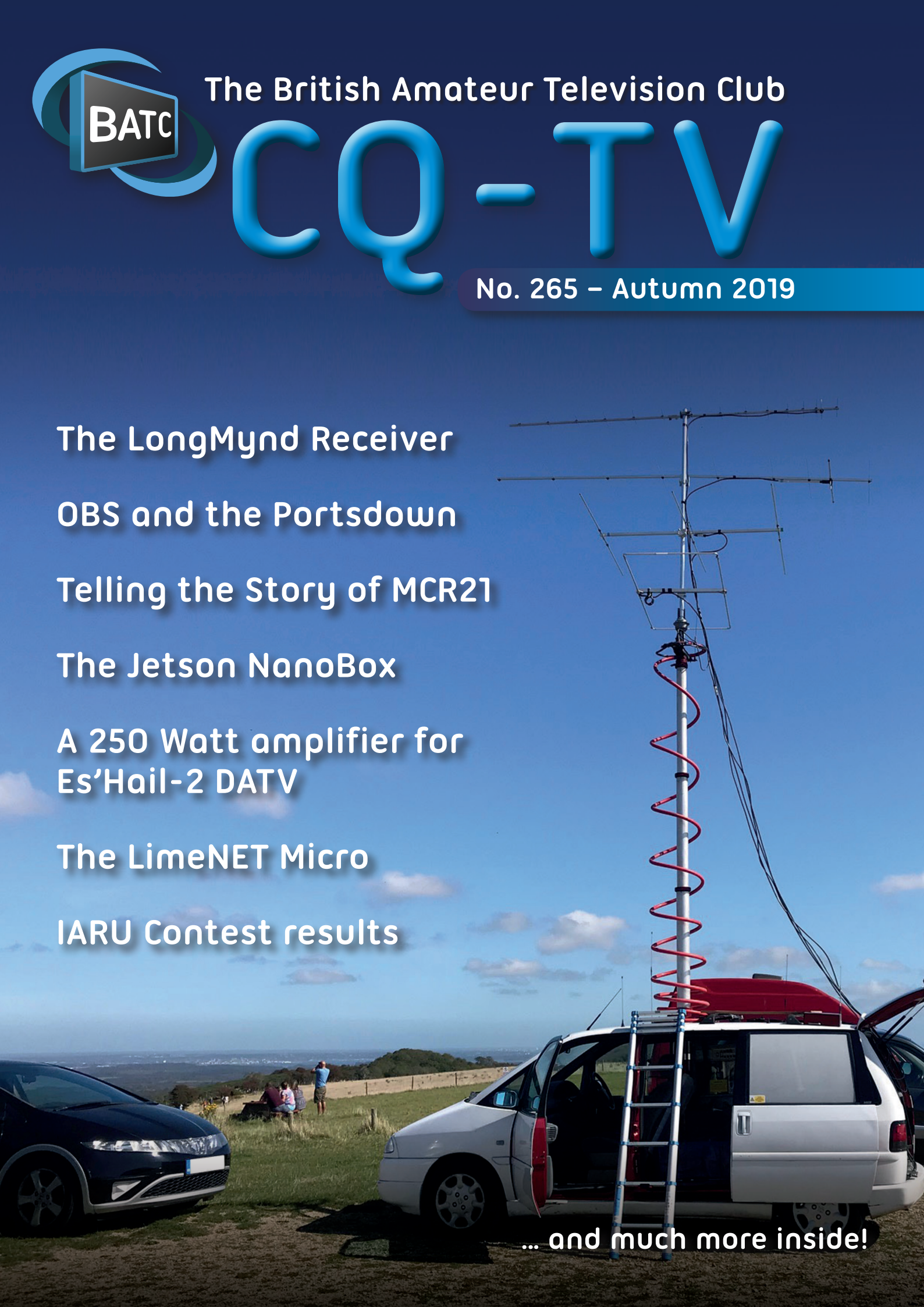
The British Amateur Television Club

CQ-TV

No. 265 – Autumn 2019



The LongMynd Receiver

OBS and the Portsdown

Telling the Story of MCR21

The Jetson NanoBox

A 250 Watt amplifier for Es'Hail-2 DATV

The LimeNET Micro

IARU Contest results

... and much more inside!

