **DL7VDK/P** on 40m CW. **DL2BQD** was QRV on 2m SOTA from the cliffs in the Harz mountains, 2950 feet high (below right), and this year will be SOTA with a Wilderness SST20 and an 'Up & Outer' antenna.



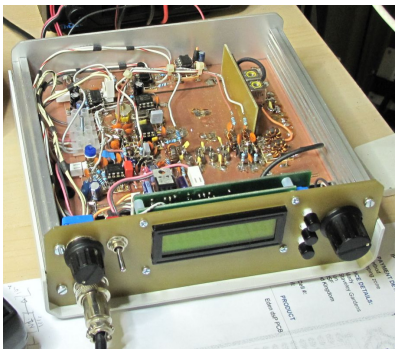
While sorting out a case for his latest project, **MW1LCR** came up against the perennial problem of lettering. Adrian found water slide transfer paper to print your own transfers (and lettering etc) that work really well. You design your labels and lettering using a WP on your PC, print on the special paper and apply in the usual water-slide Airfix kit manner to a non-porous surface (in his case painted aluminum). He got his paper from <http://www.craftycomputerpaper.co.uk/.-Laser-Water-Slide-Decal-Paper_155.htm>.

G3JNB 'poured' 5W from his FT-817 into a decidely 'wonky' 25ft high antenna, over Christmas to work **KH6NB** in Hawaii on 20m for a 539 report, and broke the pile-ups for the ARRL's **W1AW/4** on 10 and 12m. **WB3AAL** called CQ on 21060kHz on 25 December and had a very nice 15 minute chat with **GØHUZ**, both running 5W into beams, Ron's at 33ft and Tony's at 30ft. Ron says, "The best part of all is we exchanged our G-QRP numbers. Christmas Day is complete!". **M3KXZ** QSOd **FK8CE** on 17m CW on 27 December from the Brighton cliffs with his 5W into the 10ft whip antenna, for a new DXCC.

The Sudden 40m RX, TX and ATU kits recenty built by **G3ICO** (left) who claims two international QSOs with them, well GI and F, but George says it is a challenge with a crystal control TX and a 'wide open' RX, like going back to his early days on the air in 1952! His log shows **GIØRQK**, **MØSTN**, **G4EBO**, **G4KLE**, **F6HCC** so far, all with the TX 'flat out' at 2W to his 2 x 66ft doublet. **G4KRN** will be retiring this year and hopes to be more active on the QRP frequencies with some of the classic QRP circuits. Alan is busy looking through his 30 years of *SPRAT* issues trying to decide which ones to build first.

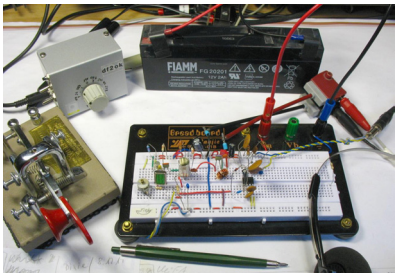
Right is Sacrow church near Potsdam, Germany that **DM4EA** and **DL2BQD** visited recently. Dieter says, "It is worth a visit! The tower marks the site where Professor Slaby made his telegraph experiments and is a remarkable place for radio amateurs", see <http://www.radiomuseum.org/forum/telefunken_gedenktafel_sakrower_heilandskirche.html>. Dieter says, "Tom used a tiny converter to receive the signals of Grimeton successfully (far right). Even if the first words of the messages were missed due to a tiny fault on the sender's side, the signals could surprisingly be received with only a short piece of wire".

After recent postings on the G-QRP Reflector about older valve equipment, **GØNSL** says those interested might find the valve section etc of this website interesting, <http://www.listenersguide.org.uk/swl/list/?section=Leaflets>. **G4WIF** has bought the *SPRAT* index up to date (issues 1 to 157) and it can be downloaded from <http://www.gqrp.com/spratindex.xls>. Tony says it is in a format that either *Excel* or *Open Office* can handle and probably other spreadsheets can open it too. **F5VLF** asks if anyone has experience of using a small radio controlled helicopter, drone, etc for placing a very light line (eg fishing line) over a house or a tree as a first stage to installing a wire antenna? **G4FDC** says the 2013 bi-annual Slovak QRP Rally was held on 18 May attended by 97 QRPers from OK, SP, HA and UR as well as the Slovakians. There were talks and video presentations, including three about SOTA, and lots of home-brew equipment on show. Alex says the next rally is in 2015 at Vrutky. Writing on 25 December, **G3CWI** says, "I have put a little Christmas present on my web-site. It is a dipole optimiser application that makes adjusting dipoles, linked dipoles and quarter-wave verticals really easy! Richard's web-site is at <http://www.sotabeams.co.uk/downloads/>.



