# SPRAT

THE JOURNAL OF THE G QRP CLUB

DEVOTED TO LOW POWER COMMUNICATION

ISSUE Nr. 115 | © G-QRP-CLUB | Summer 2003

Tony Fishpool, G4WIF [left] and Graham Firth, G3MFJ [right] are inducted into the "QRP Hall of Fame" by Dick Pascoe, GØBPS

Rochdale Convention ~ Super VXO ~ MARV-1 Transmitter
Ugly Construction Workshop ~ K2 on 5MHz ~ FOXX Double Band
Tuneable Bandpass Filter ~ Cheap QRP Linear ~ Simple Code Key
HW8 Stability Improvement ~ New Life for TS870S ~ Keyer Keying
Antennas-Anecdotes-Awards ~ Communications & Contests News
SSB & Data News ~ Member's News ~ Club Sales

# JOURNAL OF THE G QRP CLUB

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Welcome to SPRAT 115,

This issue was prepared rather hurriedly because I am fortunate enough to be attending two large radio events in the USA this year – the Dayton Hamvention in May and HamCom in Arlington, Texas, at the end of June. Both good events for meeting G QRP Club US members.

The response to the 2003 W1FB Memorial Award has been good, so I hope to include some receivers in the next issue. But keep the articles flowing. SPRAT is all about the exchange of ideas. So let us know what you have been building. We don't ask for full technical articles. I am happy to receive circuits (with values) and brief notes in almost any format. One page and even half page articles are always useful to me when juggling to fit the content into an issue.

I am still looking for some club support for our efforts at the HF Convention on 1st Novermber – see later this issue

Enjoy your summer, 72/3

G3RJV

EDITED BY GEORGE DOBBS G3RJV ARTWORK BY A.W. (MAC) McNEILL G3FCK
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# THE G QRP CLUB
# MINI-CONVENTION
## SATURDAY 11th OCTOBER 2003
### ST. AIDAN'S HALL SUDDEN ROCHDALE
**ADMISSION £1 - DOORS OPEN 10am - TALKIN S22**
**LARGE SOCIAL AREA - LECTURES ON QRP SUBJECTS**
**BRING & BUY - SURPLUS - JUNK - COMPONENTS - KIT TRADERS**
**FOOD & DRINK ALL DAY - INCLUDING THE FAMOUS PIE AND PEAS**


**LOCAL ACCOMMODATION:** The Royal Toby Lodge - Tel: 01706 - 861861.
Oakenrod House : 01706 – 642115 ~ The Norton Grange Hotel : 01706 – 630788
Travel Inn (Rochdale) about 10 min away 01706-299999. www.travelinn.co.uk
Also within close range of the site : Oakenrod House : 01706 - 642115
The Norton Grange Hotel : 01706 - 630788
Couples/families: www.hollingworthlake.com : lakeside guest house - edge of town

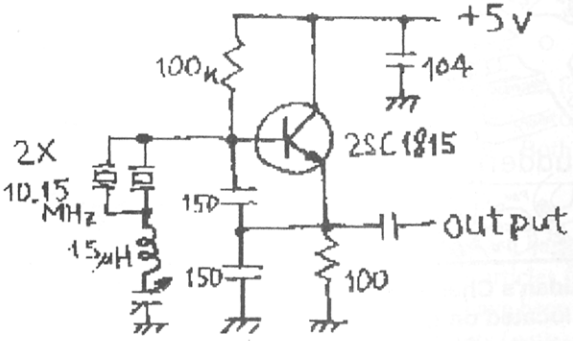
# Results with the Super VXO

**Mike McGrath G8XLC, 28 Wythenshawe Rd. SALE, M33 2JP**

My friend Robin G3RJQ is scratch building a transceiver for 40 metres and needed a stable 16 Mhz vfo. (9Mhz IF). I suggested he might try a VXO using two crystals of identical frequency in parallel. ***See below***. Since only 100 kHz coverage is needed, here are fruits of my labours.

Using a pair of 15 MHz crystals with the component values shown in the Super VXO schematic I obtained 90 kHz stable coverage. I used a BC108C transistor, a green 5-30 pf variable trimmer and 0.25 inch dia polystyrene former with iron dust core 30 turns of 26 swg wire for the inductor with the top of the iron core flush with the top of the former.
At 5 pf frequency = 15.019 MHz
At 30 pf frequency = 14.929 MHz

I think it therefore reasonable to assume a pair of 16.080 MHz crystals would give the 16 to 16.100 frequency coverage required.




An example of super VXO
Drawing by 7N3WVM

**NOTES FROM THE 7N3WVM WEBSITE**

The Super VXO uses two crystals of the identical nominal frequency in parallel instead of a single crystal of a conventional VXO. Nothing else is special. It can pull considerably more frequencies than the conventional one.

The Super VXO was invented and named by **JA0AS(Mr. Shimizu, Silent Key) and JH1FCZ (Mr. Okubo)**. An article on experimental results of the Super VXO first appeared(in Japanese) in the August 1980 issue (Number 64) of "Fancy Crazy Zippy", an HB- and QRP-related periodical magazine published by JH1FCZ. The story of their invention of the Super VXO is reported in a book (written in Japanese) entitled "Textbook for Homebrewing of Electronic Circuits" (the original title is in Japanese.) written by JH1FCZ.

# The MARV-1 Transmitter

**George Burt, GM3OXX, Clunie Lodge, Netherdale,**
**By Turiff, Aberdeenshire AB53 4GN**

Doing another wee job, building a buffer amplifier, I used a MAR6 amplifier driving a 2N4427. It gave 500mW on 28MHz using 1 mW of drive from my main transceiver. The next stage, of course, was to make a wee TTX using a crystal oscillator, MAR6 and power amplifier, all on a blob board.

It gave over a watt on 3.5MHz, but less on other HF bands, but a quick look at other MAR amps showed a MAR11 would do a much better job as it had an output of 50mW. The MAR6 was changed to a MAR11.... Marvellous....lots of RF!

Next a new PCB was made and the power amplifier changed to a 2N3553, a wee bit more rugged.
By taking the RF off the end of the crystal trimmer, the transmitter is so stable when keyed that no pulling or chirp can be noticed on any band to 24MHz. In fact when listening to the spacer it was difficult to tell that the PA was being keyed. Lots of QSOs were had with the TX lying on the bench without a box.

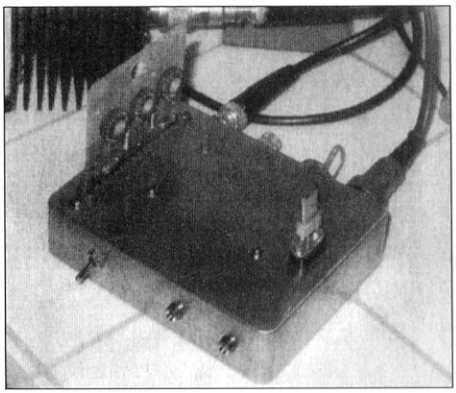
It would be easy to key the crystal oscillator or leave the PA stage connected to the supply line if you wished.
The box has a wee hole drilled in the bottom to allow the trimmer to be adjusted to alter frequency. If you must mount the trimmer on the front panel remember it must be insulated from ground.

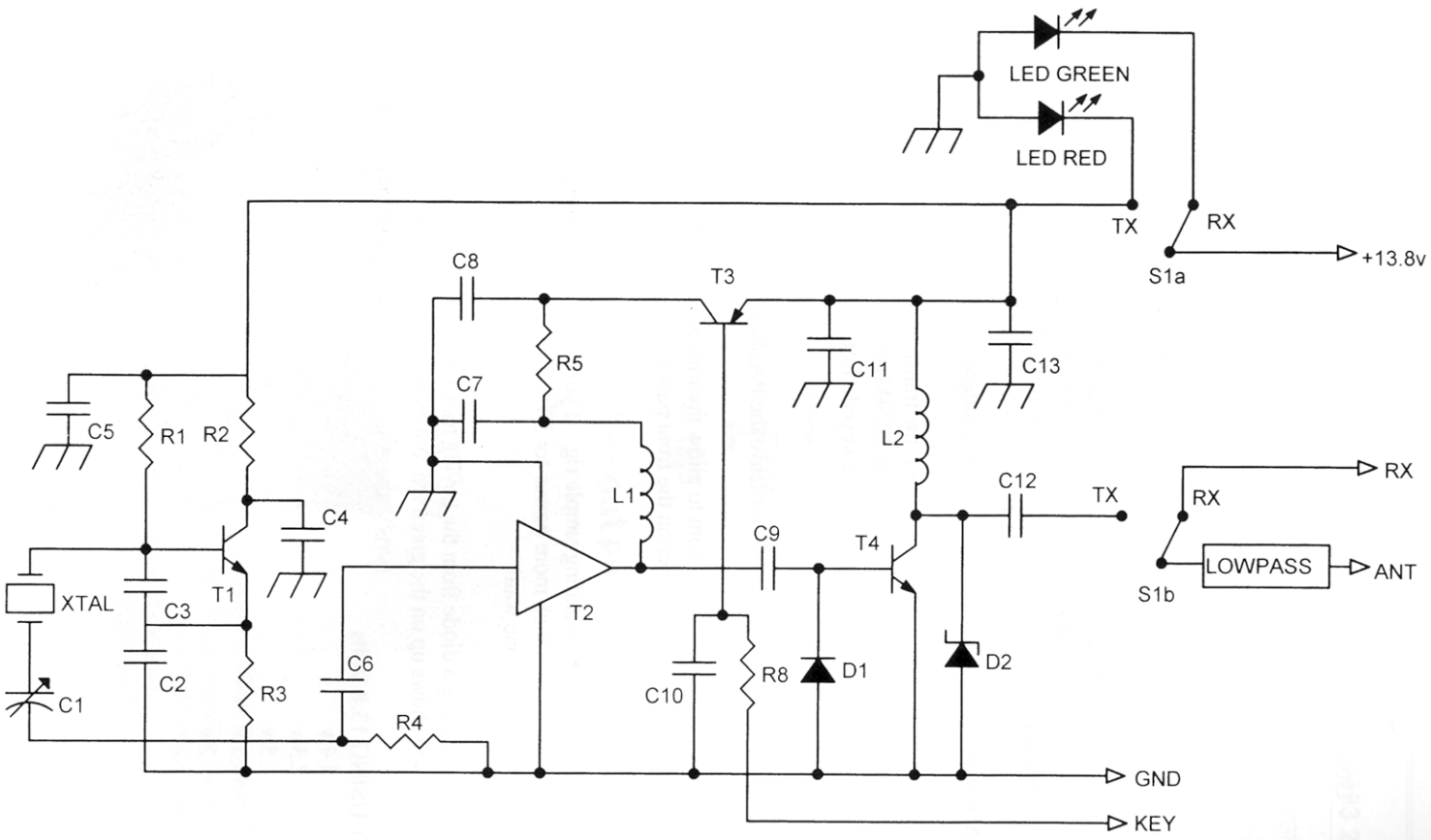
This wee transmitter is a lovely sounding simple rig. If you want more power, there are some hot transistors that would give much more power for 50mW in.
But who needs any more than one watt!

Note...I had a idea of using a diode from the keying transistor to the green led so when you switch over the keying shows up on the green led, but to lazy to take my tx to bits to do it

RF OUTPUT USING 13.8 Volts

| | |
|---|---|
| 3.5MHz | 2.4w |
| 7 MHz | 2.3w |
| 10 MHz | 1.5w |
| 14 MHz | 1.3w |
| 18 MHz | 1.2w |
| 21 MHz | 1w |
| 28 MHz | 1w |



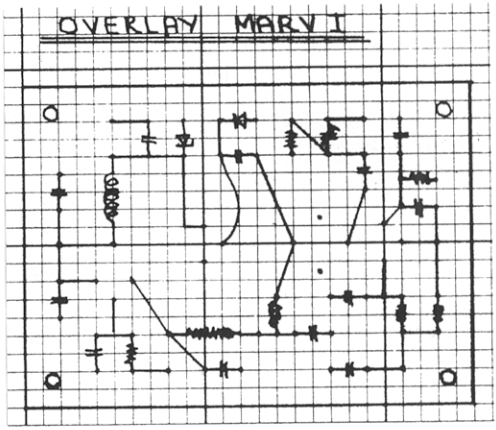

LED GREEN
LED RED
TX
RX
S1a
+13.8v
C8
T3
C7
R5
C11
C13
C5
R1
R2
L2
L1
C12
TX
RX
RX
C4
C9
T4
LOWPASS
ANT
S1b
XTAL
T1
T2
C3
C2
C6
C10
R8
D1
D2
C1
R3
R4
GND
KEY

C1 = 120pF trimmer
C2 - 3 = 100pF
C4 - 12 = 0.1uF
C13 = 150uF

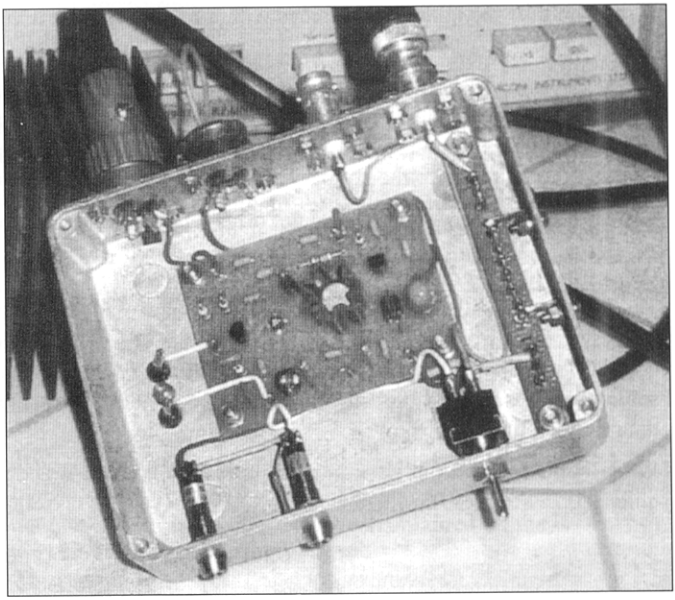
R1 = 33K
R2 = 100
R3 = 1K
R4 = 50 [51]
R5 = 130 + [L1] 21 =150
R6 = 1K

T1 = 2N3904
T2 = MAR-11
T3 = 2N3906
T4 = 2N3553
D1 = Silicon Diode [BAR28 etc]
D2 = Zener Diode BZX85C [30v]
[please do not omit D2]
L1 = 330uH
L2 = 100uH
L2 [homemade] 7 turns 0.4mm on ferrite bead
LED = Red & Green 12v type [inc series resistor]
S1 = DPDT switch
Crystal & Lowpass Filter to suit band

**Hand Drawn PCB Layout Plan**
**From GM3OXX**
not to scale




MAR-11
G.H. Engineering
Data at
www.minikits.com.au



**GM3OXX MARV-1**
**Showing edge connector strip on the right to use plug-in lowpass filters**

# An Ugly Construction Workbench

**Steve Rawlings GW4ALG, 14 The Paddock, Chepstow, NP16 5BW, UK**

## Introduction

I stopped making printed circuit boards (PCBs) a long time ago. Apart from being messy to produce, the 'printed' wiring made it difficult to substitute component types, or modify the basic design. Rather than making it easy to build projects and try different circuits, I found that PCBs hampered experimentation. Eventually, 'ugly construction' became my preferred method for rapidly transferring suggested circuits into working projects.

