The British Amateur Television Club

CQ-TV

No. 266 – Winter 2019

A New Repeater Transmission Standard for the 2020s

ADALM-PLUTO DATV TX – "How To"

A 30 watt driver amplifier for 2.4 GHz

5.6 GHz TV Receiver

Using the Jetson Nano with the LongMynd software

QO100 Live Tune software

25 MHz reference, biasT and diplexer for QO-100

The Secret Life of a TV Repeater

Jamboree on the Air and QO-100

DATV at the SDR Makerspace Conference

... and much more inside!

A Pye Mk7 image orthicon camera at the MCR21 project launch

CQ-TV 266

Contents:

Contributions

Contributions for publication or for constructive comment are welcome. The preferred method of communication is by email; all relevant committee email addresses are published in CQ-TV.

Alternatively you can write to us at:
BATC Secretary, 12 Petrel Croft, Kempshott, Basingstoke, Hampshire, RG22 5JY, UK

Contributing authors should note that we aim to publish CQ-TV quarterly in March, June, September and December.

The deadlines for each issue are:
Spring - Please submit by February 28th
Summer - Please submit by May 31st
Autumn - Please submit by August 31st
Winter - Please submit by November 30th

Please submit your contribution as soon as you can before the deadline date. Do not wait for the deadline if you have something to publish as it is easier to prepare page layouts where we have contributions in advance.

Contributions can be in almost any file format - except Microsoft Publisher! MS Word is preferred. Pictures should be submitted in high quality as separate files. Pictures embedded in a file are difficult to extract for publication however if you do wish to demonstrate your completed layout, a sample of your finalised work should be submitted at the same time.

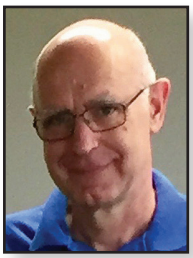
Please note the implications of submitting an article detailed in the 'Legal Niceties'

BATC

BATC Online

Website: http://www.batc.org.uk
BATC Wiki: https://wiki.batc.org.uk/BATC_Wiki
Forum: https://forum.batc.org.uk/
Stream: https://batc.org.uk/live/
Dxspot: https://www.dxspot.tv/

Printed in Great Britain. ISSN 1466-6790

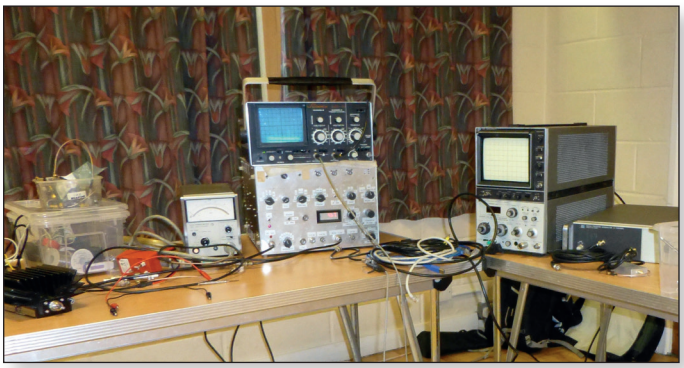


From the Chairman...

Dave Crump G8GKQ

Having moved house in the Summer, I have been focused on rebuilding my shack and getting all the associated wiring and fixings installed. It has made me realise how much more equipment I now have than when I started in ATV many years ago, and how easy it is to forget that beginners in our hobby do not have such advantages.

Some things are easier, such as the ability to receive or generate a DATV signal simply by using an easily-available software defined radio plugged into a laptop. But other tasks such as constructing and tuning power amplifiers do require test gear that is not readily available. The BATC and our members have brought test gear to the mini-conventions during the year, but I have been surprised at how little uptake there has been of these facilities.



▶ *Test Gear at the Didcot mini-convention*

Is a test gear "loan" scheme required, or do we need help to build local communities to help each other?

For QO-100 video encoding, the community built around the online chat seems to work well, but this is clearly not practical for hardware performance measurements. I'd be interested to hear members' suggestions of how we might help and encourage newcomers to ATV.

Meanwhile, behind the scenes, the Committee and a small band of members have been keeping the routine business of the BATC going. The list of never-ending tasks includes dispatching and restocking shop items, managing our finances, keeping our computer servers running smoothly and securely, editing and dispatching CQ-TV, answering members' queries, maintaining our social media presence, producing and supporting BATC designs, organising conventions and manning rally stands. Due to all these efforts, our membership has steadily risen to around 1400, and ATV activity levels are good. I have been particularly impressed that a hardcore of members, who are not on the committee, have contributed so much during the year. I would like to extend my thanks to the Committee and all those involved and thank you for your support to the Club.

Before I sign off, can I ask each of you to make a New Year's resolution to dust off any transmitting equipment that you have, and get on the air at least a couple of times during 2020? We need to keep using our precious bands otherwise we risk losing them.

Merry Christmas and a Happy New Year to you all!

73

Dave, G8GKQ

ATV activity weekends and contests

- Christmas repeater contest
  - December 21st 2019 – Jan 1st 2020
  - 1 point per Km from Tx to repeater
  - £100 to repeater group with most points logged
- Jan 11th / 12th – all band activity weekend
- Feb 15th / 16th – all band activity weekend
- March 14th / 15th – all band activity weekend & Dutch ATV Contest
- April 11th / 12th 2020 – High band contest

See https://batc.org.uk/contests/

The Listing

new and renewing members

Rob Burn G8NXG

Welcome to another listing of members who have either joined the BATC or renewed a subscription during the previous quarter; in this case September, October and November.

These days the quarterly list is derived from the sales of subscriptions within the appropriate period so at least it should be more accurate. That said, mistakes do happen and I am happy to correct any which could have slipped through.

The number of members that we have is hovering tantalisingly close to 1400 and I do hope that this number is exceeded early in the new year. In days gone by, the BATC had one renewal date of January 1st each year, which continues to make the months of December and January rather busy for all the right reasons!

As mentioned in the Autumn issue of CQ-TV one of my more onerous tasks is to delete the records of those members who have failed to renew their subscription. We allow up to 12 months for a lapsed member to renew, after this time the member record is deleted.

Everyone in this situation is sent a generic e-mail to the current e-mail address that we have on record and I am grateful to the few newly ex-members who do acknowledge and confirm that they are happy with this action.

I mention this 12 month period of 'grace' because if you do happen to overlook renewing your subscription all is not lost. You can in effect re-subscribe all the way up to the 12 month anniversary (or more accurately up to when I delete your record). The snag is you will need your log-in details however if they are forgotten just send me an e-mail for the information. If you really have allowed your membership to lapse and the records are gone you would be welcome to follow the joining process as a new member.

Finally, in another advantage for members the three year cyber membership period has just been reintroduced and at £21 represents a meaningful saving over one or two year cyber subscriptions. Another reason to ensure that your current e-mail address is maintained in your membership record!

That's it for now; Seasons Greetings to everyone!

Australia		
Ian Hocking	VK3QL	Fitzroy North
Hilary Bridel	VK2AZ	Glenmore Park
Andrew Burns	VK4YMB	Glenwood
Roy Xanthos	VK4TRX	Gracemere
Luke Groeneveld		Punchbowl
John O'Shea	VK2ATU	Revesby
John Lukey	VK2ZUH	Sanctuary Point
Reast Giles-Clark	VK7OTC	Hobart, Tasmania
Justin Giles-Clark	VK7TW	Hobart, Tasmania
John Kessner	VK3ATV	Williamstown
Phil Gardner	VK3GMZ	Woori Yallock
Austria		
Peter Mohr	OE1MPB	Wien
Belarus		
Serge Kurskov	EU1ADY	Minsk
Belgium		
Jan Poppeliers	ON7UX	Aartselaar
Rene Van de Wiele	ON6VI	Dendermonde 9200
Loïc Dremaux	ON5LDX	Mons
Jean-marie Hermant	ON4HDX	Thieu
Albert Van den Abbeel	ON4AAH	Wetteren

Canada		
Peter Jago	VA3PJ	Stittsville
Chile		
Patricio Lancellotti	CE3BSK	Santiago
Denmark		
Joern Andersen	OZ6TA	Copenhagen
Finland		
Ulf Wilhelmsson	OH6XI	Jakobstad
France		
Bringer Jean-Louis	F1AIW	Beaumont St Cyr
Jean Dentroux	F5CFN	Crolles
Jouan Francois	F1CHF	Franconville
Roland Lavigne	F6GDL	La Genette
Franck Dubuis	F1SSF	La Tuiliére
Denis Jeaningros	F6ITK	Le Fenouiller
Guy Gounel	F1BFZ	Magnet
Evariste Courjaud	F5OEO	Migne-auxances
Patrick Giraudeau	F6HMP	Paris
Dominique Taverne	F5MKM	Saint Jean le Blanc
Alain Brellier		St Laurent En Gatines
Camille Farrougia	F4IBA	Villeneuve Loubet
Germany		
Helmut Schröder	DG3KHS	Bornheim

Thomas Bäker	DL5BCA	Brake
Lutz Kinas	DL4FCJ	Einhausen
Michael Purkert	DH6MEG	Gilching
Dirk Zähler	DG4HAD	Gremersdorf
Volker Loose		Haltern am See
Mario Lorenz	DL5MLO	Ilmenau
Achim Mueller	DL3RY	Kumhausen
Matthias Rauhut	DF2OF	Sonsbeck
Hungary		
Béla Mucs	HA4BM	Szekesfehervar
Ireland		
Craig Robinson	EI3FW	Boyle
Seamus Mccague	EI8BP	Dublin
Jim Smith	EI4CP	Greystones
Israel		
Yoram Rotbach	4Z5YR	Modiin
Italy		
Liborio Durante		Seregno
Renzo Sartori	I3SWR	Treviso
Japan		
Hiroshi Matsumoto	JA1SYK	Takasaki
Malta		
Noel Scerri	9H1FX	Kirkop
Netherlands		
Wilko Bulte	PA1WBU	Arnhem
Oebele Lijzenga	PA3BJC	Damwald
Herman ten Grotenhuis	PA0TEN	Eefde
Ad Valkenburg	PE1DGW	Eindhoven
Henry Paulissen	PD0OM	Montfoort
Martin Groos	PD0RJI	Numansdorp
Sjef Verhoeven	PE5PVB	Oisterwijk
Hendrik Ten boom	PE1HTB	Ouwsternijega
Rob Krijgsman		Terborg
Michael Tel	PD4MT	Vlaardingen
New Zealand		
Kevin Ravenhill		Christchurch
Steve Fogerty	ZL2ASF	Nelson
Norway		
Jan Lustrup	LA3EQ	Egersund
John Strand	LA6OJ	Flekkefjord
Ivar Rognstad		Oslo
Peter Ebsworth	LB0K	Steinsland
Poland		
Slawomir Szymanowski	SQ3OOK	Ostrów Wielkopolski

Portugal		
Luis California	CT2GOY	Corroios
Steve Brown	G1WMD	Lagos
Slovenia		
Matjaz Zibert	S59MZ	Kranj
Spain		
Benjamin Piñol	EA3XU	Barcelona
Albert Ramos	EA3IBE	Caldes de Montbui
Manuel Martinez Reyes	EA7CTL	San Fernando
Josep Martínez	EB3DYB	Sta. Eulalia De Ronçana
Daniel Estévez	EA4GPZ	Tres Cantos
Aitor Echeandia	EB2AT	Vitoria
Switzerland		
Michel Vonlanthen	HB9AFO	Bussigny-près-Lausanne
Martin Klaper	HB9ARK	Kappel
Olivier Noverraz	HB9BBN	Morges
Charly Girardet	HB9ADJ	Roche Vd
Achim Vollhardt	DH2VA	Zurich
United Kingdom		
Bill Cardno	GM0NRT	Aberdeen
Peter Harston	GW4JQP	Ammanford
Robert Brown		Bangor
Brent Watson	G5TV	Barnsley
Alan Griffiths	G8LJY	Bath
Paul Haworth	G6OWI	Blackburn
James Davies	GW6JWD	Borth
Alan Mcdowell	G0KOO	Boston
Ivor Green	G1IXF	Bristol
Andy Jenner	G7KNA	Bristol
Brian Golding	G6AUR	Bristol
John Worsnop	G4BAO	Cambridge
Gary Franklin	G4GHD	Canvey Island
Tim Wills	G8PZD	Cheltenham
Peter Whitford	G3MME	Chesterfield
Ian Hill	G6ZVE	Chesterfield
David Thomas		Clacton On Sea
Lee West	G4TNX	Cleethorpes
Andy Carlile	G0MNI	Cleethorpes
Simon Robinson	M5POO	Corbridge
Roger Gregory	G4OCO	Cornwall
Clive Davies	G4FVP	Darlington
Dave Cawley		Dartmouth
David John	G3WCB	Dartmouth
Stuart Grant	G6ENR	Driffield
John Coster	GM3SHR	Dunfermline

Malcolm Bay	M0MBO	Dunstable
Steve Marshall	M0SKM	Dunstable
Chris Donne	G3YKK	East Halton
Andrew Britton	MM0MGB	Edinburgh
Peter Green	G0ABI	Eggesford
Dave Williams	G7GQW	Ellesmere Port
Martin Perrett	G8LCE	Falmouth
Rob Compton	M0ZPU	Gamlingay
Richard Mudhar	G7LEE	Glastonbury
Neil Smith	G4DBN	Goole
A Koeller	M5AGB	Gosport
Leonard Stockwell	M1DPE	Grays
Geoff Wilkin	G0DDX	Hardwick
Nigel Nash	M0NGL	Hemel Hempstead
Owen Williams	M7OMW	Heswall
Dean Nielsen		Hull
Neil Connor	M6CUE	Hungerford
Karl Brazier	G7AFT	Hythe
Chas Broughton	G1RSK	Immingham
Jim Fairhurst	GM6DBJ	Isle of Skye
Fred Young		Kettering
Malcolm Grant	G7HPE	Kettering
Michael Still		Lancing
Steve Greaves	2E0XAY	Leicester
Nigel Swann	M1NAS	Leicester
Colin Goodwin	G3WTT	Lincoln
Stephen McBain	M5SJM	Lincoln
James Alexander	MW1BAJ	Llanelli
Brian Greenaway	G3THQ	London
Jeremy Powell	M0JLP	Malton
Mark Bryant	M0UFC	Manchester
Terry Bailey	G6CRF	Manchester
Stephen Drury	G6ALU	Milton Keynes
Chris Towns		New Milton
John Middleton	G4TXO	Newark
Nicholas Camp	G7KFQ	Newquay
Anthony Mobbs	G8EEY	Norwich
Robert Clayton	G8SDU	Norwich
Alan Bolton	G1EAB	Nottingham
Ian Brothwell	G4EAN	Nottingham
Stephen Lovell	G8XPZ	Nottingham
Dave Sheppard	G8OUX	Orpington
Christine Cotton	M6UBI	Portsmouth
Frank Cotton	G0LFI	Portsmouth
Malcolm Stanbridge	G8NT	Radstock
Bryan Foreman	M6OZE	Redcar
Pete Coates	M1FHI	Rednal
David Bondy	G4NRT	Rochester
Andy Mace	M0MUX	Royston
Peter Scovell	G1PRX	Sandford
Mark Kent	G8PHM	Sevenoaks
Mark Horn	M0WGF	Sheerness
Barry Chambers	G8AGN	Sheffield
Stuart Tyler	G1ZAR	Shepshed
David Leary	G8JKV	St. Ives
Mike Binks	G0LJF	Stockport
Martin Ehrenfried	G8JNJ	Stoke-Sub-Hamdon
Jim Arnott	G1WKK	Tadley
Dean Brice	G0UIL	Taunton
Adrian Whatmore	G4UVZ	Taunton
Dave Hall	G8VZT	Telford
Stephen Yates	G4NZV	Tewkesbury
Philip Gabel	G1TAI	Towcester
Richard Hall	G4PGD	Truro
Josh Murray	M0JMO	Wallingford
Ciaran Morgan	M0XTD	Warwick
Julia Tribe	G0IUY	Waterlooville
Simon Tribe	G0IEY	Waterlooville
John Marlow	G1ORP	Welshpool
Nicholas Grundy	G4NKV	Whitby
Robert Hammond	G4FKR	Winchester
Graham Le Good	G4GUN	Witney
Dave Cash	G7MEG	Wolverhampton
Peter Lyall	G8FRH	Woodford Green
Rob Johnston	G7MHF	Wrexham
Brian Duffell	G3VGZ	Yarm
USA		
Rodger Southworth	WB8NZU	Beavercreek
Roger Paskvan	WA0IUJ	Bemidji
Michael Smith	K4MPS	Bowling Green
Gary Oaks	KB9VGD	Burlington
David Stepnowski	KC3AM	Claymont
Dale Hagert	W0IR	Eagan
Doug Mercer	KA6MEL	Lodi
Ronald Simpson	N6GKJ	Lodi
Thomas Stevens Jr	WB2AZQ	Long Branch, NJ
Tim Shroyer	KH6N	Los Altos
Ken Konechy	W6HHC	Orange
James Tittle	K6SOE	Pittsburg

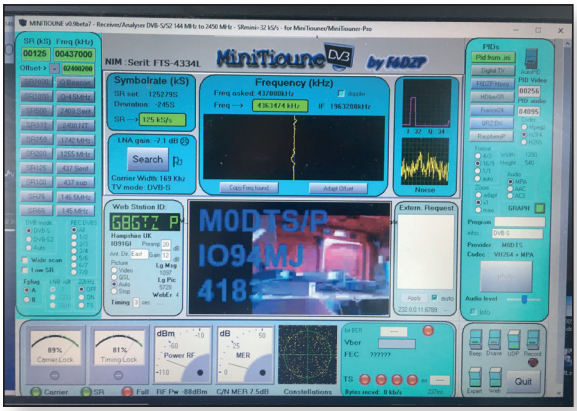
Contests and Activity Weekends

Clive Reynolds G3GJA

September Low Band Contest

For the first time over the weekend of the 14th and 15th of September, the BATC held a low band ATV contest. There was activity on 6m, 4m, 2m and 70cm from 14 stations over the two days. Disappointingly only five stations submitted logs and one of the stations that didn't enter could have claimed third place.

Best overall DX was on 70cms between G8GTZ/P and M0DTS/P at 317 km. On 4m and 2m, G4FRE/P and G8GTZ/P achieved 117 km. 6m saw 91 km achieved between G4KLB and G8GTZ/P.



Not surprisingly with Noel G8GTZ being at one end of all the best DX contacts he has collected first place with a score of 5622 points, almost 3000 more than 2nd placed Dave G8GKQ with 2674 points. Third place would have gone to Tony G4CBW with 2276 points, however, he did not submit an entry; instead, third place went to Colin, G4KLB with 2129 points. Rob, M0DTS came in 4th with 1650 points and Dave G4FRE came in 5th with 1210 points.

Over the weekend the contest generated a substantial amount of activity and interest so, the low band contest will be a feature of next year's contest calendar.

Christmas Repeater Activity Competition

This year, once again, we are going to hold a competition to promote activity over the Christmas and new year period. With a cash prize to the winning repeater group that generates the most activity through their repeater. The contest will run from the 21st December to the 1st January inclusive, enough time to get some operating in without compromising your other commitments. The runner up and the winning stations will receive certificates in addition to a £100 award to the repeater group with the most claimed points.

