

H.A.R.S. Notebook

Journal of the Hereford Amateur Radio Society

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Editorial

A number of members have sent in congratulations pointing to the club Journal. On behalf of Nigel and the Committee, I would like to thank everyone.

One such Email was received from Grant G4ILI. Grant lives in Cheltenham and bemoans the fact that he cannot get to the

club as much as he would like but, he enjoys the Journal which keeps him up to date and connected. Grant also mentions the early club days and he causes me, and many others I am sure, to remember the HARS-founder, and world-class operator, Stuart, G4CNY.

Don't forget that we are always pleased to receive items for inclusion in the *Journal*: please see page 8 for some ideas.

(Ed)

Software Defined Radio (SDR)

At the July meeting we were treated to a splendid presentation of SDR given by Bob G3IXZ and Derek G3WAG who collaborated to reveal the top end and the bottom end, of the now very popular software driven radio technique.

At the start, Bob, who first encountered SDR professionally when talking to government communications departments in 1995, introduced his FLEX3000 (£1300) unit. When connected to his PC, the receiver section generated a panoramic display of signals across the selected phone and CW sections of the 7MHz band.



Typical Flex3000 display

The members were shown how a specific signal peak on the screen, could be zero'd onto using the computer mouse, and how the variable digital filter (appearing as a vertical shadow band overlay), can be actively narrowed to produce clear crisp CW with the band noise dramatically falling away... a joy to behold!

We were told that for digital radio to work, the signal interrogation sampling rate of 96kHz is generally chosen as being the best compromise as opposed to the 192kHz option which would inevitably require a lot more speedy computing power.

The RF front end of the FLEX3000 is a super direct conversion receiver circuit with an I/Q demodulation output for processing. It has outstanding selectivity and dynamic range, and covers 10KHz to 60MHz with a resolution of 1Hz. The transmitter section is straight forward and has an output of 100W all modes with a lesser power output on AM.

By contrast, Derek introduced three low cost small-scale receivers which would virtually plug straight into a PC USB port, loaded first with the available free software.

The first was the USB DVB-T+DAB+FM priced at £5 on eBay. This is described as a radio tuner/receiver stick dongle and comes complete with the PC software to realise the active panoramic display. Whereas the FLEX3000 tops out at 60MHz, this unit limit is 2GHz and similarly covers all modes of broadcast reception.



USB DVB-T+DAB+FM tuner/receiver stick

Derek then introduced the FUNcube dongle covering 136KHz to 2GHz priced at £160 for the latest version. We were told that with this device we could tune into the auto-transmissions from aircraft and in interestingly for us, those aircraft currently flying overhead!



This is exactly what Derek proceeded to do by tuning the dongle into 1.09GHz (mid L Band), and down came a long stream of data in 1/2 second bursts. This is ADSB (Air Dependant Surveillance Broadcast), and by linking this data to the Internet we could see three aircraft in the vicinity, we could see who they were, height, type of aircraft, etc, etc. No doubt the

engine manufacturers monitor their engines performance in this way, in real time, world wide.



The final unit we were shown was the small black box called “SDRplay” which will run with free software particularly “SDR Console” designed for Windows and will run on Windows 10. This unit sells for £118 and it covers from 100KHz to 2GHz. Amazingly it has a bandwidth of 8MHz.

(Thank you Bob and Derek for a revealing talk. I might try this...Ed)



Icom's latest SDR TX/RX, the IC-7300

Every club should have one

Nowadays RF circuitry is well served by tiny components which are surface mounted onto a printed circuit board. This is known as *surface mount technology* or SMT. This is all very well but for radio amateurs building their own equipment, there is no way of telling the value of these unless it is printed on the packet. Even so, it is recommended that you do not rely on what the packet says. Of course the exception to this are the resistors which can easily be measured with a meter, but what about capacitors and inductors?

For the capacitors and inductors there is a very useful “tweezer” such as the Farnell 2444036 (£170). For capacitors it will measure from 0.5pF to 4999uF with a 1% accuracy. For inductance it will measure from 0.5uH to



999mH again with a 1% accuracy. It will also measure resistance. The tweezers will allow components already mounted into the circuit to be measured too, but remember the digital reading is likely to reflect the effect of other components shunting the component being measured.