Although ugly construction is most often used for prototyping, it is also possible to use these same construction techniques to produce the final version; such that projects are assembled quickly; are reliable in use; look good; are easy to maintain; and easy to modify. With care, the finished item really can look very presentable – so good, in fact, that the very term 'ugly construction' becomes a misnomer!

In *SPRAT* Nr 114 (page 20), George Woodworth GW4ZAG described his idea for mounting a piece of copper clad board on tag board to create robust projects having plenty of firm anchor points for lead-out wires etc.. (Copper clad board is the material used for making PCBs, prior to etching away the unwanted areas of copper foil). I am grateful to George for sharing his idea, and it occurred to me that my 'workbench' might also be of interest to other constructors.

## What is 'Ugly Construction'?

Typically, ugly construction involves building circuits above the copper surface of a piece of copper clad board. If using double-sided copper clad board, components are often mounted on both sides. Of course, whether using single or double-sided board, components can still be mounted on both sides of the board to increase the component density. Interconnecting leads and wires may be passed through small holes that have been drilled through the board – but be sure to de-burr the hole on both sides with a few turns from a much larger drill bit.

Most small components will be held in place adequately using only the soldered connections. For some components, such as wire-ended crystals and large ferrite cores, I use double-sided sticky pads; small cable ties; or hot-melt glue to ensure that they remain firmly anchored to the board. Inductors in metal cans (e.g. Toko coils) can be mounted on their side, and their earth tags soldered directly to the copper foil. ICs may be placed upside-down on the foil side.

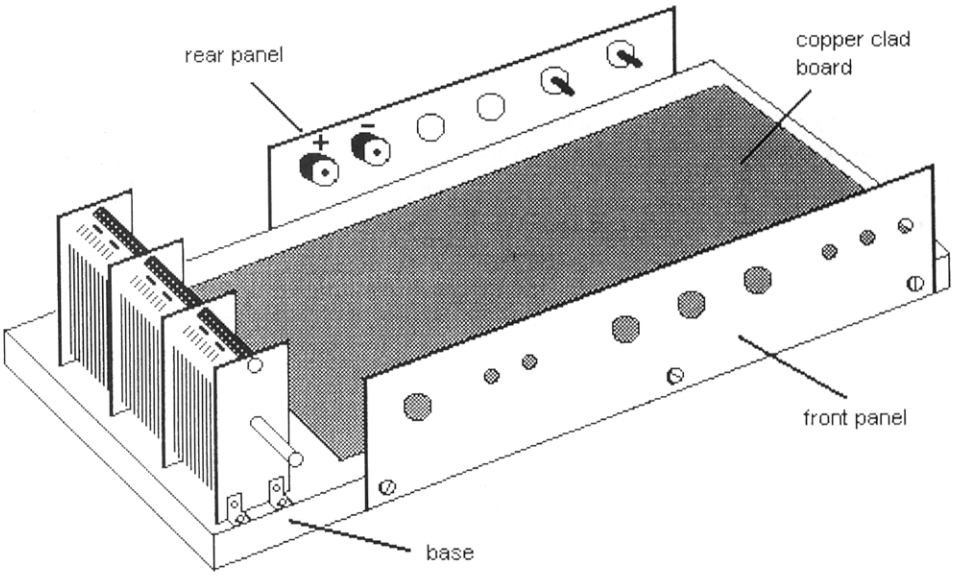
Also, 'walls' of copper clad board are often used to screen one part of the circuit from another.

## Component Placement

The positioning of the components on the board usually follows the layout implied by the suggested circuit diagram, with all earth connections being made directly to the copper foil. It couldn't be easier! Once a few of the components needing an earth connection have been soldered in place, the other interconnecting components are simply soldered 'lead-to-lead' to their neighbours.

When building the final version of a project, it is good practice to crop the component leads quite short to reduce the chance of short circuits, and to save space.

Standoff insulators can be used as anchor points for interconnections with other boards; front panel controls; and equipment sockets. I ran out of standoff insulators many years ago; so, these days, I solder one end of a surplus high value resistor to the foil, and use the other end as a terminal post. I also use high value resistors to provide additional component support by soldering them between the foil and a lead of the component.




The sketch illustrates my ugly construction workbench. The base consists of a piece of white 'melamine' plastic-covered chipboard, measuring 30 x 15 cm. On the left, I have mounted an old three-gang variable capacitor (500pF per gang). A pre-drilled aluminium front panel is mounted along the front edge of the base, which allows for the fitting of potentiometers; variable capacitors; switches; and other controls. Similarly, a back panel is screwed to the rear edge of the base, and fitted with sockets and power connectors. A piece of copper clad board is then polished (using brass polish) before being fitted to the base, foil side uppermost.

This construction aid is large enough for most small projects. For larger projects, simply connect more sheets of copper clad board around the basic workbench. When prototyping my 80 m transceiver, I ended up with about 3000 $cm^2$ (3 sq ft) of ugly construction, and yet the final version of the rig was built 'ugly' style into a case measuring only 17 x 12 x 7 cm.

## Further Information

For general information about ugly construction techniques, see:
http://www.qrp.pops.net/ugly.htm

Those needing help with the construction or use of the *Ugly Construction Workbench* are welcome to write to me, enclosing an SAE. Updates and useful tips from other ugly constructors (and, perhaps, from a few not-so-ugly ones!) will be maintained on the GW4ALG web site at: http://www.alg.demon.co.uk/radio/qrp/ucw.htm

# Using the Elecraft K2 on 5MHz – Part 2

**Dave Sergeant G3YMC, 8 Toll Gardens, Bracknell RG12 9EX**

In SPRAT 114 David Pratt G4DMP explained how to modify the K2 to work as a transceiver on the 60m 5MHz band using a modification from Elecraft in advance of the release of their K60XV option.

At G3YMC I use a separate VXO 5W transmitter similar to the Super 60 which Steve GW4ALG described in SPRAT 113. The receiver is a Datong UC1 Upconverter which produces an output in the 28MHz band. Initial operations were with a Yaesu FT101ZD, but later I used my K2, the UC1 output being connected to its dedicated receive antenna input. With the K2 tuned to 28260 or 28280 this worked well with my two crystal controlled channels.

Recently while browsing the K2 manual I realised I could take this one step further by using the built in transverter functions of the K2. My K2 now reads the correct 5MHz frequencies when operating on the band. This is done as follows:

**Transverter Set-up**

The K2 must have revision 2 firmware or later (all current K2s do)
Tap MENU then tap DISPLAY to select the secondary menu options
Rotate the tuning knob until TRN1 is displayed
Press and hold MENU to select the right hand edit option
Rotate the tuning knob and change OFF to ON
Leaving the setting in the right hand option, press DISPLAY. A set of sub menus is displayed.
Select the various sub menus by repeatedly pressing DISPLAY and set as follows:
RF 5 (for 5MHz)
IF 28MHz (for 28MHz)
OFS 0, or as required (offset, to correct for errors in the transverter reference, +/-9.99kHz)
OUT 1.0 (output power on transmit, not used here. 1W is the minimum, or set to POT)
Press and hold MENU to exit and save the settings
Press MENU again and press DISPLAY to reset to the primary menu options

Rotate the tuning knob until rANT is displayed, hold MENU to select the edit mode, and change OFF to ON. Press MENU twice to exit.

Now you will find you have a new band called TRN1 above 28MHz with the display correctly reading the 5MHz frequencies, and with the receive antenna option selected.

Check the calibration against known signals and adjust the OFS parameter to correct any offset. This feature is very useful in the case of the UC1 as it derives its reference from a 116MHz crystal and it is next to impossible to set this precisely.

If you want to use this method with the Super Sixty note that the output of its receive converter is at 29MHz. It is necessary to set the IF option to 4 (for 4MHz) so that the correct frequency is obtained when the K2 is tuned to 29MHz.

Although I only use the receive side of the K2 in my configuration, it would be perfectly feasible to feed its RF output to an external transmit converter, so making a full transverter. However my interests are only CW and the idea of using a separate QRP VXO rig seemed to be more in keeping with the aims of GQRP. Certainly it has given me much pleasure. It was

also a nice surprise to receive quite a few 599X reports, something one rarely gets these days from commercial rigs!

Note that in my set-up there is no muting of the K2 during transmit, and I use the transmit signal for sidetone. The K2 is quite happy listening directly to my transmit signal. In the case of any overload effects Elecraft have a modification to help – solder two back to back 1N4148 diodes between pins 4 and 6 of the MC1350 IF amplifier U12.

Details of my 5MHz transmitter, and other information about the band, can be found on my website – http://www.dsergeant.btinternet.co.uk/dsergeant/fivemegs/fivemegs.htm

## Notes on the SM3CLA RF CW Monitor [SPRAT 114]

**Ha-Jo Brandt DJ1ZB, Eichenweg 7, D-84160 FRONTENHAUSEN, GERMANY**

The circuit of the CW Monitor on page 17 contributed by SM3CLA, in spite of being 20 years old, demonstrating that this versatile IC is not only capable of driving a small speaker (as shown in many applications) but also contains a sensitive input to be triggered by RF fields.

I feel there is a need to limit the DC voltage developed by the RF detector, because the possible amount of RF pickup is not well defined. Therefore I recommend a diode to be connected between pins 4 and 8 (which are connected in parallel in most applications), the anode to pin 4 and the cathode to pin 8, to avoid the DC detector voltage to rise higher than the supply voltage. Otherwise the reverse base emitter voltage of the internal transistor connected to pin 4 may rise to a dangerous level and finally destroy the IC.

~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~

## Ooops! - VXO conversion for the 20m MFJ Cub [SPRAT 114]

**Ian Braithwaite G4COL**

C9 is removed from the Cub. I used its pads to mount components. (I had to check the circuit and double-check by removing the cover.) Sorry for not making this clear. Something that came to light recently on my 30 metre Cub with Ken's mod [SPRAT 112], was a VHF oscillation. This was quite hard to detect, but manifested itself by the tuning not being completely smooth, having one or two glitches. A small ferrite bead (FX1115 or similar) on one leg of the crystal cured it, and all's well. The '612 can operate at hundreds of MHz so it's not too surprising. I fitted the bead to my 20 metre Cub as well.

**It is with great regret we announce the death of Krysia, M3KEB, the daughter of John Beech, G8SEQ/M3AGM, the G QRP Club VHF Manager. Krysia also operated as DN2XA, the training call of her local Amateur Radio Club in Germany.**

# FOXX DBS (Dual Band Special)

**Jim Gauson MMØCAE, 112A High Street, New Pitsligo, Fraserburgh, Aberdeenshire. AB43 6NN**

Having built many homemade transmitters and transceivers over the years and shown these at The Banff and Buchan ARC. Other club members wishing to make similar equipment often approach me. Local amateur George Pirie MM1CNA asked me to make him a PC board to build a FOXX transceiver. Having been given permission first of all by our famous club member George Burt GM3OXX to use his design, which was first published in the G-QRP journal SPRAT in summer 1983. My PC boards are hand made e g. with a paintbrush and copper clad board then etched in the old fashioned way, which is very time consuming. I already have a homebuilt multi band FOXX built in a tobacco tin to my own specification, and have had great success using it with many DX in the log.