Christmas 2019 BATC Repeater Activity Contest Rules

1. **Introduction**. The main object of an Amateur Television Contest is to promote ATV activity. Anyone interested in ATV, whether they are members of the British Amateur Television Club or not, are welcome to take part.
2. **Eligibility**. BATC Contests are open to all licensed radio amateurs equipped to transmit pictures by analogue or digital Fast Scan
3. **Dates and Times**. The contest will run from 0000hrs GMT on 21st December 2019 to 2359hrs GMT on the 1st January 2020.
4. **Location**. The operating location must be within the terms of your licence. If operating away from your main station, please get the permission of the landowner.
5. **Frequencies**. Within the allocated segments of the 70cm, 23cm, 13cm, 9cm, 6cm, 3cm and 1.5cm bands for FSTV. The NoV bands of 71MHz and 146.5MHz are also eligible. All operations must be via repeaters.
6. **Power**. Output power must not exceed that set out in terms of your licence.
7. **Exchange**. Submit both a CALL SIGN and a FOUR FIGURE code number via video. Confirmation of reception is by transmitting back the sum of the code numbers on the talk-back channel, not the actual transmitted number. Please note that all four digits in the contest number should be different and not consecutive. The numbers must be different for each band, e.g. these numbers are OK: 2741, 4820, etc., these are not: 1111, 1138, 1381, 1234 etc. Reports should be exchanged by a talkback, using a 1-5 video quality report and a serial number, starting at 001 for each band.
8. **Scoring**. Points are claimed for the RF path from the transmitting station to the repeater. The following multipliers are used: 71MHz & 146MHz @ 5 points per km, 70cm @ 3 points per km, 23cm @ 2 points per km and for contacts on higher bands @ 5 points per km. RF or Internet links between two repeaters do not count for additional points. You may claim points for contacts with the same station on the same day provided you use a different band. The following day

you can claim points for the same contacts. Contacts from multiple locations are permitted on the same day, band and with the same callsigns, i.e., you can go out portable to two locations and all of the points earned /p can be added to those claimed for working the same stations on the same bands later in the day from the home station. Use the standard rounding for decimals when converting distance to points. 0.5 and above add one point, anything less than 0.5 uses the integer only.

9. Examples:

a. Two stations are located in the same locator square, but make a 2-way contact on 23 cm through a repeater 50 km away. Each one-way contact earns 100 points (50km x 2 points per km) from each end of the RF path, so the total score for each station is 100 points.

b. If one station transmits to the repeater on 13 cm, he uses the distance to the repeater and the 13 cm multiplier. If the other transmitting station is using a 70cm or 2m input, the points are calculated using the appropriate band multiplier.

c. A station operates /p from IO93PV and uses a repeater at IO93RS37 (distance 17.5km) to contact G9XYZ. He uses both the 23cm and 70cm inputs and claims 35 points for the 23cm contact and 53 points for the 70cm contact. He then moves to IO93OU91 (distance 14.7km from the repeater) and makes the same contacts on the same bands. He claims 29 and 44 points respectively. His total for the day if he makes no further contacts is the sum of all contacts, 161 points.

10. Distance Calculations. Your computer program should give 6371.290982 km as the earth's radius and 111.2036 km for each degree change in latitude before rounding off to the nearest km. For scoring purposes, all valid contacts shall be deemed to have taken place over a distance of at least 5 Km, even if the two stations or the repeater in the contact have the same or adjacent locators. Scoring should be based on the distance between the centres of location squares, not map distance. Full 6-character length QTH locators must be used.

11. Logs. A separate summary log sheet should be submitted for each band, with a single cover sheet for all bands. The cover sheet should indicate for each band: Call sign of station entering contest, Contest name, Band, TX Power, Aerial etc., Code number used, QTH locators used, Total number of QSOs and best DX etc., Name and address of 1st operator, names and call signs of operators and the signed declaration. The log sheets should list for each contact: The date/time, Station Worked, Report/Serial number, Repeater Callsign, Repeater Locator, Locator of other station, Distance in km from your station to the repeater and points claimed. Each band should begin with serial number 001. No station is worked more than once on a specific day through the same repeater unless using a different band or location. Please mark duplicates. You could lose points for gross errors; however the contest manager will correct minor errors of scoring and distance calculation. Logs must be posted or e-mailed by the third Monday after the contest.

12. Receive only section. Send or e-mail a log sheet giving your Call sign / BRS No. and name and address, Band, Date/Time, Call sign of station seen, Repeater Callsign, Repeater Locator, Locator of other station, Code number received, km from your station to repeater, km from repeater to distant station and points claimed. Scoring is the same as for a one-way contact defined above.

13. Disputes. The decision of the contest manager and/or the BATC Committee is final.

14. Spirit of the Contest. Don't leave your video transmission on any longer than necessary. Let other stations use the repeater as well. Contests mean activity and good fun, join in and, even if you only work one or two stations, please send a logbook in.

15. Declaration of Interest. Although acting as contest manager, I reserve the right to take part.

16. Electronic Logs. Both paper and electronic Logs are acceptable. Electronic logs should be submitted using the Excel-format Repeater Contest Logsheet which can be downloaded from the BATC Web Site.

17. Contact Address. Entries and logs should also be submitted to C. Reynolds, 49 Westborough Way, Anlaby Common, East Riding of Yorkshire, HU4 7SW. Computer logs should be submitted by e-mail to ***contests@batc.org.uk***. Please make sure that you get an acknowledgment from the Contest Manager - e-mails do go astray!

A New Repeater Transmission Standard for the 2020s

Noel Matthews, G8GTZ

Following on from the spectrum matters article in CQ-TV 265 which highlighted the potential threat to 23cms and the possible need to re-plan the spectrum between 1300 and 1325 MHz, the BATC has been investigating ways that we can help repeater groups become more spectrally efficient.

This article details the outcome of that study and describes an important initiative by the BATC to help every repeater group in the country to upgrade their transmission system to become more spectrally efficient and provide up to an extra 10dB of transmission gain.

Background

At the beginning of this century UK broadcast TV transmissions were a mixture of analogue terrestrial and MPEG-2 satellite. All ATV repeaters used analogue FM transmitters occupying 16MHz of bandwidth and FM transmitters and receivers were readily available, particularly from Comtech and other manufacturers, but a few initial DATV tests had been carried out.

By 2010 all the UK broadcast transmissions were digital and MPEG-2 was being replaced by the more efficient MPEG-4 / H264, particularly for HD transmissions. Digital set top boxes were becoming easy to buy and a number of amateur repeaters had converted to DVB-S / MPEG-2 digital transmissions.

At the start of 2020, most UK repeaters are still running DVB-S / MPEG-2 digital outputs. However, we have seen significant improvements in video coding performance such that it now possible for amateurs to send full MPEG-4 1920x1080HD in less than 333Ks and MPEG-4 HD/SD set top boxes are available from eBay and Amazon for less than £20.

The current repeater standards of 4Msymbols on 23cms and 2Ms on other bands were written in 2004 but with these advances in technology, we now believe it is time adopt new standards for repeaters transmissions. This will not only effectively give a 10dB improvement in transmitter power but will mean the ATV community is well placed for any future revision to the 23cms bandplan.

Proposal

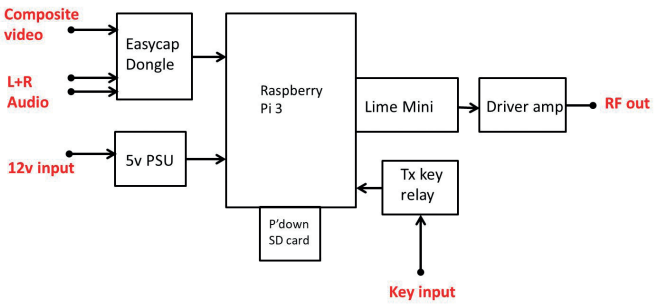
The BATC has sponsored a project to see if it is possible to produce a "drop in" MPEG-4 encoder / modulator replacement for the typical FM or MPEG-2 transmitter. Specifications were:

- Black box operation with no display or control panel
- Composite video and analogue audio input
- 12v DC power input
- 1MS DVB-S2 QPSK FEC 2/3 modulation with H264 encoding and stereo audio
- 23cms 17dBm (50 milliwatts – same level as Comtech) RF output , 13cms and 3.4Ghz also available
- PTT key line input

The design

The proposed unit uses a Portsdown transmitter consisting of an RPi and SD card operating in "headless" mode without a display, with a LimeSDR Mini providing an RF output on any frequency between 50MHz and 3.4GHz. An Easycap dongle is used to provide 2 channel analogue audio and composite video input

The proposed output standard uses H264 encoding and DVB-S2 running 1Ms 2/3 FEC in 1.2MHz occupied bandwidth.

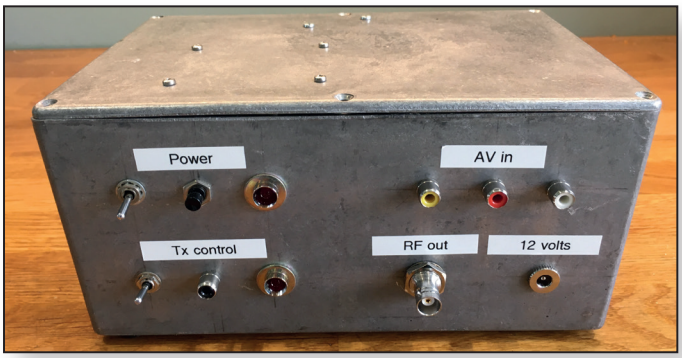


The design uses an RPi 3B with a standard Portsdown SD card available from the BATC shop. It is fed with composite video and audio from the Easycap dongle and 5.2 volts at 1.5amps from a standard switched mode PSU available from eBay. A standard LimeSDR mini is used to produce the RF output and this can be fed in to an optional driver amplifier.

Proof of concept

The design was built in to a standard 222x146x106mm diecast box and phono and BNC connectors were fitted to interface to the outside world.

A powered USB hub was used to connect the Easycap dongle and LimeSDR Mini to the USB socket on the RPi. A BATC GPIO PCB was used to break out the transmit key and RPi reset lines.

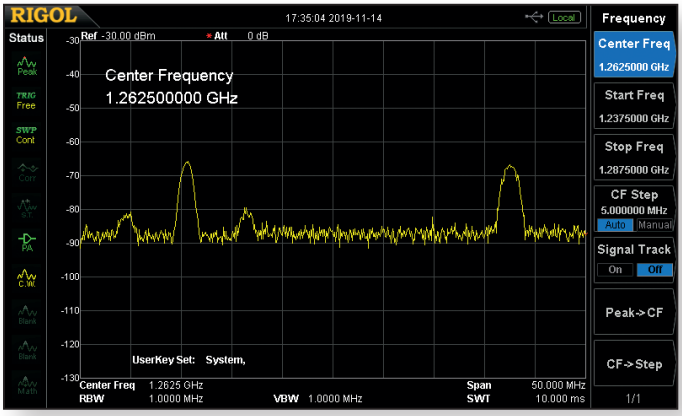


There will be no configuration required as the SD card supplied from the BATC shop will be configured ready for use in "headless" mode and with the repeater call sign and locator pre-programmed.

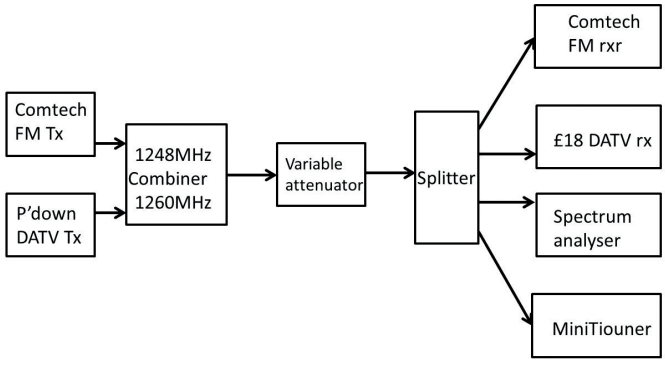
If reconfiguration or a software update is required, simply plug an Ethernet cable in to the Pi and connect in console mode using a PC as described on the BATC wiki – just make sure you leave enough space in your box to gain access to the RPi Ethernet socket!!

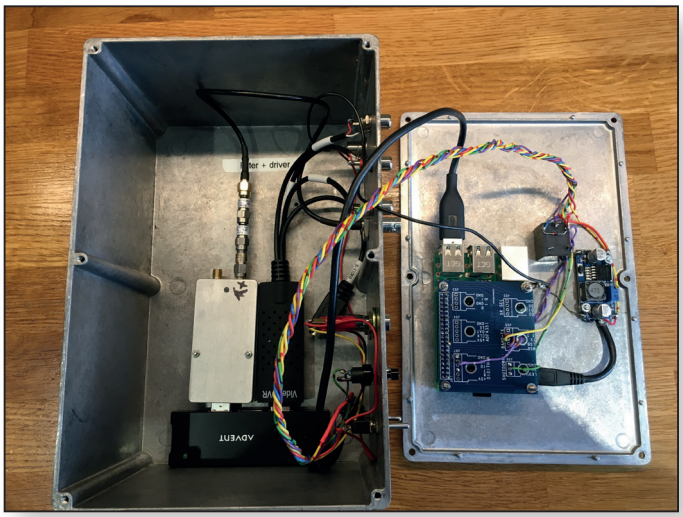
Testing and demonstration

In order to evaluate and demonstrate the difference in performance between an FM and DVB-S2 system, 2 transmitters were set up to be of equal amplitude and combined together.



The resulting signal was then fed in to an L band distribution amplifier via a variable attenuator which was adjusted to give minimum signal level for both system receivers.





Performance

As well as being much more spectrally efficient (1.2MHz vs 16 MHz) the use of DVB-S2 coding means there are very significant gains to be made over a 16MHz analogue or even a 4MHz DVB-S transmission.

The prototype unit was recently demonstrated at the CAT South meeting and reliably proved that the difference between a P3 analogue signal and loss of lock on the DVB-S2 QPSK 2/3 FEC 1 Msymbol signal was <13 dB. The difference between a P5 signal and a weak but locked D5 signal was over 20 dB! Improvement over a 4Ms DVB-S signal was approximately 5dB.

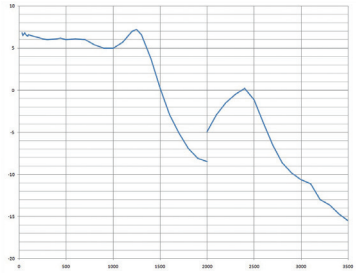
▶ *Analogue FM signal!*

▶ *A 10 watt DVB-S2 signal is equivalent to a 150 watt FM signal!*

As we are using the advanced H264 codec, the video quality is good although there is a delay of between a half and one second.

Power amplifiers and filters

The LimeSDR mini output on 23cms is approximately +5dBm and will need be fed in to an optional driver amplifier - several suitable driver amplifiers have been reviewed in CQ-TV and are available from sources including G4BAO and eBay etc.



▶ *LimeMini Output*

This higher level output should then be put through a high pass filter before feeding a power amplifier.

Tests on GB3EY have shown that the M57762 bipolar brick PAs, which are still in use on a number of FM repeaters, can provide acceptable performance on DATV if biased correctly. -45dBc shoulders have been achieved when biased with 9v (not 8v as originally designed) and the output restricted to 5w RMS.

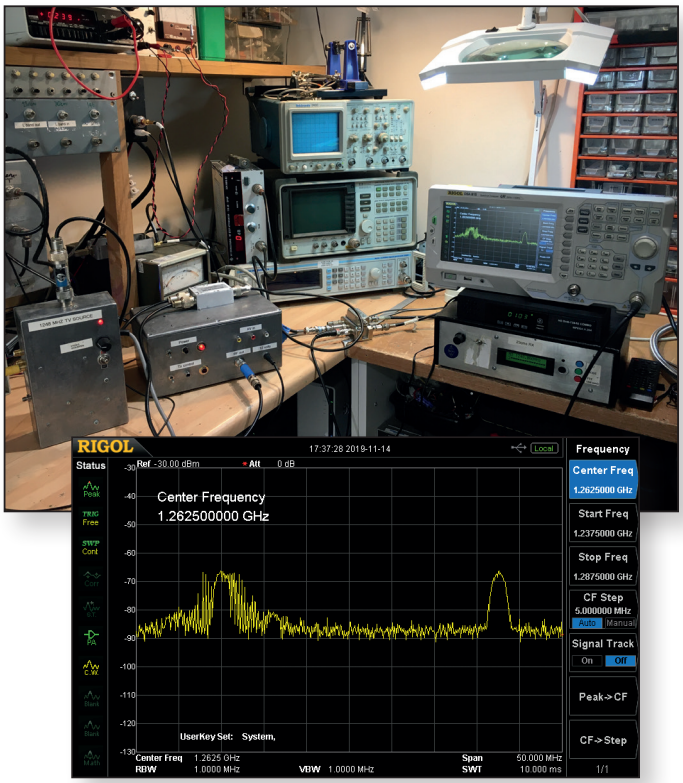
Receivers

As well as providing a repeater transmission, groups must ensure their members are able to receive the signals at a reasonable cost.

It possible to get acceptable SD video quality at much lower symbol rates, but one of the reasons why 1Ms was chosen for the proposed standard is that nearly all modern DVB-S2 consumer STBs can reliably decode 1Ms.

All the testing and demonstrations have been done using a standard STB bought off eBay for £18. This was not specially selected for the work and it is believed that any DVB-S2 H264 STB designed for free to air satellite work will work. These are also significantly cheaper than equivalent FM receivers, which have become very hard to source in recent years.

▶ *Typical DVB-S2 STB*



BATC sponsorship

Even though this is a very cost effective way to upgrade your repeater and gain an extra 10 dB of coverage, BATC realises that not every group will be able to afford the estimated £300 required. We are therefore launching a bursary fund to sponsor the upgrade for every ATV repeater group in the UK.

The repeater group will need to apply using the bursary form on the BATC website. ***https://batc.org.uk/club-info/bursary-fund/***

If the submission is successful BATC will give the group a Portsdown SD Card, GPIO PCB and Easycap from the BATC shop.

BATC will also, after receiving a copy of the receipt and proof of project completion, refund the purchase of one Raspberry Pi 3 and a LimeSDR Mini up to a maximum cost of £250.

The group would be expected to fund a suitable enclosure, USB hub and PSU etc.

Conclusions

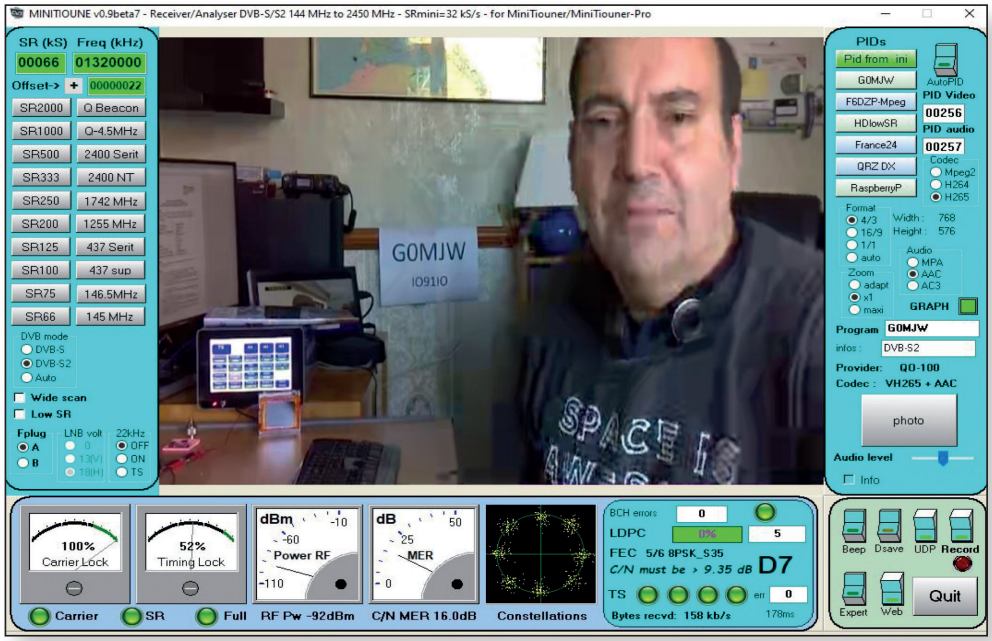
The ATV community has always been seen as developing and using the latest technologies. By adopting 1 MS DVB-S2 and H264 as the new repeater standard we will continue that approach and the BATC is keen to support our members to make that change.

