An Amateur Radio publication for the Microwave Enthusiast

scatterpoint

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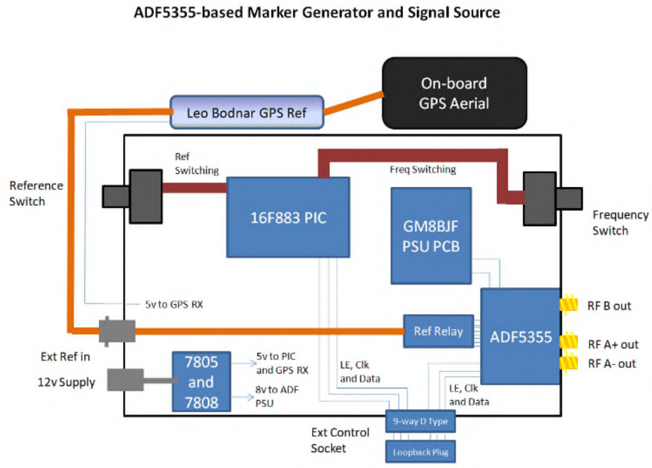
In This Issue



ADF 5355 Signal Source by Dave G8GKQ

VK3CV Status Display by Barry G8AGN

UK Microwave Group

Subscription Information

The following subscription rates apply.

UK £6.00 US $12.00 Europe €10.00

This basic sum is for **UKuG membership**. For this you receive Scatterpoint for **FREE** by electronic means (now internet only) via

https://groups.io/g/Scatterpoint and/or Dropbox. Also, **free access to the Chip Bank**.

Please make sure that you pay the stated amounts when you renew your subs next time. If the amount is not correct your subs will be allocated on a pro-rata basis and you could miss out on a newsletter or two!

You will have to make a quick check with the membership secretary if you have forgotten the renewal date. Please try to renew in good time so that continuity of newsletter issues is maintained. Put a **renewal date reminder** somewhere prominent in your shack.

Please also note the payment methods and be meticulous with PayPal and cheque details.

PLEASE QUOTE YOUR CALLSIGN!

Payment can be made by: PayPal to

ukug@microwavers.org

or a cheque (drawn on a UK bank) payable to 'UK Microwave Group' and sent to the membership secretary (or, as a last resort, by cash sent to the Treasurer!)

Articles for Scatterpoint

News, views and articles for this newsletter are always welcome.

Please send them to

editor@microwavers.org

The CLOSING date is

the FIRST day of the month

if you want your material to be published in the next issue.

Please submit your articles in any of the following formats:

Text: txt, rtf, rtfd, doc, docx, odt, Pages

Spreadsheets: Excel, OpenOffice, Numbers

Images: tiff, png, jpg

Schematics: sch (Eagle preferred)

I can extract text and pictures from pdf files but tables can be a bit of a problem so please send these as separate files in one of the above formats.

Thank you for you co-operation.

Roger G8CUB

Reproducing articles from Scatterpoint

If you plan to reproduce an article exactly as in Scatterpoint then please contact the Editor – otherwise you need to seek permission from the original source/author.

UKμG Project support

The UK Microwave Group is pleased to encourage and support microwave projects such as Beacons, Synthesiser development, etc. Collectively UKuG has a considerable pool of knowledge and experience available, and now we can financially support worthy projects to a modest degree.

Note that this is essentially a small scale grant scheme, based on 'cash-on-results'. We are unable to provide ongoing financial support for running costs – it is important that such issues are understood at the early stages along with site clearances/licensing, etc.

The application form has a number of guidance tips on it – or just ask us if in doubt! In summary:-

- Please apply in advance of your project
- We effectively reimburse costs - cash on results (e.g. Beacon on air)
- We regret we are unable to support running costs

Application forms below should be submitted to the UKuG Secretary, after which they are reviewed/ agreed by the committee

www.microwavers.org/proj-support.htm

UKμG Technical support

One of the great things about our hobby is the idea that we give our time freely to help and encourage others, and within the UKuG there are a number of people who are prepared to (within sensible limits!) share their knowledge and, what is more important, test equipment. Our friends in America refer to such amateurs as "Elmers" but that term tends to remind me too much of that rather bumbling nemesis of Bugs Bunny, Elmer Fudd, so let's call them Tech Support volunteers.

While this is described as a "service to members" it is not a "right of membership!"

Please understand that you, as a user of this service, must expect to fit in with the timetable and lives of the volunteers. Without a doubt, the best way to make people withdraw the service is to hassle them and complain if they cannot fit in with YOUR timetable!

Please remember that a service like our support people can provide would cost lots of money per hour professionally and it's costing you nothing and will probably include tea and biscuits!

If anyone would like to step forward and volunteer, especially in the regions where we have no representative, please contact the committee.

The current list is available at

www.microwavers.org/tech-support.htm

UKμG Chip Bank – A free service for members

By Mike Scott, G3LYP

Non-members can join the UKμG by following the non-members link on the same page and members will be able to email Mike with requests for components. All will be subject to availability, and a listing of components on the site will not be a guarantee of availability of that component.

The service is run as a free benefit to all members of the UK Microwave Group. The service may be withdrawn at the discretion of the committee if abused. Such as reselling of components.

There is an order form on the website with an address label which will make processing the orders slightly easier.

Minimum quantity of small components is 10.

These will be sent out in a small jiffy back using a second class large letter stamp. The group is currently covering this cost.

As many components are from unknown sources. It is suggested values are checked before they are used in construction. The UKμG can have no responsibility in this respect.

The catalogue is on the UKμG web site at www. microwavers.org/chipbank.htm

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Loan Equipment

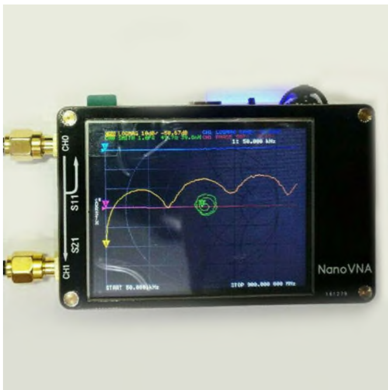
Don't forget, UKuG has loan kit in the form of portable transceivers available to members for use on the following bands: **Contact Neil G4DBN for more information**

5.7GHz 10GHz 24GHz 47GHz 76GHz

UK Microwave Group Award

At the AGM, the G3JVL Trophy and award went to Phil Boorman G0JBA

Second UKuG online Lecture



A Comparison of NanoVNAs – By Bryan Harber G8DKK

A UK Microwave Group Online Lecture streamed by the BATC

Wednesday 9th December 2020 at 20:00

Bryan will be comparing with other Vector Network Analysers and looking at VNA architecture and calibration kits.
The talk will be streamed on this URL:
https://batc.org.uk/live/ukmicrowave
We look forward to welcoming all to the talk.

Please put the 13th January 2021 in your diary for the next talk in this series.

Microwave News

Sadly the Arecibo dish feed, in Puerto Rico, has collapsed into the dish, destroying it.
Dramatic pictures: https://www.abc.net.au/news/2020-12-04/arecibo-radio-telescope-collapse-video-captures-cables-snapping/12949736

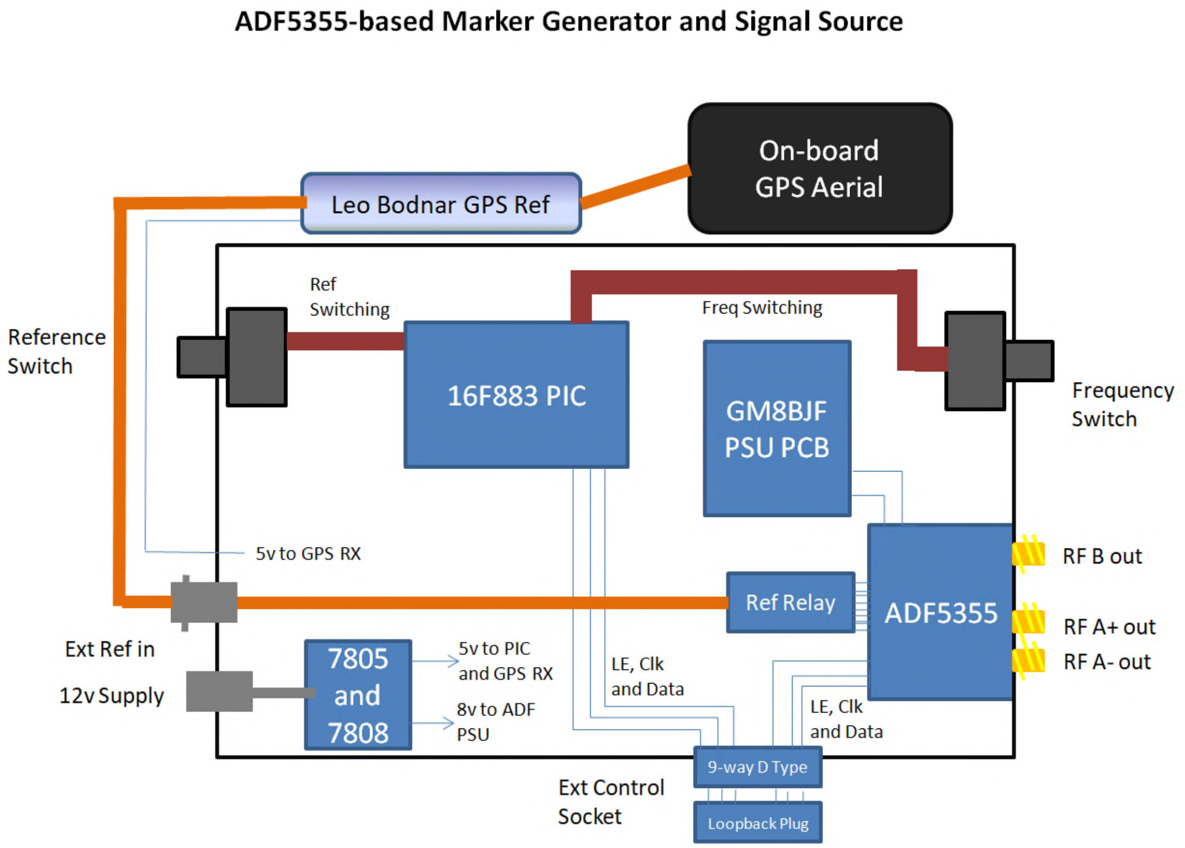
ADF5355-based Marker Generator and Signal Source

By Dave Crump G8GKQ

My main interest in Microwaves is their use for ATV, but much of my ATV gear (for 5.7, 10 and 24 GHz) is based on narrowband transverters, and I do use narrow-band for dish alignment and the occasional Microwave contest. Frequency errors of 20 kHz or so are of little consequence for ATV, so I do not build GPS-lock into my systems, relying up until now on historical calibration from beacons.