**DBS Dual Band Switching**

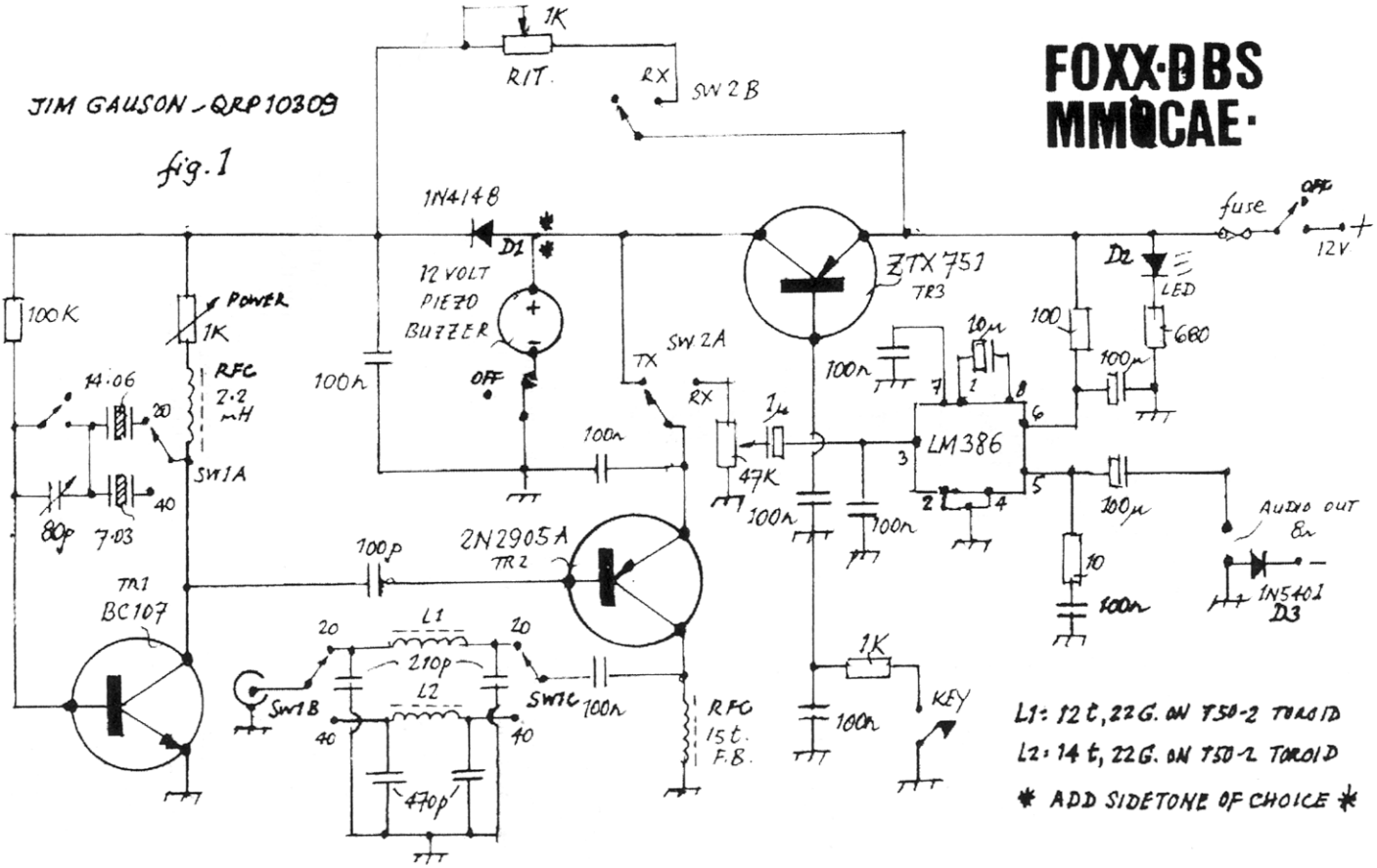
However I have toyed with an idea in my head for a couple of years, that a treble pole double throw switch could be the basis for a complete band changing system. This would give the luxury of two bands, and would be much simpler to make and operate than my multi band tobacco tin. After I made the PCB and sorted out the parts, the transceiver board was successfully built under my supervision by George Pirie, MM1CNA, and it worked first time. I then fitted it into a box from Maplin stores, bored holes for all switches and loudspeaker, with the DBS switching fitted to the rear. I gave the little rig a quick test on 40 metres at 1-watt power level. The first QSO was Joergen OZ7JU who gave me 559. Other reports included: G0TYM - 559, DL2HVM - 599, MM0CQT - 599+. Roy MM0LOS from Auchterless only 15 miles away gave 599+ 40 dB over, during a test run on the rig's internal PP3 battery giving 100 milliwatt`s output.

Shown in the sketch and circuit diagram attached the radio is fitted with a three-pole low pass filter, this should be used via an ATU for further filtering. Of course you can fit whatever filter you want be it 5, 7, or even ten pole LPF, just connect up to the switch in the same way shown in my sketch. The choice of bands is up to you, just fit the crystals to the band of your preference coupled up on the switch to a matching LPF.
This switching system can easily be fitted to any FOXX 1, 2, or 3, indeed can also be fitted to any simple transmitter or transceiver such as the PIXIE, the VU, the OXO, and the STX etc.

**The Simplest Sidetone**

I have seen some very simple sidetone circuits published in the Sprat journal over the years, some of these are very good but my one just has to be the simplest. It is a cheap piezo buzzer [DC] type, bought from Maplin stores costing less than a £1. This will connect up to your rig in a couple of minutes at the most and give the luxury of a side tone. This will sound a little bit sharp but it does the trick. Also there is an added bonus in that the side tone also works on receive so you can use it as a practice oscillator. If you want to fit another side tone circuit instead this is no problem whatsoever, just remove the piezo buzzer and connect the new circuit in its place [marked as *a and *b] on the diagram, ensuring correct polarity.
A small switch may be fitted to the sidetone for two reasons.

1. To enable you to zero beat on a received station, as is described later.
2. To disable the sidetone while you are working an external side tone or keyer.


JIM GAUSON - QRP 10309
fig. 1
FOXX·DBS
MMCAE·
1K
RIT.
RX
SW 2B
1N4148
D1
12 VOLT
PIEZO
BUZZER
OFF
100K
POWER
1K
14·06
20
40
80p
7·03
RFC
2·2
mH
SW 1A
100n
TX
SW 2A
RX
100n
100p
2N2905A
TR2
TR1
BC107
L1
20
20
210p
L2
40
40
SW 1B
SW 1C
100n
470p
RFC
15 t.
F.B.
ZTX 751
TR3
fuse
OFF
12V
D2
LED
680
100
100n
10µ
100n
1µ
47K
100n
LM386
100n
100µ
10
100n
Audio out
8Ω
1N5401
D3
1K
100n
KEY
L1: 12 t, 22G. on T50-2 TOROID
L2: 14 t, 22G. on T50-2 TOROID
* ADD SIDETONE OF CHOICE *

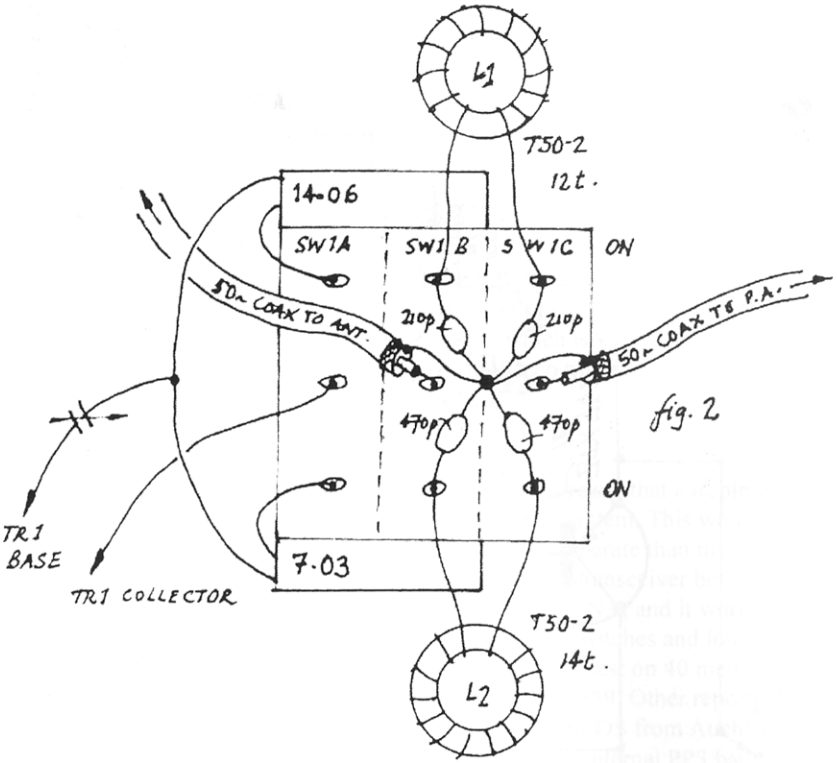



fig. 2

**Polarity Protection**

Simple polarity protection has been included in the circuit by fitting a 1N5401 diode as shown in the negative supply line. It is worth spending the extra 5 pence for the diode to protect your valuable little rig.

**RIT**

The RIT pot is fitted to the front panel for adjusting the receive offset, this is much better than fiddling about with a screwdriver adjusting an internal trimmer pot.

**VXO and Volume control**

These are also taken to the front panel with quality knobs fitted for an extra bit of refinement. The VXO can be switched on or off so that it is possible to use the crystal direct.

**Power Control**

This control is optional and may be taken to the front panel for those who wish to work at even lower power levels; this control alters the drive to the PA.

**Loudspeaker**

This is fitted inside the box and is bypassed as soon as the headphones are plugged in. It should be pointed out here that it is best to try different headphones to get the best volume. Headphones as used in personal Hi Fi systems can give good results. Try and fit a sensitive pair, but remember to fit a mono jack plug. One can always plug in personal Hi.Fi. booster speaker's to the headphone socket, these have a built in self-powered audio amplifier if you

wanted to entertain guests etc, these give a good loud volume and can be picked up cheaply in the high street stores.

**Built in battery**
A rechargeable nickel metal hydride PP3 is fitted, boasting 100 milliwatts or so transmit power for that QRPp challenge. For those who don't know the extra p on QRP means you are operating at a power level lower than one watt. Operating at this power level requires a reasonably efficient aerial system and a little more patience; I use a full size G5RV and a Kenwood AT 230 ATU with excellent results. A station who is receiving you at this power will be equally rewarded in that their receiving equipment is working well, being sensitive enough to pick up such a tiny signal, and not forgetting their skill involved as a radio operator, to pull you through. A good operator will never give up a contact once they are hooked.
The internal PP3 battery is bypassed as soon as the DC plug is fitted e.g. 12-volt battery or 13.8 V power supply. At this higher voltage one can expect around 1watt output on 40 metres and half a watt or so on 20 metres. This depends on the individual transistor used for the PA; sometimes you can be lucky and get a nice hot one, which will go above two watts. It is advisable to keep the power down a bit and fit on a heat sink for added protection.

**LED**
A light emitting diode is fitted as an indication that the power is switched on. It would be easy to fit a red one for transmit, and a green one for receive.

The FOXX is both a simple and very clever radio design in that the transistor for the power amplifier on transmit is switched on receive to act as a mixer and detector. This has an excellent wee transmitter capable of world-wide contacts, although the receiver is a most basic direct conversion type it can with the aid of an efficient aerial and an ATU bring in distant stations with ease.

**OPERATING**
Operating the FOXX is straightforward; first connect the aerial e.g. a resonant dipole with 50 ohms coax, or a G5RV, doublet, windom, etc. Then plug in the DC lead ensuring the correct polarity {positive in the middle of the socket} although polarity protection has been included in this circuit it is better not to take any risks. Turn the on- off volume control full up, then tune in for best reception with the ATU, then move on to check the SWR reading on pressing down the key in transmit DO NOT KEY For more than a couple of seconds at this stage. Once the lowest possible reading has been attained e.g. I must stress to tune for perfection; you can then proceed to put out a call without wasting any of those precious milliwatts, remembering to switch back to receive. Make sure the RIT is advanced above the zero beat or you will be transmitting and receiving on different frequencies. Should a station come back to your call adjust the RIT to tune to your preferred tone on the received signal.
To zero beat for accuracy on a wanted signal with this circuit, hold down the key in receive [with the side tone off] and zero beat on the signal you want to work, then let go of the key and adjust the RIT on the desired station to the tone you like.

If you like using the rig and don't mind spending a little more money, George Burt reminds me that you can add a matching crystal in parallel for each band for loads more pull on the frequency.

# A Tuneable Bandpass Filter for All HF Bands

**Tasa Sinisa, YU1LM, Petefijeva 41/15, 11000 Belgrade, Serbia**

At the beginning of the 80s I worked with stations which had serious problems with IMD products such as the FT101B, this was very noticeable on lower the bands 7, 3.5 and 1.8 MHz . In the literature I saw a very simple tunable bandpass filter designed by M. Martin DJ7VY in CQ-DL 7/84, which cures IMD problems substantially.

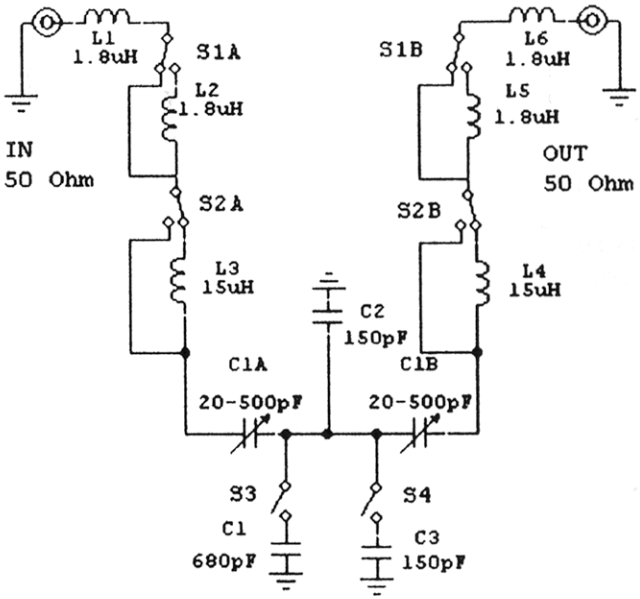
The Filter has 3 coils , double variable capacitors and few toggle switches for the frequency and bandwidth selection. The Filter behaves as a tuneable peak filer and insertion loss is changing very much with changing operation frequency from less than 1dB to 15dB. Bandwidth and selectivity changes considerably with operating frequency and because of that it was not suitable for use in transmitting systems.