CQ-TV 265

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Contributions

The preferred method of communication is by email, all email addresses are shown above.

Alternatively you can write to us at:
BATC, Silverwood, South View Road, Pinner, HA5 3YA, United Kingdom

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 November 30th

Please send your contributions in as soon as you can prior to this date. Don't wait for the deadline if you have something to publish as the longer we have your article, the easier it is for us to prepare the page layouts. If you have pictures that you want including in your article, please send them, in the highest possible quality, as separate files. Pictures already embedded in a page are difficult to extract at high quality but if you want to demonstrate your preferred layout, a sample of your finished work with pictures in place is welcomed. Please note the implications of submitting an article which are detailed on the contents page.

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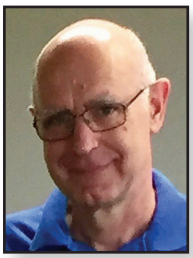
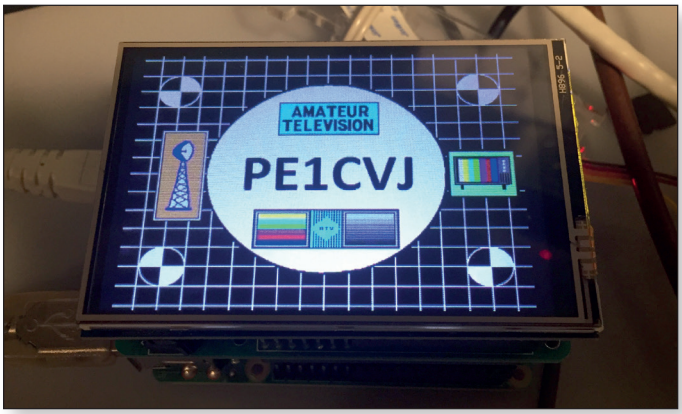


From the Chairman...

Dave Crump G8GKQ

Welcome to another innovation-packed issue of CQ-TV. The big news in this edition is the launch of the LongMynd Linux-based receiver to go with the MiniTiouner. I hear many of you say: "Linux, that's just for computer geeks isn't it?". The answer is no – anybody using a Portsdown is using Linux, and this advance enables us to build a decent DATV receiver simply by plugging your MiniTiouner into your Portsdown. So, now the Portsdown is not just a transmitter – it is a receiver as well. Thanks to Heather M0HMO and everyone else who has helped to make this happen.



▶ *PE1CVJ Received through QO-100 During LongMynd Testing on the Portsdown*

The article on the Jetson Nano describes the hardware required for H265 encoding at very low symbol rates – the results achieved at 33 kS recently have to be seen to be believed. There is massive potential in using these low symbol rates: for example 20 video channels in the 146 MHz band, or transmissions through QO-100 with 5W and a 1.2 m dish. A fast-moving area, and we will describe the software in the next issue.

For those of you who want more power on QO-100, Jim G7NTG describes his homebuilt PA which has been successfully reproduced by a number of other constructors.

The slightly reduced entry in the IARU Contest this year shows that we all need to get on the air for terrestrial contacts more often. Congratulations to Noel G8GTZ for winning the UK section and coming 4th in IARU Region 1.

My faith in terrestrial ATV has been restored this weekend. We were blessed with good conditions for the BATC Low Band Contest and I managed a 2-way QSO of 237 km on 70 cm 333 kS digital from a new site only 30 minutes away from my new QTH in Salisbury. Always worth trying – so please try to support all the activity weekends and contests.

The BATC will be at the Lincoln Hamfest later this month and also at the final Regional CAT of the year to be held at Didcot on 9 November. Please make an effort to come and see us at those events and tell us what you want from your BATC. We think that we are getting it right, as membership has been increasing, but it would be good to hear your views.

73
Dave, G8GKQ

▶ *Operating from Dean Hill near Salisbury*

The Listing

new and renewing members

Rob Burn G8NXG

The quarterly period between each issue of CQ-TV seems to go by with increasing speed - as is usual this edition covers the three months to the end of August.

The format and intention remains as originally conceived – to alert members to other like-minded members within your locality for a possible sked or an exchange of ideas. I regret that the odd error does creep into the list and I am grateful for member feedback to correct any mistakes or omissions.