I had a Chinese ADF5355 module in the drawer having replaced it as the local oscillator in my 24 GHz transverter with a Nort SLO block. I also had a Leo Bodnar Mini Precision GPS that I had used in setting up the Goonhilly QO-100 WebSDR. Lastly, in addition to writing some PIC code for programming the ADF5355, I had also programmed the Portsdown 4 Signal Generator to control the ADF5355 with touchscreen frequency control.

I decided to build a single unit that would provide a frequency reference on all the lower microwave bands for portable use, and could also be used in the shack with the Portsdown 4 to synthesize any frequency from 54 MHz to 13.6 GHz. The block diagram is shown below.



The unit is programmed to accept 3 reference frequencies: 26 MHz from the ADF5355 on-board reference (for use without the GPS receiver), 25 MHz from the GPS Receiver and 10 MHz from other references. The PIC is programmed for 12 frequencies from the ADF5355:

100.0 MHz
144.1 MHz
432.1 MHz
1296.1 MHz
2320.1 MHz
2400.1 MHz
3400.1 MHz
5760.1 MHz
10368.1 MHz
8016.0333 MHz (= 24048.1 / 3)
9417.62 MHz (= 47088.1 / 5)
10853.74286 MHz (= 75976.2 / 7)

I used linear regulators to provide the internal supplies and also to provide 5v for the GPS receiver. The GM8BJF power supply for the ADF5355 significantly reduces phase noise, and I optimised the ADF5355 settings for low phase noise, rather than for spur rejection.

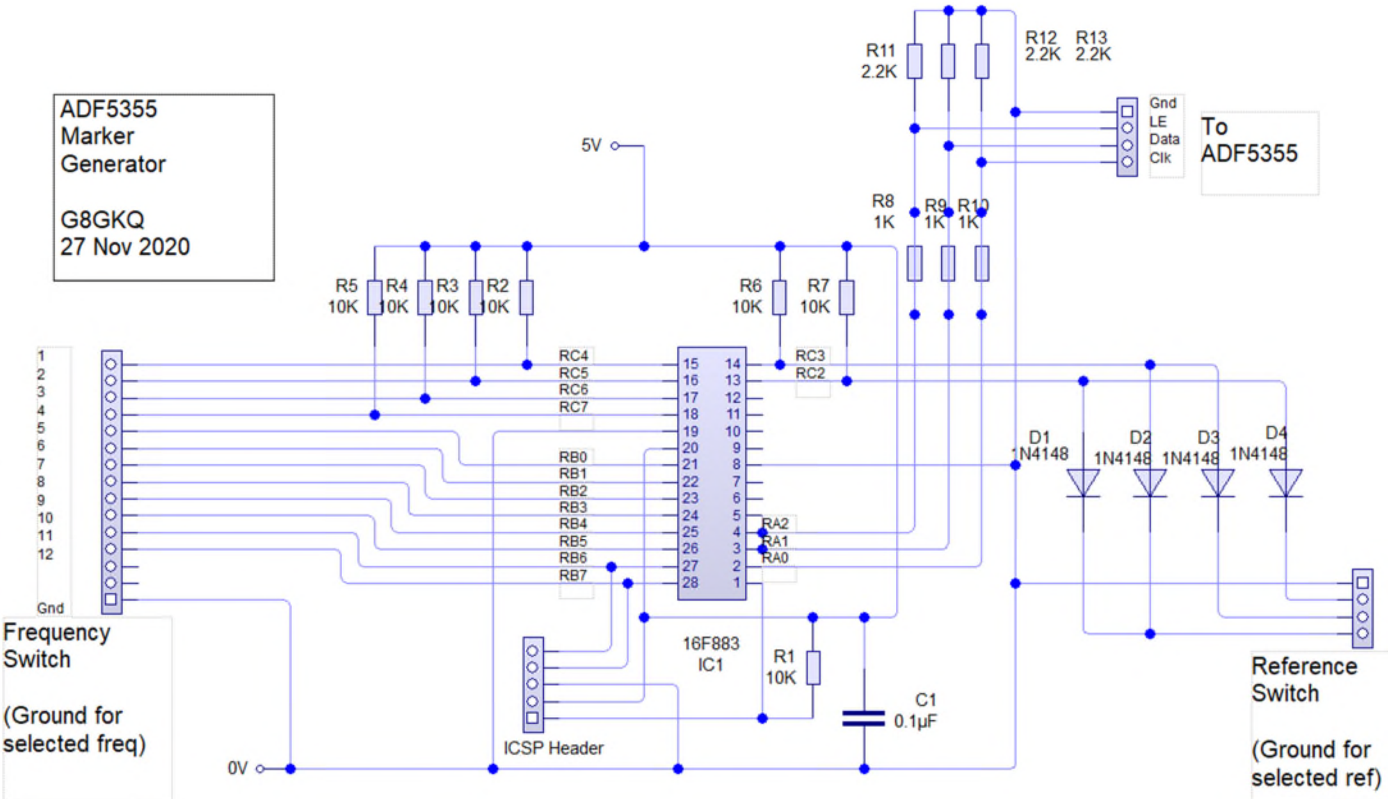
A miniature relay is used to switch between the external and internal references; it also switches the internal reference off when an external reference is in use.

The 3 data control lines are looped through a 9-way D-type to enable connection of the Portsdown 4 and thus the setting of any frequency required for output from the touchscreen.

Here are internal and external views of the project:

The GPS receiver is external so that it can be used for other projects, and other GPS aerials can be connected.

The circuitry around the PIC is shown below. The rest of the circuitry is straightforward and probably implementation-dependent.



The PIC assembler and hex files are available from my GitHub site https://github.com/davecrump/adf5355-ref . I have also published the ADF5355 register settings for each frequency and reference on that site.

Dave, G8GKQ

122 GHz mode operating summary using UK channel 6

Chris Whitmarsh G0FDZ

CW Beacon Test

On System 1

Channel to A
PTT to ON
KEY to ON
This will put the system 1 into a CW beacon TX mode on channel A
LED glow red on CW signals characters and the system is put into transmit
1500 Hz sidetone is available

NOTE that unlike UK beacons the signal is only on the mark frequency when the callsign characters are sent and the carrier then goes to the space frequency between callsigns and inter-characters. The CW uses wide spaced FSK so Mark is on 122400.0 MHz and Space is on 122256.0 MHz

On System 2

Channel to A
PTT to OFF
Key to OFF
The system is in RX mode and the LED glows **green**, Connect an I.F. receiver to the I.F. port on the PCB and tune the receiver to 144.0 MHz to receive channel A. Set the receiver IF mode to CW
A CW signal should be received on the I.F receiver

NOTE that unlike UK beacons the signal is only on the mark frequency when the callsign characters are sent and the carrier then goes to the space frequency between callsigns and inter-characters. The CW uses wide spaced FSK so Mark is on 122400.0 MHz and Space is on 122256.0 MHz

If channel B is selected then at the sending end the CW beacon signal will be MCW so at the receiving end the IF should be set to NBFM and the signal will be a 1500 Hz keyed tone but received on Channel A

FM voice Contact

On System 1

Channel to A
PTT to ON
KEY to OFF
This will put the system into FM Voice TX mode, turn the electret mic on, and turn the LED red. Tune the I.F. receiver to 144.0 MHz Set the receiver IF mode to NBFM.

On System 2

Channel to B
PTT to ON
Key to OFF
This will put the system into an FM Voice TX mode, turn the electret mic on, and turn the LED **red**. Tune the I.F. receiver to 144.0 MHz Set the receiver IF mode to NBFM

Full duplex voice audio should be heard by both operators

CW Contact

On System 1

Channel to A,
PTT is OFF
Key is OFF
The system in RX mode and the LED glows **green**. Connect an I.F. receiver to the I.F. port on the PCB and tune the receiver to 144.0 MHz. Set the receiver mode to USB or CW. Connect a CW Morse Key and a 1500 Hz sidetone is available when the Morse key is operated. The system is put into transmit and the LED will glow **red** on key down

On System 2

Channel to A,
PTT is OFF
Key is OFF
The system in RX mode and the LED glows **green**. Connect an I.F. receiver to the I.F. port on the PCB and tune the receiver to 144.0 MHz Set the receiver mode to USB or CW. Connect a CW Morse Key and a 1500 Hz sidetone will be available when the key is operated. The system is put into transmit and the LED will be **red** on key down

If channel B is selected at the sending end then the transmission will be MCW with a tone of 1500 Hz and at the receiver end it will need to be set to NBFM on Channel A
Note: The switches KEY, PTT and CHANNEL when operated in the down position to indicate the ON position put a ground on the respective inputs of the PCB. So for example the channel B means the PIC RB1 input is low (ground)

Key	PTT	Ch A/B	Mode
OFF UP	OFF UP	A UP	RX mode on Channel A (FM, SSB or CW mode receive on I.F.) LED GREEN, Microphone Not Active
OFF UP	OFF UP	B DOWN	RX mode on Channel B (FM, SSB or CW mode receive on I.F.) LED GREEN, Microphone not active
ON KEY DOWN	OFF UP	A UP	TX mode Channel A, (TX CW), Side tone on LED RED, Microphone not active Receive o channel A
ON KEY DOWN	OFF UP	B DOWN	TX mode Channel B (TX MCW FM Tone), Side tone on LED RED, Microphone not active. Receive on channel A
OFF UP	ON DOWN	A UP	TX mode Channel A (FM Audio), RX mode FM Duplex LED RED, Microphone Active. Receive on channel B
OFF UP	ON DOWN	B DOWN	TX mode Channel B (FM Audio), RX mode FM Duplex LED RED, Microphone Active. Receive on channel A
ON DOWN	ON DOWN	A UP	TX mode Channel A, Beacon CW (TX CW), Side tone keying LED Flashing RED keying, Microphone not active, Receive on channel A
ON DOWN	ON DOWN	B DOWN	TX mode Channel B, Beacon FM (TX MCW FM Tone), Side tone keying . LED Flashing RED keying, Microphone not active Receive on channel A