When building HF bandpass filters, especially for 50□ systems, the problem is how to design them so that building them is as simple as possible. Without appropriate measuring equipment adjustment will be a nightmare especially with unknown coils or coils with taps. I designed a simple tunable bandpass filter for whole HF range and it is one of my ***RF BRICK***-s for design on the table. It was designed and realized with the following design goals:

- All HF frequencies (1.8-30MHz)
- Insertion loss in range to max 3dB
- Selectivity at harmonic related band in range of 30dB
- Input/output impedance 50 Ohm
- Coils with fixed inductance without taps

The Tunable bandpass filter circuit is very simple and compact - made in one box based on soldering PCB material. It is important to notice that double variable capacitors (both connection) are isolated from the ground. Inductors are made with toroid cores but I tried a BP filter with fixed moulded chokes and results are similar except little bigger insertion loss (see example diagram for filter 3.5 MHz). It is possible because working Q in bandpass filter is small and sensitivity to component values is small too. It is possible to realized an HF filter with only 2 coils (for example toroid T50- ) with taps but it is not recommend for inexperienced builders.

The Filter schematic diagram is shown in the diagram. The toggle switches S3, S4 are possible to change to one SPDT with one neutral position. It is possible also to use fixed values for C and L to make filters according to given component values for each band.



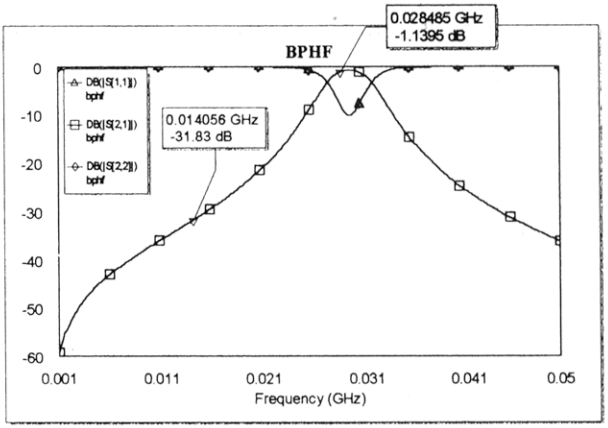

YU1LM/QRP GQRP10091
HF 1.8-30MHz TUNABLE BANDPASS FILTER

**The Actual Values for each Band:**

**FILTER 28MHz**
**L=1.8uH Q=100**
**Cvar=20pF**
**C1=150pF**

**FILTER 24MHz**
**L=1.8uH Q=100**
**Cvar=25pF**
**C1=150pF**

**FILTER 21MHz**
**L=1.8uH Q=100**
**Cvar=36pF**
**C1=150pF**
**or**
**L=1.8uH+1.2uH Q=100**
**Cvar=21pF**
**C1=150pF+100pF**



**FILTER 18MHz**
**L=1.8uH+1.2uH Q=100**
**Cvar=28pF**
**C1=150pF+100pF**

**FILTER 14MHz**
**L=1.8uH+1.2uH Q=100**
**Cvar=50pF**
**C1=150pF+100pF**

**FILER 10.1MHz**
**L=1.8uH+1.2uH Q=100**
**Cvar=88pF**
**C1=150pF+100pF**

**Alternative values**

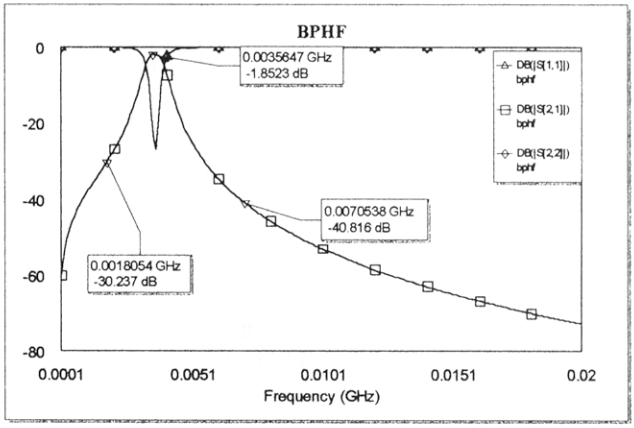
**FILTER 18.1MHz**
**L=1.8uH+1.8uH Q=100**
**Cvar=24pF**
**C1=150pF+150pF**

**FILTER 14MHz**
**L=1.8uH+1.8uH Q=100**
**Cvar=39pF**
**C1=150pF+150pF**

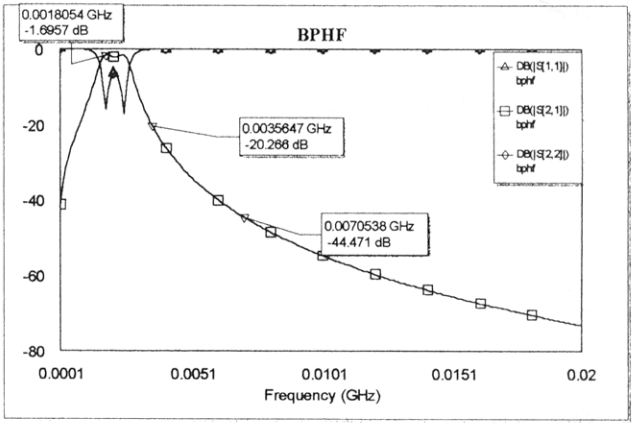
**FILTER 10.1MHz**
**L=1.8uH+1.8uH Q=100**
**Cvar=70pF**
**C1=150pF+150pF**

**FILTER 7MHz**
**L=1.8uH+1.8uH Q=100**
**Cvar=155pF**
**C1=150pF+150pF**
**or**
**FILTER 7MHz**
**L=1.8uH+15uH Q=100**
**Cvar=32pF**
**C1=150pF+680pF**

**FILTER 3.5MHz**
**L=1.8uH+15uH Q=100**
**Cvar=130pF**
**C1=150pF+ 680pF**



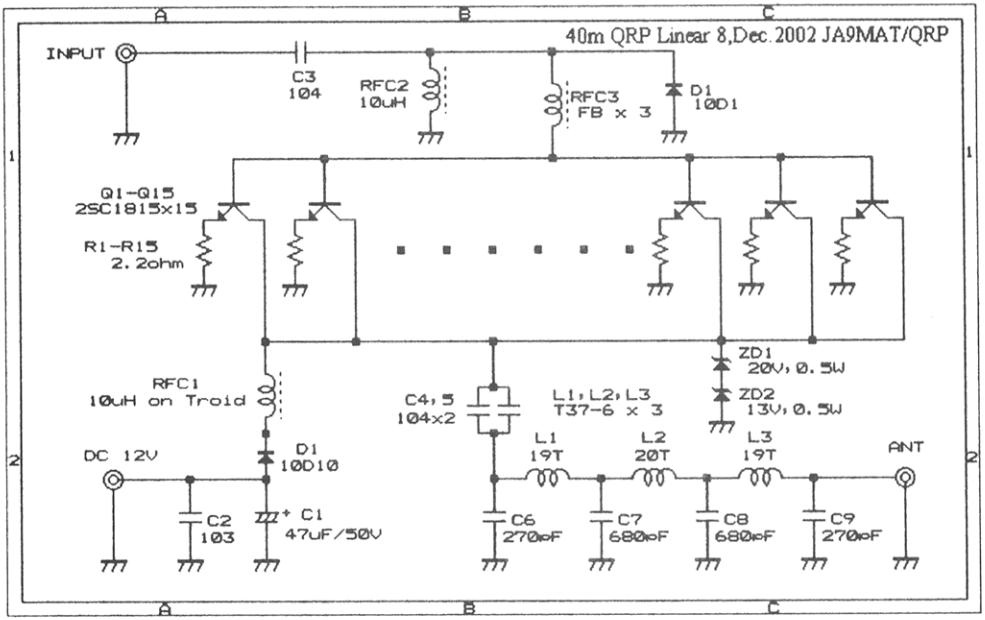

**3.5MHz toroids above moulded coil below**

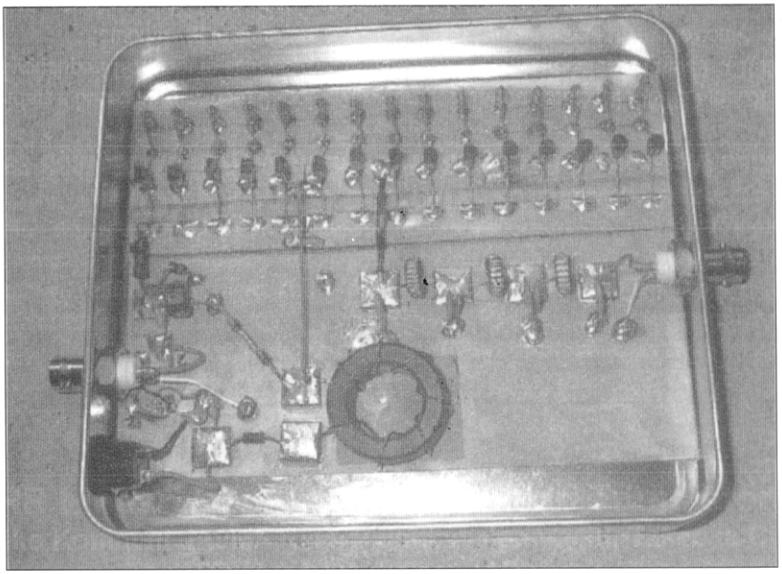


# QRP Linear Amplifier using Cheap Transistors

Hehiko Komachi JA9MAT, 44-10 Ishize-Honmachi, Takaoka City,
TOYAMA. 933-0011. JAPAN.

**2SC1815 (Pc=400mW) x 15pcs, Pout = 2.5W @Pin=200mW and Vin=13.5V**



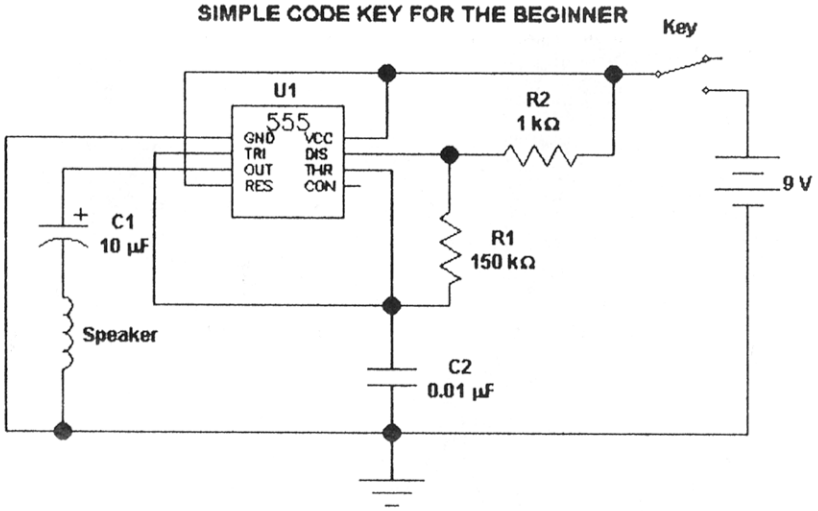



# SIMPLE CODE KEY TO ENCOURAGE THE BEGINNER

**Howie Krausse, W5OM, 1553 Miller Ave. Ann Arbor, Michigan 48103 USA. email: hkx2@netzero.net**

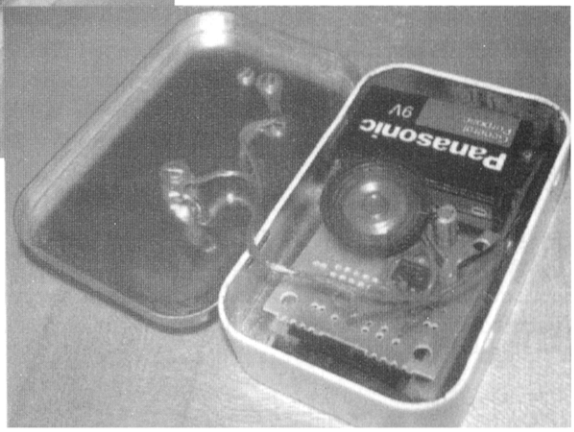
My friend, KC8ICT, has been teaching Morse code license classes for several years for the Ann Arbor radio club. When I asked him if many of the students were using CW on the air after receiving their license, the answer was regrettably, very few. I suggested that since learning to send code is no longer required to get a code license, perhaps giving them the chance to practice might give them the confidence needed to get them on the air. The answer then, was an inexpensive key. I built a simple key using double sided PC board material for the key lever with a rubber foot for the knob, attached with two small screws to an Altoids tin. A sidetone oscillator was built on perfboard, using a 555 timer chip and a mini cell phone type speaker and was installed inside the tin. The total cost, including mints, is under $5. I showed the completed prototype to my wife Anne, KC8SUW, who has been slowly learning the code for over 28 years without success. She picked it up, tried it, and w ould not give it back to me! For the next three days, she was not seen without it, and then reported that she had mastered the code. I quickly built up several more keys for the club, and seven of seven students taking the code exam passed. Most of the credit goes to KC8ICT, but I believe the keys helped!

The action of the keying lever comes from the inherent flexibility of the Altoids tin cover. The key lever is electrically attached to the cover. The lever contacts a small screw which is insulated from the case with a plastic "shoulder washer" on the underside, the type usually used to insulate TO3 power transistor leads, and a piece of scrap plastic on the top of the lid. The resulting key is fun to play with, and is good enough to use on the air, as well.




Adjust R1 to change tone Value used produced maximum output for my speaker

SIMPLE CODE KEY
on Altoids Tin




INSIDE SHOWING
OSCILLATOR
AND SPEAKER

## Is Ionospheric Propagation In Decline?

**Steve Rawlings GW4ALG, 14 The Paddock, Chepstow, NP16 5BW, UK**

In October 2001, a small group of LF experimenters met at the HF Convention held at Old Windsor, Berkshire. This group of old timers comprised: Bill G0AKY; John G3BDQ; Colin G3KMP; Dave G3YMC; and myself. At some point, the conversation digressed from 73 and 136 kHz topics to our memories of HF band conditions when we were first licensed. There was general agreement that HF radio propagation appears to have been in decline over recent decades, and a number of possible causes were discussed.