Some common case sizes are:

- 0402 1mm x .5mm
- 0603 1.5mm x .8mm
- 0805 2mm x 1.2mm

The choice of capacitors for RF work would be multilayer ceramic.

Tadpole

Drone Technology

The club meeting in August was a little bit unusual. But, it was so entertaining!

Nigel, our Chairman, produced a **Blade Chroma Quadcopter** drone and explained to everyone its control finesse. Afterwards, we all went outside for a flying demonstration.

Apparently drones have had something of a bad press, so it was not surprising to hear that they have to be flown 150m away from any crowd and not within 5km of any airport! Further, permission has to be sought from principals before a flying session begins. However, the legal height attainable is 122m and the range is 500m without a CAA permit.

The lift is provided by a combination of four powerful contactless motors driving contra-rotating propellers. Position calculation, as expected, is by cross referencing between a multitude of received satellite signals. Power is provided by a plug-in 2.2Ah battery which should provide a half an hour flying time.

The control options are numerous with the



The Blade Chroma Quadcopter

requirements of speed, direction, height, and battery status, quite obvious. There are at least three interesting operational modes available.

- 1) Position of the drone is referenced to the location of the control unit.
- 2) Drone is the centre point and the control unit is referenced to it.
- 3) Emergency “get yourself home”.

With the latter, the drone will come home from whatever height and position, and plummet downwards to within 10 feet whereupon the motors will pick up and make a soft landing... astounding!

On board is a high resolution wide-angle camera. The perfectly focussed pictures are streamed down to the ST10 controller screen and can be streamed on to any other wi-fi connected device.

The Blade Chroma Quadcopter is available from Maplin for £1099(rrp) inclusive of case and camera.

(Whizzo! Mr Chairman, thanks.....Ed)

NB There is a YouTube video of a Quadcopter at <https://youtu.be/iDJekpejdTY>

Automatic "CQ" Keyer

By Steve G1YBB

I was scrolling down my Facebook feed and spotted a post in I think one of the SOTA Facebook groups mentioning a BX-184 CQ Parrot. It looked interesting at first, then awesome! Within 20 minutes I had it ordered.

This is a modification to the standard MH-31 microphone that comes with the FT-817, FT-857D and FT-879D etc. It will record and playback a message, perfect for calling CQ Contest or CQ SOTA etc, but without the requirement to carry and connect up another gadget as it fits completely inside the microphone body. It was designed by Oliver DH8BQA and he describes it on his website <http://www.dh8bqa.de/bx-184/>.

It is available for sale on the German Funk Amateur site here Funk Amateur BX-184 (http://www.box73.de/product_info.php?products_id=2360). However, they also do another kit which includes an MH-31 microphone body (if you don't want to disturb your original mic) and the Funk Amateur BX-184M (http://www.box73.de/product_info.php?products_id=2361) is the option I chose.

This is the German website and if like me, you don't speak German "Google Translate" will help a lot! There is also now a USA vendor at <http://www.box73.com/product/2>

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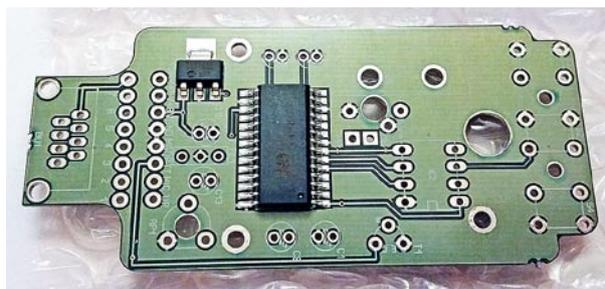
The kit arrived pretty quickly and this is what you get in the box:



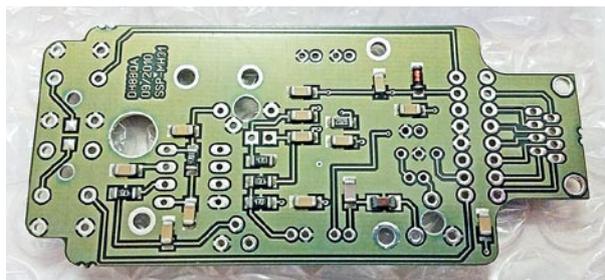
A complete kit with all you need. The PCB is part SMT (surface mount technology) and part through-hole components. You just need to fit the through-hole components.