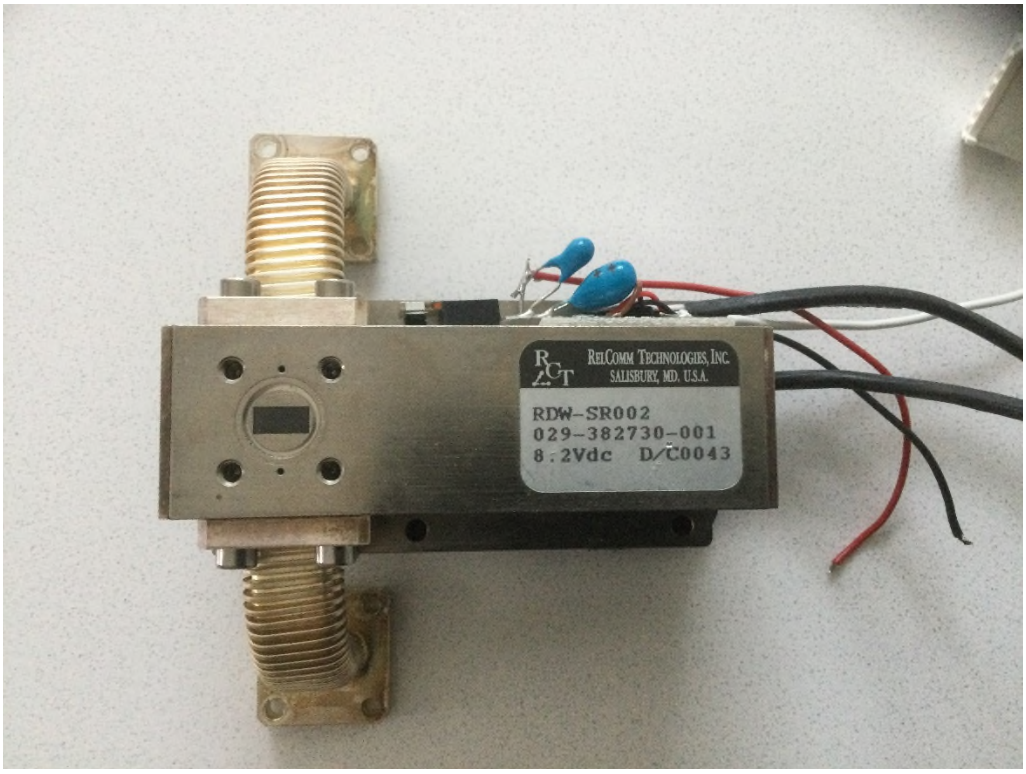
LED Flashing quickly alternate RED/GREEN - supply voltage below 9.5V
LED flashing RED on start up – PLL not locked (LED should initially be RED and then go GREEN (RX mode). LED RED – TX mode and GREEN RX mode
Using CW the Key switch is affectively DOWN when the Morse key is pressed
When switches are DOWN (ON) the input (Key, PTT & CH A/B) is grounded via the switch

Editors Comments

This month there has been a number of challenges with the editing. Mainly due to formatting of the received articles. Please, if possible send text by Word, un-formatted, and pictures separate. PDF'd diagrams present even bigger problems.

A solution to understanding the status of the VK 122GHz board, is covered in the net article by Barry G8AGN

Technical Thoughts
With the failure of both my 10 & 24GHz Systems on my mast at home. I will mention a couple of technical traps that I fell into.
The first was the RelComm waveguide switch. This is specified as 8.2V. Running fine in the shack, on the mast at 8V after time the wg switch stuck in the TX position. I have now changed the regulator to 9V, and all is working again.
On the 10GHz transverter, I have had no issues running the RelComm 8.2V relay on a diode drop below 12V.
The other issue on the 10GHz transverter was also a relay. I had believed the Ebay spec. on the RC-S6232 as 12V. It was running very hot with a current of 350mA. Finding a real data sheet, showed it was a 5V relay, or 12V via a 2W 47ohm resistor! Also was that it was a 26.5GHz unit with low loss, and high power handling. So, it has been repurposed somewhere more useful, on the correct supply.



A simple status display for the VK3CV 122GHz transceiver board

Barry Chambers G8AGN

<u>Introduction</u>

Many operators have found initial difficulty in deciding which switch combinations to select on their VK3CV 122GHz transceiver boards to enable operation in a particular mode. This brief note describes how to add a simple status display which not only shows the current operating mode and frequency channel information but also the time and the 10-character Maidenhead locator.

The design is based on an inexpensive 1.8-inch, 160 x 128-pixel, SPI TFT colour display which is driven by a 3.3v 8MHz Arduino Pro-Mini. The latter was chosen for simplicity since the PIC controller on the VK3CV board uses 3.3v logic and thus interfacing between the PIC and the Arduino is thereby simplified. The Arduino is used to monitor the logic levels on those PIC pins which are used to control the various modes of operation of the VK3CV board and it then displays appropriate information on the TFT display. The VK3CV board status is checked periodically but the TFT display is only updated if a change has been made.

The display also has sufficient space to show the current time and the 10-character Maidenhead locator using data provided by an optional GPS module connected to the Arduino. The choice of GPS module is not critical and both a ublox NEO-6M and a SKM52 have been used during prototype testing. The time and locator information are updated every 30 seconds but this interval may be changed in the sketch to suit the user.

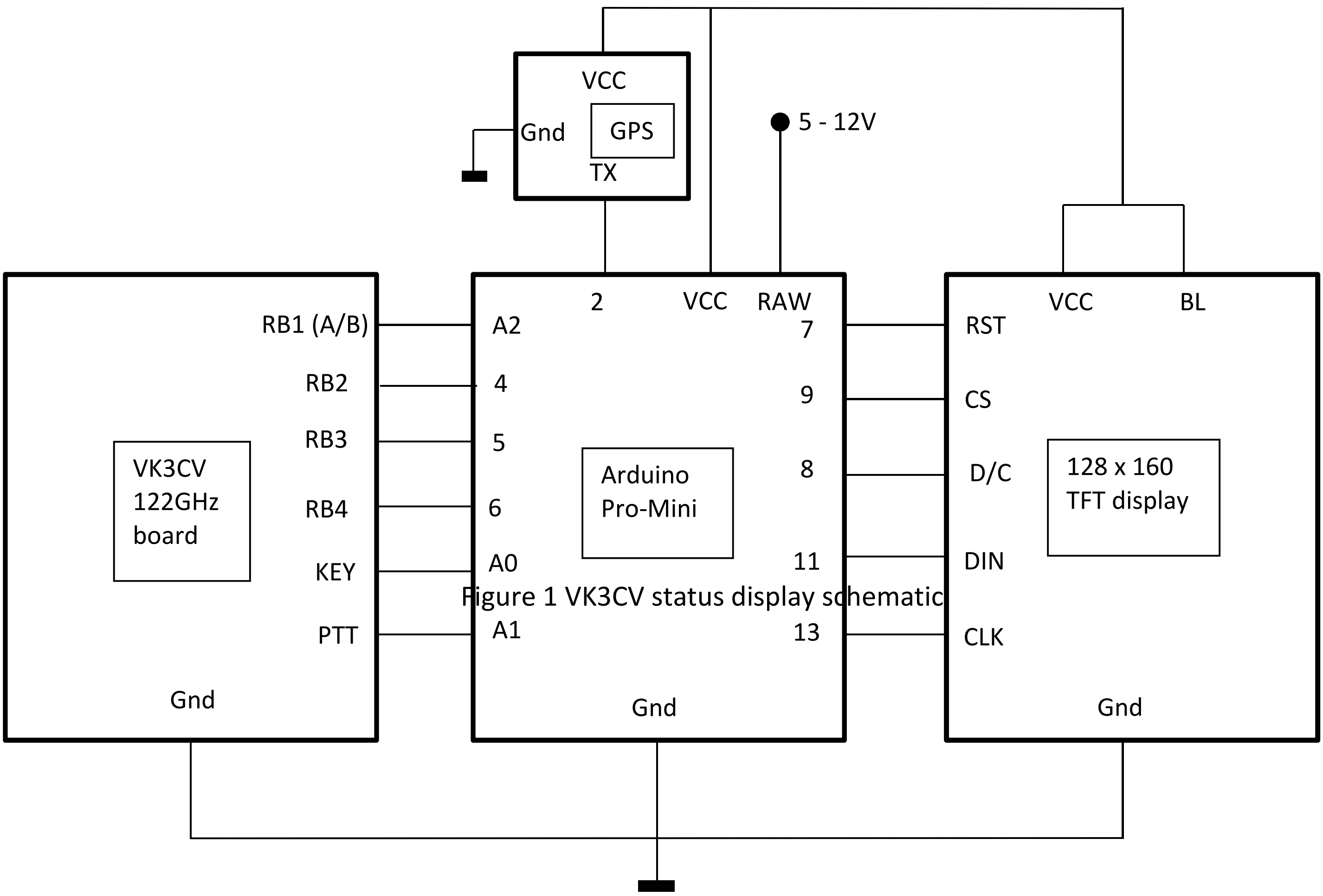


Figure 1 VK3CV status display schematic

Figure 1 VK3CV status display schematic

The circuit schematic for the display is shown in Figure 1. This should be examined in conjunction with the VK3CV circuit schematic so that the appropriate connection points between the Arduino and the VK3CV board can be identified. Three of the inputs to the Arduino can be made via the toggle switches CH A/B, PTT and KEY; the other three, RB2 – RB4, will need to be tapped off pins on the DIL rotary channel switch which is mounted on the VK3CV board.

The circuit shown in Figure 1 should be powered by its own independent 3.3v regulator but a common ground connection should be established between the VK3CV board and the display.

Software and Testing

The sketch contains a section of code which enables the display to be tested in the absence of external connections to the Arduino inputs. This facility may be switched on or off in the sketch, depending on the value of a variable called diagCheck. With diagCheck set equal to 1, the default test conditions are with all the Arduino inputs RB1 (CH A/B), RB2, RB3, RB4, PTT and KEY set equal to one. This corresponds to all the VK3CV board switches being 'off' and their inputs being held 'high' via pull-up resistors connected to 3.3v. The resulting TFT display is shown in Figure 2. As a warning that the display is being operated using internally generated test data rather than external signals, a red asterisk is displayed in the top right-hand corner; this is not shown under normal operating conditions when diagCheck is set to 0.