BATC report to the RSGB Spectrum Forum, November 2019

The ATV community continues to innovate with very low bandwidth transmissions using H265 video encoding and DVB-S2 modulation.

BATC recently submitted a report to Ofcom detailing the tests done on the 71MHz band using just 80 KHz of occupied bandwidth to transmit high resolution full frame video and audio over a 29 km obstructed path.

A copy of the video file can be viewed here:
https://tinyurl.com/rku9xn9



▶ *G0MJW on 71MHz DATV in just 80 KHz bandwidth*

Activity levels

Terrestrial ATV activity on all bands has plateaued, perhaps due to increased DATV activity using the wideband transponder on the geo-stationary QO-100 satellite.

This was reflected in a slight fall in UK entries to the recent IARU Region 1 ATV Contest where UK stations submitted entries on all bands from 71MHz to 24GHz. G4FRE and G8GTZ won the 24GHz section with a 136 km contact (a new DATV world record).

https://wiki.batc.org.uk/images/e/e1/IARU_Region_1_ATV_Contest_2019_Results.pdf

The Bands

50 MHz

Tests have continued on 51 MHz to support the IARU region 1 team initiative at WRC 2019. The current distance record using low power stations stands at 140 km. Note, DVB-S2 is currently used which will limit the use of any enhanced propagation modes due to its vulnerability to multi-path and other phase distortion effects.

71 MHz

ATVers have had to learn new skills to operate on the band including coping with higher noise floors and huge antennas!

Even with the 100 watt ERP restriction, the current DX record is 160 km and again phase distortion will prevent the use of any enhanced propagation modes 71MHz offers.

146-147 MHz

Many ATVers have applied for a special NoV to operate in this band and even though the maximum transmit power is limited to 50 watts ERP, ATV QSOs using 500KHz or less bandwidth over 200Km are now happening regularly with the current record standing at 407Km.

430-440 MHz

This band is much more active due to the narrower bandwidth of digital TV transmissions that can now fit into this crowded allocation. Regularly there are long distance transmission of over 200 Km made around the UK and into Europe.

1.3 GHz

In light of the potential changes to 23cms, BATC is investigating the potential of migrating TV repeater outputs to DVB-S2 1 Ms (1.2MHz occupied bandwidth) operation. Tests indicate a gain of 13 dB over a 16MHz FM signal with no loss in video quality.

Work is ongoing to develop a suitable DATV transmission system and BATC is proposing to provide funds to help repeater groups migrate to the new standard.

2.3 – 2.4 GHz

There are still two repeaters licensed for this band and even though we lost 40MHz of the band in the PSSR process there continues to be a small amount of simplex operation.

A large number of operators have built 2.4GHz DATV and NB equipment to operate on Oscar100 – we need a plan to encourage these stations to use the equipment for terrestrial contacts!

3.4 GHz

7 repeaters are now licensed for this band and due to a lower noise floor and easy receive systems using C band LNBs, the performance is equal to or better than 13cms. With the band having been reduced to 10MHz, there is only sufficient bandwidth to allow the digital repeater output to be on this band with inputs on other bands.

Due to bandwidth limitations there is little simplex operation on this band although stations are active during BATC and IARU contests using Reduced Bandwidth DATV.

5.6GHz

With the availability of the low cost (<£20) FPV FM ATV transmit and receive equipment we are seeing a significant increase in the number of ATV and WBFM stations using the 5.6 GHz band. There are two repeaters with inputs on 5665MHz and we believe this will become an important band to attract newcomers to ATV and microwaves.

10 GHz

Six repeaters are licensed for this band and it is also quite active with simplex operation.

A number of stations are active with DATV on the band using standard narrow band transverters from144 / 432 MHz to generate DATV signals on the band. The current best DX stands at 407Kms between M0DTS and G4UVZ worked during a tropo opening in October 2018.

24GHz

A number of stations are active on 24GHz ATV undertaking mainly portable work with the current best DX standing at 136Kms.

Higher bands

Two stations are active on 76GHz and have achieved a 35.6 km QSO (a new world record) and M0DTS has successfully transmitted video on 134 GHz. A number of ATVers are purchasing 122 GHz equipment and we expect to see some FM ATV activity on that band in 2020.

Oscar 100

The launch of the geostationary Oscar100 satellite has seen a large increase in activity and interest in ATV – over 150 stations are known to be operational on DATV ***https://wiki.batc.org.uk/QO100_DATV_Users***

The BATC WB spectrum monitor and NB web SDR have enabled everyone to get a glimpse of the activity and innovation on the satellite which provides coverage of 60% of the world's population.

https://eshail.batc.org.uk/wb/

https://eshail.batc.org.uk/nb/

TV Repeaters

Overall we currently have 42 TV repeaters licensed on the 1.3 GHz, 2.4GHz, 3.4GHz and 10GHz bands with a mixture of analogue and digital transmission outputs.

The BATC

BATC membership continue to grow with Oscar100 encouraging more stations to be active on DATV - the Portsdown DATV system proving to be a popular route back in to the hobby for many.

BATC believes that building a community of ATV builders and operators through online communities on the member's forum, providing a reliable source of relevant information on wikis and in the CQ-TV magazine and reporting activity on social media is fundamental to the growth we have seen both in ATV activity and BATC membership.

The BATC continues to support and drive initiatives with a program of awards and grants to recognize achievements in the community and the use of the BATC shop stocks otherwise difficult to source components for BATC sponsored projects.

In order to further increase operator numbers, BATC has awarded a number of prizes for contest winners and organizes a monthly activity weekend timed to coincide with activity weekends in neighboring IARU countries.

BATC regularly attends a number of rallies around the country encouraging people to take an interest in ATV and helping to promote the use of all our bands from 50 MHz up.

ADALM-PLUTO DATV TX – "How To"

Paul M0EYT

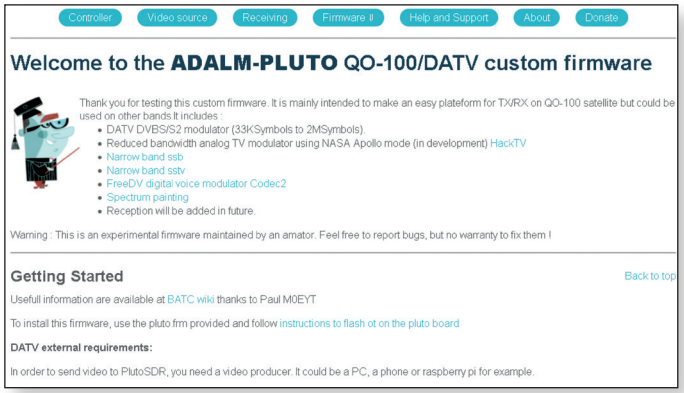
Introduction

Firstly, I'm not a DATV expert but have played with a number of SDRs over the years since my first SDR-14 back in 2005. I dabble in GHz stuff so have a rough idea what I'm doing, but that's about it! I like to make sure I learn something new related to technology every day, so both DATV and the PLUTO SDR fulfill this. I got the PLUTO SDR after borrowing one from Jules G0NZO and being super impressed by it, for the price you really cannot go wrong. It works out of the box, has TX+RX and with a few minutes work, can have its frequency range extended to cover 70MHz to 6GHz, not bad at all, plus it runs Linux internally (Linux pluto 4.14.0-g387d584d434e) which is a great bonus. The receiver is great and I used the loan unit to listen to all Bell Hill beacons up to 5.7GHz with something akin to a paperclip pushed into the RX port.

This is the unit in question, shown to the left, it's very compact at 5"x3"x1" with separate transmit and receive SMA sockets and a pair of micro USB sockets for I/O and power. It draws 400-420mA when idle or transmitting. When the QO-100 narrow band transponder was used with PLUTO SDRs for TX, some frequency drift was apparent. It turns out that the integral TCXO wasn't particularly good, so it's worth replacing it with a decent TCXO such as the ASTX-13-C-40.000MHz-I05-T which you can get from Mouser. This solves all frequency stability issues (well most...). For the ultimate stability, external GPSDO reference is still recommended.

First Steps

I've built the Portsdown filter/modulator unit for DVB-S which performs really well, but was looking for a non-LimeSDR method (it's a long story) of generating DVB-S2 8PSK and 16/32APSK DATV. I saw on Twitter that EvaristeF5OEO(@F5OEOEvariste) of rpitx fame was developing replacement firmware for the PLUTO that would provide DATV capabilities as well as some other goodies, so I pinged him a message and asked if I could beta-test the firmware. The firmware arrived quickly. The 'pluto.frm' file is copied into the root directory of the PLUTO mass storage memory, where the configuration files exist. Once copied up, 'eject' the device, don't unplug the USB but use the software eject. The blue LED1 in the PLUTO will rapidly flash for 3 or 4 minutes then reboot and the mass storage device will reappear. Full details on this process are at ***https://wiki.analog.com/university/tools/pluto/users/firmware*** - don't unplug it during the flash process for obvious reasons; you might brick it although it can be recovered. With the SDR still plugged into your PC, you can browse to the internal web-server by pointing a browser at ***http://192.168.2.1*** with all being well you should see something similar to the next screenshot.



Having updated the firmware and confirmed that it was working, next was the start of a massive learning curve. What would I need to use to generate some 'digital stream' with video in it? What software should be used? How does the stream get from the PC to the SDR? How do you set all the parameters needed to generate DATV? How do I get video from my phone camera into the PC? The list of questions was growing the more I looked into this stuff....

Digital Video Source

I know John GI7UGV as we work in the same industry and know that he's really into DATV, so had a chat with him and within minutes had vMix (***https://www.vmix.com/***) installed – this looked like the easiest initial method of doing what I needed; make a PC generate some video stream to control the PLUTO. This was pretty intuitive and within half an hour I had a test card source, spitting out the relevant data to the PLUTO. This was done by simply setting an external RTMP stream target with the following parameters;

```
URL : rtmp://192.168.2.1:7272/,437,DVBS2,QPSK,333,23,
Pass : ,M0EYT,
```

The above parameters form part of the URL and are parsed by the F5OEO firmware to set the various DATV transmission parameters;

```
Frequency in MHz: 437
Mode (DVBS/DVBS2): DVBS2
Constellation (QPSK,8PSK,16APSK): QPSK
(only QPSK in valid in DVBS)
SymbolRate in KS (33-2000): 333
FEC (12,23,34,67,78...): 23
CALLSIGN: M0EYT
```

It's particularly important to look at the RTMP stream definition syntax, probably best to cut and paste the above URL / pass text and then modify to suit your own requirements. With the PLUTO SDR plugged into the USB port of the PC running vMix, it worked right away and a QPSK carrier was being generated at 437MHz, receivable on the Minitiouner. I had noted that vMix was not free / open source, so after further discussing with John GI7UGV, I decided to uninstall vMix and give OBS (Open Broadcaster Software ***https://obsproject.com/download***) a try. Since this is open source, there are no licensing 'difficulties' and although it's not as polished as vMix, it's fully functional and just works.

OBS Basics

In OBS the first thing to do is to define the output stream so it points at the PLUTO SDR, so go to settings, stream, and type in the following, obviously tweaking the IP address, modulation parameters and callsign to suite your own environment:

You will be able to see a 'Controls' box docked at the bottom of the OBS window, this is where you press 'start streaming' to enable the PLUTO's DATV output. A green block should appear in the status bar indicating that streaming to the PLUTO is occurring.

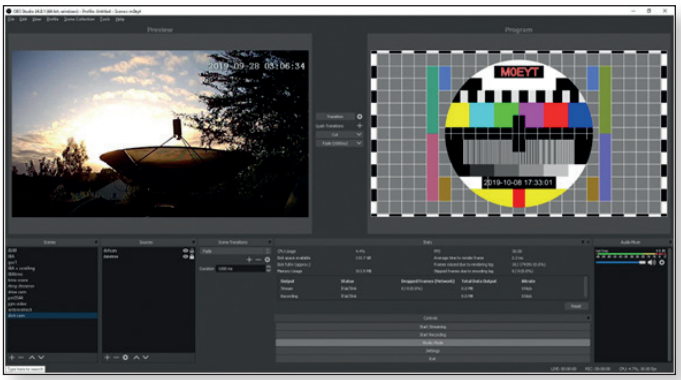
Before you jump in and press 'start streaming', you will need to set the streaming bitrate to avoid any overflows between OBS and the PLUTO. Visit ***http://www.satbroadcasts.com/DVB-S_Bitrate_and_Bandwidth_Calculator.html*** type in your DVB-S/S2 parameters, press calculate, and make a note of the 'Netto TS bitrate' – you want to set your streaming bit rate to about 65% to 70% of this figure. So if the Net TS bitrate is 440Kbps you will want to set your video bitrate to say 286Kbps, better to set it on the lower side. This means that the video plus transport overheads will not cause overflows when streaming data into the PLUTO. Once you are familiar with the various bitrates, and your favourite settings, you will be able to guesstimate the video bitrate in OBS. It is set via 'settings', then 'output', then under the 'streaming' section type your bitrate. I have my encoder set to x264 compression and my audio bitrate set to 64Kbps. With these settings, there are no interruptions in the audio stream and everything works fluidly.

Next, you will need a picture source, so the easiest method in OBS is to go to the 'scenes' dock, press +, enter a name for your scene, such as 'test card'. Next in the 'sources' dock, press +, select video capture device, create new, type in some name and press OK. You should see a 'colour bar / grey fade / bar' test card appear in the 'Preview' window. Ensure that in the 'Controls' dock, you have pressed 'Studio Mode' so you see Preview and Program windows.

Whatever you see in the 'Program' window is the video that is being streamed to your PLUTO.

You can set a number of 'scenes' so that you can quickly select and fade or cut between them. If you have desktop video files these are easy to add. You can create an additional scene and for example put a JPG/PNG image there, or add some desktop video. I found that my camcorder dumped its video out in a .VRO file, never heard of that, but OBS could ingest it and stream it correctly including the stereo audio tracks.

You can also easily add scrolling text messages to overlay across your images, various analogue and digital clocks, inputs from webcams, RTSP CCTV cameras, dancing chicken / cat overlays etc; there are a lots of choices. You probably want to spend a few hours clicking through the various menus to get a handle on the software options and what it can do. I found it fairly easy to set up sources and to be able to chop and change parameters whilst watching the DVB-S2 stream on another laptop that had the BATC Minitiouner attached. Within OBS it's also worth looking at the various extensions / add-ons that others have written for the platform, these basically are additional features for you to use. You will end up with something similar to my instance;



In my OBS 'scenes' I have an 'rtmp streamer' input, this allows me to use the camera / microphone in my Android mobile phone, along with software called Larix

Broadcaster ***https://play.google.com/store/apps/details?id=com.wmspanel.larix_broadcaster*** - what this does is streams the video from the phone, but you cannot ingest this directly into OBS since you need an RTMP streaming server. You could use this mobile app to directly stream to the PLUTO SDR but then all the nice video processing features of OBS are lost. Luckily there is a thread at ***https://forum.batc.org.uk/viewtopic.php?f=69&t=6179*** detailing what needs to be done to build such a server, you can drop this onto one of your Raspberry Pi's and it consumes very little CPU. Basically it uses an NGINX HTTP server with a RTMP streamer plugin and just works. Point your phone and OBS at the IP of the NGINX host with the port defined in the configuration file, press the various go buttons and video / audio will be streamed from the phone into OBS.

If you can get away from having any analogue video sources in your setup, your overall stream output will be digital from the sensor through to the display at the other end of your QSO. This means that quality will be maintained and you won't have poor quality audio with earth loops / buzzing or video that suffers from typical analogue artifacts.

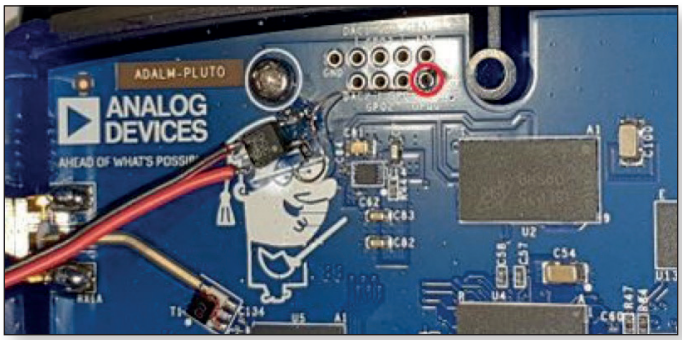
System Integration

Having thought about how to integrate the PLUTO into my existing QO-100 narrow band system, I decided that I shouldn't go that route, and should build a new DATV system based around the Axis-NT power amplifier. First I needed to get the PLUTO on the LAN so I can just feed mains + Ethernet to my outdoor unit (ODU).

I found an old USB<>Ethernet adapter and an OTG adapter and plugged it into the PLUTO's USB IO port, and a phone charger battery into the PSU USB port; the PLUTO defaults to DHCP so quickly obtains an IP address once its internal Linux OS has booted, this can of course be set as a static IP by editing the config.txt file on the PLUTO. Network operation really is the way to go as it eliminates lots of USB issues and allows multiple sources to use the SDR without having to continually mess around with USB cables and fragile micro-USB connectors.

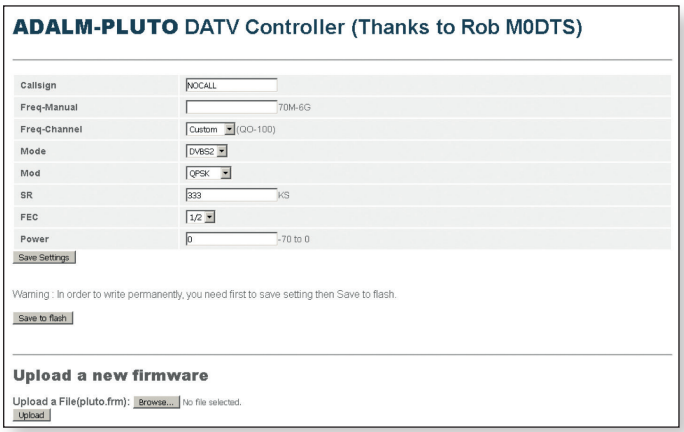
Matthias DD1US has written up his PLUTO LAN experiences at ***https://tinyurl.com/y4qtcmau*** which is worth digesting.

The later PLUTO Firmware versions support a PTT output so that when a valid RTMP stream or SSB, etc. feed starts, the PTT pin changes state to allow amplifiers to be keyed up. The primary PTT comes from GPO0 circled in red below;



The logic-level output is 0/1.2V which is just enough to drive an opto-coupler, this provides decant isolation between the PLUTO and whatever it is you are controlling. I used a '356' opto-coupler recovered off an old PCB. Note: During the PLUTO boot process the GPO0 pin toggles from low to high, stays there for 5 seconds, and then toggles back to low. No RF output was seen during this toggle etc. Latest version of the firmware also toggles the GPO1 pin as well so with a simple transistor AND gate, you can get true PTT out without the boot time PTT toggle.