Right is the 5W homebrew SSB transceiver used by **G4GXO** on 60m. It is based on the Eden-9 design, originally built as a 4m transceiver, and modified by Ron for 60m to allow him to join the weekly UMIST net held on 5278.5kHz at 1700z on Fridays. The transceiver IF system was described in *SPRAT* 144 and uses a simple Si570 to allow it to be be easily converted for HF or VHF use. Ron uses a 'stealth' antenna comprising a length of wire run behind the ground floor gutter at the front of his house and tuned against a counterpoise by an automatic tuner hidden in the garage. The arrangement also allows operation from 40m to 10m and is a good solution for those faced with difficulties or restrictions in putting up visible antennas. **G3XGY** thinks 5262kHz is a good QRP calling frequency, but says one should not be afraid of also calling on 5260kHz as stations there often also use low power. Using his **GA4XQJ** callsign, **GM4XQJ** says the 5262kHz QRP calling frequency has been working fine while 5405kHz has given him QSOs with **4X1MK**, **4X4DK**, **5P5Q**, **CU3AK**, **LZ1LZ**, **OU5U**, **OK1FZM**, **OK1HAS**, **OZ9XU** and **VO1NA**. Brian eventually managed to QSO **FT5ZM** on 15m CW and found it, "very hard going indeed". Your scribe also QSOd **FT5XM**, but on 12m, for a new QRP DXCC. **GØIAX** has been having a, "whale of a time" on 10m working into Asiatic Russia, VE and CO with 10W or less SSB. Richard QSOd **9K2/SP4R** on 17 February for a 599 report, reduced power to 5W and still got 599"

When **G3MFJ** made a plea a few issues back in *SPRAT* for members to run a stall at their local rally, he received a few answers. The first was from **G7ENA** pictured right at the Horncastle Rally in Lincolnshire on 26 January. Graham says Daphne had great success - a few new members and over £100 worth of club sales stuff he had sent her. Due to a family bereavement, **GM4VKI** is unable to organise a Highland Gathering in Aviemore this year but will try next year. Roy will have the G-QRP stand at the Norbreck Rally on 6 April. The next Scottish rally is at Livingston on 7 June followed by Crianlarich and Galashiels (dates to be arranged).



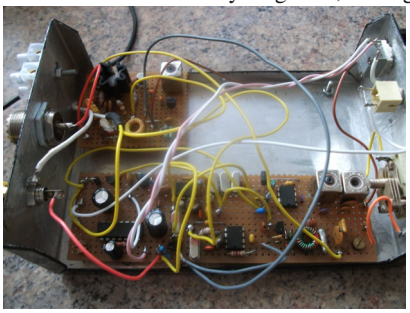
A young local amateur had trouble building a 20m Pixie and **DF2OK** decided to use his breadboard to see what the problems might be (right). After some 'squeezing and mods', Michael got 400mW of HF and a 'bullet proof' RX, and then wanted to try it on the air. He called CQ and **IK5XCT** replied, running 5W, and gave a 599 report. Stefano was very strong and Michael thought, "Wow, that's fun!". He tried the Pixie again on 14 December and QSOd **GWØHUN**. **GØKJN** completed the Limerick Sudden Z match ATU kit and extended the antenna to 98ft and 8ft high resulting in improved reception. John will only be able to fully prove the ATU kit when he builds the Limerick Sudden 30m TX kit.