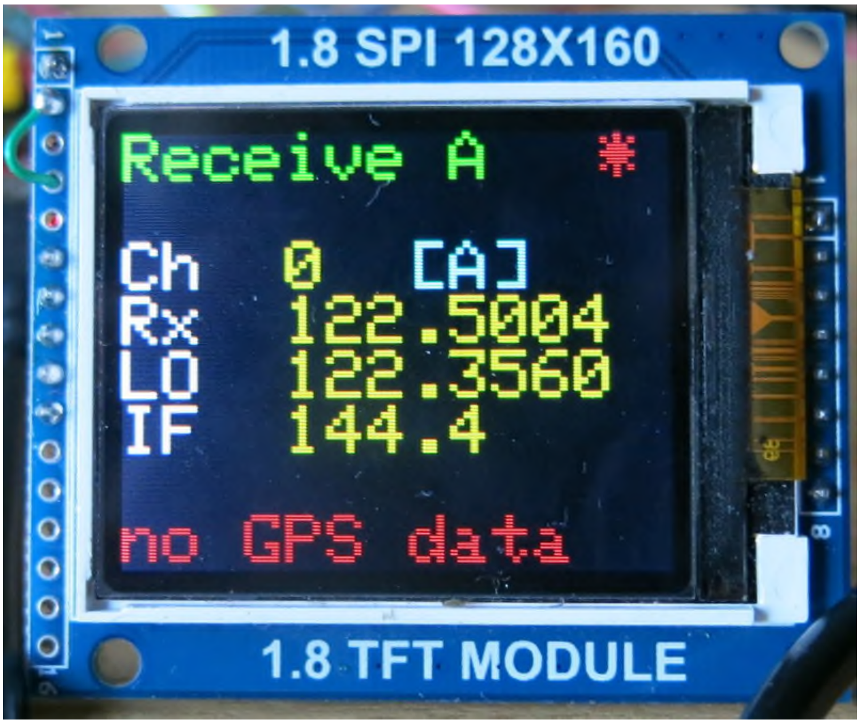


Figure 2 Display status test 1

In Figure 2, the colour of the first line of data on the display indicates whether the VK3CV board is in receive (green) or transmit (red) mode. Subsequent lines show the channel number (0 – E), the position of the A/B switch and the frequencies appropriate to the selected mode of operation (in this case the receive, L.O. and I.F. frequencies). Also shown in Figure 2 is a message in red to indicate that no valid GPS data is available. Figure 3 shows the same VK3CV board status messages but now the GPS has a valid 3D fix and so the 10-character Maidenhead locator and time are also shown.

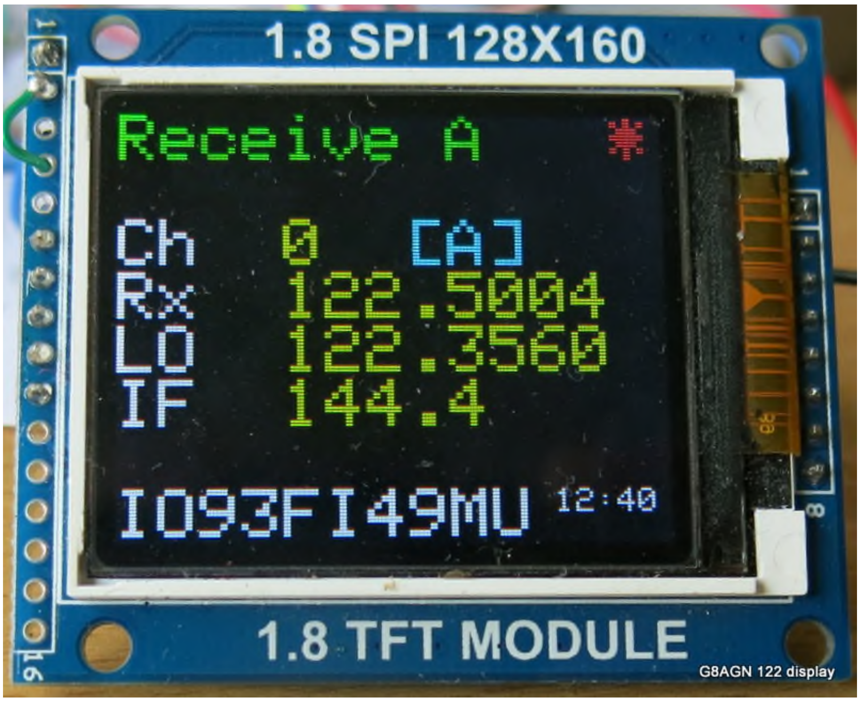


Figure 3 Display status test 2

Once initial testing is complete, the internal diagnostic check should be switched off by changing the value of diagCheck in the sketch to 0 and up-loading the modified sketch to the Arduino. Further testing now requires switches to be connected to one or more of the Arduino input pins 4 – 6 and A0 – A2. As an example, the connection to one input (KEY) is shown in Figure 4. Using six such connections, the full range of the VK3CV board modes of operation can be simulated. Examples of other display modes are shown in Figures 5 and 6.

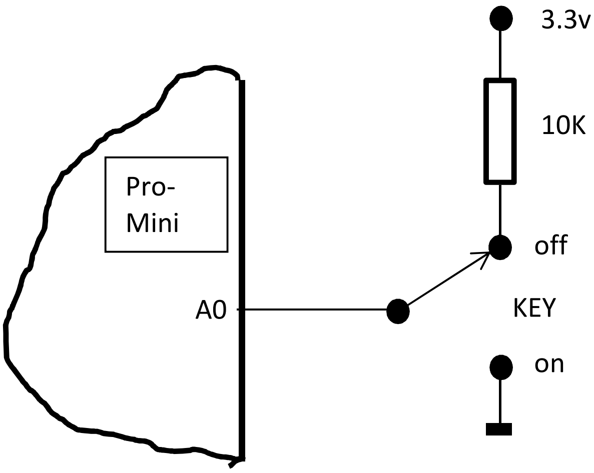


Figure 4 Switch circuit for testing an input to the VK3CV board

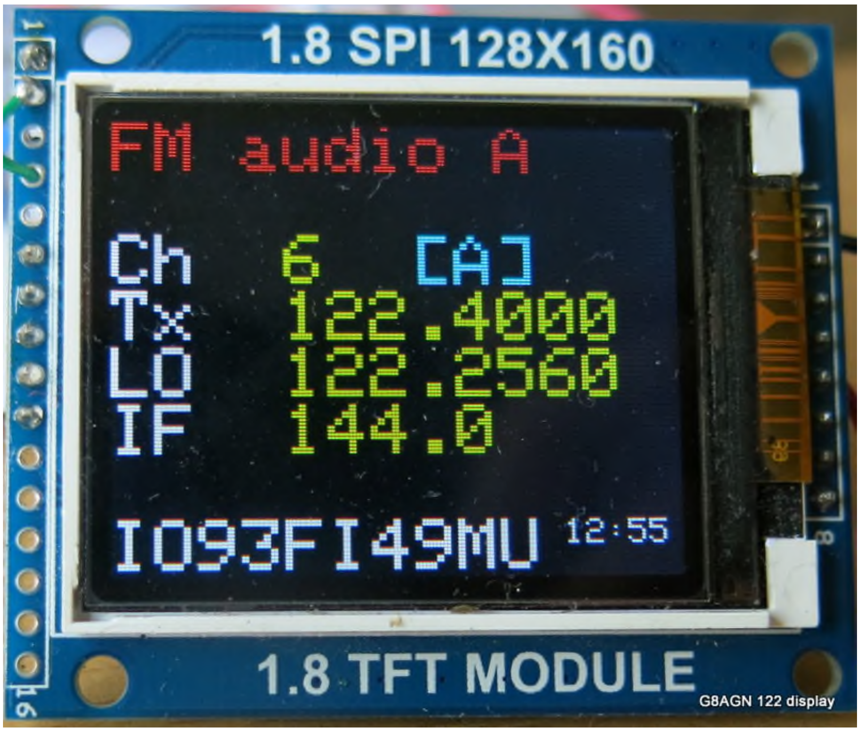


Figure 5 VK3CV board in FM speech duplex mode

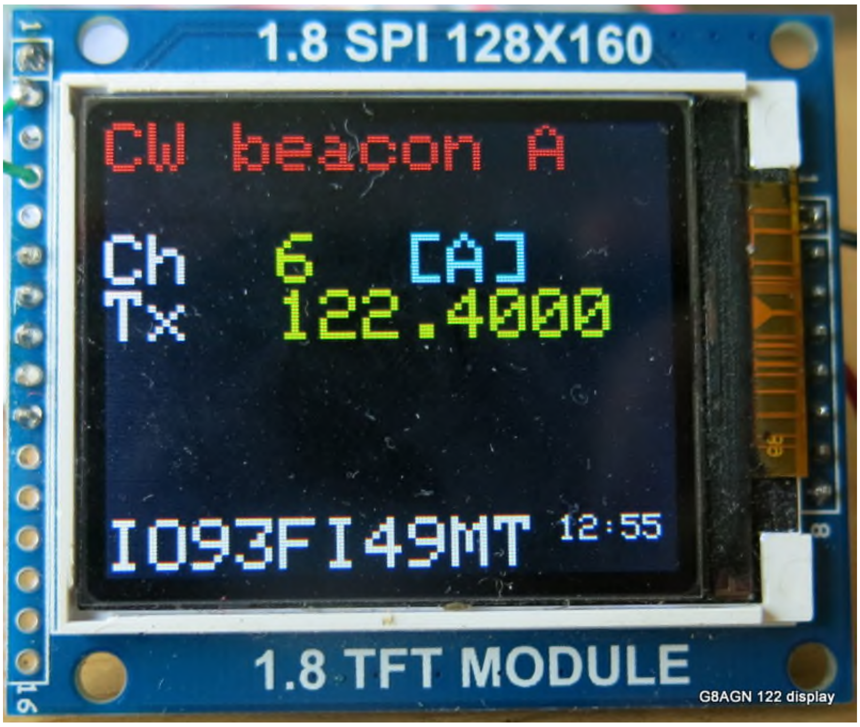


Figure 6 VK3CV board in Morse beacon mode

With testing complete, any switches and associated wiring used to exercise the display should be removed and connections made to the VK3CV board as shown in Figure 1. No inputs to the VK3CV board should be connected externally to 3.3v as all inputs are already held high (3.3v) via internal connections. The display should now operate correctly with the VK3CV board as intended.