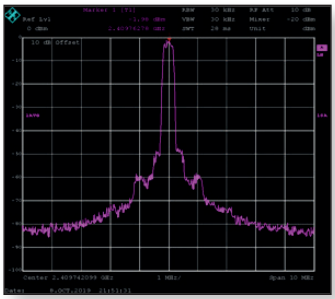
You may be wondering how you update the PLUTO firmware if you are running it via a LAN connection, well, it's pretty simple. Download WinSCP, configure it to point at the IP Address of your PLUTO, copy the pluto.**`frm`** file up to **`/root`** (root home directory). Once done, SSH into the Pluto (download Putty or similar and use **`username=root, password=analog`**) then execute **`update_frm.sh pluto.frm`** this will extract the firmware and update the internal flash memory, the blue LED will blink rapidly during this process. Once done, type '**`reboot`**'. When the Pluto comes back up, it'll be at the firmware level just uploaded; this saves having to plug the Pluto into a PC via USB and using the normal firmware update method. The December 2019 F5OEO firmware also supports updates via the web page as shown below;



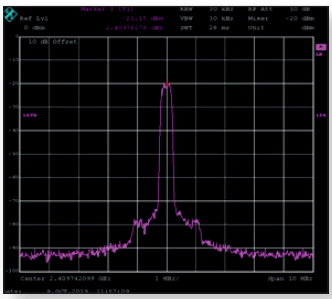
RF Topics

The RF output level of the PLUTO is pretty low, about -15dBm at 2.4GHz so clearly this needs some amplification to do anything useful with.I decided to look at some of the random amplifier modules I had laying around and see what each did to the output spectrum, in particular the spectral regrowth / shoulders.

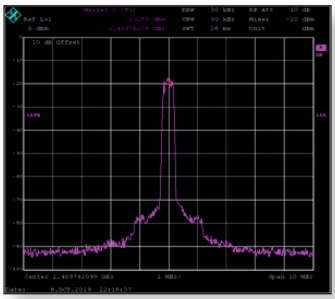
All measurements below are taken with the PLUTO generating DVBS2 at 2409.750MHz centre, 8PSK, 333Ksps, 2/3 FEC.



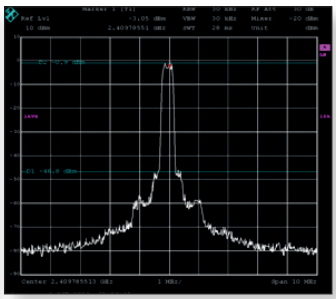
▶ *Avantek SA82-2340*



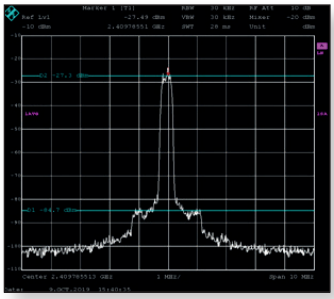
▶ *SPF5043 + 10dB Pad on o/p*



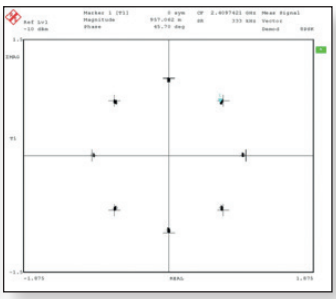
▶ *LNA4ALL + 10dB Pad on o/p*



▶ *3 X amp 30~dB gain (+ 10dB Pad on o/p)*



▶ *PLUTO direct output 8PSK baseline*

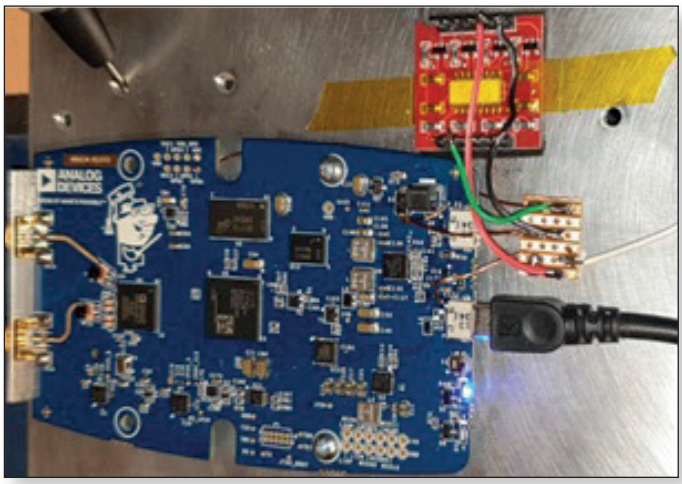


▶ *PLUTO 8PSK baseline*

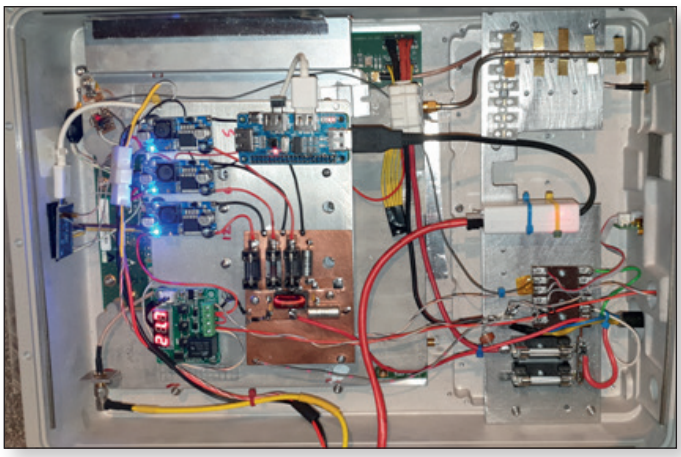
From the tests of LNAs to get the PLUTO output up a bit, it appears the more modern devices do not add significant IMD to the xPSK providing they are not over driven.

M0EYT System

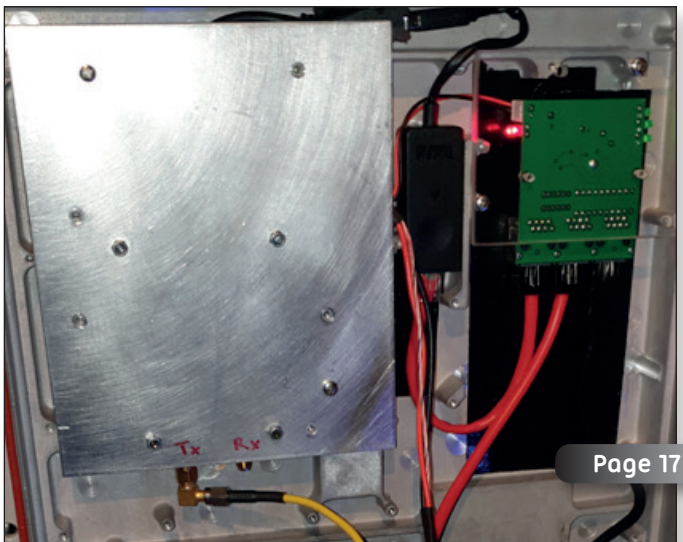
I first mounted the PLUTO SDR onto an aluminium plate that could be mounted inside the Axis-NT amplifier. I added an external 5V PSU input, fixed the OTG mode switch bug, and added an opto-coupler board to GPO0 as discussed above.



In order to fit this into the amplifier case, the internals of the top part of the case were milled away to leave plenty of room for the PLUTO board, and an Ethernet switch since I also intended to add telemetry to monitor the power amp. The bottom half of the amplifier are shown below, and include the PSUs for PA logic, Raspberry PI Zero and the PLUTO SDR. I did note that the output UT141 coax got warm when running at full power so I added some heat sink fins so nothing got uncomfortable. There is a temperature controller that switches on a pair of external fans once the heatsink temperature rises to 30°C.



The top half of the amplifier contains the PLUTO SDR, its Ethernet interface and a 3 port Ethernet switch.



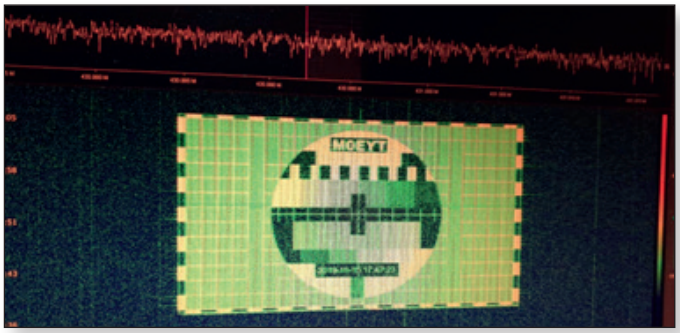
The telemetry monitoring dashboard will be the subject of another write up, but gives an easy way to monitor what the amplifier is doing in real time and typically looks like the following screenshot.

Once telemetry values can be easily read by the on-board Raspberry Pi, it's possible to add lots of safety features, i.e. if temperatures get too hot or the SWR suddenly changes, a PTT inhibit output can toggle shutting off the PA. I decided that it was worth adding to the values that could be read out of the Axis-NT controller (an Arduino) so I added some 1-wire temperature sensors, and did some calculators to work out SWR based on the forward / reflected power values.

Wrapping Up

The PLUTO SDR with the F5OEO firmware certainly does offer a simple way to generate DATV from VHF up to the lower microwave bands. For QO-100 with a suitable amplifier chain (i.e. Axis-NT) it is an ideal DATV source and should result in many more users appearing on the wideband transponder. There are no annoying pre-transmission calibration carriers to spatter over the transponder which is nice. The generally released firmware can be downloaded from h***ttp://vivadatv.org/viewtopic.php?f=60&t=692*** – this is one of the first DATV versions.

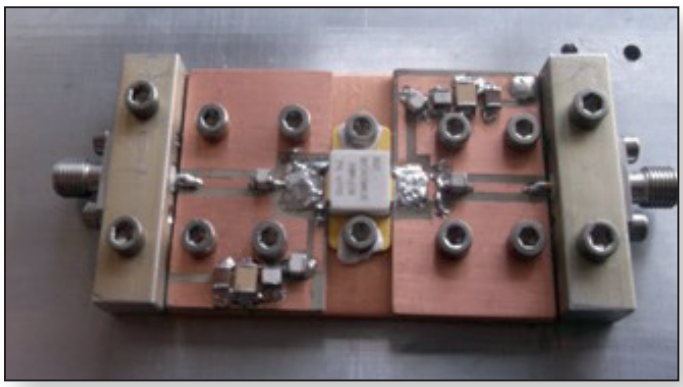
A great amount of credit should be given to Evariste F5OEO for his amazing work on this firmware, and I would recommend you donate to his efforts via ***https://www.paypal.me/f5oeo*** - something for a decent bottle of wine or two for example! I'm sure that many hundreds of man-hours have been put in to the PLUTO DATV project so a bit of support won't go a-miss and might even encourage further enhancements. Supporters of the PLUTO firmware project do get early access to later versions which are always on the bleeding edge of what is possible, i.e. image to waterfall writing, SSB, free-DV support etc;



See you on the transponder! Thanks to John GI7UGV for sanity checking this write up ;-).

A 30 watt driver amplifier for 2.4 GHz

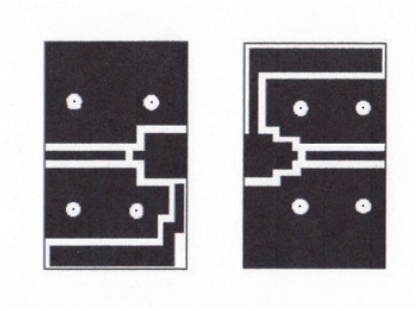
Jim Smith G7NTG



After I had built several 250 Watt power amplifiers for QO-100 it soon became apparent that there was a need for an amplifier to provide enough power to drive the final. The supply of suitable Andrew modules has now dried up and prices are high for any that appear for sale. Something with about 30 watts output, so that it was nice and linear for the actual power required.

I went back to the Ampleon site and selected the BLF2425M9L30 as it had a simple circuit for the test jig with dimensions supplied by scaling their diagram. I redesigned the supply tracks to allow for more decoupling and came up with the artwork.

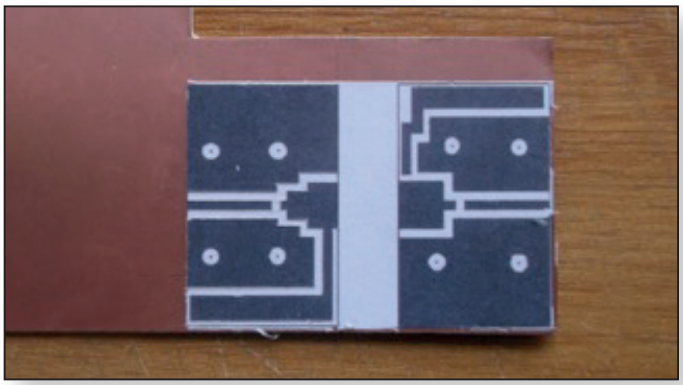
The artwork was printed out onto self adhesive label paper and the printout was adjusted to measure 25mm x 40mm for each half as accurately as possible using the printer % scaling. The artwork can also be found on **DATVPA@groups.io**



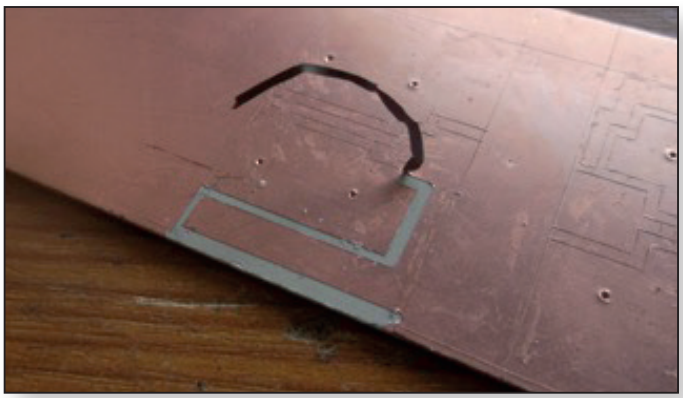
▶ *Fig1 Artwork for the PCB's – this needs scaling when printing so that each PCB measures 25 x 40mm.*

After printing a label to scale this was stuck on to the PCB material for which I used Arlon25FR , 0.762mm thick 1oz copper. Alternatively you could use Rogers 6035HTC with the same dimensions or a different material as long as the Er is about 3.5 and the thickness the same at 0.762mm. Don't use FR4 as it is too lossy.

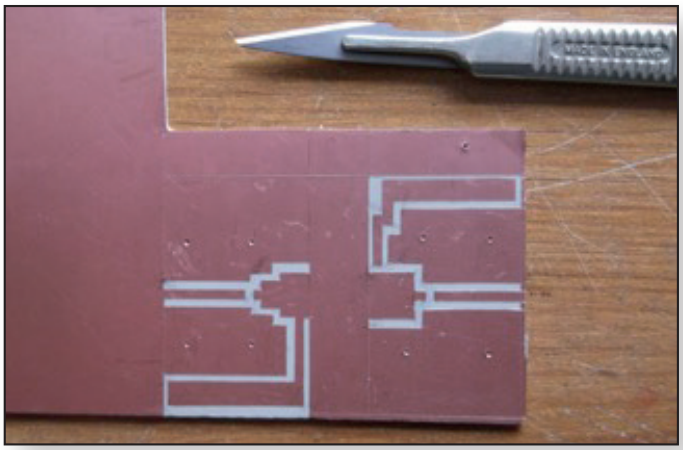
Construction of the PCB used the same method as for the big PA described in CQ-TV 265, by carefully scoring along the lines with a SHARP scalpel, marking the hole positions with a dot punch, peeling off the paper label and then peeling off the unwanted copper by lifting one end with the scalpel and simply peeling off. This is very easy with ceramic based boards.



▶ *Fig 2. The label stuck on to the PCB*

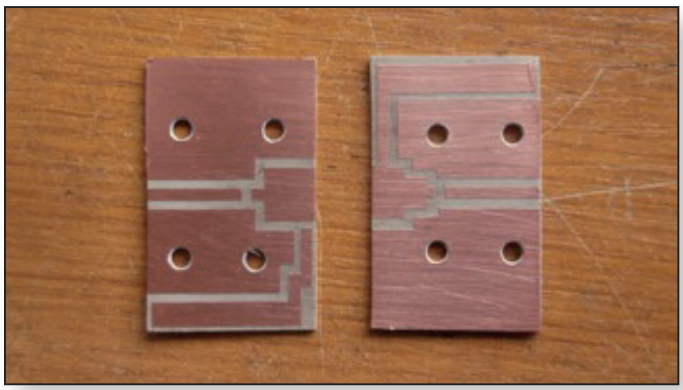


▶ *Fig 3. Peeling off the copper after scoring (note the hole positions marked with a dot punch.*



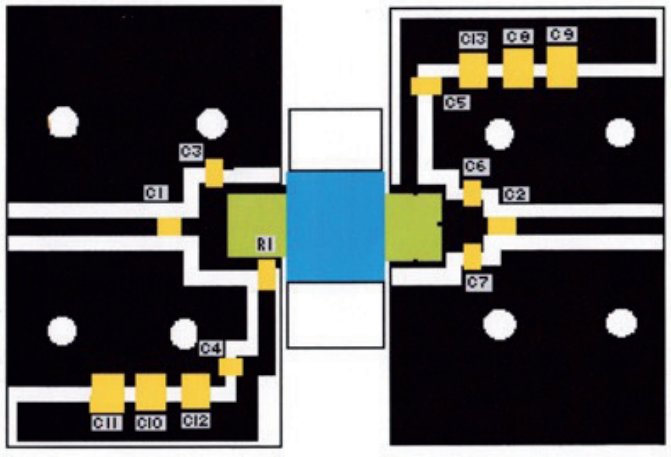
▶ *Fig 4. The peeled board ready for drilling and cutting.*

It is easier to drill the PCB before cutting it.



▶ *Fig 5. The finished PCBs. Note that, once again, I have not used any vias.*

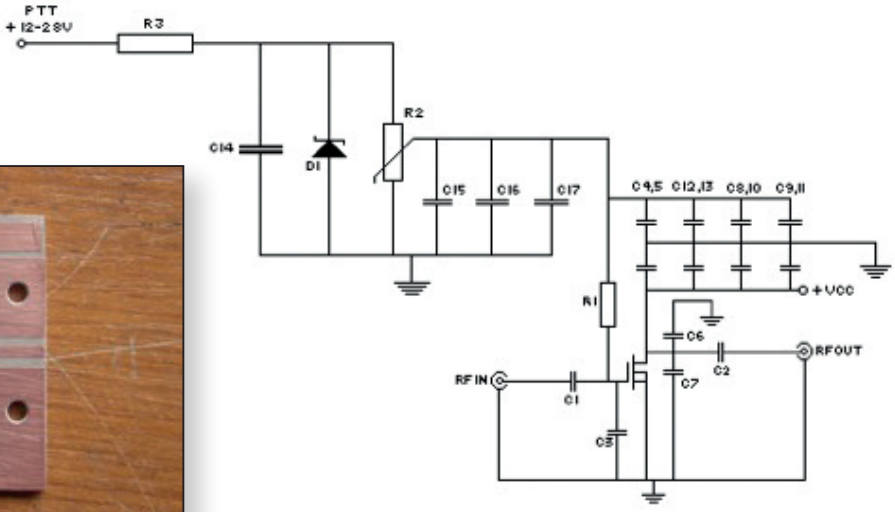
The next stage is to fit the capacitors and resistors as shown in Fig 6.