The double sided PTH PCB is very nicely manufactured.

Top:



Bottom:



Before it arrived I did some research and found that there were some mods made by DG2IAQ on eHam which sounded worthwhile:

Mod 1:

"I do always replace C8 (4,7µF) by a non-polarised SMD 1,0µF to speed up the AGC. With this change the internal AGC works more as a mic compressor than as a (slightly delayed) mic Level limiter."

Mod 2:

"And for the first time I changed R4 (82k) into 56k to bring the sample rate from 8kHz up to 12kHz (by a shortened play time of 40s instead of 60s, but that's still more than enough for my needs). This change gives even more punch for the replayed calls as the sound is a little more high-pitched afterwards. You simply can solder a 100k SMD in parallel to R4 instead of completely replacing it."

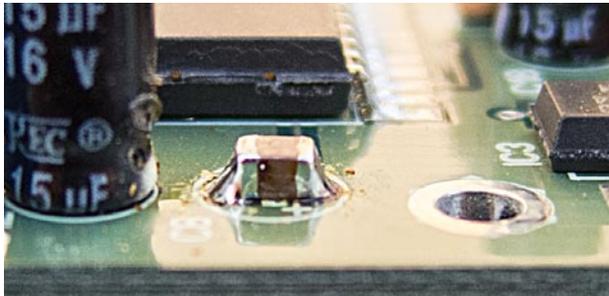
I emailed Oliver DH8BQA for his thoughts on these mods and he confirmed they should be worthwhile.



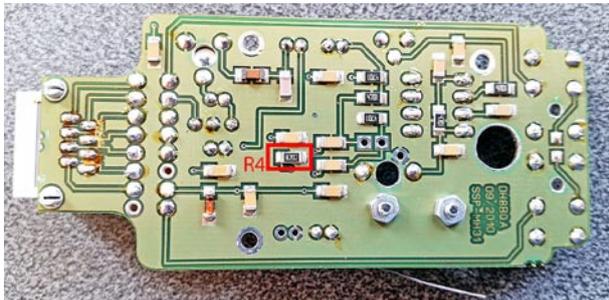
The assembled PCB.

So I decided that an 0805 ceramic chip 1 μ F capacitor would fit best across the pads for the 4.7 μ F electrolytic it was replacing:

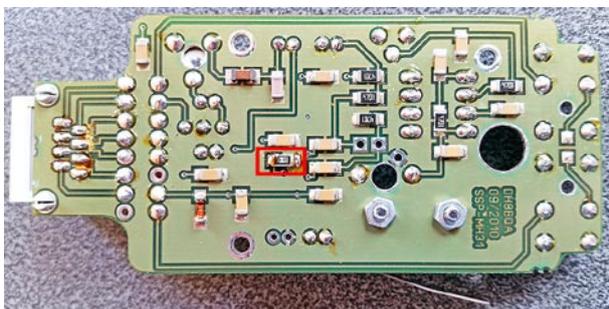
I should have fitted this first as the 15 μ F cap next to it made it awkward to get a good solder joint on the GND side of the capacitor due to the ground plane wicking the heat away. Got there in the end though:



R4 is an 82K 1206 sized resistor located on the rear of the PCB (this is easy to locate as the kit comes with build instructions in German with a good circuit and layout supplied. English instructions can be downloaded here, page 5 onwards <http://www.box73.de/download/bausaetze/BX-184.pdf>):



And with a 100K 1206 fitted in parallel (on top of the fitted resistor) as suggested above:



With all parts now fitted (including a 1206 capacitor fitted across the supplied electret insert terminals) all that is left to do is mount the electret insert into the microphone body and solder that to the PCB.