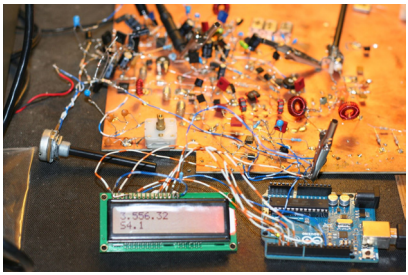
G3KJX will be QRV for six weeks from mid-March from Portugal. Brian says his September trip to CT was, "Very poor radio wise with only the odd G station and GM noticeable by it's absence. However

my time wasn't wasted - I played with antennas, an end-fed vertical but only on receive, but I intend to transmit this time". Brian has been QRV on 60m and found the band very pleasant to use. He has built a K4el keyer, although a type D key is his favourite. **IKØIXI** will be QRV 27 April/3 May on the northern shore of Lake Trasimeno in central Italy with homebrewed rigs and a FT-857D, mostly on 40m QRP and some ragchewing. Fabio's antenna will be a half-wave end-fed. **M1KTA** was due to be QRV 27 February/10 March as **C5/M1KTA** with his KX3 and vertical dipoles for 20-10m.

Pictured right is the prototype 'Keyer Driven, Iambic Straight Key' built by **MWØGMH** over the last year. Owen says, "All I've really done is to separate the knob into a knob and skirt, the knob creates the dits and the skirt the dahs. It can also be used as a traditional straight key. I would be interested in what other members think - I might be persuaded to make some more". **N2CQR** had such a good time building his 17m BITX that he has built a second BITX, this one a dual-bander for 20 and 40m. Bill says members should give SSB QRP a try, and a homebrew BITX is a great way to do so. **G3XGY**'s Christmas present was an Open QRP kit for 40m causing him to relearn his soldering techniques. Brian says Kanga and others helped one small problem of drift. The set is easy to use with plenty of options and he is now relearning how to use the bug-key.

GØNSL says, "Occasionally a query gets posted as to the origins of the term '72' versus '73' we use, I found this article of interest on the general subject, at <http://www.signalharbor.com/73.html>. **UA3LMR/RD2A** adds it was first mentioned in *SPRAT* 68 see <qrp.ru/images/museum/u-qrp/Sprat68-2.gif>. **IZ5ZCO** has opened a new forum for those who love QRP at <http://www.qrpclub.org/qrp> and Nicola hopes members will sign up. Our sympathy to **EI/MØNJP** who, with his wife while lying in bed during the night of 4 December, thought they heard intruders. Not seeing anything they went back to sleep and the following morning woke to find they had had an intruder! Nick says, "Some angry Irish giant had visited and ripped up the large tree holding one end of my dipole and thrown it into next door's field, together with the wire, half the feeder and the middle support. The other support, an ex-army metal telescopic mast, was still standing because the piece of wet string joining my military mast to the Clansman military dipole wire had parted like a piece of wet string, thank goodness, acting like a mechanical fuse. The violence also took out my long-wire, leaving me without any amateur-band radiator".





GØEBQ reports, "Bit of a disaster! I turned on the Cub for the Winter Sports and it didn't work! An IC had blown, a quick email to **G3MFJ** and a replacement arrived in the usual efficient manner. It was fixed but not in time for the Winter Sports". Nigel was forced to dig out an old DC rig from his 'early period', at least 25 years old, and had many QRP QSOs around Europe with it on 20m, finding it 'interesting' without any offset or sidetone. Left is Nigel's Ugly 17m rig which is now working, although he needs to iron out a couple of bugs with it.

MØVVC writes, "Many thanks to all, past and present, who have contributed to *SPRAT* and the G-QRP Club. Without your contributions and inspirations I would have had a much more difficult time starting and completing my very first radio receiver. I have always wanted to build my own receiver, and I've done it with your help - thank you!**".** Matt's Kennet receiver is pictured left and he recently added a simple AGC circuit, RF gain control and an IF amplifier after the crystal filter to increase sensitivity. Matt was kindly loaned an Arduino Uno that he has interfaced to the board to give him frequency and signal strength readout and was so impressed with it that he bought the Arduino Leonardo and a couple of backlit LCDs.

Thanks to all the contributors to this column. Please let me know how your spring goes for the summer edition of *SPRAT*, in particular what you have been building, who you have been working, and any other information, news, ideas, suggestions or opinions about QRP, by 10 May. Also interesting photographs 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 photograph to let other members know what you look like! Let me know if you intend operating from somewhere other than home during the summer and autumn, so I can let members know to listen out for you.