Since that meeting, I have taken the opportunity to discuss this matter with other old timers. I was interested to discover that all those asked supported the view that the ionospheric mirror is not as effective as it used to be. This view is shared by Ron G6RO, and Vic G8IK – both having personal experience of QRP HF operation dating back to the 1930s. Vic has given the matter some thought, and wonders whether a decline in HF radio propagation might be related to long-term changes in the Earth's magnetic field.

I am interested in hearing from others who have a definite view as to whether HF ionospheric propagation has, or has not, been subject to long term decline over several decades, with brief supporting remarks. I am especially interested to hear from those having access to relevant signal measurement data. My email address is steve@alg.demon.co.uk

I propose to summarise the responses received, and post the results on the GW4ALG web site at: http://www.alg.demon.co.uk/radio/propagation/intro.htm

# Stability Improvement for the HW8 VFO

Andrea Insolera, I2IAL, Via Sangallo 40. I-20133 Milano. Italy

During the past few years I noticed that my old 'HeathKit - HW8' transceiver had problems of vfo stability. The short term drift observed was in the range of some kilocycle, but the serious problem was that this drift presented a 'hysteresis' cycle: after a complete thermal cycle the frequency was always different and a periodical calibration was necessary.

The oscillator, from the original schematic HW8 diagram, is a Hartley consisting of Q2 ( FET) , an L9 tuning coil and a network of both series and parallel capacitors. The inductance of the coil is 2,3μH and the total fixed capacitance is 133pF.The original variable capacitor has an excursion of about 6 to 17 pF. The frequency control range from 8645 kHz to 8895 kHz. This frequency is converted by a pre-mixer stage. For the 40 meter operation the vfo is mixed with a crystal oscillator set to 15895kHz.( 15895 – 8895 = 7000 kHz ) .

As is the case with all type of these, circuits the stability is obtained from the compensation between the positive inductor coefficient and a set of capacitors with their own opposite coefficient. A good compensation is obtained experimentally. The mechanical stability of whole system and each single component is very important. Moreover, all the oscillator stages have a certain voltage dependence. The best solution is a regulated voltage level.

I started to check the thermal behaviour all the critical vfo components, one by one.

I noticed that the variable capacitor had a strong temperature dependence and that the shield of the coil was mechanically unstable, also due to the fact that it was made of aluminium.

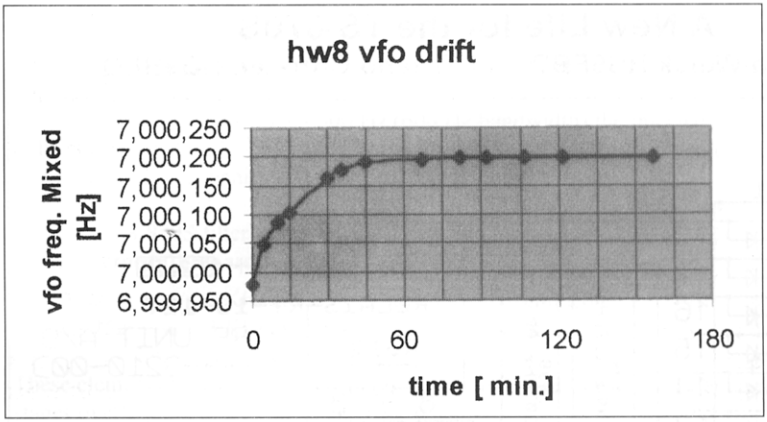
I decided to replace the original variable capacitor by a surplus ceramic model, adapting it for the required excursion by eliminating a few plates. The thermal behaviour was better than that of the original component. For this reason, a set of critical operations concerning the mechanical matching was required. I built a new shield of L9 using a 1mm brass foil .

I also replaced the original calibration capacitor with a high performance air ceramic - brass model (Cmax = 23pF ).

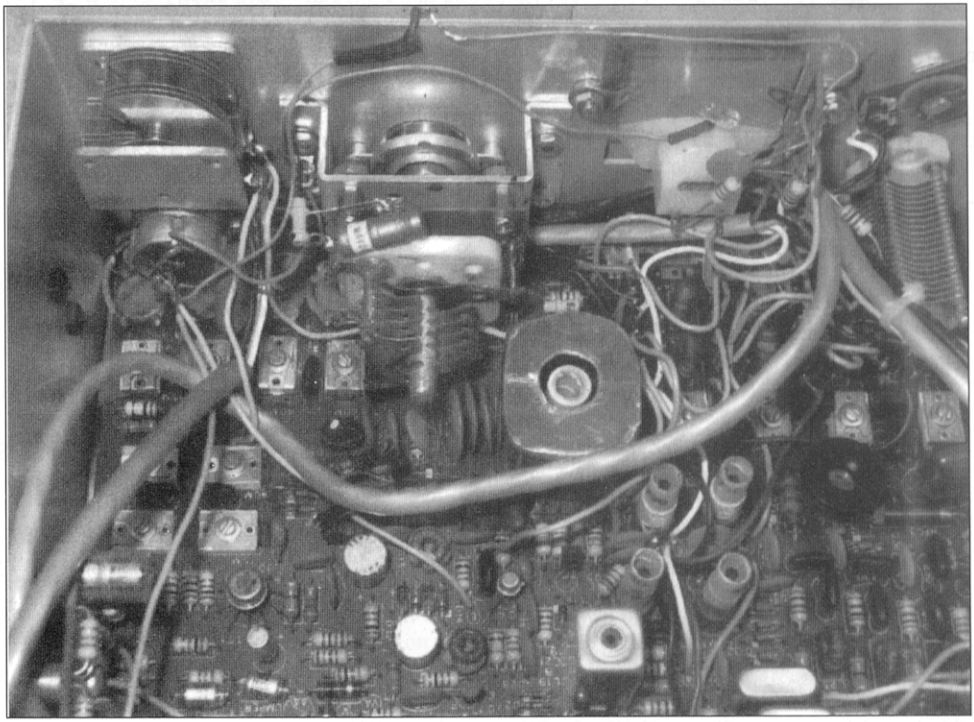
The original coil of L9 has a ceramic support with a slug for the tuning. In order to increase its stability I tried coating it with two layers of bi-component epoxy adhesive 'UHU 2', as here in Italy I can't find the Q Dope that Doug DeMaw (W1FB) indicated in bibliography. Before using the adhesive, I put it for some minutes in a microwave oven in order to verify the absence of any hydroxyl group. The hardness of the UHU 2 sample remained unchanged and the sample was almost cool. Then, when using this coating, the complete L9 thermal test received a small positive coefficient drift.

In order to improve stability and noise reduction I used an LM 317 adjustable IC regulator set at 9 V, instead of the Zener diode voltage regulator. In the photo we can see the new variable capacitor, the brass shield and the additional regulator circuitry.

I finally calibrated the vfo according to the canonical alignment procedure stated in the HW8 manual, and I started the drift measurements. Remember to block the slug coil by drops of bee wax. I picked out the antenna signal by connecting a dummy load for two hours while the key was pushed only during acquisition. The master clock of the frequency meter was a high stability reference oscillator ( 0.05 ppm). The box was closed and the equipment was in normal condition of operation. The final result is reported on the plot.



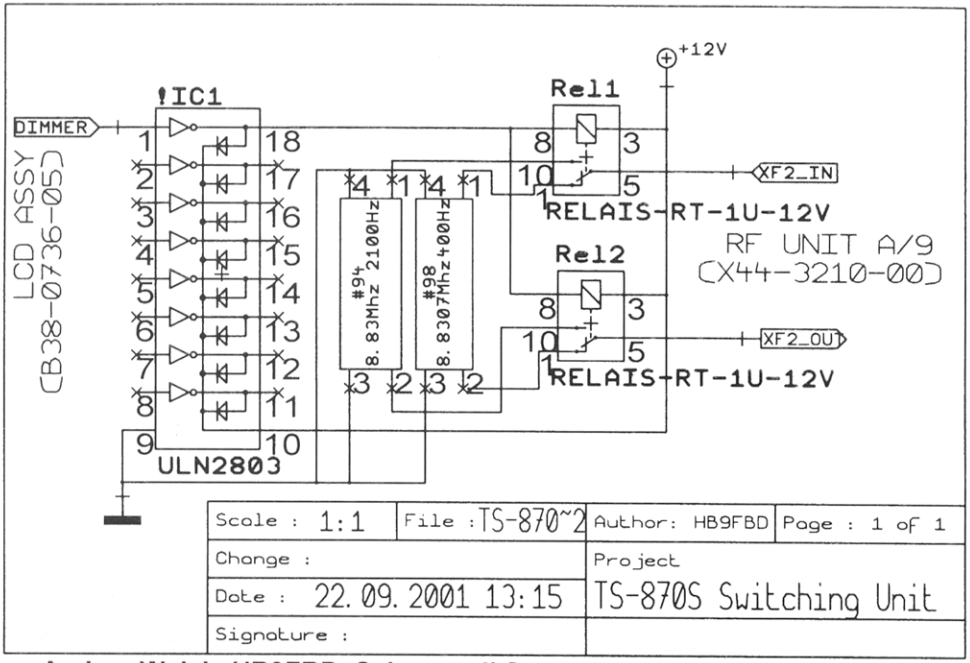

This is the result obtained with many trials and a lot of patience.
We can observed that the drift value (short term) is 210 Hz after about 45 minutes.
The worst case of the measured long term drift (starting one hour after the warm up) is 5 Hz / hr, while the general specification of Heath Company guarantees less than 150 Hz/hour after 60 minute warm-up.



I hope that all this information can be of some help for improving our inexpensive oscillators.
Tnx to Marcello ( I2DNM) for the advice and Carlo for the photo.

# A New Life for the TS-870S

**Andrea Weick HB9FBD and Tiziano Christen HB9BLQ**




**Andrea Weick, HB9FBD, Sciarana di Sotto, 6516 Cugnasco, Switzerland.**
**andrea.weick@bluewin.ch**

## 1. Introduction

The TS-870S is still a good rig for its 6 years old lifetime. Its advanced features include dsp filtering and demodulation, antenna tuner, keyer, complete remote controlling and more. But under some circumstances intermediate stages get overloaded showing some intermodulation behaviour. These signals cannot be repaired by the processing of a dsp ...
Nobody is perfect ! Here the reader will learn how this annoying drawback can be really improved.

I remember the first time I asked Tiziano if he was interested in a new modification for the TS-870S. We were participating at the Helvetia contest and experienced overloading at the IF stage and dsp section.
I already had some modification information by k3bu Yuri and UT1IA Vladimir [1], but I needed additional selectivity for intensive CW operation. The planned solution should integrate a smart way to switch between filters without external components.

## 2. Modification description

### 2.1 TS-870S filter principle

The TS-870S uses two filters of 3 Khz for CW as well for SSB filtering below 2.6 Khz : one for the second IF at 8.83Mhz and one at the third IF at 455 Khz.

How can two filters of 3 Khz be used to set a CW bandwidth of 600 Hz ? Both the bandwidth and the work frequency of the filters are fixed. If we make the first filter working on the hi-cut slope

tune and the second filter on the low-cut slope tune, the sum of this selection will be the same as a unique 600 Hz filter.
To build a cut frequency of +/- 300 Hz (600 Hz bandwidth) the injected signals in the mixers have to be shifted of about +/- 1200 Hz. The right shift is calculated by the microprocessor and generated by the DDS. These details are described in [4].

2.2 TS-870S filter selection
The concerned filters are :

- XF2 3 Khz at 8.83Mhz and 600 Ohms impedance
- CF452 3 Khz at 455 Khz and 2 KOhms impedance

These elements behaviour quite well during normal conditions, but under strength conditions lead to stages overloading due to the inadequate selection.
The proposed solution replaces the existent filters with better ones. The improved filters are produced by International Radio Corporation [3] and matched for Kenwood radio TS-850 and TS-830.

Here is some data :
- #94 8830.0 Khz, 2.1 Khz bandwidth
- #98 8830.7 Khz, 400 Hz bandwidth
- #96 455.0 Khz, 2.1 Khz bandwidth All the filters have symmetric behaviour.

The reader is pleased to pay attention to the frequency cut of filter #98 : 8830.7 Khz. The filter is cut for 700 Hz away from the IF frequency. This could lead the operator to assume it doesn't work, but it does. A filter cut to 8830 Khz would not properly work, because the microprocessor shifts the received signal somewhere near the cut frequency of the 3 Khz filter (-/+ 1500 Hz). Installing a filter with the exact cut frequency of the IF would filter a part of band (window) without ham signals.
The overall modification was evaluated as easy also because no special equipment is required.
The implementation is split in 2 parts :

- insertion of the 2.1 Khz filter in the 3rd IF (455 Khz).
- insertion of the switching unit at the 2nd IF (8.83 Mhz) for 2.1 Khz and 400 Hz filters.

Some advices before starting : use caution when handling electronic boards and elements suffering from static charge. Be careful when dissoldering existing filters.

2.3 3rd IF SSB filter modification
1. Remove the upper cover.
2. Locate FINAL UNIT board X45-351x-xx (C/5) near the loudspeaker as depicted by picture 1.
3. Unplug cables and remove screws.
4. Substitute filter XF2 with 2 piece of coaxial cable like RG174 as shown in picture 2.
5. Remount the board and plug all the cables.
6. Place the new filter #96 nearby the loudspeaker as shown in picture 3 and 4. For dimension comparison the reader sees the old filter on the loudspeaker. Fix the filter to the chassis as shown in picture 5 and solder the coaxial cable to the filter as shown in figure 6.
7. Remount the upper cover.

2.4 2nd IF SSB/CW filter modification
1. Remove the lower cover.
2. Locate RF UNIT board X44-3210-00 (A/9) as depicted by picture 7.
3. Remove shielding board, unplug cables and remove screws.
4. Substitute filter CF452 with 2 pieces of coaxial cable like RG174 as shown in picture 8.