The Arduino sketch can be obtained on request by e-mailing me at b.chambers@sheffield.ac.uk

Acknowledgement: The hardware and software for this project have been beta-tested by myself and John, G8ACE, and I am grateful for his many helpful comments and suggestions

Audio Keyer for Microwavers

Andy Talbot G4JNT November 2020

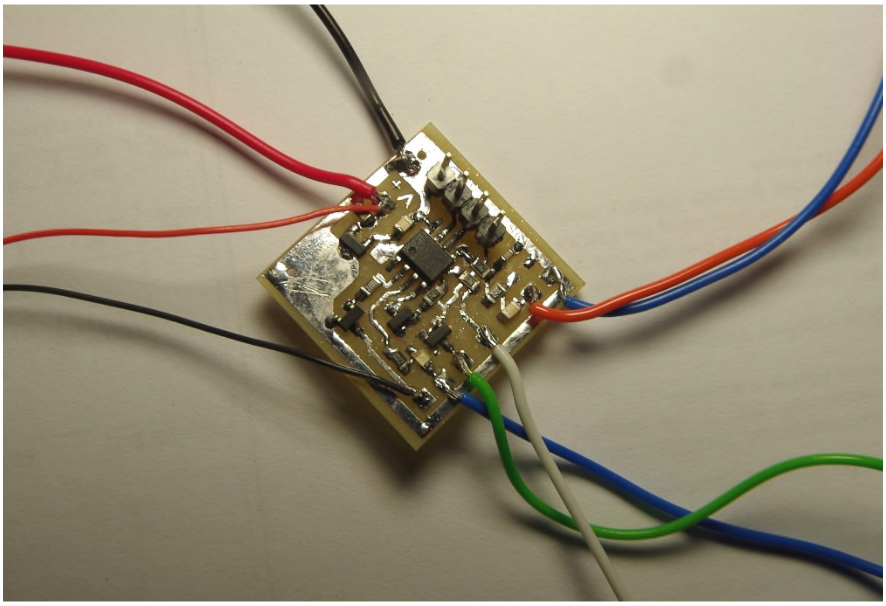
Having used an FT817 and now an Elad FDM-Duo for microwave operations, there is a big annoyance that can cause problems in the heat of the moment when trying to set up a contact; switching from CW mode to SSB. It is often normal practice to send a carrier, or pulses, or a CW message on a loop when setting up a contact, then revert to SSB for the actual QSO exchange. This often leads to several issues and things that can go wrong.
The tuning point for CW and SSB rarely agree, so the receiving station often has to retweak the tuning dial, missing parts of the message in the process.
On many of the smaller transceivers, typically those used for microwave transverter driving, mode change involves cycling through a menu; repeatedly pressing a button and watching the display to get the right one. When the talkback message arrives saying "I can hear you", it is all too easy to forget to change to SSB mode and just start shouting into a microphone with no RF output – and not noticing. The solution is not to switch to CW mode on the radio at all, to stay in SSB at all times and generate CW using an audio tone fed into the microphone socket in parallel with the microphone. Generating the test signal using an audio source gives other possibilities for sending a unique recognisable waveform, such as a chirp.

Module Functionality

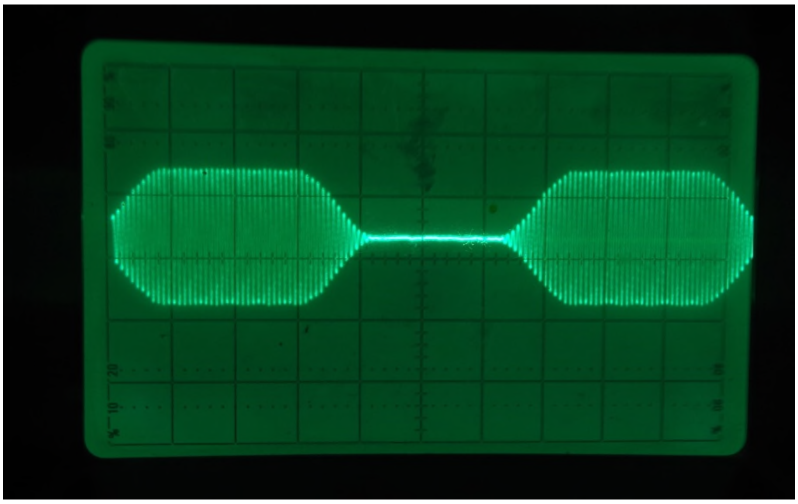
This PIC based module can do three different tasks:

Manual CW Keying	Take a manual key input and generate a clean sinusoidal audio tone to feed to the transceiver input. Control of the PTT line is enabled, with a Tx/Rx delay before dropping back. The CW keying has a shaped rise and fall giving a particularly smooth-sounding CW signal.
Chirp Test Signal	Continually transmit a rapid chirp, giving a distinctive signal for the far end to recognise and to peak up on.
CW Beacon Keyer	Transmit a prestored CW message. The same beacon keyer capability with user programming from a serial COM port with nearly identical commands and interface as for the original G4JNT/G0IAY beacon keyer [1]. Both polarities of serial interface are now allowed.

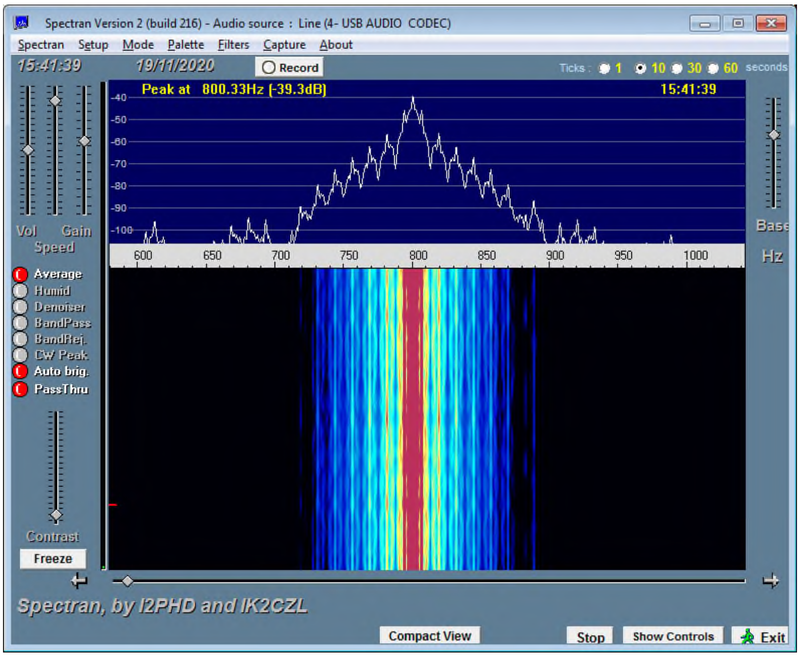
Hardware



A circuit diagram of the controller can be seen in Figure 1 and is built onto a single sided PCB approximately 25mm square. The breadboard version is shown in Photo 1.



The 12F617 PIC microcontroller includes an on-chip pulse width modulation source which is used to generate the sinewave output. The tone is generated using a Numerically Controlled Oscillator sampled at 7812.5Hz +/- 1% uncertainty due to the PICs factory calibrated RC clock oscillator. The PWM output is sampled at four times this, 31.25kHz. The CW pulse edges are amplitude shaped over a 16ms interval using a 32 point raised cosine waveform. This can be seen in Figure 3 along with its close-in frequency spectrum. At a sampling rate of 7.8kHz and only basic RC filtering on the module's output, some of the 7.8kHz waveform will be present on the audio output. Any commercial transceiver will filter this out so there is no need for additional audio filter components.



The output from the module can be taken via a resistor whose value needs to be in excess of 10k to avoid degrading the low pass filtering. This is connected in parallel with the microphone input. Choose a resistor value that attenuates the 5V Pk-pk waveform down to the few tens of mV needed for maximum audio drive. A value in the region of 100k – 1MΩ will be typical. Alternatively, install the shunt resistor on the output for further attenuation. This component position on the PCB can alternatively be used to add another filter capacitor.

The CW key (***CWkey***) and a mode control pushbutton (***ModeSW***) control the unit's operation. An LED indicates operating state.
CW tone frequency can take on eight user-programmable values from 432Hz to 1760Hz. The chirp goes from 800 to 1600Hz with a repetition rate of 2.5 chirps per second. These values can be changed by device reprogramming, but are not user adjustable.
The pre-stored CW message is held in non-volatile memory and can be changed in user-programming mode, via a serial link at 1200 Baud (either RS232 polarity or 5V TTL from such as an FTDI-Chip device) and standard ASCII terminal software such as *Putty* [2]. The entered message data can contain embedded tokens that allow CW speed to be altered during the message. Tokens can also give delays inserted into the message. The delay time can have a range of lengths from 1 to 90 seconds, and each separate delay can be individually specified with PTT on or off, and tone on/off. Thus the module can be used as a standalone beacon keyer with audio tone output.
User programming mode is entered by powering-up the module while holding down both ***CWkey*** and ***ModeSW***. More details are given in the User Programming section below.

Functionality

When it is first turned on the unit is in manual keying mode. A tone is generated whenever the key is pressed, with rise and fall times smoothed by the raised-cosine pulse ramp shaping. The PTT line goes active as soon as the key is pressed and remains active for a period of 0.8s after the key is released. The LED comes on with PTT operation
Chirp mode is entered by pressing ***ModeSW*** briefly. The PTT line goes active as soon as the chirp starts. Chirp transmission stops when ***CWkey*** is pressed, whereupon the unit reverts to manual mode releasing the PTT after the Tx/Rx delay period. The LED is on continuously while the chirp is being generated
CW beacon mode, replaying the pre-stored message, is started by pressing ***ModeSW*** and ***CWkey*** together. Transmission commences as soon as the key is released. Beacon mode is stopped by again pressing ***CWkey*** which needs to be held down until the current symbol, a dit or dah, is completed. The LED follows the CW keying pattern and during the programmed delay periods it indicates the transmit state.

Tone Frequency

Although any receiving station will adjust the SSB tuning to set the received tone to their own personal preference, the ideal situation would be that very little further tuning change is needed when switching to voice. This is accomplished by making the transmitted tone equal to a favourite listening frequency. General opinion is that this usually lies in the region 500 – 700Hz, and sometimes lower. Therefore a user-programming option has been added allowing one of eight tone frequencies to be selected and stored in memory. The choice can be taken from 432, 528, 645, 789, 964, 1178, 1440 and 1760Hz

Non - CW Version

Built using identical PCB and circuit diagram, an alternative version with no CW beacon message or programmability is also available. It has the same manual keying tone, with ramped pulse edges. The tone frequency is fixed at 523Hz. As an alternative, a Gaussian shape is applied instead of the raised cosine used on the main keyer.