As reported last time, member numbers are comfortably in excess of 1300 and it seems that the number of new members joining continues to exceed those that fall by the wayside. So, although the pace has slowed we are still seeing a welcome increase in membership. Thank you to all who have recently joined and to those members who continue to support the club.

One of my monthly tasks is to delete member records who have not renewed and paid a subscription for the previous 12 months. After this period we have to reluctantly accept that the member has no further interest in the club and has, in effect, resigned. We are also obliged to delete the details in line with the GDPR and our constitution. Regardless of this, as a courtesy the ex-member is notified of this action, either by letter or e-mail. I always hope that this advice could reignite interest in amateur TV for the member so that he or she rejoins!

Finally, mindful of maintaining correct records don't forget to update and change your e-mail or postal address if such changes affect you. As said before, if you spot an error do get in touch: ***memsec@batc.tv***

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Sakari Mattila	VK2XIN	Canberra
Tony Falla	VK3KKP	Castlemaine
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Robert Hensel	VK3EHT	Geelong
Tony Hutchison	VK5ZAI	Kingston SE
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Peter Bakker	PA0CDY	Noordwijkerhout
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Arvid Andreassen	LA7QM	Tromso
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Jacinto Rebelo	CU2ED	Feteiras
Slovenia		
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Jaime Codina Jodar	EA3DZN	Barcelona
Alberto Martinez salcedo	EA9AN	Melilla
Juan Piqueras	EA3TA	Sabadell
Gonzalo Giron Castillo	EA7AYB	Sevilla
Planas Jaume	EA3NE	Terrassa
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Jörgen Overgaard	SM4WWG	Fjugesta
Sverker Petersson	SM7THS	Nybro
Ulf Hansson	SM7EGM	Ystad
Switzerland		
Thomas Suter		Oberengstringen
Peter Studer	HB9DUT	Riggisberg
Michel Burnand	HB9DUG	Vich
United Kingdom		
Graham Felton	GW0FEM	Amlwch
John Fowler	G4VHG	Axminster
Ralph Moyle	G0UWB	Banbury
Nick Holden	M0NPH	Banbury
John Manley	M1CNJ	Banbury.
Nigel Berrie	M0NQB	Basingstoke
Robin Vince	G8DRK	Bath
David Cromie	GIOWCE	Belfast
Peter Morys	G4HQX	Berkeley
Nick Isherwood	M0NJI	Blackburn
Steve Williamson	G3WGU	Blackpool
Jim Aldebert		Bothwell
Russell Tribe	G4SAQ	Botley
Roger Ray	G8CUB	Brentwood
Viv Green	G1IXE	Bristol
Adrian Lambert	G8TNU	Broadstone
John Nichols		Bromley
Jonathan Cope		Burgh le Marsh
James Colwill	G0DQH	Chandlers Ford
Andrew Dunham	G6OHM	Chatteris
Peter Townrow	G6LTB	Cheltenham
Graham Jones	G3VKV	Cheltenham
S Withnall		Cheltenham
Dan Bedwell	M1EZU	Chippenham
John Hudson	G3RFL	Cleveleys
Roger Killick	G8KWR	Congleton
Barry Sankey	G7RWY	Coventry
James Welsh	G4YLB	Darwen