5. Remount the board and plug all the cables.
6. Solder the filter input/output of the circuit shown in the following chapter to the coaxial cable as shown in pictures 9 or 10. They show two different implementations. Please note there is not much place in the rig. The filters are placed one by the other, and positioned as depicted by picture 11. Picture 12 shows the circuit by side.
7. Solder the switching unit power supply (12V) to the same RF UNIT board with a shielded cable as shown in picture 13 and note that the ground connection is screwed to the print.
8. Locate LCD ASSY board B38-0736-05 up left of picture 14 near the flat cable.
9. Solder the DIM signal (the signal used to switch the relay) to a shielded cable and ground the shield to the print by the same screw as shown in picture 15.
10. Remount the shielding board and the lower cover.

10.1 Switching unit and electrical circuit

(electrical circuit)

The electrical circuit describes how the filters on the second IF (8.83Mhz) are switched.
The input signal used to switch the selectivity is taken by the signal DIM (DIMMER) located on the LCD ASSEMBLY (B38-0736-05) at capacitor C3. After being buffered by the ULN2803A (IC1), the signal is applied to both paralleled relays (RL1-2) and connected to Vdd (12V).
Note that the buffer IC integrates the discharge diodes for the relay coils and that each darlington can provide up to 500 mA continuous. The relays used are small signal SPDT (Single Pole, Double Through) functioning at 12V. The power supply for the switching circuit is taken by a point of measure located on the same board where the 8.83Mhz IF filters are located, the RF Unit (X44-3210-00, A/9).

11. Operation proceeding
Operating mode in SSB do not change, but note that the new 2.1Khz filter is selected only if the DSP high cut frequency is lower than 2.6 Khz.
CW must be handled differently.
Personally I assigned menu number 50 (DIMMER – Light of the front panel) directly to one of the four programmable front panel keys. By pressing the preset key the user will select the IF filter by pushing up/low keys. The confirms of the setting is seen through the grade of light on the LCD front panel.
Another solution is to insert menu number 50 into the quick menu ; details are given in the TS-870S instruction manual.
Receiving CW with the 400 Hz filter is achieved by setting CW-R and will not affect transmitting mode. Selecting 400Hz filter permit to get very clean signals with DSP filter set to 400 Hz. Tuning a signal with a narrower DSP filter (for instance 200Hz) will not succeed. The installed IF 400Hz filter is cut for a frequency about 100Hz away of the IF frequency the operator is currently reading. If the operator really want to use narrower DSP filter, then the 2.1Khz SSB filter should be reselected.

12. Results
As the operator switches the TS-870S on for SSB receiving, signals are clearer and gain in understanding.
Setting the receiver for CW (remember – mode is CW-R) gives the operator a new dimension.
To understand the meaning of this experience, set the DSP filter bandwidth to 1Khz and move around in the band. The band is almost quiet, but in the moment the operator tunes a station, will copy a very clean signal.
At the time of this writing, the modification was successfully implemented in 4 transceivers, without problems.

13. Improvements

The project could be further improved if both IF and filter frequencies could be aligned eliminating the need to receive CW in reverse mode (CW-R).
This could be done in two ways at least : by having an IF filter cut to the actual shifted IF or by recalibrating the transceiver to the slightly shifted filter frequency.
The reader may note I did not mention transceiver calibration. This operation could be done by experienced technicians with professional instruments.

14. Conclusion

This project was developed to give to TS-870S operators the ability to get cleaner signals from a rig still on the edge. The modification overall cost is not cheap, but good IF selectivity always needs good IF filters in new rigs too.
I please any amateur radio who will implement this modification and have advice or tips, let me know at [2].
Finally, a heap of thanks to the people who supported me in this project: Tiziano, George W2VJN, ...

15. Annex

[1] Link to a TS-870S modification site : www.mods.dk
[2] Authors e-mails : andrea.weick@bluewin.ch, tich@bluewin.ch,
[3] International Radio Corporation, 13620 Tyee Road, Umpqua, Oregon 97486, USA. e-mail : inrad@rosenet.net and WWW site qth.com/INRAD
[4] HF Transceiver Kenwood TS-870S Service Manual

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# Electronic Keying for an Electronic Key

Igor Grigorow. RK3ZK. Box 68. BELGOROD – 15,308015. RUSSIA

When I used an electronic telegraph key made on CMOS chips during my QRP- expedition, I found out that the key is very sensitive to dampness. Even when I covered a PC- board of the key by paraffin (it is possible easily to delete paraffin with the help of hot water and after that with petrol if repair is necessary), the failures in activity of the key continued. Also I found out that small drops of water influenced on key operation, i.e. the drops covered contacts of the key's manipulator and so brought to false operation of it.

Only reed relays (magnetically operated with hermetically sealed contacts) helped me to solve that problem and make reliable work of the electronic key in field operation. The reed relays were placed on the PC- board of the automatic electronic key, near keying "dot" – "dash" chip. I used old reed relays, taken from burned old relay of a telephone station. Fig. 1 shows the scheme of the unit. The PC- board of the automatic electronic key with the reed relays was covered with paraffin. Manipulator of the key was placed outside the key's body. The reed relays had a self- made windings. Each winding contained several thousands turns, coiled by copper wire 0.1 mm in diameter or #36 BWG. Winding of reed relay consumed current near 3-4 m□ at 12 volts of key power voltage. Such small current did not load much key battery.

The electronic telegraph key, consisted of such electronic keying unit and PC- board covered with paraffin, reliably works even while raining. Also the key was serviceable in the morning when both key PC- board and manipulator were covered with dew.

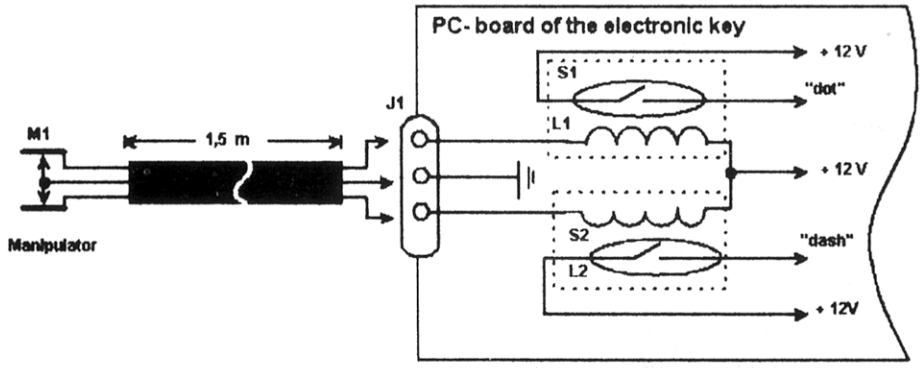
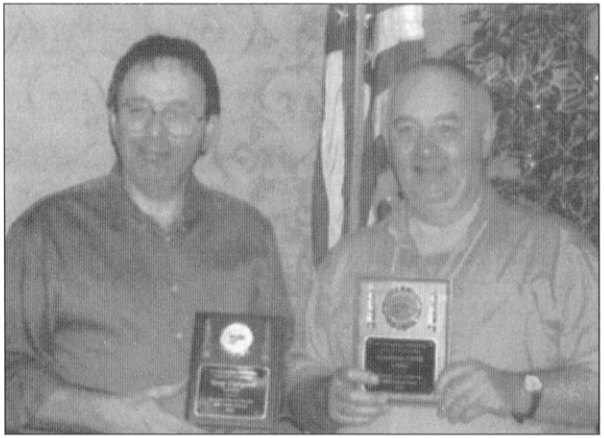



Figure 1



## G QRP CLUB OFFICERS HONOURED AT DAYTON

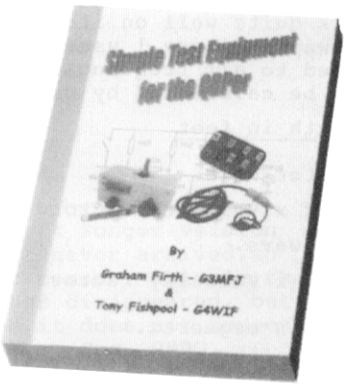
As part of the "Four Days in May" QRP symposium at the Dayton Hamvention in May, two G QRP Club officers, Graham Firth, G3MFJ and Tony Fishpool, G4WIF, were inducted into the QRP ARCI "Hall of Fame".
Graham and Tony were presented with their plaques by yet another G QRP Club officer Dick Pascoe, GØBPS [SSB & Data Manager].

Graham and Tony were honoured for their unique contributions to QRP. Graham is the G QRP Club Sales Manager and also maintains the membership database. Tony is Webmaster of the club website and is also responsible for the club data sheet service. For several years they have been ambassadors for the G QRP Club at various QRP events in the USA. Each year they have travelled to attend a local QRP convention or event somewhere in the USA. At their own expense, they have represented the club, recruited new members and usually given a QRP presentation. This year, apart from being at Dayton to receive their awards, they will be at HamCom in Arlington, Texas.

Usually their presentations in the USA have been on Simple Test Equipment for the amateur radio workshop. Their work is been brought together in the book below.

# SIMPLE TEST EQUIPMENT FOR THE QRPer

*"A wonderfully useful book by G3MFJ and G4WIF .... A must for any QRP library .. in fact, I wish I had written it!" - G3RJV*
*"Don't be mislead by the title, this book will be useful for any amateur... excellent source book" - Review - Jan 2003 Radcom.*
20 projects in a 58 page book. The U.K. price is £6.00 post paid. The EU & DX price (surface mail) is £6.50 post paid. Airmail £7.50 post paid. EU & DX orders International Money Order only. Make cheques & money orders payable to "G.Firth" and post to 13, Wynmore Drive, Bramhope, Leeds, LS16 9DQ UK
- see www.fishpool.org.uk for U.S. orders.



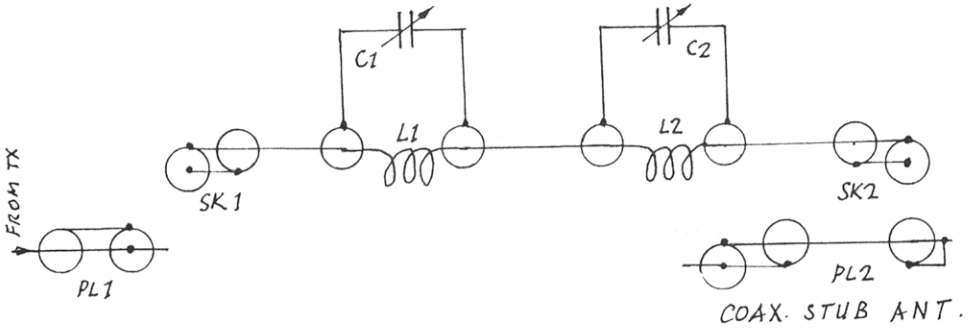



FIGURE 1

AN EXPERIMENTAL MULTI-BAND, PRE-TUNED , CO-AXIAL STUB ANTENNA.

Gus Taylor, G8PG

Assuming that co-axial cable with a velocity factor of 0.66, such as RG58 is used, the length of an antenna can be reduced by approximately one third. The advantage of this is particularly useful at the lower frequencies. For example rather than being 66 feet high a co-axial stub quarter wave antenna for 3.5 MHz will only be approximately 44 feet high, a height much easier to achieve in the average location. Similarly at 28 MHz a stub antenna a quarter wave long is only approximately 5 feet 4 inches long! It has also been found by experiment that such an antenna seems to work quite well on its harmonuc frequencies. For example the model shown in Figure 1 uses a quarter wave stub for 7 MHz, but can be tuned to all frequencies up to 28 MHz. Length for a given band can be calculated by using :-

| Length in feet | Length in metres |
|---|---|
| Quarter wave. | Quarter wave. |
| 234/f x Velocity factor. | 71.5/f x velocity factor. |
| Half wave. | Half wave. |
| 468/f x Velocity factor. | 143/f x velocity factor. |

f is in meghertz.

Based on previous experience of changing the Cobra into a tuned antenna, it was found that a tuned circuit using a coil made from the shield of the co-ax cable and a suitable variabe capacitor could be used to tune the antenna to all bands between 7 and 28 Mhz. It was then that a sudden idea occurred to the Author.

Parallel tuned circuits present a high impedance at resonance, but a low impedance away from resonance, so would it be possible in this particular arrangment to connect two parallel tuned circuits in series and tune them to different bands ? An extra parallel circuit was added, as shown in Figure 1, and the idea worked perfectly, as it did when a third circuit was added temporarily, It is thus possible to use a number of tuned circuits set to different bands and to change bands simply by altering the transmitter output frequency.
Turning now to the details of Figure 1, The lead to PL1 is the co-ax output lead from the transmitter, and is conventionally wired, with the inner carrying the rf and the outer sheath earthed. At SK1 the connections are transposed, with the rf being applied to the outer sheath and the inner conductor being earthed. At L1, three turns of the cable are wound on to a 2 inch (5 cm ) diameter former and secured in place with insulation tape. C1 is a 500p variable capacitor. It is connected to the co-axial cable sheath by carefully removing some of the cable outer inulation and using crocodile clips. The circuit L2/C2 is made in exactly the same way. SK2/PL2 allow the rf-carrying outer sheath of the tuner to be connected to the outer sheath of the co-ax stub antenna, the outer sheath and inner conductor being conected together at the far end of the stub. In the experimental model the stub was cut as a quarter wave for 7 MHz (22 feet).

Experiments with this antenna were caried out over a period of weeks, using 3 watts of cw. Despite very poor conditions on the higher bands results have been quite promising. What we need now is further data from different locations, so how about it you antenna enthusiasts ? Another idea at the back of my mind is a pretuned,multi-band counterpoise system using stubs.Please experiment with stubs and report your results.

AWARD NEWS

Hearty congratulations to the following on their Awards and Endorsements.

QRP COUNTRIES

100 NU4y, 50 GoTAK, DL2LAB.

WORKED G QRP C

1220 G2DAN (Excellent !), 600 G4NBI.

TWO-WAY QRP

20 DL2LAB, NU4Y.

ANYBODY SEEN A LOST SNAIL ?