The chirp is generated with a wider frequency span, from 350 to 2750Hz, suited more to coping with greater frequency uncertainty.

Instead of the CW message, the alternative transmission is a sequence of three tones at frequencies of 494, 523 and 587Hz sent repeatedly at roughly 1/3 second intervals. These tone frequencies correspond roughly to musical notes B, C, D and when correctly tuned on an SSB receiver should "sound right". Tones and interval spacing as well as the chirp limits and rate can be changed by PIC reprogramming.

User Programming

First connect a serial, or COM port interface to the four-way header as shown in Figure 2. The keyer has been designed to detect both serial interface polarity options: RS232 polarity signalling (a negative voltage that pulses positive when data is transferred) and the alternative TTL level format from devices such as the FTDI-Chip family. The latter sits at 5V and pulses low when data is transferring. The 4k7 resistor shown in the programming lead in the circuit diagram is to prevent excessive current into the PIC input pins from the typical +/-12V RS232 levels. When 5V TTL levels are used, a resistor in this position is not essential, but does help towards preventing an annoying situation that can arise. A TTL source driving the Serial Input is in its quiescent state sitting at 5V. With no power applied to the keyer and the supply line open circuit, the serial input connection can supply enough power which passes via protection diodes in the PIC, to power up the whole module. A resistor in the serial input line reduces the chance of this happening.

The beacon keyer module is reprogrammed using this link. On a PC run *Putty* or some equivalent terminal emulator programme to drive the serial COM port. Set the operating parameters to 1200 Baud, No parity, 1 Stop bit and all handshaking off; half duplex operation with no local echoing of characters.

Power-up the module while holding down both ***CWkey*** and ***ModeSW***. The LED fast-flash while the buttons are held down and for 1 second after they are released, then will illuminate fully. The keyer will respond with a message on the terminal :

G4JNT Beacon Keyer
[D]isplay [E]nter [S]end Fre[Q]
?

If you get this message, the module has correctly entered programming mode.

With the terminal software running on the PC the keyer module is then programmed as follows:

Press D and the module will respond with its current stored message which may look something like:

```
<WF>G4JNT UW KEYER
```

(or anything else that happens to be in memory). This is interpreted as :

Words per minute rate F (approx 20WPM) for one message sequence, then repeat.

To change the message, press E and the keyer will respond with

```
Token Codes
Delay seconds A-1 B-5 C-10 D-15 E-20 F-30 G-60 H-90
WPM           A-6 B-8 C-10 D-12 E-15 F-20 G-24 H-30
?
```

Type in the wanted message, speed and delay tokens are entered as characters surrounded by angle brackets <…> . Details of the makeup of these are given below.

Carriage Return terminates message entry.

Pressing D again should display the new stored message.

Finally, press S to start sending the message and exit programming mode. Check that the LED flashes correctly and the audio tone is as wanted, then remove the serial COM port link. The new message has now been stored and will be sent when beacon mode is selected. Note that when the message is first replayed after the 'S' command, PTT will not be activated unless a programmed delay with PTT-active has been stored, such as <DTDA> == Delay, Transmit, key Down, delay code A, in which PTT will then be activated as soon as it is encountered. Normal PTT operation occurs when the Beacon message is called directly from (***ModeSW*** + ***CWkey***).

Tokens

Apart from text characters, 'tokens' may be stored within the message. These consists of certain characters enclosed between angle brackets that define speed and delays.

Tokens can :

1) Change the speed of the keying over a range of values.
2) Include a delay, with PTT On or Off and with the tone on or off.

Details of making up the tokens can be found in the **Programming Summary** below.

References

[1] Beacon Keyer http://g4jnt.com/JNT_BeaconKeyer.pdf

[2] Putty terminal software https://www.chiark.greenend.org.uk/~sgtatham/putty/latest.html

If there is sufficient demand I will get a batch of PCB's made up and make them available, with programmed PIC devices if wanted. PCB price will depend on the amount of interest shown and likely number to be supplied.
To get the PIC firmware, go to htttp://www.g4jnt.com/beacons.htm
and follow the links to the Microwavers Audio Beacon Keyer

Programming Summary

Terminal (eg. *Putty*) set to 1200 baud, N81, full duplex.
Connect the serial COM port lead, hold down both ***ModeSW*** and ***CWkey***.and power-up the keyer. The LED will flash for a couple of seconds then fully illuminate.
The unit responds with and intro message and menu –

```
 [D]isplay / [E]nter / [S]end  Fre[Q]
```

Press D To see the current message stored.
E To enter and store a new message.
S To go to normal sending and leave programming mode.
Q To change the tone frequency.

Press E and the prompt for the CW Message will appear:

```
Token Codes
Delay seconds A-1 B-5 C-10 D-15 E-20 F-30 G-60 H-90
WPM           A-6 B-8 C-10 D-12 E-15 F-20 G-24 H-30
?
```

Enter the CW message data and any programmed delays, [rtn] completes the message. The LED will flicker slightly as data is entered.
Press D To see new message.
CW Speed and delays are set by entering a special code (a token) in the message entry string, placed between angle brackets.

<Wx> Where x = A to H, sets CW Speed according to the table below.
<Dxyz> Sets a programmable delay
x = R / T sets PTT line to Receive or Transmit
y = D / U sets key Down or Up
z = A – H Delays for a duration according to the table below.

eg. `<WC>G4JNT <WE>G4JNT IO90IV58 <DTDC>` sends callsign at 10WPM with a space, then again at 15WPM followed by the locator, then a delay in transmit mode with the key down for 20 seconds. If no WPM code is included, a default speed of 15 WPM is used.
Approximately 55 locations are available for message storage. Each token takes up one location. A warning is issued when entry overflows the storage capability.
If a mistake is made, press [rtn] to go back to the main menu, then start again with the [E]nter option.
Delay times and CW speed are taken from this set of values.

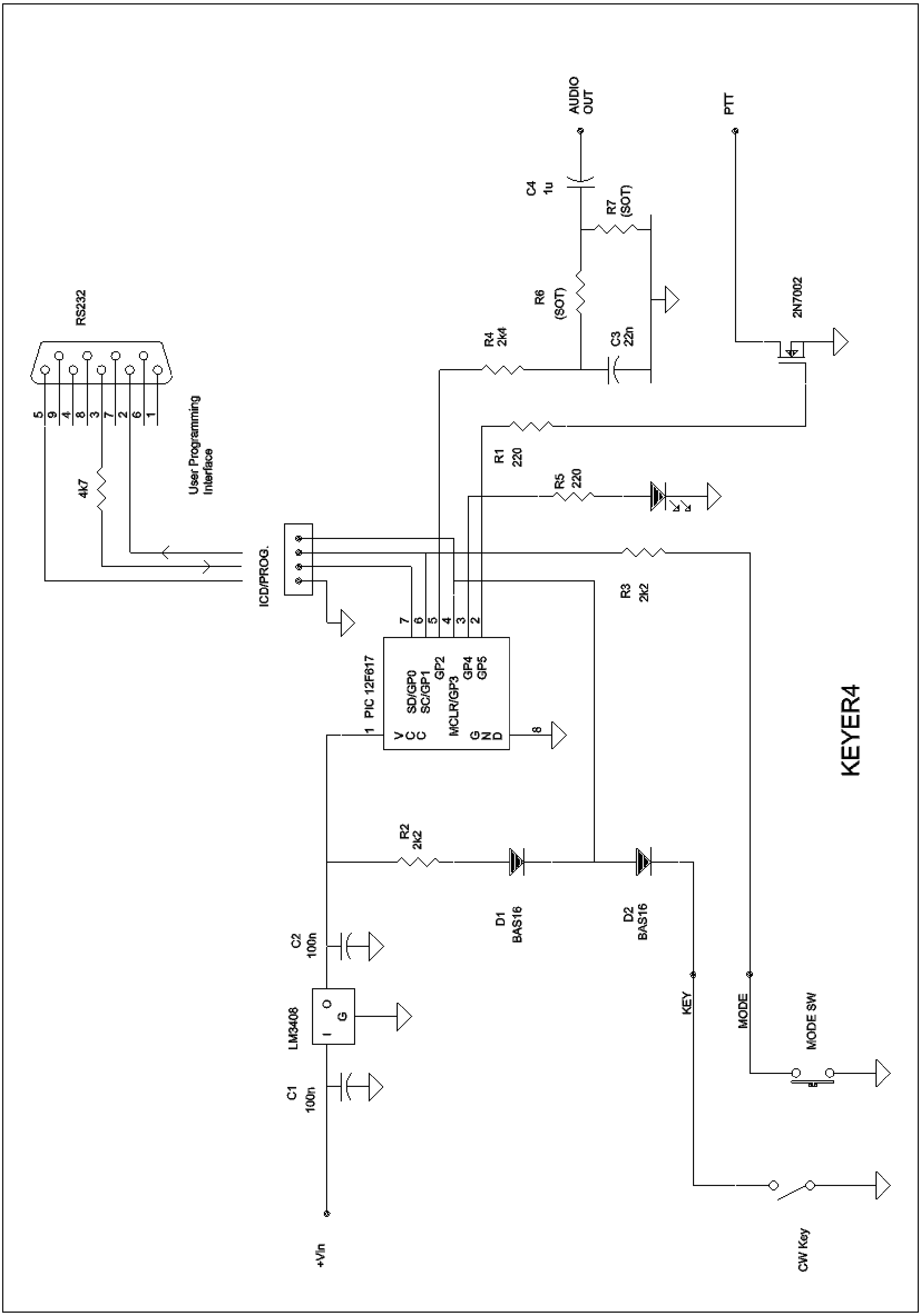
Letter Code	A	B	C	D	E	F	G	H
CW Speeds	6	8	10	12	15	20	24	30 Approx WPM
Delays	1	5	10	15	20	30	60	90 seconds

While sending, the LED flashes with the CW characters, and is on when PPT is active with Key Down during delays. The LED is on during programming mode and flickers very slightly during RS232 data entry.