Opening up the supplied microphone and removing the PCB revealed these 2 slabs of steel in the body. The only function of these

I could see was to add weight to make it feel more substantial. So I got rid of those. No point in carrying dead weight:



Next I hot-melt glued the electret insert into the mic and filled up the void as the instructions said. Actually I filled more than the picture in the build instructions showed by mistake. Then solder the screened cable to the PCB and fit the IC and it's ready to be assembled:



As the replacement PCB does not have the two position slide switch, there is the unused hole in the back of the mic. For this I just used some good quality sticky label material I have to hand. Given more time (I wanted this to use in a contest quite quickly) I would come up with something a little more elegant.

One piece inside and another on the outside (not pretty, but functional):



Once assembled I compared the standard supplied Yaesu MH-31 mic for weight against the BX-184 CQ parrot. A 40% saving in weight, I'll take that:



I soon connected it up to the radio ready to go but there was no outgoing audio! What!? With several projects on the go I could do without time spent fault finding. What if I have cooked the electret soldering the capacitor on now it's well and truly hot glued into place. Hmm. Hold on, what was that pot trimmer for? I remembered when building it I couldn't see any mention of it. A check of the circuit confirmed the obvious answer. It's on the mic output to the radio. A quick check with the meter confirmed it was currently set to ground. A quick tweak and we are back in business.

In fact the worst part was setting up to monitor myself. Eventually I had a reasonable system, FT-857D on 5Watts into a dummy load near

the FT-897D with a 4mm banana plug as an antenna feeding into the sound card on the PC, with Audacity dealing with the recording. The recordings are not broadcast quality but are good enough for a comparison.

I might need some on air radio reports for final setting but it doesn't seem to be clipping at all though does have a little more punch.

Can't wait to try this out in a contest or SOTA activation.

Conclusion: All in a great little kit well thought out and which went together very well. The only small point is no actual mention of the trimmer function or setting which would be good as a reminder - if nothing else. I know this kit is aimed at radio amateurs who should be able to look at the circuit and deduce why the pot is there so this is a very minor point in a great kit.

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I have since used this 'in anger' in 144MHz hill-top contests. In the first contest I had some complaints about overdriving and being wide; (complainant was also wide for that matter!!). But I turned SSB mic gain down in the FT-817 and back at home I did turn down the audio output level on the microphone itself and did some tests between it and the standard MH-31. Subsequent contests have resulted in zero complaints but some good audio reports.

The Balloon Goes Up

Some of the club members will know that Ryan Ing, a sixth-form student at John Masefield School, Ledbury, has been diligently putting together a project for his thesis. The project is to put an inflated balloon high into the atmosphere and track its ascendancy using GPS. He has a PITS module which will transmit telemetry data including temperature, humidity and pressure. The data will be transmitted back to control on 434.250MHz (70cms) received on a radio scanner MVT-7100 and the launch date is expected to be the week beginning 12th September subject to the weather. Launch will also be subject to other telemetry operations and activity on the frequency at the time. Ryan asks for others who are interested, to join in and record the transmissions, just in case control loses a few "0"s and "1"s !!

(Good luck Ryan... Ed)



RSGB 3rd 144MHz Backpackers Contest

Yes, you've guessed it!, our illustrious Steve G1YBB has won again. Congratulations Steve.

This session was timed to coincide with the last three hours of the VHF NFD and after set-up the first objective was to find a quiet frequency!!

See the table below. This gives all of the participants technical information and more. Steve says that even though Scotland DX was rare, they did contact the Orkneys. No ON & PA however.

(Well done again Steve.....Ed)

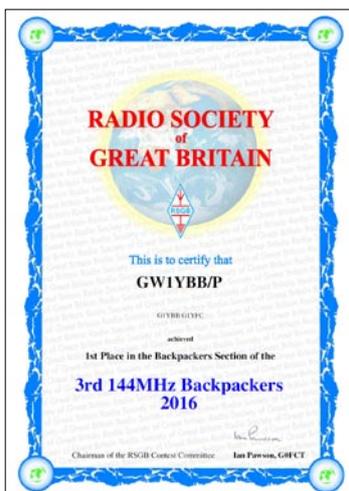


Shack up and ready for use



Antenna up and ready.