Apologies for this shortened version of AAA. A longer version was sent to our Editor by snail mail, but it never arrived,so this version had to be prepared at the last moment. This is the first time in some 25 years that material has disappeared, but we are putting proceedures in place to see it does not happen again. Very best wishes to all AAA Readers. Gus, G8PG.

# COMMUNICATIONS AND CONTESTS

**Peter Barville G3XJS e-mail: g3xjs@gqrp.com**
**40 Watchet Lane, Holmer Green, High Wycombe, Bucks HP15 6UG.**

**CZEBRIS 2003**

It seems there was a reasonable amount of activity this year, and one or two of the scores reflect this. Gus, G8PG, kindly sent a check log, in which he says that it was great to hear all the activity, despite the rather poor propagation forecast, and that it was good to meet many old friends. Of the 7 logs received, our good friend Valery, RW3AI, came in top of the bunch with an impressive score of 194 points. Very many congratulations Valery. Ron, G4MRH, was not that far behind, with an excellent points score of 145. My thanks also to 2E0ATZ, G4FDC, GM4XQJ and LZ1BB for supporting this annual event. It would be nice to be able to list a few more call signs next year, and I am hoping you will all help me do just that!

Now, here's an interesting point that Gus has raised .. when he and Peter (OK1CZ) first started the event, they called it CZEBRIT (standing for Czech/British), but it has since become known as CZEBRIS. Looking back through my copies of SPRAT, this change seems to have occurred during the 90's, and I suspect may purely have been a slip of the pen. Unless anybody can suggest good reason otherwise, I propose the event revert to its original (and more logical) name.

**2003 SOMERSET HOMEBREW CONTEST**

The inclusion of contacts on the HF bands during this year's event did encourage 2 overseas members (F5RQG and RW3AI) to participate, and submit logs. Other entries came from G3VAJ, GW0EGH and M0AVN/M3NSB. Everybody scored well, but the winning entry was that from Dan Taylor (GW0EGH), who used a 7mHz homebrew ssb transceiver based on the RadCom Belthorn design. It uses "all ugly construction" 2mHz vfo, 9mHz Club xtal filter and a cheap ceramic mic. The aerial Dan used was a bent dipole (erected specifically for the Contest) incorporating a small toroid balun, at an average height of 23' supported on various poles and bamboo canes. Dan amassed an excellent score (70 points), and is the deserving winner of the Walford Electronics £50 voucher, so generously donated by Tim Walford.

**YEOVIL AMATEUR RADIO CLUB FUN RUN**

36 QRP stations, in 7 countries took part in the 2003 Fun Run. 14 entries (plus one check log) were received by the Yeovil Club, the winners of each section being:

| | | |
|---|---|---|
| 40 metre section | G3YMC | 488 points. |
| 80 metre section | G4PRL | 525 points. |
| Both bands | G3GC | 973 points. |

The station using the lowest power was F6GGO, who used 2 watts throughout the event.

YARC have commented that they did miss several regular supporters of the event, but hope they are still well, and active. They would like to thank all those who took part, and especially PA0RBO, GW4ALG and G3CQR for operating the Bonus Stations.

News from the I QRP Club

Our Italian QRP colleagues have organised an interesting new event, which might be of interest to you. It is called the WW I-QRP Game, and here is a copy of the rules of their game:

1. The OM of the whole world can participate in the WW I-QRP Game.

2. Game objective: to achieve the highest score in a continuously updateable world wide classification.
3. The score is determined by the QRB of a single QSO and is calculated in the following way: "(QRB x 5) : Pout" for example (5000 Km x 5) : 10 Watt = 2500 points - (5000 Km x 5) : 5 Watt = 5000 points (5000 Km x 5) : 4 Watt = 6250 points.
4. "Pout" is defined as the RF power output from the connector and will be considered in steps of 1 watt rounded to the highest number (eg: 1,2W=2W - 5,9W=6W).
5. The QRB will be calculated by entering the geographical co-ordinates of the two qth's in dedicated software. In absence of co-ordinates the country-country QRB will be calculated.
6. For a homemade TX, OR homemade RX, made by the participant, even from a Kit, a bonus of 1.000 points will be added.
7. For homemade RX/TX, made by the participant, even from a Kit, a bonus of 2.000 points will be added.
8. In case of controversies the decision of the OM Co-ordinator of the WW I-QRP Game will be final.
To participate, send a photocopy of the QSL confirming the occurred QSO, possibly in colour, and a declaration of the working conditions to: I-QRP CLUB c/o Ari Montebelluna, P.O.Box 11 – 31035, Crocetta del Montello (TV), ITALY.
Each participant may send a maximum of 3 QSLs in a period of 12 months, for contacts made after 01/01/1999. The OM Co-ordinator may request to see the original QSL at any time. The classification of the participants will be regularly updated and will be published in the Bulletin of the I-QRP Club www.arimontebelluna.it or in specialised magazines at every significant variation.

I also have details of the I-QRP Club's I-QRP Club Award, and their 4th Marathon HF I-QRP Club Contest 2003 available, if anybody would like further details.

Please let me have items for inclusion in the next SPRAT by the beginning of August.
As always, have FUN. 72 de QRPeter

**MEMBERS ADS - MEMBERS ADS - MEMBERS ADS - MEMBERS ADS - MEMBERS ADS**

FOR SALE: Walford TAUNTON transceiver kit, complete and unbuilt, for 80, 40, 20 & 15m bands with manual. Optional extras, S meter and CW filter kits included. £150 ovno. Frequency display kit available at extra cost. John Teague, Perrotts, Lynford on Fosse, Somerton, Somerset TA11 7HA. Tel: 01963 240319.

FOR SALE: "Morsum Magnificat" No.s 1 – 80 inclusive. £40 or offer. Tel: 01843 863795.

FOR SALE: Trio TS530SP gwo including manual,extn spkr, fist mic ,spare valves etc., £200 plus carriage. WANTED: To borrow or buy. Handbook for Trio TS130V QRP Trcvr. Contact John. G4VPU GQRP No. 10181. QTHR. Tel: 0191-2522304 Whitley Bay.

FOR SALE: TRIO R-599 [or R-5990 as it says on the back) solid state, see review in PW a couple of years or so ago, no WARC bands, £100. TEN-TEC PARAGON, all filters, voice unit, £350. TIMEWAVE DSP-9 + filter, £95.
Keith, GØOZK, 07974 953018 – after 6pm, or weekends.

# SSB & Data Report

**Dick Pascoe GØBPS. Seaview, Crete Road East. Folkestone. CT18 7EG**
**Tel 01303 894390 – Email gØbps@gqrp.com**

Alex KR1ST wrote that that the small signals have the better ears. He had a contact with a TI5 station both running just 5 watts. He also worked a friendly HI3 QRP station on 20 and 10 also. He said "Boy, a contact is so much more fun when you know the other side is QRP, too".

"CU2JL in the Azores has been active on 20 meters with a 1 watt HB DSB rig and a ground plane vertical. The DC RX uses 3 NE-602s and one LM-386 and is based on a VK3AWC's design in Sprat #93. Bill reports many European contacts and some USA QSO's when conditions are good. Bill, CU2JL will be QRT in the Azores in late July and will QSY to London in early August."

Darren MW5HOC had never worked the States QRP on 40M, so he thought I'd give it a go one Saturday night, he heard many stations and called loads of them with 5 watts but they never heard him. Then he heard KC1XX very loud, and gave him a few calls. After 5 minutes of calling him he called me back. Finally the States on 40M QRP!!!!

Geoff, G0PFH, expects to be operating from Guernsey using the Halifax and District Amateur Radio Club callsign as GP2UG/M from October 3rd to 6th 2003 inclusive. He expects to be operating from 1000 to 1600 (local) each day on 40m SSB. Whilst Geoff will be using QRO, he will be listening for QRP stations and M3xxx callsigns in particular. So if you want to work at one and the same time an uncommon DXCC entity, IOTA EU 144 and a prefix which we think has never been used before, listen for him. He says he will QSL contacts either via his own call, or via G2UG.

Graeme VK3BGH writes: Just to let you know that the new PSB reporting format for PSK31 has started and that you are welcome to use it and refer other operators to the website. Suggested text for a 579 PSB report at this early stage is: "Your signal, reported in the PSB format (Print, Strength, Bandwidth) is 579. See WWW.PSB-INFO.NET for further info." PSB reporting can improve the value of PSK31 signal reports and help reduce excessive signal bandwidth and distortion. We appreciate your support in making PSB reporting seen on the bands.
The new PSK63 has also been seen on the bands here at G0BPS at double the bandwidth of PSK31 I have yet to be convinced of its worth. Has any other member tried it?

Peter PE1MHO wrote that Simon HB9DRV has just completed testing on v2.2 Build 607 beta of his amazing FREEWARE FT-817 Commander and PSK31 Deluxe programs. This is probably as close to the final release version as we will get. Rumour has it that Simon will soon be starting a new project that has the tentative name "Ham Radio Deluxe" but he can't disclose too much about it at the moment. Suffice it to say that it will knock spots off many commercial offerings and result in moaning and gnashing of teeth...
http://www.halpin.tomaatnet.nl and http://www.hb9drv.ch

From John W2AGN: As a confirmed CW operator, I rarely mess around on SSB. If there is a country I need that is only on SSB, I'll give it a try. I was messing around with an old SB104 I

got the receiver working, and was fiddling with the drive. I didn't even have the jumper in back for the "High Power." I was on 10M SSB, and kept hearing 7X4AN calling CQ. He worked a few, but no pile up. As I was just messing around, I gave him a call, just using the driver, about 1 watt...and he answered and gave me a 53 report! Amazing! Something to do while snowed in.

After many months of gathering components together, Charlie wrote, I've finally had the time (due to "enforced" holiday) to put together a 40m SSB transceiver using the excellent TCF design from VK3XU's book. I must pay tribute to the design as apart from a couple of mistakes on my part, it all worked first time! Had my first QSO today with an M0 station in Birmingham in the middle of a PA contest!! I've made receivers in the past but never the full TCVR and what a thrill it is to have a 2-way QSO on home built kit.

There will be mention elsewhere about the induction of Tony G4WIF and Graham G3MFJ into the QRP-ARCI Hall of Fame. This is the highest honour our American club can give to any amateur. They both thoroughly deserved it.

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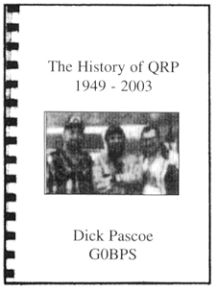



**A new book on QRP**

## *The History of QRP 1949 – 2003*

**By Dick Pascoe G0BPS.**

**Full of details of past and present clubs, the people in the hobby and much more. Available now for £11.00 Inc UK postage (NON UK buyers £12.95 or US$20)**

**Also Available: Introducing QRP £6 Inc post (outside UK $10) reprinted 'Pascoe's Penny Pinchers', £5 inc postage**

**Seaview, Crete Road East. Folkestone. CT18 7EG, Mail Dick@trickie.com**

## YOUR HELP WANTED for the RSGB HF Convention

**The 2003 HF Convention will at the Britannia Country House Hotel, Didsbury, Manchester, Friday 31st October to Sunday 2nd November. The Saturday will include a QRP FORUM. The club will have a display and will provide speakers.**
**Can you help? Offers of help would be gratefully received by G3RJV.**
**Do you have a talk? We still have a spare 'speaker slot'.**
**As we are being offered this chance to promote QRP, it would be good if as many members as possible could be involved.**
**All of our QRP displays and activities will be on the SATURDAY.**
**Details of the event will be carried at http://www.rsgb.org.uk/hfc or contact G3RJV for more information.**

## EXPRESS TEST [join other QRP stations on the air]

I want to inform all QRPers about QRP Express-test. RU-QRP Club members say "Welcome!" to all the World's QRPers every Sunday with the following time table:

SUNDAYS

| | |
|---|---|
| 10.00 UTC 7030 | 10.40 UTC 21060 |
| 10.10 UTC 10106 | 10.50 UTC 24906 |
| 10.20 UTC 14060 | 11.00 UTC 28060 |
| 10.30 UTC 18096 | 19.00 UTC 3560 |

This is a good chance to monitor condition, test equipment and antennas, and make 2-way QRP QSOs.

Also, don't forget about the International QRP Net

Saturdays 10.00 & 22.00 UTC at 14060 KHz.