To change the tone frequency, at the main menu Press Q and the prompt for tone frequency appears:

```
Tone Code  A-432 B-528 C-645  D-789  E-964 F-1178 G-1440 H-1760
?
```

Enter a letter A – H and the keyer returns to the main menu with the new tone frequency stored.


KEYER4
RS232
User Programming Interface
4k7
ICD/PROG.
PIC 12F617
VCC
SD/GP0
SC/GP1
MCLR/GP3
GP2
GP4
GP5
GND
AUDIO OUT
PTT
C4 1u
R7 (SOT)
R6 (SOT)
R4 2k4
C3 22n
2N7002
R1 220
R5 220
R3 2k2
R2 2k2
D1 BAS16
D2 BAS16
C2 100n
LM3408
C1 100n
+Vin
KEY
MODE
MODE SW
CW Key

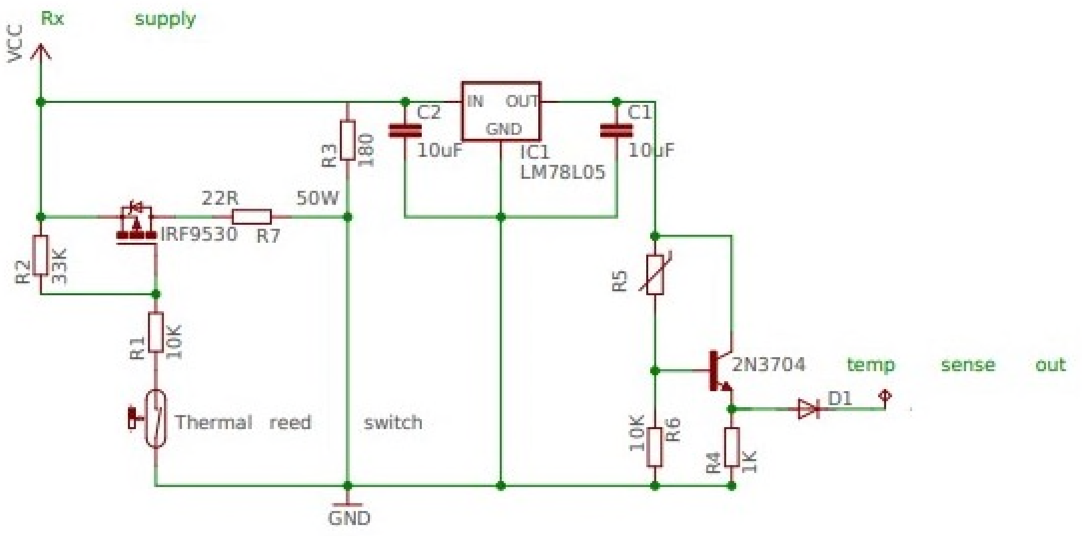
A heater circuit for Transverters mounted at masthead

Richard Bown G8JVM

This a simple circuit to help combat condensation inside remotely mounted transverters.
It uses a low cost thermal reed switch to turn on a P ch MosFet and connect a 50W wire wound resistor to the supply. I found the IRLIB9343 useful as the tab is insulated, but anything that will withstand 100V and 5A will be reliable.

I have used two versions, one for the 13cms transverter and utilised the +25v supply for the antenna changeover relay.
Note: on my remote transverters I supply +13.5V, +25v with 4 core 2.5mm cable.
The other on my 6cms transverter.
As there is very little space in the 6cms transverter enclosure, there was not enough room for the large 50W resistor and I had to use one in a flatter package.
The only value I had was 22ohms and that was run on a regulated 15V supply.
22 ohms as shown in the schematic is fine for 12V supplies, just pick a value to give about 18 ~ 20W of heat.
When the Mosfet is switched on the resistor will produce about 18W of heat.
I found although the Kemet thermal reed switch is specified to open at 10C +/- 2.5C,
it does not close until the temperature drops to 5C, hence the additional 180ohm wire wound resistor to continuously generate a couple of watts of heat.
Both of the heater circuits are mounted on the lid of the DB6NT transverter enclosure, this does need to be kept warm, I found problems with moisture from condensation getting under the helical filters.
No need for a pcb or to keep things neat , I just soldered a couple of 1nF feed through caps to the lid and built dead bug style.
Most people will use the DC output from a directional coupler to give an indication of RF output in the shack, this can be wire "ORd" with the output line from the temp sense line, hence the diode.
If you are using two diodes to OR the outputs from the directional coupler and the temp sense line power the circuit so it is active during the Rx period, If you are running enough Tx power the enclosure will warm up then anyway, In my case 100W on 13cms and 10W on 6cms help to keep things warm during the Tx period.
A third version will be fitted in the 9cms transverter , active from December 2020

It's important to keep the NPN bipolar transistor, which can be any small signal device and the thermistor away from the heated surface, hence the use of long leads.
Condensation in diecast boxes mounted outside is a big problem, ABS is a better material, but not as strong and does not give any RF shielding



The Thermal Reed switch is a Kemet M-TRS5-10B, Farnell part number 298-5761, closes at 5C And opens at 10C , The bipolar NPN transistor can be any small signal The thermistor R5 is 10K @25C Farnell part number 249-2882

Scatterpoint activity report

Activity News: November 2020


By John G4BAO

Please send your activity news to: **scatterpoint@microwavers.org**

From Graham G3YJR

Activity- wise I continue to enter the 13cm and 3cm UKACs, and this month I have been putting together a Portsdown 4 + Langstone microwave transceiver project. I'm thinking this might be an inexpensive way to get on 6cm initially and maybe 9cm. Using Langstone I've received the GB3FNY beacon on 70cm 599 via a 19 el Yagi & pre-amp. With the recent arrival of a pre-amp from China, I lashed up a 64-patch array panel and aimed it at Finningley and was rewarded by receiving GB3KEU on 6cm at 519 on my Langstone (RasPi4+Pluto). This was my first narrow band reception on 6cm and my first microwave reception on Langstone.
From Es'Hail2, I've decoded DATV on Portsdown 4 down to 33kS symbol rate in spite of having an unlocked Rocket LNB; it just runs on its internal crystal.
Look at my Blog at https://g3yjr.wordpress.com/ for details

From John G4BAO

First of all, thanks for all the kind words about my tenure on the UKuG committee and as treasurer, I felt I needed a break for a while. I'm sure David M0GHZ will do an equally good job with your finances.
Please do not send me any more subscription cheques, as I no longer have the means to pay them in to the bank. Please send them to David. QTHR
I plan to continue to write these pieces for Scatterpoint as long as you continue to send in your activity reports, and post-COVID-19, will continue to provide tech support and access to my test workshop for the Eastern Counties by appointment!
I'm slightly ashamed to admit here that November was a "zero QSO" month for the GHz bands from the Fen Edge. I confess to have got the HF CW bug a bit recently!
That said, the good news is that my 24GHz terrestrial system I reported as "dead" last month has risen from the dead like Lazarus with absolutely no intervention from me, so I'll be available if anyone wants to do any tests East of the Meridian.
Nice to see the GB3PKT 10 and 24GHz beacons are still working reliably due to sterling work by Tony G0MBA fitting my filters to kill the interaction with the co – sited HF beacons. The 10GHz beacon is a reliable troposcatter signal here over the "Suffolk Alps" and regularly comes up strong on rainscatter. 24GHz makes a rare decode here, but a recent spot by G0JBA in Kent at 63km reassures me it's still OK.
The build continues on my 24GHz EME system. The TWT's outdoor power supply is now installed in yet another Ex-Storno 9000 base station box (thanks to fellow Camb-Ham, Rob G1ZPU for that!) and is awaiting the last high voltage connector to come from CPC. With a 3.6kV supply I want to do things properly! Still on target for the first QSOs in the spring of 2021.

Contests

November 2020 Lowband Contest Results

Conditions and activity were rather mediocre for this session, with little DX to work.

On 1296MHz John G4ZTR managed to find enough planes to get some good aircraft scatter contacts in the log to take first place by a good margin from Gordon GI6ATZ, who had the best points per contact average by some way.

Mike G8CUL was the only entrant on 2300MHz this time out.
Mike was also the winner on 2320MHz with David M0GHZ in second place. Best DX was from G8CUL to PA0WMX at 497km.

Margins were much smaller on 3400MHz, where G8CUL won by a handful of points from David M0GHZ. G8DMU provided the best DX for the three leading stations at distances up to 287km.

The overall winner was Mike G8CUL, who won on 2300, 2320 and 3400MHz and was third on 1296MHz. Overall runner up was John G4ZTR who won 1296MHz. Congratulations to them both and to the following winners and runners up.

1296MHz G4ZTR, GI4SNA, G3SQQ (Low Power)
2300MHz G8CUL
2320MHz G8CUL, M0GHZ, G3SQQ (Low Power)
3400MHz G8CUL, M0GHZ

John G3XDY
UKuG Contest Manager

November 2020 Low Band Contest Results

Overall

Pos	Callsign	1296MHz	2300MHz	2320MHz	3400MHz	Overall
1	G8CUL	729	1000	1000	1000	3729
2	G4ZTR	1000	0	613	842	2455
3	M0GHZ	495	0	705	977	2177
4	G3SQQ	600	0	697	0	1297
5	G4LDR	377	0	680	138	1195
6	G8DMU	0	0	0	758	758
7	GI6ATZ	748	0	0	0	748
8	G4BXD	350	0	0	304	654
9	G3TCT	466	0	0	0	466
10	G3TCU	443	0	0	0	443
11	G8AIM	92	0	65	137	294
12	GM8IEM	278	0	0	0	278
13	G4GUG	210	0	0	0	210
14	G1YFG	204	0	0	0	204
15	G4JNT	0	0	0	182	182
16	GM4BYF	161	0	6	0	167
17	GM4DIJ	54	0	6	0	60
18	G1JPV	58	0	0	0	58
19	G0LGS	48	0	0	0	48

Low Band Championship 2020

A very different year from normal, for obvious reasons. Lockdown restrictions increased the number of fixed stations taking part, but severely curtailed portable operation after the first event of the year. Entries overall were up from 40 in 2019 to 47 this year.

There have not been any exceptional conditions to report, in fact the lack of planes in the air has limited DX opportunities for many. April’s event saw the highest number of entrants this year.

1.3GHz

John G4ZTR moves up to take the leading position and the G4EAT Memorial Trophy this year, with two wins and a second place. New entrant Anthony G7LRQ is runner up, and Phil G3TCU of the Combe Gibberlets was third.