QSL Cards from Nasko - LZ1 YE

LZ1YE has sent me details of some attractive QSL cards including the Club Log.
Members can make their orders by sending samples, explaining what they want to print, and sending the materials: photos, files...etc via e-mail: qsl@qslprint.com or qsl@kz.orbitel.bg or if no internet access via the postal address: Atanas Kolev, P.O.Box 49, 6100 Kazanlak, Bulgaria. Examples of cards and prices can be seen at **www.qslprint.com**
For people need QSL cards urgently LZ1YE dispatches three days after the payment is made. UK Members can pay via a UK address: Please send your cheque / cash via recorded delivery to: LZ1YE QSP Print service, c/o Melanie Rowe, St. Leonards House, 35 St. Leonards Road, Exeter, EX2 – 4LR, Devon. e-mail: m0mja@aol.com (make cheques payable to : Melanie Rowe)

Look at 'www.celticpilgrim.com' for
Amateur Radio in a Lovely Place

G3RJV has a Wooden Lodge situated in the Dyfi Valley in central Wales close to the Irish Sea and in the Snowdonia National Park. It has been completely refurbished with a large living area, conservatory, double bedroom, twin bedroom and a double bed sofa in the living area. Naturally there is a small amateur radio station with a QRP HF transceiver and a 2m multimode. An easy to use station in a quiet location.

Look on the webpage above or for leaflet write to G3RJV or email g3rjv@gqrp.co.uk

GQRP Club Sales

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

Antenna Handbook – 2nd edition – members £6.00, non-members £10.00 plus post } £2.00 (UK) or £5.50 EU
Radio Projects volumes 1, 2, 3 & 4 – by Drew Diamond – members £5, non-members £10 } or £7.50 DX per book

6 pole 9MHz SSB crystal filter (2.2kHz) £12 plus post (max of one) } £3.00 (UK); or
Polyvaricon capacitors – 2 gang (A = 8 to 140pF, O = 6 to 60pF) c/w shaft extension & mtg screws - **£1.40 each** } £2.50p (EU); or
– 2 gang – (both 8 to 295pF) c/w shaft extension & mounting screws - **£1.40 each** } £3.80p (DX)