Kenneth Aspden		Darwen
Adrian Lawrence	M0OJR	Derby
Clive Graham	G3XIG	Dorchester
Andrew Hood	GM7GDE	East Kilbride
Kevin Wheatley	M0KHZ	Egremont
John Bailey	M0MTW	Ely
Alec Jefford	G8GON	Exmouth
Jason Flynn	G7OCD	Felixtowe
Jacob Saunders	2E0DQX	Ferndown
Gordon Findlay	GM7VYR	Glasgow
Michael Rainbow	G6OTP	Gloucester
Steve Barrett	G4HTZ	Great Wakering
Stephen Hedicker	G8XJO	Greatham
Andrew Stephens	M0XRE	Grimsby
David Pykett	G0IIQ	Grimsby
Pete Kozlowski	M6LFP	Grimsby
Simon Kennedy	G0FCU	Guildford
Graham Smith	G4NMD	Guildford
David Warwick	G4EEV	Harrogate
Anthony Free	G4EYE	Harwich
Brian Hardy	G4BIP	Hemel Hempstead
Raymond Gifford		Hemel Hempstead
Fraser Stuart	G8FEZ	Herne Bay
Simon Lloyd		Hersham
Michael Scott	G3LYP	High Wycombe
David Ellins	G0GGL	High Wycombe
Paul Widger		Holmfirth
Robert Connett	G0WSC	Horton Ilminster
Raymond Newsome	G1MSD	Huddersfield
Robin Gape	G8DQX	Ipswich
Mike Bues	G8AAI	Ipswich
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David Richards	2E0SKF	Kings Lynn
Dave Davy	G6EWP	Lincoln
Tony Morris	G0UOZ	Lincoln
David Houghton	G0MXW	Liverpool
Graham Smith	2E0JOG	Loughborough
Adrian Hodgson	G8UGD	Lower Darwen
David Chislett	G8XCK	Maidenhead
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Jenny Bailey	G0VQH	Newmarket

Paul Bowen	M0PNN	Newport
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Robin Carter	G4NDM	Nottingham
Steve Sorockyj	G0LCG	Nottingham
Gwilym Jones	GW6PVK	Nr Wrexham
Andy Brooker	G4WGZ	Orpington
Jeff Laing	GW6KLQ	Oswestry
Allan Copland	GM1SXX	Paisley, Renfrewshire
Norman Swann	G1TEX	Parkstone, Poole
Colin Richardson	M0YXR	Pickering
Dave Mann	G8ADM	Pinner
Julian Smith	G0NZO	Poole
Steven Rosbottom	G0JEH	Preston
Simon Watson	M0ZSU	Reading
John Robb	M0JRZ	Reading
Alison Johnston	G8ROG	Reading
Phil Hayes	M0PIT	Roade
Geoff Boyce	M1AHN	Ross-on-Wye
George Low	G0RLF	Runcorn
Paul Archer	M0PJA	Sheffield
Ray Hughes	G8JBQ	South Perrott
John McCarthy	G7JTT	Southampton
Mark Johnson	G4ZRT	Southampton
Keith Webster	G8VMP	St. Albans. Herts
Anthony Kevin Kerr	M1BWS	St. Helens
George Quarterman	G3NHX	Sutton
Dennis Fitch	G8IMN	Sutton Coldfield
John Smith	G3JZF	Sutton Coldfield
Alan Mayhew	G8TQK	Sutton Surrey
Peter Yarde	G8DKC	Swadlincote
Phil Bourke	M0IMA	Swanscombe
Robin Miles		Swindon
Derek Blight	G0PGL	Taunton
Ted Bottomley	G4MXR	Thornton-Cleveleys
Iain Tennent	M1IAN	Walton On Thames
Mark Champion	M0LTG	Walton on the Naze
David Hall	G8CLI	Warwick
John Pryke	G8BXH	Watford
Julian Horn	M0NUX	Watton
Stuart Le Poer Trench-Brown	G7DTG	Westbury
Andrew Coombs	G4SZM	Weston-super-Mare
John Grandshaw	G8IKP	Weymouth

Gary Heald	G0VLJ	Weymouth
Paul Marsh	M0EYT	Wimborne
Martin Dixey	G4OSU	Wolverhampton
Alan Gladding		Woodham Ferrers
James Johnson		Wrexham
Pieter Smit	G0LIY	York
Canada		
Terry Moorby	VE3DIJ	Ottawa
Stefan Wagener	VE4SW	Winnipeg
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Richard Peterson	WA6NUT	Buena Vista
Farrell Winder	W8ZCF	Cincinnati
Larry Westmoreland	K5PHD	Fort Worth
Charlie Short	K9BIF	Goshen
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Ronald Fredricks	K8DMR	Jenison
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Joel WIlhite	KD6W	Menlo Park
Scott Chapman	K4KDR	Montpelier
Carl Sorensen	NB7C	Payette
Paul Fredette	K1YBE	Portsmouth
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Richard Diehl	KJ6RNL	San Jose
Gary Ashkenazy	AF7M	Tucson
Argentina		
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Corrections, omissions etc:		
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Ray Hughes	G8JBQ	South Perrott

The BATC bursary scheme

Just over a year ago we announced the BATC bursary fund to enable grants of money to be given to individuals and groups who are initiating projects to benefit the ATV community in their local area, nationally or internationally.