Section 3B												
Pos	Callsign	Locator	QSOS	Score	P/QSO	Mults	Total	ODX	Kms	Power	Ant	Equipment
1	GW1YBB/P	IO81KW	118	22,333	189	28	625,324	GM0HTT	797	2.5	9 ele DK7ZB @ 4m, 800m ASL	FT-817
2	GW7LAS/P	IO82HV	86	13,883	161	26	360,958	GM3WOJ	545	3	9 element tonna @ 3m, 830m ASL	TR751e
3	G4XZL/P	IO90JO	58	12,263	211	27	331,101	PA1T	622	3	9 Element DK7ZB yagi @ 4m, 235m ASL	FT-817
4	G4TCU/P	IO82QJ	99	12,287	124	21	258,027	F5SGT/P	474	3	Diamond A144S10R @ 3m, 533m ASL	TR-751e
5	GW4IDF/P	IO81NV	63	9,374	149	19	178,106	PA1T	670	3	11el @ 4m, 425m ASL	FT817ND
6	G1MDG/P	IO91LT	50	7,315	146	21	153,615	MM0HCE/P	529	3	9 ele Yagi @ 4m, 198m ASL	Kenwood TR751e
7	GW4TJC/P	IO83EB	39	7,615	195	20	152,300	G5LK/P	403	2.5	5-ele OWL @ 3.8m, 532m ASL	FT-817ND
8	M1EYP/P	IO83WE	62	7,169	116	18	129,042	GM4JJJ	332	2.5	SOTAbeams SB5 @ 3m, 343m ASL	FT-817
9	G0LGS/P	IO81XW	47	6,451	137	18	116,118	GI4GTV/P	375	2.5	9 Ele @ 3.9m, 320m ASL	FT-817
10	G0PEK/P	JO01FH	25	2,769	111	13	35,997	F5SGT/P	437	3	7 ele ZL special @ 3m, 180m ASL	Elecraft KX3
11	M0ZGB/P	IO91DM	24	2,978	124	11	32,758	EI9E/P	366	2.5	5 Element Yagi @ 3m, 277m ASL	FT-817nd
12	G8IRI /P	IO90KQ	14	2,328	166	11	25,608	M0NFD/P	413	2.5	5 ele SOTA @ 2m, 100m ASI	FT-817
13	M6POA/P	IO91HH	19	1,859	98	8	14,872	G4ZAP/P	194	2.5	5 element yagi @ 4m, 261m ASL	FT-290r



Getting Started with Radio

Finding a project to get started with can be difficult. Getting started means finding out about components, what they look like and what their special diagram symbols look like. Note that many of the same components are used in both electronics and radio.

Take a look at the Velleman FM radio kit from Rapid Electronics (70-4037) priced at £17.87.

This is not a “ham” project but it is nevertheless a radio. The kit includes a VHF tuner and all of the resistors and capacitors and ics for you to put together and enjoy. Better than this, all of the components are pictured together with their circuit symbols on the assembly sheet. Also given are indications on how to solder, and how to fit the components into place.

Don't forget the club members are always available and would be delighted to help.

Watch this space for other radio kits, for the ham bands etc.



(Will do... Ed)

Dear Member

Please note that the *Journal* will be issued bi-monthly and the December issue will be special.

Please think about submissions/projects you might like to send in, such as that 7MHz crystal receiver for example!!

General topics and key words are listed below.

Members projects	Events	Training
Members station	Notices	QRP/QRO
Construction	Help	Illustrations
Items wanted	News	Photographs
Items for sale	DX	Early radio
Hints and kinks	Militaria	Restoration...

... or anything that might be of interest to HARS members. If you have an idea for a submission, but don't know how to present it, feel free to ask for advice.

Please submit anything and everything to topix@hars.wagnet.co.uk or talk with Mike at the Club meetings.

73s es GDX, G3LZM
Mike Bush (Editor)