2.30GHz

This year five stations appeared in the table. M0HNA(/P) took full advantage of the two sessions they operated in to win by a large margin, with Graham G3YJR as runner up.

2.32GHz

John G4ZTR mirrored his performance on 1296MHz on this band, with two wins and a second place to achieve a strong lead over David M0GHZ as runner up.

3.4GHz

David M0GHZ moves up to take the lead on 3.4GHz with a commanding performance comprising two wins and three runner up spots. Andy G4JNT concentrated on this band and is the runner up for 2020.

Overall

David M0GHZ was the overall winner this year, with John G4ZTR not far behind as runner up. A special mention for silent key Denis G3UVR, a stalwart supporter of these events who was active on three bands earlier this year.

I hope that we will see a return to normality in 2021 and that everyone stays healthy in the meantime.

Congratulations to the winners and runners up mentioned above.

73
John G3XDY
UKuG Contest Manager

Low Band Championship 2020

Final results after five sessions, the best three events count towards the total

Overall

Pos	Callsign	08/03/2020	05/04/2020	03/05/2020	07/06/2020	15/11/2020	TOTAL
1	M0GHZ	2003	2218	2280	2027	2177	6675
2	G4ZTR	1902	1762	0	2000	2455	6357
3	M0HNA(/P)	4000	1481	0	0	0	5481
4	G7LRQ	0	1408	1523	1631	0	4562
5	G4LDR	0	1745	885	1352	1195	4292
6	G8CUL	0	0	0	0	3729	3729
7	G3UVR	1429	2289	0	0	0	3718
8	G3SQQ	478	0	275	1213	1297	2988
9	G3UKV	1085	223	309	1527	0	2921
10	G4BRK	0	1455	801	0	0	2256
11	G3YJR	791	452	965	0	0	2208
12	G4JNT	0	922	438	772	182	2132
13	G8AIM	486	701	325	720	294	1907
14	G8DMU	0	1078	0	0	758	1836
15	G3TCU	0	598	355	758	443	1799
16	G4BXD	26	123	33	931	654	1708
17	G4FRE	0	778	617	0	0	1395
18	G3TCT	0	522	240	315	466	1303
19	GI6ATZ	0	0	519	0	748	1267
20	G3VKV	303	329	186	629	0	1261
21	G1EHF	0	0	1133	0	0	1133
22	F4VRB	0	415	297	354	0	1066
23	GD8EXI	0	1000	0	0	0	1000
24	PA5Y	0	0	1000	0	0	1000
25	G6KWA	467	259	134	0	0	860
26	G4KIY	0	0	319	388	0	707
27	GM4BYF	0	0	51	287	167	505
28	G8EOP	306	146	0	0	0	452
29	G0EAK	0	0	441	0	0	441
30	G4RQI	0	279	0	132	0	411
31	G4KZY	0	187	42	182	0	411
32	GM8IEM	51	64	40	0	278	393
33	GM4DIJ(/P)	222	12	35	78	60	360
34	G1YFG	0	0	0	65	204	269
35	G8AQA	0	258	0	0	0	258
36	GW4MBS	43	72	0	113	0	228
37	G4GUG	0	0	0	0	210	210
38	G8DOH	0	0	0	209	0	209
39	G4BAO	0	190	0	0	0	190

40	G1PPA(/P)	140	0	0	32	0	172
41	G0LGS	0	0	0	94	48	142
42	G6GVI	0	40	12	70	0	122
43	M0WGF	0	0	0	76	0	76
44	G1JPV	0	0	0	0	58	58
45	GD1MIP	17	0	32	0	0	49
46	G0HIK	0	41	0	0	0	41
47	GW4JQP	0	0	0	15	0	15

1296MHz

Pos	Callsign	08/03/2020	05/04/2020	03/05/2020	07/06/2020	15/11/2020	TOTAL
1	G4ZTR	905	762	0	1000	1000	2905
2	G7LRQ	0	840	523	886	0	2249
3	G3TCU	0	598	355	758	443	1799
4	M0GHZ	367	549	370	512	495	1556
5	G3SQQ	218	0	275	541	600	1416
6	G3TCT	0	522	240	315	466	1303
7	M0HNA(/P)	1000	276	0	0	0	1276
8	GI6ATZ	0	0	519	0	748	1267
9	G4BRK	0	866	247	0	0	1113
10	F4VRB	0	415	297	354	0	1066
11	GD8EXI	0	1000	0	0	0	1000
12	PA5Y	0	0	1000	0	0	1000
13	G3UVR	355	639	0	0	0	994
14	G6KWA	467	259	134	0	0	860
15	G4LDR	0	159	110	265	377	801
16	G8CUL	0	0	0	0	729	729
17	G4BXD	26	90	33	285	350	725
18	G4KIY	0	0	319	388	0	707
19	G8DMU	0	614	0	0	0	614
20	G3UKV	209	126	83	205	0	540
21	GM4BYF	0	0	41	278	161	480
22	G8AIM	87	151	65	215	92	458
23	G4RQI	0	279	0	132	0	411
24	GM8IEM	51	64	40	0	278	393
25	G4KZY	0	187	42	153	0	382
26	G3YJR	59	229	74	0	0	362
27	G3VKV	64	97	26	165	0	326
28	GM4DIJ(/P)	222	12	22	1	54	298
29	G1YFG	0	0	0	65	204	269
30	G8AQA	0	258	0	0	0	258
31	GW4MBS	43	72	0	113	0	228
32	G4GUG	0	0	0	0	210	210
33	G8DOH	0	0	0	209	0	209
34	G4BAO	0	190	0	0	0	190
35	G1PPA(/P)	140	0	0	32	0	172

36	G0LGS	0	0	0	94	48	142
37	G6GVI	0	0	9	70	0	79
38	M0WGF	0	0	0	76	0	76
39	G4FRE	0	67	0	0	0	67
40	G1JPV	0	0	0	0	58	58
41	GD1MIP	17	0	32	0	0	49
42	G0HIK	0	41	0	0	0	41
43	GW4JQP	0	0	0	15	0	15

2300MHz

Pos	Callsign	08/03/2020	05/04/2020	03/05/2020	07/06/2020	15/11/2020	TOTAL
1	M0HNA(/P)	1000	1000	0	0	0	2000
2	G3YJR	648	0	678	0	0	1326
3=	G1EHF	0	0	1000	0	0	1000
3=	G8CUL	0	0	0	0	1000	1000
5	G4LDR	0	121	0	0	0	121

2320MHz

Pos	Callsign	08/03/2020	05/04/2020	03/05/2020	07/06/2020	15/11/2020	TOTAL
1	G4ZTR	997	1000	0	1000	613	2997
2	M0GHZ	645	736	910	515	705	2351
3	G7LRQ	0	569	1000	745	0	2314
4	G3SQQ	259	0	0	672	697	1628
5	G4LDR	0	465	374	449	680	1594
6	G3UVR	657	921	0	0	0	1578
7	M0HNA(/P)	1000	205	0	0	0	1205
8	G4BRK	0	589	554	0	0	1143
9	G8CUL	0	0	0	0	1000	1000
10	G3UKV	268	0	226	502	0	996
11	G8AIM	173	243	186	286	65	715
12	G3YJR	84	223	213	0	0	520
13	G8DMU	0	464	0	0	0	464
14	G8EOP	306	146	0	0	0	452
15	G0EAK	0	0	441	0	0	441
16	G3VKV	157	97	38	178	0	432
17	G4FRE	0	0	178	0	0	178
18	G1EHF	0	0	133	0	0	133
19	GM4DIJ	0	0	13	37	6	56
20	G6GVI	0	40	3	0	0	43
21	G4BXD	0	33	0	0	0	33
22	GM4BYF	0	0	10	0	6	16

3400MHz

Pos	Callsign	08/03/2020	05/04/2020	03/05/2020	07/06/2020	15/11/2020	TOTAL
1	M0GHZ	991	933	1000	1000	977	2991
2	G4JNT	0	922	438	772	182	2132
3	G4LDR	0	1000	401	638	138	2039
4	G3UKV	608	0	0	820	0	1428
5	G4FRE	0	711	439	0	0	1150
6	G3UVR	417	729	0	0	0	1146
7	M0HNA/P	1000	0	0	0	0	1000
8	G8CUL	0	0	0	0	1000	1000
9	G4BXD	0	0	0	646	304	950
10	G4ZTR	0	0	0	0	842	842
11	G8DMU	0	0	0	0	758	758
12	G8AIM	226	307	74	219	137	752
13	G3VKV	190	232	148	286	0	708
14	G1PPA/P	650	0	0	0	0	650
15	GM4DIJ	0	0	0	40	0	40
16	G4KZY	0	0	0	29	0	29

2020 has been an unusual year for microwave contests, with portable operation badly disrupted. I hope that 2021 will be nearer to normal. The contest calendar planned for next year will be broadly similar to this year, but with some changes to the millimetre wave programme as the higher bands are becoming more accessible.

Now is your opportunity to help shape the rules and calendar, please let me have any feedback and suggestions prior to 20th December 2020 and I will see what can be incorporated in 2021.

John G3XDY
UKuG Contest Manager
g3xdy@btinternet.com

UKuG MICROWAVE CONTEST / ACTIVITY WEEKEND CALENDAR 2020

Dates, 2020	Time UTC	Contest name	Certificates
26-27 Dec		Activity Weekend	

Special award for any contacts via Sleigh Bounce / Scatter. Contacts via Santa's Sleigh on 24/25th December will be written up in the next Scatterpoint. Please send your logs & pictures attached to a bottle of whisky /wine /beer etc. to the Editor.

EVENTS 2021

Events may be subject to cancellation due to the Coronavirus
For latest information consult https://microwavers.org

2021

January	Heelweg Cancelled	www.pamicrowaves.nl/
January 10-15	European Microwave Week '2020' - now virtual	www.eumweek.com/
February 20	Tagung Dorsten –refer to web page	www.ghz-tagung.de/
April 24	CJ-2021, Seigy	www.cj.r-e-f.org/
May 21-23	Hamvention, Dayton	www.hamvention.org
June 25-27	Ham Radio, Friedrichshafen	www.hamradio-friedrichshafen.de
August 19-22	EME 2021, Prague – rescheduled from 2020	www.eme2020.cz
October 10-15	European Microwave Week, London, Excel	www.eumweek.com/

80m UK Microwavers net

Tuesdays 08:30 local on 3626 kHz (+/- QRM)

73 Martyn Vincent G3UKV