▶ *Fig 6.Component placement. Parts list below.*

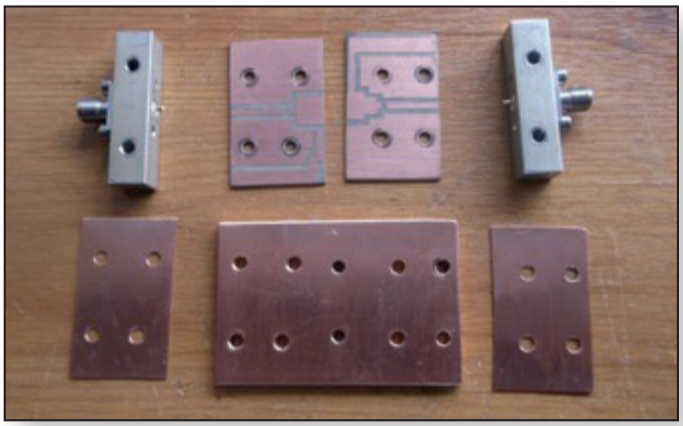
Parts list for 30 watt BLC2425M9L30 amplifier and bias supply

C1,C2,C4,C5	15pF	ATC100A150FT150XT
C3	0.6pF	ATC100A0R6BT150XTV
C6,C7	0.8pF	ATC100A0R8BT150XTV
C8,C10,C16	100nF	100nF 200V CERAMIC LOW ESR
C9,C11,C15	4.7uF	4.7uF 100V CERAMIC LOW ESR
C12,C13,C17	470pF	ATC 470pF 200V
C14	100nF	100nF 50V
R1	10R	
R2	500R	PRESET 10 TURN
R3	1.2k	2 WATT
D1		ZENER DIODE 4.7 VOLT



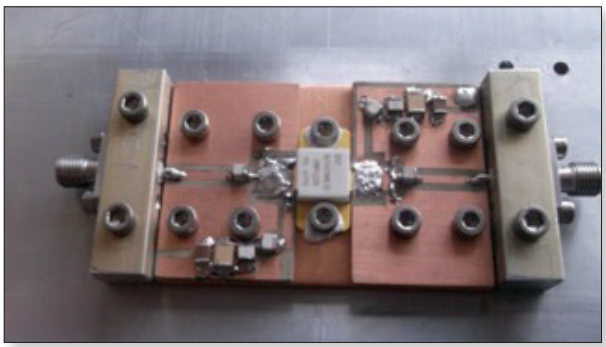
▶ *Fig 7. Schematic including the simple bias circuit that I used.*

I then made the heat spreader from 3mm copper sheet and the two spacers from 0.5mm copper sheet to raise the PCB to fit under the gate and source tabs of the transistor as well as the end termination blocks for the SMA connectors. Note that these connectors must have long Teflon insulators which will pass right through the blocks.



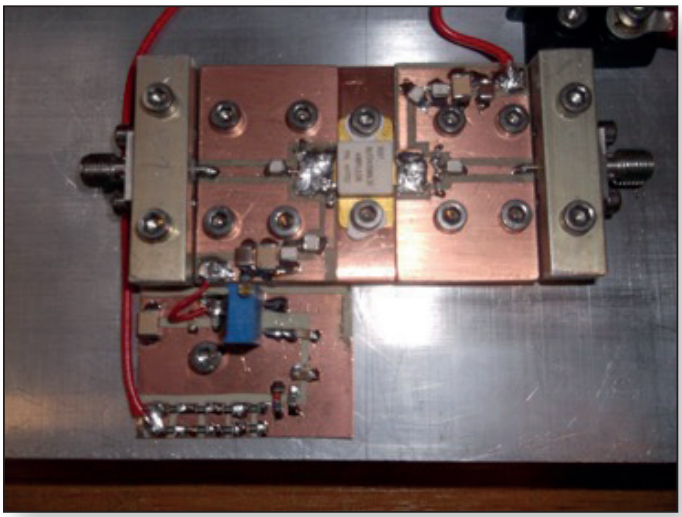
▶ *Fig 8.Heat spreader, spacers and connector blocks.*

The populated PCBs, spacers and heat spreader were then bolted down on to the heatsink using heat sink compound under the heat spreader. The next stage was to bolt down the transistor using a smear of heat sink compound under the device flange, solder the transistor tabs and connector pins.



▶ *Fig 9 The assembled amplifier.*

The next stage was to make a simple gate bias PCB and fit that next to the amplifier.



▶ *Fig 10. Showing the very simple bias PCB I used.*

The next stage was to connect a dummy load to the output and then connect up the supply volts through my trusty old AVO to measure the current. I used a 28 volt supply capable of about 5 amps. I then turned up the bias voltage until the transistor drew 200mA.

Power was then applied to the input and I was able to get 35 watts output at 2.405GHz for 1.32 watts drive and 2.35 amps from the supply.

At lower power 10 watts output is achieved for 220mW drive and 1.2 amps supply current. I have built a second amplifier with results within a few percent of the first. 1dB compression point seems to be around 30 watts.

CONCLUSION

This is a very easy amplifier to build as long as you can get hold of the PCB material – I found some on Alibaba.com from a company in China called Wangling Insulation and I have ordered some to test it. The transistor is available from Digi-Key for about £45 inc VAT.

Capacitors can be got from the same source or HFO-Poland although the 0.6 and 0.8pF ones are difficult – I just used ATC 0.5pF instead and the amps work fine!

This amplifier is great as a driver for a big PA but it should also work fine as a PA for the narrowband part of the satellite.

Out portable for the BATC November Activity weekend

Gareth, G4XAT

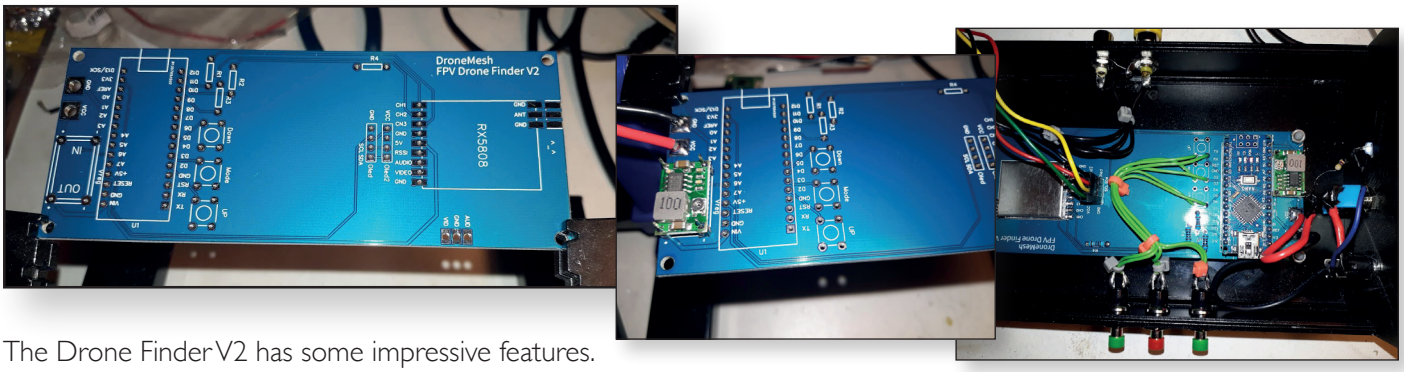
These monthly 'activity weekends' do provide some incentive to go out and 'play radio' so although I've 'sorned' the camper radio truck for the winter I still have good antenna support capability based around my trusty Ford Scorpio. To maintain some of my sanity I only took 2M DATV & Talkback with me, setting up by prior arrangement in Woldingham, Surrey IO91XH.

The sun was out and after 30 minutes I had my 12 element ZL portable at 7M with a 3 element tape-measure yagi below for vertically polarised talkback. Unfortunately that was picking up S6 noise in the westerly direction I was beaming, hoping for a contact with Noel, G8GTZ located on Walbury Hill some 100K distant. With voice contact on 144.750 established, I switched over to DVBS2 at 333kS and was rewarded with a D10 report (good strong signal). For the reverse trip I was trying my newly tested AMSAT preamp but didn't get anything. Switching over the standby RPI and RTL Dongle setup and using the spectrum viewer in Lean DVB I could see Noels carrier but not enough for a decode. I asked him to switch to a lower symbol rate (125kS) and that raised the signal, still not quite enough. By now the sun had gone into hiding and it was rapidly getting cold to the point of numb fingers so I packed away and went home. The operating positions (s) in the car are far from ideal, so maybe next year when I'm better set up with the gear I'll stick to the camper radio truck which has an ideal operating position and a HEATER!

5.6 GHz TV Receiver

Paul M0PNN

After looking at the various basic drone receivers available on eBay etc I wanted more functionality from my receiver but still low cost. Eventually, I came across a drone finder project from "DroneMesh" The DroneMesh FPV Drone Finder V2. Based on the Boscam rx5808 receiver which by default only supports 8 channels but with an Arduino using an SPI interface (Serial Peripheral Interface) this is expanded to 48 Channels. More importantly, 5.665 GHz is covered.



The Drone Finder V2 has some impressive features.

- RX5808 Module (SPI interface).
- RSSI (Received Signal Strength Indication).
- Band Scanning 5.3Ghz to 6Ghz.
- Band Scope Display 5.3Ghz to 6Ghz.
- OLED Display.
- Video and Audio output.
- Easy to Build.
- Arduino Based with plenty of open source to play with.

The Drone Finder PCB can be purchased from pcbway.com $25 for 5 PCBs or directly from DroneMesh at $9 each plus tax and postage.

https://shopdronemesh.com/product/fpv-drone-finder-v2-rx5808-pro-diversity-pcb-only/

https://www.pcbway.com/project/shareproject/RX5808_Pro_Diversity_FPV_Drone_Finder_V2__DroneMesh_.html

The Drone Finder V2 is designed to be used handheld with the operator holding the PCB with a small antenna attached looking for their lost drone using the signal strength meter displayed on the OLED. The pushbuttons and OLED mounted directly on the board.

The PCB is 51mm wide and 127mm long with four 3mm plated mounting holes one in each corner. I bought five PCBs from pcbway.com they took three weeks to arrive. I sold the rest of the PCBs to members of my local club (TDARS).

I wanted to box the whole thing up and mount it as close to the receiving antenna as possible. It would not last long as a bare PCB with a delicate OLED in my hands. Construction is easy using readily available through the hole parts and should take no more than an hour with chassis bashing taking much longer.

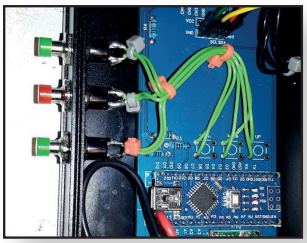
Parts List

- Adjustable DC-DC step-down Module.
- Four Resistors 10k x 3 100k x 1.
- Three push to make buttons.
- Arduino Nano.
- RX5808 Module (SPI interface).
- OLED LCD Display 128x64 IIC I2C.
- On/Off Switch.
- Power On/Off led.
- SMA Antenna Socket.
- Phono Sockets.
- Power Socket.
- Header Pins.
- Aluminium Enclosure.
- Internal wiring.
- Nuts & bolts for OLED mounting.
- All available from eBay, Banggood etc.

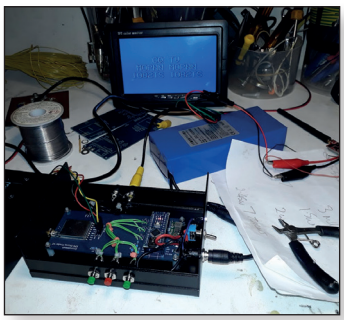
Construction is easy take the bare PCB board use it as a template and mark out the position of PCB holes in your enclosure. Solder a couple of wires to the board for the

supply use four header pins to mount the dc-dc module add power and adjust trimmer on dc-dc module to just over 5v output. Solder the header pins into the Arduino Nano mount it directly into the board (check orientation) and solder in. I used two female header sockets to mount the Arduino in the choice is yours. Next install 10k resistors at R1, R2, R3, fit a 100k resistor at R4. Mount the RX5808 Module at the top of the board carefully aligning it with the solder pads. Blue tack is great at holding things like this in place while you tack a corner pad. Be careful not to bridge the pads next solder the SMA socket in place again be careful not the bridge pads.

That's all the onboard components fitted now the off-board parts.



Three push to make buttons are used for menu control with four holes on the PCB for each one Down, Mode, Up. Only the pads on one side are connected to the PCB tracks.



The Oled Display is next to be fitted it's not uncommon for VCC voltage in and GND ground connections to be reversed on Oled displays that's why there are two positions for the Oled to be fitted check your Oled. I used header pins on the board and Oled display and connected them with Dupont connectors. Oled displays are very delicate order two and after you have broken the first one keep it and use it as a template for future projects using 1.3-inch Oled displays.

Last video and audio out connectors I used phono connectors yellow for video and white for sound.

Two instructional videos are available on YouTube detailing the construction process and programming the Arduino nano. Together with how to use the finished project section.

Part 1 ***https://www.youtube.com/watch?v=7DcFrbro-hU***

Part 2 ***https://www.youtube.com/watch?v=1f3IjSiONbc***

Installing Arduino Code

The code for Drone Finder V2 is available from the link below.

https://dronemeshforum.com/viewtopic.php?t=147

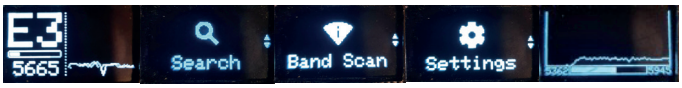
After loading the code into the Arduino editor, it's a large program with many options just compile and upload it if your happy to use it as is. I just removed the option to have a screen saver by commenting out some lines of code in the main program loop.

```
// if (
// StateMachine::currentState !=
        StateMachine::State::SCREENSAVER
// && StateMachine::currentState !=
        StateMachine::State::BANDSCAN
// && (millis() - Buttons::lastChangeTime) >
// (SCREENSAVER_TIMEOUT * 1000)
//    ) {
// StateMachine ::switchState
       (StateMachine::State::SCREENSAVER);
// }
}
```

You can install the Arduino code before or after soldering the Arduino into the PCB. Trouble shoot problems with the drone finder forum below. ***https://dronemeshforum.com/viewtopic.php?f=39&t=5393***

Navigating The Menu System

The DroneMesh FPV Drone Finder V2 has a simple but effective menu system using three pushbuttons *Up, Mode, Down*.



When in search **mode** press the mode button (the middle one) and hold for two seconds then let go this opens the side menu.

To navigate the side menu a quick press of **mode** button mode selects top or bottom options and up/down swaps between an option.

Options in top side menu **M** or **A**

M Is manual mode increment the channel number or frequency by individual button presses **Up/Down**.

A Is auto mode automatically search up or down the band by channel number or frequency with a single button press. The unit will scan until a strong signal is found.

The bottom options in the side menu are **Hz** or **ABF**. **ABF** allows you to search in Channel mode (**ABF**) A1,A2,A3 etc (**Hz**) Search by Frequency (**Hz**) 5780,5785,5790.

Calibration

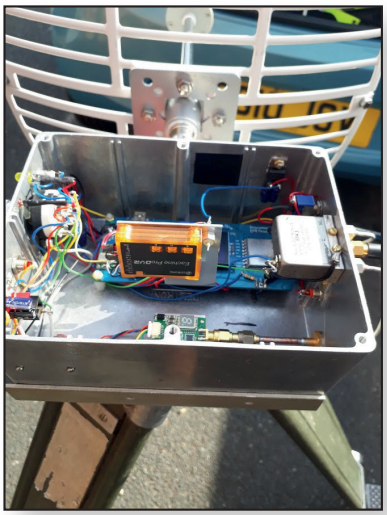
The unit needs to be calibrated before use. Select 5.665Ghz or channel E3 as your receive frequency and remove the antenna if fitted. Hold the **Mode** button until

the **menu** appears use the **Up/Down** buttons to navigate to the **Settings Menu** a quick press of the **Mode** button selects it.

Displayed on the Oled is "Press mode for RSSI calibration" follow the on-screen prompts you will need a 5.665Ghz transmitter to complete the calibration.

Once completed the drone finder can be used as a receiver on its own or part of a unit. My unit on left receiver only with output fed into DVR unit.

On the right a full 5.6 Ghz Rx/Tx system built into one box by G8VZT using the Drone finder as the receiver. Below is a Still received by me from G8VZT at 60KM.

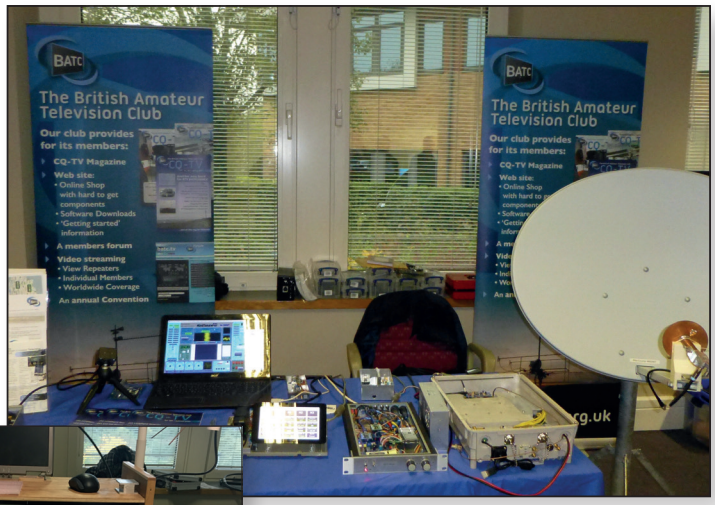


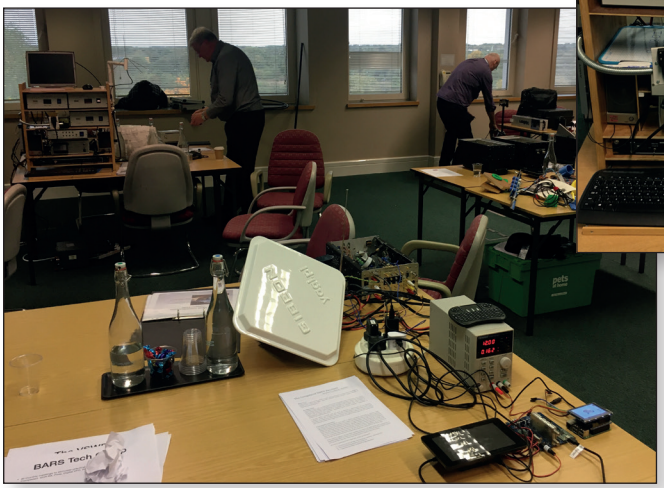
Conclusion

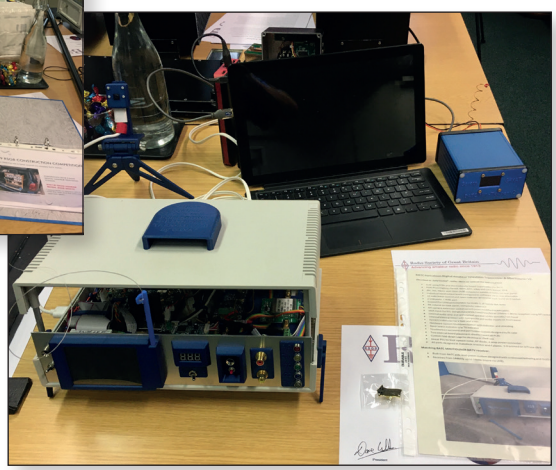
It works and was fun to build I learned a lot and was helped on the way by Dave G8VZT (Cheers Dave). There's room for future experimentation with Rx/Tx on one board with a fixed frequency of 5.665 GHz and RSSI with an Arduino Nano. It's cheap too – I like that.

RSGB Convention 2019

BATC had a small stand in the societies lounge at RSGB convention in October 2019 where Portsdown and Oscar100 was demonstrated to a steady stream of visitors throughout the weekend. As well as running a small stand we live streamed the AMSAT sessions and Dave G8GKQ and Noel G8GTZ gave presentations in the VHF and AMSAT streams. Several BATC members submitted Portsdown based projects in to the constructor's competition – at one point the judging room looked like a BATC CAT event!







Using the Jetson Nano with the LongMynd software

John G7JTT

The LongMynd software by Heather M0HMO is already integrated into the Portsdown and works very well, except the Raspberry Pi used is unable to deal with H265 - so the normal process would be to UDP back to a PC or other device to watch the H265 signal. I was doing this with a Jetson Nano but then had a thought about installing LongMynd on the Jetson and run it on there. I'm glad to say that with a lot of help I now have it working on the Jetson with Mpeg2,H264 and H265 and it should work with most other codecs.