Oleg V. Borodin RV3GM RU-QRP Club's Chairman

## Two Way QRP QSL Labels and Blank G-QRP QSL Cards

**QRP Labels:** Black Lettering on Gold with Club Logo : 200 labels £2. Post inc.

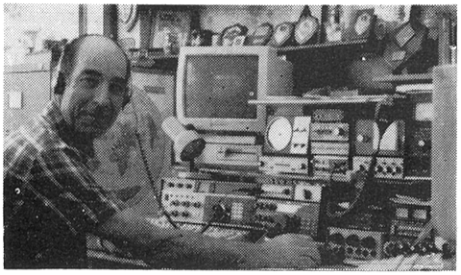
**Blank QSL Cards:** You complete your address and call. Blue lettering on white card, 5.5" x 3.5". 100 cards £4. Post inc. Sample from : **M.L. Prickett [Max] G3BSK, 260 Haslucks Green Road, Solihull, West Midlands. B90 2LR.**

Cheques: "M.L. Prickett" [The G QRP Club benefits from each order]

## N.B.T.V.A

The Narrow Bandwidth TV Association (founded in 1975) is dedicated to low definition and mechanical forms of ATV and introduces radio amateurs to TV at an inexpensive level based on home construction. NBTV should not be confused with SSTV which produces still pictures at a much higher definition. As TV base bandwidth is only about 7kHz recording of signals on mini cassette is easily achieved. A quarterly 12 page newsletter is produced and an annual exhibition is held in April/May in the East Midlands. If you would like to join, send a crossed cheque / postal order for £5 (or £4 plus a recent SPRAT wrapper) to Dave Gentle, G4RVI, 1 Sunny Hill, Milford, Derbys. DE56 0QR, payable to "NBTVA"

# MEMBERS' NEWS



## by Chris Page G4BUE

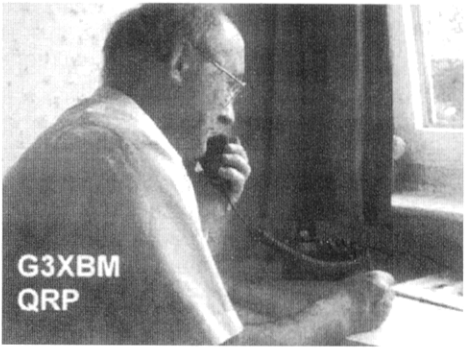
Highcroft Farmhouse, Gay Street,
Pulborough, West Sussex RH20 2HJ.
Tel: 01798 815711
E-mail: g4bue@adur-press.co.uk

The ARRL Newsletter Vol 22 No 21 of 23 May 2003 announced the QRP WARC Speed DX Challenge. Starting on 1 June 2003 and ending 31 May 2004, the object is to work as many DXCC entities as possible on 30, 17 and 12m using 5w (CW and digital) or 10w PEP (phone) or less. Certificates will be awarded for the top three totals from each CQ Zone in each of several categories for working 100 entities on any single band (17 and 12m CW, phone, digital and total; 30m CW and digital, and total CW, phone and digital and total overall). You do not need QSLs, just post your scores on the Internet 3830 Score Submittal page at <http://www.hornucopia.com/3830score/>. The Challenge is being promoted by Dan, **K7SS**, and Ward, **NØAX**, and the Western Washington DX Club with help from Bruce, **WA7BNM**. For more information, contact Ward, **NØAX**, <n0ax@arrl.net>.

My suggestion for annual DXCC tables in the last SPRAT met with a mixed response. **M3THO** says, "Please no tables! They would take up valuable space, and are particularly dull to read". **G3YMC** says, "My present 2003 country score, all QRP CW, is 117. Number 116 was a nice one, **ET3BN**, so things cannot be that bad. All time score, QRP CW with the K2, is 179". **GW4ALG** says, "If you are going to start a table in *Members' News*, my country total for 2003 is 41, all QRP CW". With only three responses to the idea, I will not be pursuing it!

The ARRL DX CW Contest clashed with **MW5HOC**'s wedding anniversary and so Darren, "Was unable to give it a proper go and popped on now and then". He had never had a QRP QSO with USA on 40m before and called several loud stations on Saturday night without success until he called **KC1XX**. "After five minutes of calling he called me back and he was very impressed with my 5w. Finally the States on 40m QRP!". On Sunday afternoon Darren used his new Sandpiper 10 band portable antenna stuck in the ground while operating from his car and was amazed how easy it was to work North American stations on 10m. Sunday evening he was back on 40m with his FT-817 reduced to 2.5w and the only station who heard him was **W2FU** in New Hampshire. Darren uses a loaded dipole for 40m and says, "I know that lots of people don't like contests, but they are a very useful tool when it comes to working DX, new countries etc, especially when running QRP. There are *lots* of very large antennas out there during the big contests, and that makes the QRP op's life that little bit easier".

Congratulations to **LZ2RS** for winning the QRP Overseas Section of the 2002 RSGB's 21/28MHz Contest, the seventh consecutive time he has done so. Rumi recently received his WAS QRPp CW for two-way milliwatts from ARCI for all 50 states. Congratulations also to **G8PG** who won the new




**Roger 'in action' on the FT-817 and Miracle Whip from the bedroom table!**

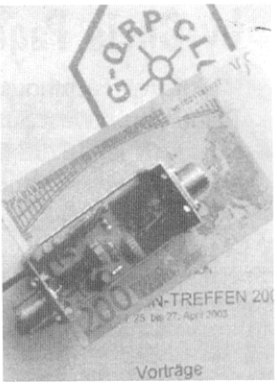
QRP Section in the First Class CW Operators' Club (FOC) annual Marathon contest for members. Congratulations to Arnie, **CO2KK**; Graham, **G3MFJ**, and Tony, **G4WIF**, who were inducted into the *QRP Hall of Fame* at Dayton this year.

"It's amazing what you can do on QRP," says K5IC after being QRV in the ARRL DX CW Contest from his New Mexico QTH. Audie worked **XT2WP**, **5B4/RZ9UA** and **9G5ZZ** using a four element Yagi at 13 metres with 2.5w. He went on 40m and forgot to reset the FT-817 to 5w and worked **JH1AEP** while using a Hustler 6BTV up three metres with three radials. **PA9RZ** worked three USA stations on 40m the CW Contest and one new state (MS) in the SSB Contest. Robert has now worked 43/38 states for his QRP WAS and says KH6 will be the tough one. He is planning to attend the Yeovil Convention in June.

**VP8NO** worked some UK stations in the RSGB's Commonwealth Contest on the HF bands and 40m with his K2. Mike says, "Not bad for a 40m inverted vee at 10 metres apex coax fed. The K2 auto ATU sorted out the match. Now thinking of turning the vee into a doublet with open wire feeders and a 4:1 balun". **DL2BQD** worked **DH2DAM** (using 150mW) and **DJ6FO** (using 300mW) on 40m using his K1 at 4w and a 12 metre wire, "Out of the window of a concrete block to a near tree". **PY2CSU** is QRV on 40m with a 2w QRP transmitter (2N3553) and a DC receiver (NE602 Neophyte). Carlos is a new member of the Club.

**N3AAZ** says that PSK31 is , "A real QRP mode. You can work overseas stations the ear cannot hear". It is John's preferred mode now. **PE1MHO** and **HB9DRV** have developed a new version of Simon's FT-817 Commander CAT program. Pete was testing it in April prior to the release of v2.2 He says, "The next step is to tackle PSK31 Deluxe, but that will take us up to (probably) June to get done". The program can be down-loaded from <http://www.kns.ch/sysgem/hb9drv/FT817Build592.exe>. **K1RC** has "Just received an Argonaut V and been having a blast with it so far".

**DL2BQD** reports on the annual German Pottenstein meeting, "The organisers did a jolly good job again and so did all the members who offered valuable and interesting contributions. There had been a wide field of technical reports including IF amplifiers, PA construction for a 40m riglet, experiments with baluns, mini vertical antenna and its surprising effects and results, practical delta loop constructions and demonstration, TX with three volts and lower, testing a new oscillator IC to name just some. The ladies were spoilt by a wonderful trip to Coburg and its castle. It was a pleasure for us that we could again welcome amateur radio friends from HB9 and OE. See you 2004 in Pottenstein".


**Dieter says he had never seen a 200 Euro note before. The 40m PA by Willi, DK6SX, is displayed on that background, "QRO plus QRP", says Dieter.**

**DH3FAA** went to Lanzarote with a homebrew JSB TX, a Sony RX, ten metres of copper wire for an end-red halfwave antenna (which he put up at two metres) and worked **VK8AV** on 20m. Klaus received 339 for his **EA8/DH3FAA** signal.

Older members may remember the legendary *Milliwatt: National Journal of QRPp* published by Ade Weiss, **WØRSP** (**K8EEG** at the time) from 1970 to 1975. **WA8MCQ** says a CD is available of the entire 33 issues in PDF format, details at <http://www.qrpworld.com/>. **KC2HUJ** has worked 82 DXCC in two years with his FT-817 and MFJ rigs CW on 20 and 30m from his Long


**A collage of more home-brew equipment on show at the 2003 Pottenstein QRP Meeting - *thanks DF2OK.***

Island, NY QTH. Bob uses an end-fed wire with an artificial ground and "A lot of listening". **M3RAL** has never used more than 5w since being licensed and during his military service rarely operated higher than 20w. Rick says, "The secret was in learning what the radio and antennas are capable of, as well as understanding the importance of good operating skills" and, "I have to say that operating low power has to be up there as one of the greatest challenges in amateur (or professional) radio operation, not only in terms of the technicalities involved but also the operating procedures used too. QRP is not always easy, but if it was, is it really worth doing?". Well said Rick.

Sadly I have to report that Angel, **LZ1SM**, passed away on 2 February. He was Club member 5192 and achieved his QRP Master using a home-brew VXO one watt transmitter on 20m only. Harry, **LZ1BB**, says, "His one watter is quiet now but we will remember Angel for ever". The German QRP Club new project *Miss Mosquito* is designed by DK1HE and is an *Altroids* tin superhet VFO transceiver for 40m with an adjustable receiver and 1 to 3w output. Pictures of the prototype are at <http://www.werdau.net/qrpproject/images/Moskital_klein.jpg> and **DK3RED** says it will be available as a kit for about •55 at the Friedrichshafen Ham-Radio 2003 at the end of June. Ingo says an optional kit with an *Altoids* case, jacks, variable resistors and other parts will be available for •12.50.

**N6KR** announces a new "Easy-to-install upgrade to the K2's PLL synthesiser stage". Wayne says, "This will be of particular interest to those who use the K2 with the KPA100 option, or who frequently operate outdoors or mobile". More details at <http://www.elecraft.com/order_form_parts.htm#K2%20Parts>. During the February local QRP meeting of **DL2BQD**'s crew, they decided to build a little QRP transmitter using an original design by Uwe, **DL7UWE**, who also gave them valuable help and technical advice. Dieter says, "The board and some basic parts were supplied by the crew of Schwedt upon the Oder who prepared a kind of semi-kit to offer an easy start. There are 10 amateurs who will be soldering 30, 20 and 15m versions including **MØBST**, **M3NPB** and **DL4NSE** as members. By now the first should be on air already, so the QRP banner is again waving proudly".

**GW4ALG** used his K2 at 5w and a G5RV antenna in the WPX CW Contest and made 646 QSOs for a claimed score of 411,768 points and **G3LHJ** made 408 QSOs on 20m (an all-time record for Derrick).

Let me know how your summer goes, by 20 August please, and please let me have photographs for this column, either digitised by e-mail or hardcopy by snail mail.

# GQRP Club Sales

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

(Non-members prices are in brackets)

**Radio Projects for the Amateur by VK3XU. £6 (£7.50)** } plus postage per book: UK - £1.25;
**GQRP Club Antenna Handbook. £5 (£6.25)** } EEC - £2.90; DX - £3.50

**6 pole 9MHz SSB crystal filter 2.2kHz @ 6 dB, 500ohm in/out £12 (£14)** } plus postage: UK - 50p;
**6 pole 9MHz CW crystal filter 500Hz @ 6dB, 50ohm in/out £12 (£14)** } EEC - 80p; DX - £1

**Pair LSB/USB carrier crystals HC18U wires - [9MHz ± 1.5kHz] £6 (£7) pair** } plus postage
**MC1350 at £2.25 (£3) each; SA602AN at £1.75 (£2);** } (any quantity)
**CA741 op-amps 8pin DIL – 5 for £1; CA3046 quad transistor array – 5 for £1** } 30p (UK)
**IRF510 FETs £1.25 (£1.50) each; Electret mic inserts – 10p each** } 40p (EEC)
**2SC536 transistors – (fT-100MHz, hFE-320, VCBO-40V) - 5 for 50p** } 70p (DX)

**NJ-QRP Club pad cutters (Sprat 109) - £4.50 each inc post UK, £5.00 EEC & DX**

**Toroid cores – Available in packs of 5 – max of 2 packs of each per member**
**T37-2 – 65p; T37-6 – 75p; T50-2 – 90p; T50-6 – £1.10; T68-2 - £1.80; T68-6 - £2.20**
**FT37-43 – 70p; FT50-43 - £1.20; FT37-61 - £1.00; FT50-61 - £1.20**
Plus postage – up to 5 packs = 30p (UK), 50p (EEC), 75p (DX); 5 – 10 packs = 60p, £1, £1.50 etc.
Please note some slight price adjustments on these. (The packs may have the old prices on them!)

**MK484 radio on a chip - £1.00 (£1.50) inc postage & circuit diagram.**

**Sprat on CD (1 to 109) - £10 inc postage.**

**G-QRP Club mouse mats £3.50 each inc post UK £4.00 EEC & DX**

**MAR-4 RF amplifier** – 8dB gain at DC to 1GHz! £1.75 each inc postage – **Limited stock – one per member!**

**Miniature calling frequency crystals** (watch crystal size – very low power) –
3.560, 14.060, 21.060, 28.060. £2 each, plus postage (any quantity) 30p (UK), 40p (EEC), 70p(DX). Very limited stock – one of each frequency per member.
These should be used in very low power circuits – they are tested before dispatch & no returns can be entertained.

## New Items

Ceramic resonators – 3.68MHz and 7.2MHz – 50p each – limited quantities. (plus postage as IRF510)
*These will pull nicely in an "invertor oscillator" (Thanks to Peter 9V1PC for these)*
More miniature crystals – 7.030, 10.106, 18.096 and 24.906 – £1.75 each. ALSO – 7.030MHz HC49-wires - £1.75
All are one of each per member - same postage as IRF510
Varicap diodes – MVM109 – 40pF @ 9v, 500pF @ 1v 75p each – max of 2 per member (plus postage as IRF510)
Still coming shortly – binders for Sprat – watch this space!!

**Back issues of SPRAT – 50p each.** *At the time of printing, I have most issues from 78 (except 84)*
**Plus postage** (sorry about the large postage charges – posting magazines is not cheap nowadays!):

**UK : 1st magazine 33p + 17p each extra magazine**
**EEC : 1st magazine 75p + 26p each extra magazine**
**DX : 1st magazine 115p + 50p each extra magazine**

**To keep within second class postage limits, orders may be sent in more than one package!**

**Cheques (UK) and payable to G-QRP Club** (cheques payable to me will be returned!)
**Sorry, but cheques in Euros are uneconomical to us due to bank exchange charges!**
**Visa/Mastercard. Please quote full card number/expiry date. We can only send the goods to the card owner's registered address.** Sorry, we do not accept Debit Cards such as Switch or Connect.

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