Pair 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, } plus postage
7.028, 7,030*, 7.040, 7.0475, 7.122, 10.106, 10.116*, 14,060*, 18.086, 18.096, } (ANY quantity)
21.060, 24,906, & 28,060 all are **£2.00 each** (* = also available in low profile HC49/S) } £1.20 (UK), or
HC49U crystals- 1.8432, 3.500, 5.262, 7.00, 7.159, 10.006, 10.111, 14.00MHz – **50p each** } £2.60p EU, or
HC49U crystals – 2.00, 3.00, 3.20, 3.579, 3.5756, 3.5820, 3.6864, 4.0, 4.096MHz } £3.80p (DX)
4.1943, 4.433, 4.5, 5.0, 6.0, 7.2, 7.6. 8.0, 9.0, 10.0, 11.0, 12.0, 13.50, 15.0, 16.0, 20.0, }
24.0, 25.0, 26.0, 27.0, 28.0, 32.0MHz – **all 35p each** (Some of these are low profile types) } Post free
14.070MHz – 20m PSK – set of 3 crystals - **£2.55** } if ordered with
Ceramic resonators – 455, 480kHz, 2.0, 3.58, 3.68, 4.00, 14.32 & 20.00MHz – **50p each** } with heavier
Diodes - Schottky signal diode – 1N5711- 20p each; 1N4148 GP Si – 10 for 10p } things
Varicap diode – **MVAM109** – 40pF @ 9v, 500pF @ 1v. **50p each** } max of 2 } like binders, toroids
SA602AN - £1.50 (note – I may supply NE or SA, 602 or 612 as available. All are fully interchangeable. } polyvaricons
MC1350 - £2.00 These are getting in short supply now so max of 2 per member } or filters
LM386N-1 - 4 to 15v, 300mW, 8pin **DIL - £0.40, LM386M-1 SMD – 35p** } Use just
TDA7052A - 4.5 to 18v, 1W 8pin **DIL** low noise & DC vol control – **£0.60 each** } that postage
TA-7642 Radio IC – direct equivalent of **MK484** (& ZN414) – **75p each** } If ordered
2SC536 transistors (npn) fT - 100MHz, hFE-320, VCBO +40V **- 5 for 50p** } with books
MPSH10 transistors (npn) fT - 650MHz, hFE 60, VCEO 25V **- 8p each** } or CDs
2N3904 transistors (npn) fT - 300MHz, hFE-150, VCBO +40V **- 10 for 50p** } add
2N3906 transistors (pnp) fT - 250MHz, hFE-150, VCBO -40V **- 10 for 50p** } this
BC517 Darlington (npn) fT - 200MHz, hFE-30,000, VCBO +40V **- 13p each** } postage
FETs - IRF510 – 50p; 2N3819 - 17p; 2N7000 - 10p; BS170 – 8p - all each } as books
Dual gate MOSFET – BF981 - SOT103 - 1GHz (diode protected gates) **- 85p each** } or CDs
Pad cutters – 2mm shaft – 7mm o/s, 5mm i/s diam – 5mm pad with 1mm gap **£5.75 each** } do not
10K 10mm coils – 0.6uH, 1u2H, 1u7L, 2u6L, 5u3L, 11u0L, 45u0L, 90u0L, 125uL – all 80p each } travel well
Magnet Wire – 18SWG – 2 metres – 60p; 20 & 22 SWG – 3 metres - 60p; } with parts.
24, 25 & 27SWG – 4 metres - 40p; 30, 33 & 35SWG – 5 metres - 30p. }
This is solderable enamel insulated. Max of 3 sizes per member per order } Postage
QRP heatsinks - TO92 – 30p; TO39/TO5 – 40p; TO18/TO72 – 60p (pics in Sprat 148) } as for
Axial lead inductors (they look like fat ¼W resistors) these are low current }
4.7, 6.8, 10, 15, 18, 22, 33, 39, 47, 56, 100, 150, 220 and 1000 - all uH and all 18p each. } components

Toroid Cores – **priced per pack of 5 – max of 2 packs of each per member**
T25-2 – 50p, T25-6 – 60p, T30-2 – 60p; T30-6 – 70p ; T37-2 – 75p; 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 - £2.20; T130-2** - £1.50ea ; T130-6** - £2.00ea. FT37-43 – 80p ;
FT50-43 - £1.20 ; FT37-61 - £1.20 ; FT50-61 - £1.60; FT140-43** - £2.50 ea ; FT140-61** - £2.50; BN43-2402 - £1.20; BN43-202 -
£2.00; BN43-302 - £2.00; BN61-202 - £2.40. Ferrite beads – FB73-101 (3.5mm dia x 3.2mm long, 1.2mm dia hole) – 40p for 5
All toroids are plus postage – up to 5 packs = £1.20 (UK), £2.40 (EU), £3.50 (DX). Each additional 5 packs, please add 50%
** Except ** items – they are heavy and each counts as 2 packs (ask for quote if you want more than 2 of the large toroids)

SBSS PCB clamps – single - £12, two - £20 all plus post (£2.80 UK & EU : DX – order direct from Rex please)
MeSquares & MePads - £6.50 each plus post (£2.80 UK & EU : DX – order direct from Rex please)
Limerick Sudden kits RX & TX both single band (160 through 20m); **ATU** (80 through 10m) **£36.00 each plus post**
UK - £3.00, EU - £5.20, DX - £7.80
Sprat-on-DVD – 1 to 148. Only £4 each to members plus postage, UK - £1.20, EU - £2.60, DX - £3.70
Sprat Binders – nylon string type – Black with club logo on spine -16 issues per binder – **new stock** - £5.00 each plus postage
(one: UK - £1.80, EU – 3.00, DX - £4.00. More - add £1.10, £1.50, £2.50 each)

Cheques (UK) and payable to G-QRP Club. Sorry, but cheques in other currencies are uneconomical to us due to bank exchange charges!

MINIMUM ORDER for cheque or PayPal payments is £5 For orders less than £5 – please use postage stamps (any denomination) - any quantity of stamps is OK, or cash. 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 g3mfj@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 - thanks