So the process to get this working on the Jetson is to install Heathers software using the command line within a terminal on the Jetson,

git clone https://github.com/myorangedragon/longmynd.git

Then you need to create the scripts below - the **`longmynda.sh`** uses Robs software to send frequency, SR and LNB offset to the script; **`longmyndm.sh`** is for manual entry of frequency and SR - you also have to edit the file to enter your LNB offset; **`quit.sh`** is used to quit the current set up and enter new parameters; and **`stream.sh`** is used to UDP the video to another device. This can be rem'd out in either of the longmynd scripts if not needed.

Longmynda.sh (copy to home folder)

```
#!/bin/bash
# This version is used with Robs (M0DTS)
click and go software
clear
resize -s 3 35 # resize terminal to use
less screen space
clear
cd ~/longmynd
./fake_read &
# Start of Robs routine to listen for the
click and go software
echo "Start listening on port 6789"
netcat -ul 6789 | while read line
do
  echo "$line"
  freq=$( awk -F',' '{print $2}'  <<<
$line | awk -F'=' '{print $2}' )
  sr=$( awk -F',' '{print $5}'  <<< $line
| awk -F'=' '{print $2}' )
  lnb_offset=$( awk -F',' '{print $3}'
<<< $line | awk -F'=' '{print $2}' )
  echo "$freq"
  echo "$sr"
  echo "$lnb_offset"
# set frequency and symbolrate
freq2=$((freq - lnb_offset))
echo "Rx $freq with a symbolrate of $sr"
# Start Rx process
totem udp://230.0.0.10:1234 & # Start
player
gnome-terminal --geometry 35x3+0+70 -- ./
stream.sh & # stream to PC, rem out if not
needed
gnome-terminal --geometry 35x3+0+140 -- ./
quit.sh & # Routine to stop longmynd
./longmynd -i 230.0.0.10 1234 $freq2 $sr
# restart longmynd with params
clear
# start of repeat process
echo "Start listening on port 6789"
done
```

Longmyndm.sh (copy to home folder)

```
#!/bin/bash
# This version is for manual entry of
frequency and Symbolrates
clear
resize -s 6 31 # resize screen to save
space
clear
cd ~/longmynd
./fake_read &
freq=10492500
sr=2000
# start of input of data
echo -n "Enter Frequency in KHz "
read freq
echo "Enter Symbolrate"
read sr
freq2=$((freq - 9749854)) # set LNB offset
here
echo "Rx $freq with a symbolrate of $sr"
totem udp://192.168.1.105:1234 & # open
Totem player
gnome-terminal --geometry 31x6+0+0 -- ./
quit.sh & # Start routine to kill LongMynd
./longmynd -i 192.168.1.105 1234 $freq2
$sr # Start LongMynd
# Start of repeat process
cd ~
clear
PS3='Please enter choice:'
options=("Repeat" "Quit")
select opt in "${options[@]}"
do
    case $opt in
        "Repeat")
      exec ./longmynd.sh # restart
LongMynd
```

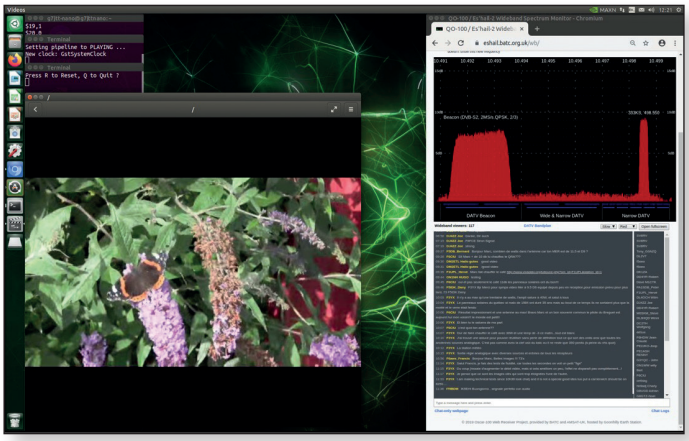
```
            ;;
        "Quit")
      xdotool getactivewindow windowkill #
Close all terminals and end
            ;;
        *) echo "invalid option $REPLY";;
    esac
done
```

Quit.sh (copy to the longmynd folder)

```
#!/bin/bash
while true; do
echo "Press R to Reset, Q to Quit ? " ;
read -n1 input;
if [[ $input = "r" ]] || [[ $input = "R"
]]
then killall longmynd gst-launch-1.0 ;
exit # kill LongMynd and return to main
script
elif [[ $input = "q" ]] || [[ $input = "Q"
]]
then xdotool getactivewindow windowkill #
close all terminal and end
else
echo "Invalid Option"
fi
done
```

Stream.sh (copy to the longmynd folder)

```
#1/bin/bash
# set host IP to PC running Robs (M0DTS)
click and go software
clear
gst-launch-1.0 udpsrc port=1234 !
tee name='repeat' ! queue ! udpsink
host=192.168.1.101 port=5000
# change host IP to the device's IP
address you want to send to
```



Once you have written all the scripts use **`chmod +x`** to make them executable ie ***`chmod +x quit.sh`***. To run the scripts plug the Minitiouner into the Jetson; open up a terminal then type **`./longmynda.sh`** or **`./longmyndm.sh`** depending on your needs. Pressing "**Q**" whilst the video screen it selected will close it (or click the X), then one of the small terminal windows you'll see "R" resets the process so you can enter new parameters and "Q" will close all windows and end.

I'd like to thank Dave G8GKQ for his help and advice and also Rob for his code to grab the info across UDP. And one other disclaimer this is my first attempt at this and I know it can be improved upon, but I've enjoyed the learning curve and I hope it will encourage others to have ago and learn something new.

GB3ET Repeater

Peter G8DKC and John M1CNJ

The original callsign allocation was to a rather adventurous bunch in a celebrity location, Emley Moor transmitting station, West Yorkshire at 329m ASL with a mast height of 330.4mtr. Well known callsigns that were very much involved included Peter G3PYB, Barry G6LIC, David G3PTU and Trevor G8CJS.

▶ *Picture of Emley Moor Mast during it's restoration, ET's equipment was in the gallery with it's antennas just above.*

Moving forward to today, GB3ET is located near the quiet village of Edgehill on the Warwickshire/Oxfordshire border, at 218mtr ASL with very steep roads on all sides, so on occasion access can be a challenge in winter. The steep sides are to our advantage in most directions with up to 100 mtr rise from the surrounding area to the ET plateau.

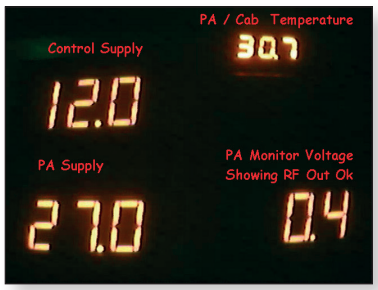
The NOV was applied for some time ago but due to problems getting 23cms approved, an application went in for 3.4Ghz. Thanks to Noel G8GTZ - with his UK Repeaters hat on - and the RSGB, a number of 23cms NOVs were granted. How quickly November comes along when you decide in August to get a repeater on air by the middle of October.

Due to the shorter days we decided to get ET on the air and perform a rebuild in the Spring/Summer, so at the moment, for experimental purposes Tx 2 M/s H262 from DTX-1, Rx 1249 Analog and Digital 2M/s H262, with thoughts of changing this to H264, in the future, possibly a Pi DATV Express or Pi Lime.

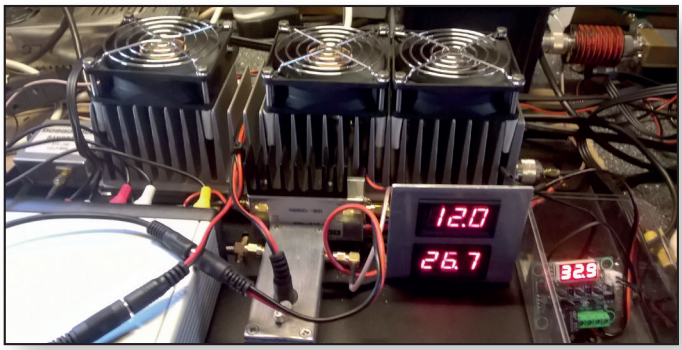
Spring upgrade 'wish list': DTMF control via RF, 2M/s H264 Sat Rx, 144.750 Talkback, 437 Rx,(with possible S/R options). Maybe at some stage Raspberry Pi stream input…

John is "off air" streaming from his home QTH, usually 10:00 to 23:00, the site has no landline at present, so access to repeater is via Sim card 4G Router, and TeamViewer, giving access to a Pipo mini PC running testcards and pictures, also control software designed for GB3GV by the late G8OBP, we can also control relays via the Pipo, options to switch Tx off and a timer (set to 24/7 at the moment).

Also displaying another "Engineering" screen with repeater RF Level, PSU voltages and cabinet temperature, this was fine as a second channel on 4M/s but at 2M/s a bridge too far.



We can access the 'Engineering Channel' via TeamViewer, and stream to 'IO92GQ-ET CH-2 Link' also stream ET main output if problems with John's off air stream.



As ET is single aerial working we are using an ID Elektronik 23cms Duplexer and extra ID Elektronik 1249 Filter, followed by a 23cms SBA1250 LNA from Martyn G8FEK.

Fixed IP SIMs are just silly money at the moment and DDNS doesn't work with the standard SIMs private IP address, so a separate remote relay box is being tested using a mobile phone, to send commands - rebooting the Pipo is the main one! Monthly cost of this second SIM is entry level as data use is minimal.

During the on site testing of the Alford Slot John received pictures from GB3TV at Dunstable with Comtech Rx without preamp, at the time running low power.

Dave G4FRE located in the Malvern Hills at 57km with a 23 element Tonna antenna in the loft and LNA, has kindly streamed MiniTioune display, showing signal levels. A heavy rain storm recently showing increase from D4-D5 average to D6, MER of 7.7dB.

I'm 64km North of ET in the clear until the last 3 miles! Then a low hill, working on more power, longer Yagi, and better preamp. But I can Skype in with sound and a modest "Picture in Picture" window on ET output..

Video Fundamentals 20

Outside Broadcast Vans

Brian Summers G8GQS

▶ *OB1 at the 2012 Open Golf competition.*

This is number20 of the "Video Fundamentals" and it's time for a change of content. The BATC and it's members have a long association with outside broadcast vans. This started a long way back in 1956 with Matilda in CQ-TV 31, then came Joe Rose's Monoculus, an ex ATV van which he fitted out with Pye Mk3 cameras, see CQ-TV 75. Next was Brian Summers and the ex BBC MCR21 which, over a period of time, had a number of different cameras fitted and it was exhibited at BATC shows and rallies; CQ-TV 112. More recently Paul Marshall has several vintage OB vans; CQ-TV 213 shows his Viviat project which is re-equipping an ex BBC van with mid 1950s Marconi equipment; CQ-TV 229. Tony Hornby has built a Van fitted with cameras, transmitting and receiving equipment which he has displayed at many BATC CATs and radio rallies; CQ-TV 254.

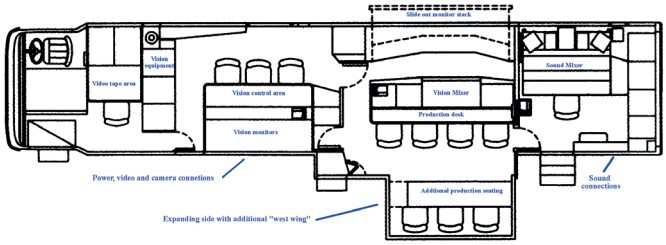
For ex BBC MCR21 which was first used by the BBC in 1963, progress of the Broadcast Television Technology Trusts restoration project is going well and MCR21 is now with a professional vehicle restoration firm. I am going to use the Fundamentals series to describe the work, the why and how the various systems are there.

When designing an outside broadcast van, there are many choices to make. Some will be forced on you if you adapt an existing vehicle or if you start with a blank sheet of paper more options are possible. At this stage good planning is vital.

The first choice is to decide what it is going to do? These days some things are better done with one or two single cameras and edited together in post. However if you wish to cover live events, with multiple cameras for immediate use or recorded "as live" the requirements are much more complex. There is also the use for communications, more in the style of a broadcast "Links" truck. We will explore these options.

An early choice is how many cameras? What size of van? To some extent this depends on the first choice and obviously the budget. The internal layout?

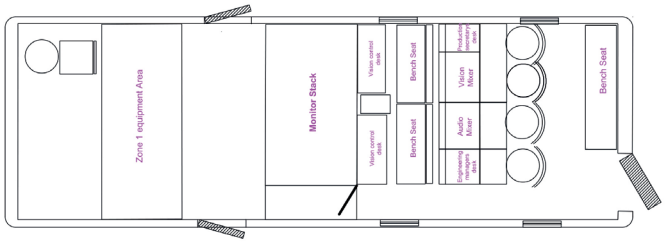
There are endless options for this, but an early fundamental layout choice is transverse or longitudinal. Then there are the number of internal compartments, production, sound, engineering and possibly video recording to consider.



▶ *Fig.1 The layout of a BBC type 8 Outside Broadcast van*

Fig 1 is a longitudinal layout of a large vehicle with 4 separate compartments, video recording, vision control, production and sound. One of the advantages of this is the isolation of each department this enables work and conversations to take place without disturbing production. Sound have a good quiet environment for monitoring the programme. A larger number of crew can be fitted into the longitudinal layout. The type 8 is an early example of a OB van with expanding sides, the monitor stack and the production area slide out to increase the space with the addition of the "west wing" for even more real estate.

In later vehicles this has been taken to the extreme of "triple" expanders were the full length of both sides move. The photo above is Satellite information Services OB1. A very large articulated trailer with seating for at least 36 crew and 24 or more cameras, two independent sound and vision mixers and extensive video editing suites.



▶ *Fig 3.*

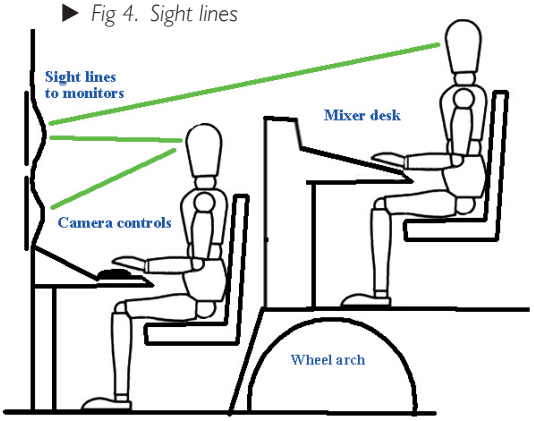
Fig 3 shows a transverse layout more suited to small and medium size vehicles, it is actually the layout of MCR21 which we are restoring, but it makes a good example. It is more suited to smaller crews were jobs double up. The

production and sound desks run across the width of the vehicle with a small walk through gap. It seats 8 to 10 people. In front of the production desk are the 4 vision engineers positions with two control desks and a central oscilloscope as the master waveform monitor.

Due to the wheel arch step both production and engineering are able to share the same picture monitors. One 14 inch for each camera, two 14 inch switchable preview monitors and a 17 inch transmission monitor. In fig 4 is a side view drawing showing the sight lines and how the monitors can be shared. This works well from a space point of view using the change in height from the wheel arch.

There are a number of 'saved' OB vans that have not been featured in CQ-TV a list is is here:- ***https://bttt.org.uk/links/ob-vans-slug/***

▶ *Fig 4. Sight lines*



QO100 Live Tune software

Rob - M0DTS

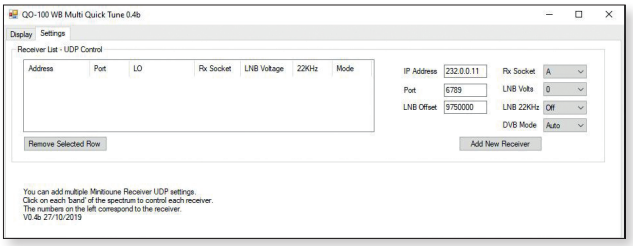
Tuning to QO100 signals can be tedious and repetitive, particularly when they only appear for a few seconds.

To overcome this, Rob M0DTS has developed a small application designed to run on a PC that grabs the fft data from the BATC Wideband Spectrum monitor page. This then allows the user to click on signals which automatically configures Minitioune to the required settings to receive the signal via udp control.

The program is available for download on the BATC wiki ***https://wiki.batc.org.uk/QO100_Live_Tune*** where full install instructions are also available.

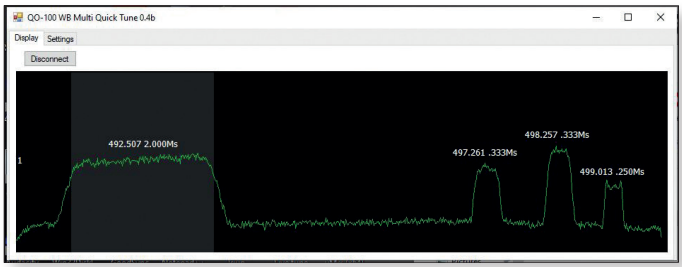
Configuring and using the program

The program needs configuring before use, including entering your own LNB offset frequency. When the program is first run, click on the "Settings" tab in the Live Tune program.



Enter your MiniTiouner LNB offset in to the LNB offset box and confirm all other setiings are correct - if you have not changed your MiniTiouner external control settings you do not need to change the IP address or port settings. Click "Add New Receiver" and the details should appear in the receiver list.

Click the "Display" tab and then click "Connect" and the program will display the QO100 spectrum display:



Simply click on the signal you wish to view in the spectrum display. If you have "Expert" mode selected (the small picture), the signal parameters will appear in the MiniTiouner "Extern. Request" box:

After a short delay MiniTiouner will receive and decode the selected station - simple as that!!

With Live Tune running, you no longer need the Web spectrum view, so you can reduce the load on your PC (and the BATC Server) by running the chat-only web page that can be found here:
https://eshail.batc.org.uk/wb/chat/

Portsdown Newsletter

Dave Crump, G8GKQ

Keeping it Simple

It's great to see so many operators playing with different ways of generating high quality digital TV signals on QO-100. It might at first glance appear that the Portsdown is being left behind. However, the philosophy for the Portsdown project has been to describe and implement something simple that just works out-of-the-box.

The current Portsdown build will generate good H264 encoded signals for amplification and transmission to QO-100 from the Pi Camera without any soldering or network/computer configuration. All that is required is to assemble of-the-shelf modules and to enter the transmission frequency on the touchscreen.

So, while we will try to make it easier to do the complex stuff (H265, video mixing using OBS, use of other SDRs etc), the first priority has to be to keep it simple for the first-time user.

Future Improvements

Most of the recent development work on the Portsdown has been aimed at improving the reliability when using the LimeSDR Mini. As many of you will have discovered, it currently works perfectly well with the Pi Camera, but is less reliable with other video sources.

The main change will be to use some new encoding software from Evariste, and to enable the use of the custom DVB firmware for the LimeSDR Mini. As these are both major changes, I am taking the opportunity to upgrade the operating system from Stretch to Buster at the same time so that I only have to do one set of testing. This will mean that (as with the move from Jessie to Stretch) there will be no automatic upgrade option to get these new features. They will only be available if you rebuild your SD Card, or use a new card. The Stretch-based software will continue to function (forever), and may receive occasional enhancements, but will not be the main focus of development effort.

Other features in the pipeline include the ability to suppress the LimeSDR start-up calibration spike, and the addition of a button to select a UDP (IPTSIN) input.

Recent Enhancements

In the 2 recent Portsdown updates, the following enhancements have been added:

- Enabling of Composite video output while using the 7-inch screen. Previously, the Composite video output (on the 3.5mm jack) had been disabled when the 7 inch screen was connected. There is now a button on the System Config Menu (via Menu 3) to enable this output.
- Attenuator control button on Menu 1. In the original design, the attenuator had to be set for each band from the "Set Band Details" menu (via Menu 3). The attenuator setting for the current band can now be directly adjusted from Menu 1.
- LongMynd Receiver improvements. A number of minor improvements have been made to the LongMynd receiver control and display. The most notable is the availability of a full-screen MER display for the QO-100 beacon to allow easy dish alignment.

There is also a red/green progress bar at the right hand side and, if you are using a 3.5 inch touchscreen, an audio tone is also available.

Portsdown for Repeaters

To support the introduction of the new DVB-S2 standard for UK repeaters, a special mode of the new Portsdown (Buster) build is being developed. This will use similar features to the current Portsdown Repeater streaming software to increase reliability and minimise the need for site visits. The new build should be tested on GB3HV in the New Year and available for general roll-out within a few months.

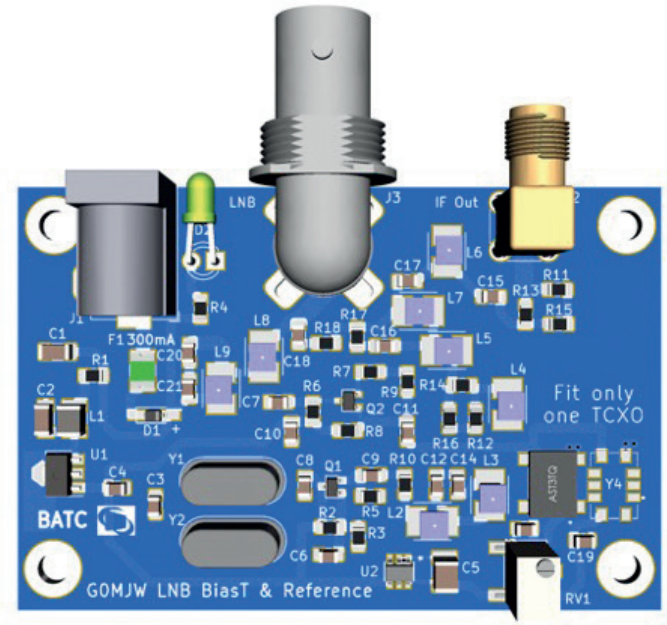
25 MHz reference, biasT and diplexer for QO-100

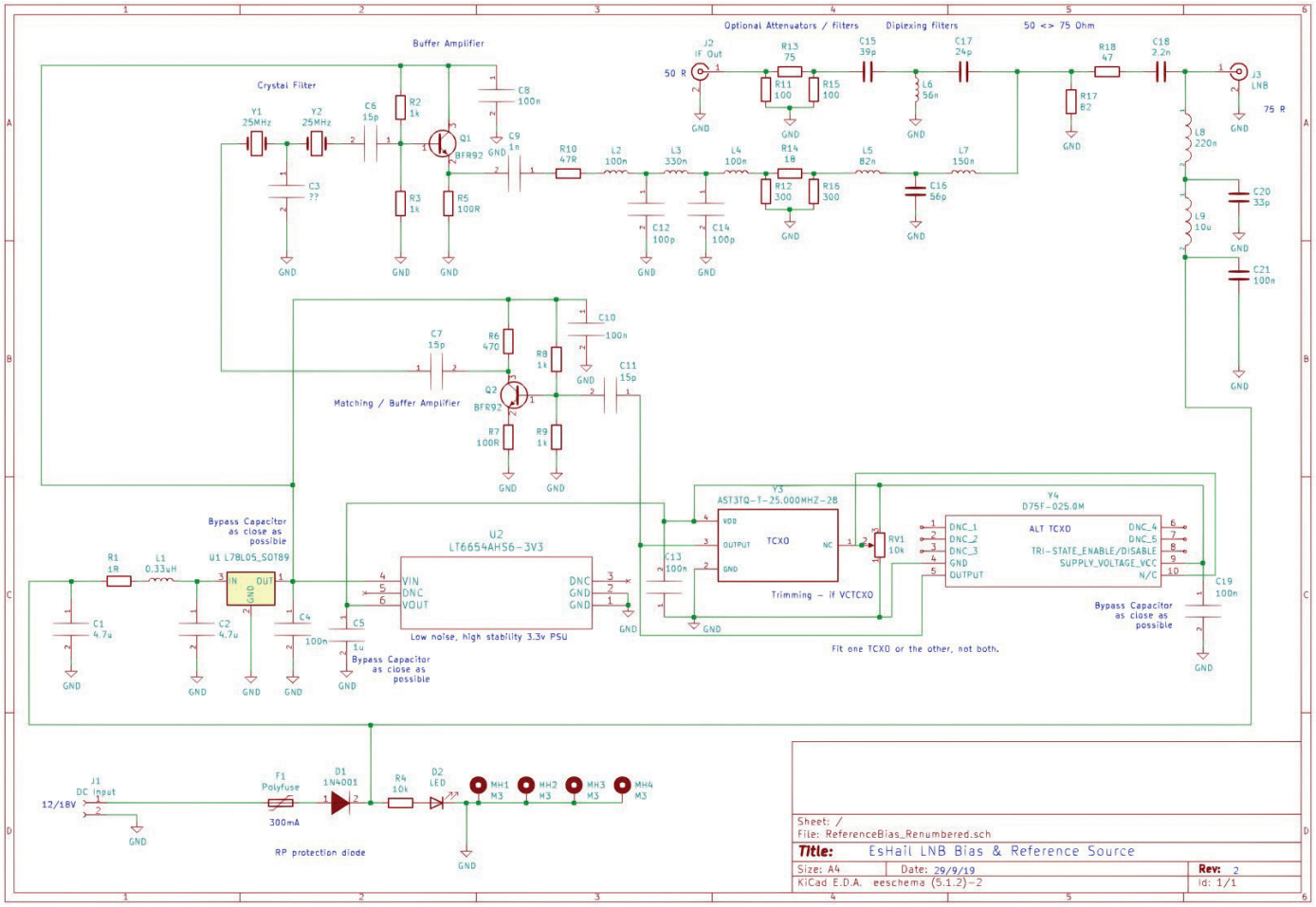
Mike Willis G0MJW

This board is a 25MHz TCXO reference for a suitably modified PLL LNB. It multiplexes the 25 MHz reference, DC supply and received signals onto a single coaxial cable. It is a development of my previous board that used an external reference, adding a TCXO for those who do not need GPS locking.

Several TCXO footprints are supported, with or without voltage trimming. The reference is passed through a crystal filter to reduce wideband phase noise and spurs, buffered and combined with the DC power and sent to the LNB. The LNB received signals are separated out. Attenuators can be fitted to set levels appropriate to the installation.

Building this ought to be straight forward, however the TCXO has all the pads underneath, it is suggested this be fitted first, tinning the pads and with hot air or a hotplate. You can, just about, also solder it. There are several TCXO or VCTCXO options, needless to say, you only fit one.





Parts List

Reference	Qty	Description	Digi-Key Part Number
C1, C2	2	CAP CER 4.7UF 50V X7R 1210	399-7049-1-ND
C12, C14	2	CAP CER 100PF 50V C0G/NP0 0805	399-1122-1-ND
C15	1	CAP CER 39PF 50V C0G/NP0 0805	399-1116-1-ND
C16	1	CAP CER 56PF 50V C0G/NP0 0805	399-1118-1-ND
C17	1	CAP CER 24PF 50V NP0 0805	399-15476-1-ND
C18	1	CAP CER 2200PF 250V C0G/NP0 0805	399-15030-1-ND
C20	1	CAP CER 33PF 50V C0G/NP0 0805	399-1115-1-ND
C4, C8, C10, C13, C19, C21	6	CAP CER 0.1UF 25V X7R 0805	399-8000-1-ND
C5	1	CAP CER 1UF 25V X7R 1210	399-8220-1-ND
C6, C7, C11	3	CAP CER 15PF 50V C0G/NP0 0805	399-1111-1-ND
C9	1	CAP CER 1000PF 50V C0G/NP0 0805	399-7988-1-ND
D1	1	DIODE GEN PURP 50V 1A SOD123FL	SM4001PL-TPMSCT-ND
D2	1	LED WHITE CLEAR 3MM T/H	365-1467-ND
F1	1	PTC RESET FUSE 30V 350MA 1206	507-1801-2-ND
J1	1	CONN PWR JACK 2X5.5MM SOLDER	CP-002A-ND
J2	1	CONN SMA JACK R/A 50 OHM PCB	A120734-ND
J3	1	CONN BNC JACK R/A 50 OHM PCB	A97570-ND
L1, L3	2	FIXED IND 330NH 450MA 1.05 OHM	490-5697-1-ND
L2, L4	2	FIXED IND 100NH 650MA 560 MOHM	490-5691-1-ND
L5	1	FIXED IND 82NH 1A 220 MOHM SMD	490-18515-1-ND
L6	1	FIXED IND 56NH 1A 180 MOHM SMD	490-18510-1-ND
L7	1	FIXED IND 150NH 580MA 700 MOHM	490-5693-1-ND
L8	1	FIXED IND 220NH 500MA 840 MOHM	490-5695-1-ND
L9	1	FIXED IND 10UH 1A 460 MOHM SMD	490-10563-1-ND
Q1, Q2	2	RF TRANS NPN 15V 5GHZ SOT23-3	BFR92PE6327HTSA1CT-ND
R1	1	RES SMD 1 OHM 5% 1/8W 0805	541-1.0ACT-ND
R10, R18	2	RES SMD 47 OHM 5% 1/8W 0805	541-47ACT-ND
R12, R16	2	RES SMD 300 OHM 5% 1/8W 0805	541-300ACT-ND
R13	1	RES SMD 75 OHM 5% 1/8W 0805	541-75ACT-ND
R14	1	RES SMD 18 OHM 5% 1/8W 0805	541-18ACT-ND
R17	1	RES SMD 82 OHM 5% 1/8W 0805	541-82ACT-ND
R2, R3, R8, R9	4	RES SMD 1K OHM 5% 1/8W 0805	541-1.0KACT-ND
R4	1	RES SMD 10K OHM 5% 1/8W 0805	541-10KACT-ND
R5, R7. R11, R15	4	RES SMD 100 OHM 5% 1/8W 0805	541-100ACT-ND
R6	1	RES SMD 470 OHM 5% 1/8W 0805	541-470ACT-ND
U1	1	IC REG LINEAR 5V 100MA SOT89-3	497-1183-1-ND
U2	1	IC VREF SERIES 3.3V TSOT23-6	LT6654BIS6-3.3#TRMPBFCT-ND
Y1,Y2	2	CRYSTAL 25.0000MHZ 18PF T/H	300-6048-ND
Y3 (alt)	1	XTAL OSC TCXO 25.0000MHZ LVCMOS	535-12700-ND
Y4	0	XTAL OSC TCXO 25.0000MHZ LVCMOS	CW654TR-ND

The Secret Life of a TV Repeater

Justin G8YTZ/EI3IOB

It has always baffled me why more people with an interest in Amateur Radio have not applied their interest to Amateur TV. I could never get the part of chatting over the radio when there was a perfectly good telephone that was clearer, more secure and offered full duplex conversation to boot. (duck and cover!).

For me, my whole interest in Amateur Radio & Electronics stemmed from an early years fascination with Television, I remember at my infant school after the lunchtime session of "Watch With Mother" saying: "Please Miss, may we watch the dot disappear" and then to the cries of all the kids saying "I can still see it!", "I can too!" I probably drove "Miss" straight up the wall! Somehow, I survived! There was another school incident when I was about 14, at school we had a number of WWII '88 sets that we could use at lunch time, they had one channel that we were not meant to use, that channel happened to be on 41.5MHz. Apparently, a complaint was made to the BBC when Andy Pandy was alleged to have uttered a phrase much used by Gordon Ramsay…

I came to the conclusion that Amateur radio is a quite accessible hobby, many get their joy of operating rather than construction of electronics and let's face it, construction is quite a messy affair, not all XYL's are particularly impressed with the thought of their kitchens' being turned into an electronics workshop. For the life of me I have never understood why. In my case the strategy was to persuade the daughter, wife, stepdaughter, brother and now niece to obtain their foundation licenses, the step niece is on her way too, bless her, she's just turned 13 so is having another go at the foundation exam this summer.

In the early 1980's I was playing with Analogue TV on 70cms 625-line B&W using an old PYE Lynx "Videcon" Tubed security camera that I had bought at a rally. A home brew Wood & Douglas 1W strip, a high-level series modulator and a series of home-brew amplifiers and a Microwave Modules 435MHz up-converter hooked to a (transistorised) Grundig Portable TV and a 21-Element Tonna made up the rest of the station. I managed to get signals across to Germany, The Netherlands and France and received a few stations on this somewhat rudimentary set-up as well.

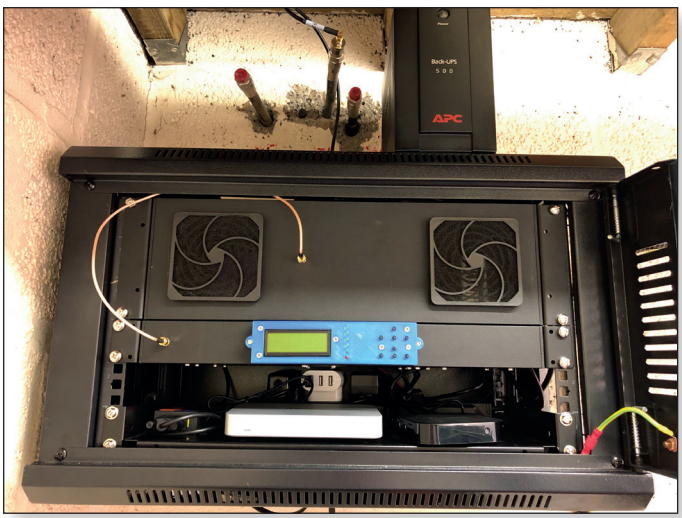
So, fast forward a few years to the world of Digital TV, a grown-up family, my interest in Radio & Electronics rekindled and from this has been born the GB3JV repeater. It all happened quite quickly, I had some spare SR-Systems modules that I had purchased for a previous project, including a compatible 3.4GHz up-converter purchased from the late DG0VE, so I had everything for an exciter and with the abundance of Stealth Microwave Wi-Max amplifiers on eBay, I decided to purchase a couple of those too.

By chance I was chatting to an old friend, Bob Dunne over a Beer and I mentioned that I would like to put up a TV Repeater to try to encourage more people into Amateur Radio. I just needed a site. My thoughts were that this technology, especially with software defined transceivers, surplus Cellular and Satellite equipment is becoming really accessible to many more amateurs and SWL's and you never know, potentially to new entrants to the hobby, after all let's face it digital is the new Cool! Bob mentioned he had a friend who was a property developer and he'd ask him if he could help. Bob duly arranged a meeting and Richard loved the idea, so GB3JV was born at his 4-storey office building in Petts Wood. All that was needed now was a license (a minor technicality, as this never stopped me as a teenager!). I was particularly pleased with having a site so close to home and to other Amateurs who could act as switch-off operators. The great thing about a location in a heavily built-up suburb of London is the population coverage; 500,000 homes within range of a tiny antenna is a pretty decent addressable audience. The sheep in fields of the Home Counties are pretty well served already!

I dropped Noel a line and he suggested that 3.4GHz was indeed a good option, so with Noel's help submitted an application to the ETCC. A few months later the NoV was issued so the site preparations began. First thing was to order the Antennas; patch antennas for the receive side and a PE1RKI Slotted Waveguide for the main Tx together with new LDF4-50 feeders and terminators supplied by

The DX Shop (Roger, GW4WND). The Antenna arrived from The Netherlands in August, so a trip down to Tony, G1HBD's place to give it a final tweak to optimise the antenna for 3.404GHz and we were all set for the installation. The antenna installation was completed by Chiltern Antenna Systems back in September with Bob managing the site works.

Whilst all this was going on, I was working hard to get the system up and running on the bench and build the network and telemetry system for the remote management and system control. Gareth G4XAT meanwhile helped with his amazing mechanical and 3D Printing skills to assemble the shelves. All that was left for



me to do was to fire the whole thing up and tune for maximum smoke! The repeater is currently working in beacon mode, but the plans are to have the receive side working over Christmas, a slight firmware compatibility issue on the NIM and me working every week in Ireland has delayed my focus on getting this completed.

GB3JV Technical description:

Antennas:	
Tx:	Slotted Waveguide (Horizontal Polarisation)
Rx:	4 x 4 Patch Antennas (2)
Feeders:	Andrew LDF4-50

Driver Transmitter:	
Modulator:	SR-Systems DVB-2TS-MidiMod2 v2 (Supports DVBS/S2/T/ATSC)
H264 Encoder:	SR-Systems MPEG-Encoder v4
Up-Converter:	DG0VE KON-UP-3337
Mux:	SR-Systems DVB-MiniMux v2.8
Rx NIM:	SR-Systems NINM-DVBS2-Duo (Diversity Rx)
Power Amplifier:	Stealth Microwave SM3437

Telemetry:	
Modbus Controller:	USR-IO424T-EWR (PA Temperature sensing, Remote SWR Monitoring and PA on/off control
Term Server:	USR-TCP232-302 (For remote management over LAN/SDWAN of the modulator/Encoder and NIM via the RS-232 Port
On Site PC:	SMALLRT Windows 10 Atom 4GB RAM 64GB EMMC
VPN Router:	Cisco Meraki Z1, with L2TP VPN back to the home Cisco network
WAN Modem:	Huawei E3372 LTE
Mobile Network	"Smarty" (H3G) Unlimited Data Tariff

Power Supplies:	
UPS:	APC BACK-UPS 500
PA:	Mean Well LRS-150-12 12V / 150W
Driver:	Mean Well LRS-35-12 12V / 36W

Web Site:
WordPress, hosted by Fasthosts; ***www.gb3jv.co.uk***

Jamboree on the Air and QO-100

Frank M0AEU

The Scout's Jamboree on the Air (JOTA) takes place over the third full weekend in October every year and now involves over a million participants worldwide. The event is intended to provide all sections (6 - 25 years in age) of the Scout movement with the opportunity to contact other scouts and discover a bit about their Scouting and lifestyle, wherever they may be located. JOTA started off primarily on shortwave but today, 62 years after it started, it utilises all modes and frequencies to achieve its aim.

▶ *The main 'shack' at GB100GP*

Gilwell Park is the Scouts' UK Headquarters for training and camping, located in Epping Forest, North London. The site has its own permanent amateur radio station - with the regular callsign of GB2GP - and this year the site celebrated its centenary of Scout activity, including the special call GB100GP for the big events.

For JOTA the station played host to over 300 youngsters during the weekend and for the first time, included two QO-100 stations - one for the narrowband transponder, and a station the DATV wideband transponder.

Phil, M0DNY, very kindly brought his portable QO-100 station to the site to provide the scouts with

▶ *Phil's 'deluxe' dish feed weatherproofing*

contacts on the satellite while Frank, M0AEU & Sam Raby provided the scouts with a TV studio experience - greenscreen; lower thirds graphics and even an autocue! The scouts wrote their own scripts on topical issues: 'Climate change', 'Homelessness' and 'The Use of Plastics' - as well as the traditional weather presenting; selected their backdrop graphics and keyed in their names for the lower thirds. They then presented their piece to camera which was recorded to be sent to them after the event.

The station made several contacts over the weekend via the satellite, most notably with John G7JTT and a scout station in Eindhoven, The Netherlands. The scouts delighted in not only being able to chat with Dutch Scouts, but also being able to see them! Thank you to everyone for their patience on the satellite with the scouts over the weekend.

It's hoped that for future years the station at Gilwell will have its own QO-100 set-up and that more scout stations around the world will be able to join the party on the satellite.

▶ *The team at GB100GP for JOTA 2019*

CAT 19 South - a short report

Rob G8NXG

It is in the scheme of things that in life, if there are two possibilities of getting something wrong, so you will! Which pretty much sums up my attempt to arrive at the venue for CAT19 South in time to help unload…

Actually I did arrive early. So early that I assumed that I had arrived at the wrong venue, there being two halls in the locality with the similar names. Anyway, by the time that I had investigated the wrong hall and returned, the car park was a throng of people loading stuff into the hall! I should have trusted the SatNav, which was spot on.

This particular village hall turned out to be a superb choice. Clearly very well thought-out it had the appearance of being recently built and is certainly well maintained. A centrally situated kitchen provided counter access to both major halls and was manned by members of Harwell ARS for us.

Displays and the two presentations were held in the larger of the two halls, the smaller reserved for the BATC shop, the MCR21 restoration project display and members' sales.

In time-honoured fashion the main hall was laid out with displays on the longer sides, with one end reserved for seating for the talks. The displays featured the Portsdown, now in many guises, a fully functioning test area to help with Portsdown or MiniTioune problems and a new initiative for the BATC – a Raspberry Pi/Portsdown DATV repeater transmitter. The ideas behind this new initiative appear elsewhere in this edition of CQ-TV.

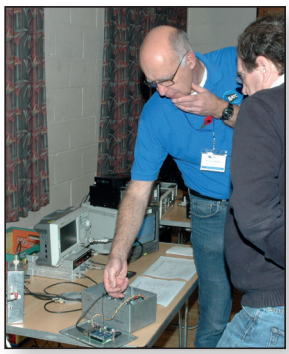
BATC members also provided displays. Gareth G4XAT brought along samples of his exploits with 3D printing; David M0YDH featured a nice display of his award-winning DATV transmit system and John G7JTT, among other items showed his re-purposed laptop monitor system.

Those who attended found this Mini-CAT particularly inspiring and I can think of no other way to conclude this report than repeating the words of Jen, G4HIZ who said in the forum:

"As well as many 'show and tell' demonstrations - and many thanks to the contributors for these - there were two interesting talks from Dave G8GKQ on the Portsdown status and Gareth G4XAT on 3D printing. Whilst Phil M0DNY, provided a live transmission demo via QO-100.

The event also gave the opportunity to chat with other members and put faces to names on the Forum. The Club shop was there, as was Brian G8GQS, raising funds for the MCR21 restoration, with lots of tempting things to buy.

The hall had plenty of parking and provided a nice warm environment, with hot drinks and food available. An outside area provided the opportunity for testing (weather permitting - and it was raining cats and dogs yesterday !).



I think that given the synergy with the Microwavers, a two day event like Finningley this year (TV Saturday, Microwaves Sunday) could also be interesting for next time round.

Many thanks to the Committee for organizing the event."

73, Jen G4HIZ & Joan 2E0HIZ

Thanks Jen and Joan! Particular thanks go to the members of Harwell RS and Ann F4VSO/G8NVI who provided the catering facilities.

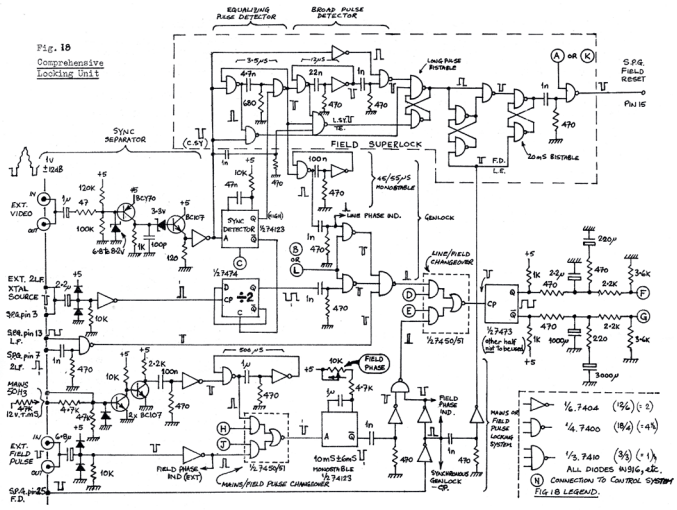
Turning Back the Pages

A dip into the archives of CQ-TV, looking at the issue of 47½ years ago

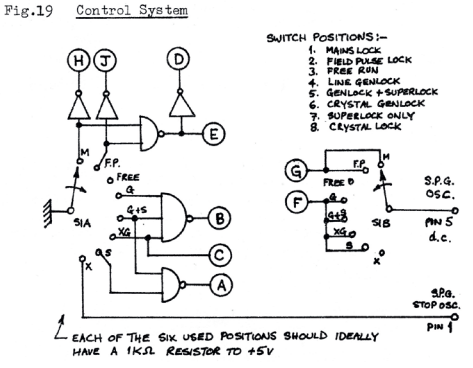
Peter Delaney - G8KZG

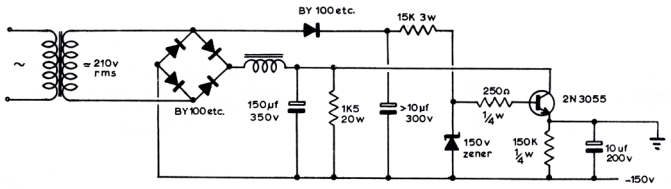
CQ-TV 77

The editorial in the February 1972 issue of the magazine, CQTV 77, apologised that it had been delayed, but also gave notice that the next Club Convention would be held in September that year, at the ITA Headquarters in Knightsbridge.

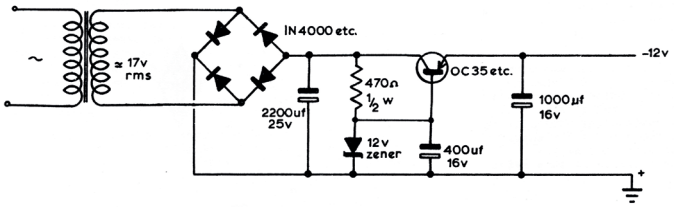


Arthur Critchley had been asked add more information about his design for a multi-standard sync pulse generator. A number of corrections and further notes were included, such as a variant to cope with the non-standard Belgian line ident signal, low pass filters for the pulse output stages, as well as information on how to buy a printed circuit board for the spg - the cost was £1.75 per board. A variety of methods for locking the generator to a remote source were discussed, including how to automatically detect if there was such a signal present, and if not, to revert to a crystal controlled oscillator, and also how to lock to the local mains supply. This resulted in a circuit for a comprehensive locking unit, offering a choice of 6 different locking methods, as well as a crystal oscillator or a free running oscillator. The control switch (maybe not surprisingly) also used logic circuits to select the various options.

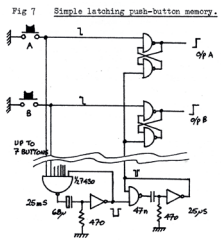


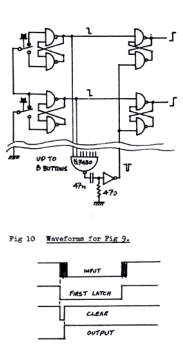


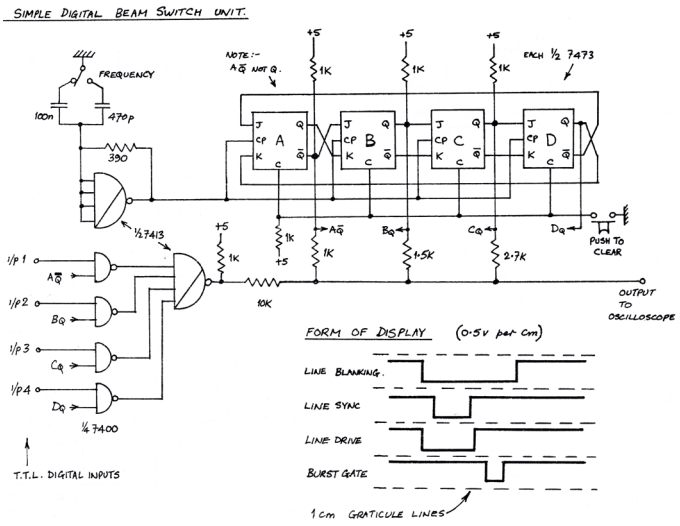
Much less complex, but nevertheless useful, circuits were two stabilised power supplies designed by Brian Kennedy. Producing supplies of -150 V and -12 V respectively, they were developed initially for use in powering a transmitter modulator, and used then commonly available power transistors as the series control elements, with the stabilisiation simply derived from a zener diode at the base in each case.



Arthur Critchley had also contributed a further part of his long running series on integrated circuits. This time, ways to match the logic circuits to a standard television 75Ω line, both as an input or as an output, with 2V peak to peak pulses was explored. Another use for these logic circuits was to allow simple momentary contact push buttons to be used to replace mechanically latched ones. Not only did the circuit have to 'remember' which button had been pressed, but also it had to ignore the effect of contact 'bounce'. In the simple latching push button memory, pressing any of the buttons triggers a monostable with a 25 ms output pulse - the leading edge of which resets the R-S bistable corresponding to each of the push buttons. So long as the push button is held down for longer than this 25 ms, the appropriate R-S bistable is then 'set' - although if more than one button is pressed at the same time, they will all be 'set'. A more refined version used change-over push button switches, the left hand R-S bistable for

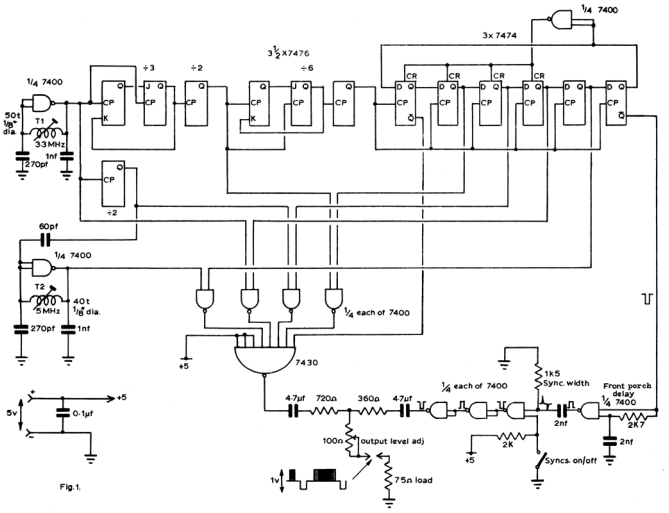






each button eliminating the effect of any 'switch bounce'. Another useful circuit was included, to aid the examination of the digital pulse trains generated by all of these logic circuits. This worked by switching at high speed between each of the 4 input signals. A, B, C and D had the J input triggered by the output of the previous stage (A being triggered by D), so that they formed a ring counter. The outputs selected each of the 4 inputs in turn. At the same time, a dc voltage determined by the resistors at the outputs of A, B and C would be added to the selected input signal, so that each would be displaced on the oscilloscope screen - a typical kind of display was included with the circuit.

At the time, (pre repeaters, of course) there was a well-established network of amateur television stations in East Anglia, and the station identification image, captured off air, of Jeremy Royle, G6NOX-T at Saffron Walden, included a picture of his impressive aerial tower. Another name that was familiar to many at that time was John Birkett, in Lincoln. His shop in The Strait was a veritable Aladdin's Cave of components - just a few being mentioned in his advert in CQTV 77 - RCA 115 watt power transistors at 40 p each; Gunn diodes - either for X band or J band - at £1.50 each; set of 12 communication series ics (likely the Plessey SL series), at £2.75 for the set; sub-min 5pF



air spaced trimmers at 8p each ... and a visit to the store would have revealed lots of test equipment, military surplus radios, and much much more!

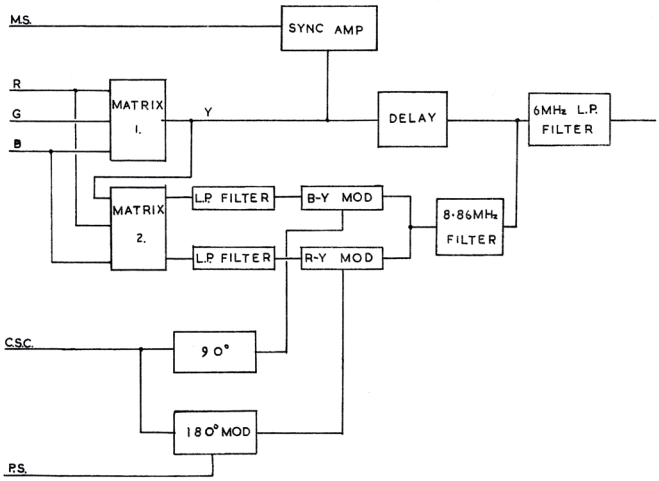
One of the ways in which television lent itself to a solution to a test need was in checking the frequency response of a system. For other types of circuit, a frequency sweep would be made, recording the response at each stage. With a television set up, by putting the different frequencies across the line of picture, the response would be displayed on an oscilloscope screen - any fall off in frequency response resulting in the amplitude of the waveform diminishing. The required set of frequencies were produced in a multiburst generator, and D J Long described his version in the magazine. The 3.3MHz master oscillator output was counted down by the series of dividers across the top of the diagram, and 6 different frequency outputs selected in turn by the logic of the 7400 and 7430 NAND gates in the middle of the diagram. The signal at the right hand end of the counter chain was at tv line rate from which sync pulses were derived, to be added to the 7430 output at the foot of the diagram.

Digital logic was not the only new technique that television amateurs were learning at that time. With colour television becoming more widespread from the national broadcasters, amateurs were looking at ways to move from black and white to colour working. Producing the additional pulse timings was not difficult, but the process for encoding a PAL signal to produce the composite signal, so it could be displayed on standard colour receivers, was more complex. Nigel Walker explained the principles in the first of his "Ideas for Amateur Colour" series of articles.
The red, green and blue signals were combined in matrix 1 to produce the Y signal - the equivalent of the black and white one, where :-

$$Y = 0.587\ G + 0.299\ R + 0.114\ B$$

to which sync pulses were then added, whilst matrix 2 combined the signals so as to produce what were known as colour difference signals - one being (B -Y), and the other being (R - Y). Each of those had to be filtered to reduce

the bandwidth to 1.3 MHz, and then modulated by the 4.43361875 MHz subcarrier (C.SC), the combined output being then filtered to remove any second harmonics that came from the modulators. However, as the PAL system alternated the phase of the R-Y signal on alternate lines (hence the name PAL), the subcarrier fed to the (R-Y) modulator had to be inverted under the control of a Pal Switch signal. The effect of the low pass filters was to fractionally slow down these chrominance signals, so a delay had to be put into the Y signal path, before the combined signal was filtered and then output. In addition to the processing shown in the block diagram, the coder had also to produce a burst of subcarrier during the line blanking period, to enable the display decoder to lock its subcarrier to the same phase and frequency as that of the source.



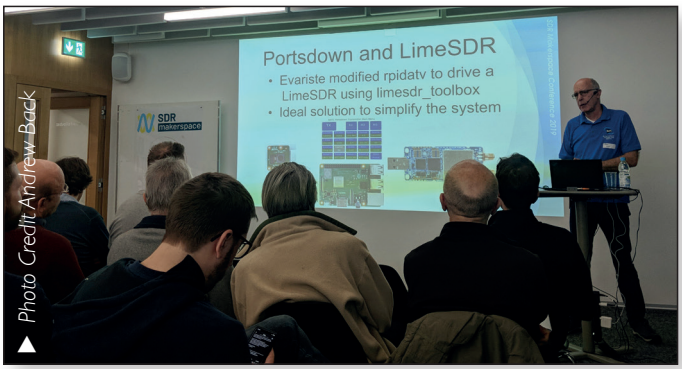
DATV at the SDR Makerspace Conference

Dave, G8GKQ

The SDR Makerspace (***https://sdrmaker.space/***) is a European Space Agency initiative implemented by the Libre Space Foundation in collaboration with the University of Applied Sciences and Arts of Western Switzerland (***Hes.so***).

The Foundation organised a conference in Payerne, Switzerland at the end of November, and I was invited to attend as a presenter by Lime Microsystems, specifically to talk about how we had used the LimeSDR Mini in the Portsdown project. There were about 50 attendees from all over Europe, a mix of electronics and space professionals, hobbyists and radio amateurs.

The first day included presentations on subjects including "Open Source SDR Software for Satellite Communications" (Alex Csete OZ9AEC describing the follow-on software for the popular GQRX), and "From Bits to mmWave: An Introduction to LMS7002M, LimeSDR and The Road to 100GHz" (the Lime Microsystems team talking about single board up-converters that would cover 24, 47 and 76 GHz). I also described how the Portsdown project used the LimeSDR.



▲ Photo Credit Andrew Back

There was an exhibition in the evening where I was able to demonstrate the Portsdown in operation, with signals received on both a MiniTiouner and using SDRAngel on a PC with a LimeSDR Mini.

I was pleased to see Michel HB9DUG at the conference and he exhibited his Portsdown-based system and also replayed recordings of his locally-received ISS Ham-TV transmissions during the evening event.

▲ Photo Credit Michel HB9DUG

There were 2 workshops on the second day. The first workshop entitled "Satellite communications using Software Defined Radios" discussed and practiced the use of GNU Radio. The second workshop, entitled "LimeSDR Mini SDR Satcom Workshop" talked the 25 participants through installing a virtual machine including LimeSDR and SDRAngel on to their laptops, so that they could receive local signals using a LimeSDR Mini. I had set up a Portsdown transmitter at the back of the room, and most participants were able to receive Digital ATV transmissions before the end of the workshop – even if they did have to hold their laptops in the air to achieve sufficient signal strength!

In summary, a very interesting event which achieved significant industry and hobbyist exposure for Digital ATV. Thanks to Lime Microsystems for enabling my attendance..

The British Amateur Television Club

Out and About

Rallies and events with a BATC stand: (subject to change)

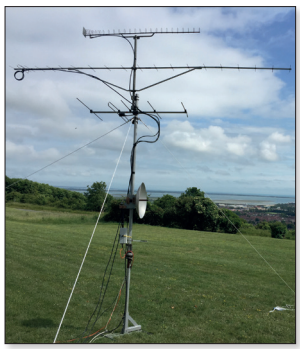
2020

9 February	Harwell, Didcot, OX11 8AY	***www.g3pia.net***
1 March	Exeter	***www.exeterars.co.uk***
19 April	West London Radio & Electronics Show	***www.radiofairs.co.uk***
26 APRIL	NARS, Blackpool Rally	***www.narsa.org.uk***
??? May	Dunstable Downs RC	***www.ddrcbootsale.org***
21 June	West of England	***www.westrally.org.uk***
28 June	Newbury	***www.nadars.org.uk***
26 - 28 June	Friedrichshafen	***www.hamradio-friedrichshafen.de***
12 July	McMichael	***www.mcmichaelrally.org.uk***
9 August	Flight Refuelling & Hamfest, Dorset	***www.frars.co.uk***
25-26 September	National Hamfest (Showground)	***www.nationalhamfest.org.uk***
9-11 October	RSGB Convention	***www.rsgb.org***
24-25 October	BATC Convention and BGM, Coventry	***www.batc.org.uk***

For a list of all rallies see: http://rsgb.org/main/news/rallies/

If you are able to help on the BATC Rally stands, please contact the BATC secretary.

Activity Weekends & Contests



Activity Calendar

0001 UTC 21 December 2019 - 2359 UTC 1 Jan 2020 - Christmas Repeater Contest

11th & 12th January 2020 – Activity Weekend

15th & 16th February – Activity Weekend

14th & 15th March - Activity Weekend and Dutch ATV Contest

1200 UTC 11 April – 1800 UTC 12th April – BATC High Band (23cm and up) Contest

16th & 17th May – Activity Weekend

1200 UTC 13 June – 1800 UTC 14 June – IARU International ATV Contest

BATC Online

Website: http://www.batc.org.uk
BATC Wiki: https://wiki.batc.org.uk/BATC_Wiki
Forum: https://forum.batc.org.uk/
Stream: https://batc.org.uk/live/
Dxspot: https://www.dxspot.tv/