During the year we have received the following 7 applications for funding, note the figures are the maximum approved amount and not necessarily what has been donated to the group.

- Oscar100 ground station to provide the NB SDR and WB spectrum monitor facilities - £500
- Portsdown filter modulator board to provide a signal source for the Long Mynd receiver development - £100
- Bristol regional CAT meeting premises hire - £200
- GB4HAM MiniTiouner demonstration equipment - £120
- Purchase of HiDes OFDM equipment for evaluation and loan equipment - £750. Note if any members wish to borrow this equipment please contact the committee.
- Purchase of 10GHz DATV system for GB3XY - £500 (approved but not yet spent).
- Provision of DATV receiver and uplink equipment for Oscar100 to be used at the DP0VGN amateur radio station based at German Antarctic Research Station "Neumayer III" in Dronning Maud Land, Antarctica - £500. Equipment currently under construction and due to be on station in 2020.

If you have a project which you believe could qualify for a BATC bursary, please fill in the form on the BATC website describing the project, the amount required, the reasons why it should attract BATC funding and how it will benefit the ATV community. The applicants should be prepared to have a telephone call with committee members to provide more details and answer any questions before the application is considered.

A condition of the award will be to submit an article to CQ-TV detailing the project and its success or failure.

The ideas below give some guidance on the types of projects that might attract funding.

- Pump-priming for development projects to fund things such as development tools / hardware, prototype PCBs manufacturer and software licence costs.
- One off funding for repeater groups - this can be used for whatever the group needs but should be towards one-off costs such as rebuilds or legal fees. We will not accept applications to fund ongoing annual fees such as site rent and electricity costs.
- ATV infrastructure – a typical example could be the Es'hail-2 ground station project which BATC has committed to build.
- Funding for Dxpeditions with an ATV interest.
- Outreach support for ATV groups and funding for demo kit and sponsoring Radio Clubs to buy ATV equipment for use by their members.

IARU Region 1 ATV Contest 2019 Results

The IARU Region 1 ATV Contest was held on 8/9 June 2019. There were 55 entrants from 9 countries competing, using all bands from 432 MHz to 76 GHz.

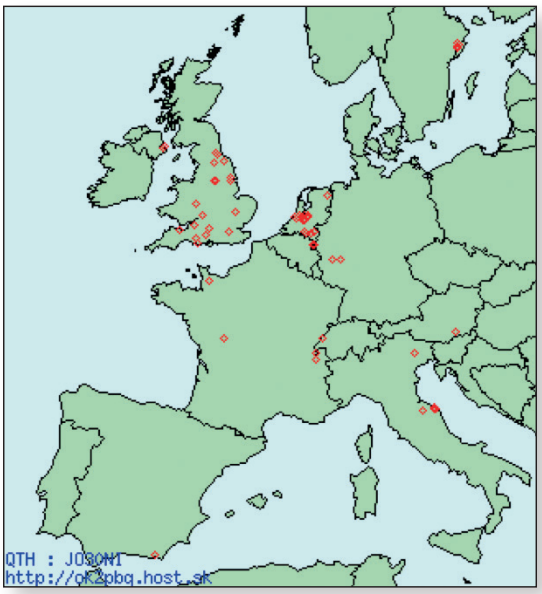
The overall winner was Wim PE1EZU. The best DX was a 70 cm ATV Contact between Rolf F9ZG and Jean-Michel F1AGO at 293 km.

Participation was reduced from last year (100 to 55), possibly because of the distraction caused by ATV Activity on QO-100.

Full results are available on the BATC Wiki: ***https://wiki.batc.org.uk/IARU_ATV_contest_2019_International_Results***. Key highlights are published below.

Please don't forget next year's IARU ATV Contest on 13/14 June 2020.

Dave, G8GKQ



▶ *Participants in the IARU ATV Contest June 2019*

Overall Rankings

Pos	Call	Locator	Score
1	PE1EZU	JO22LE	13095
2	PE1ASH	JO22KF	11197
3	PA0BOJ	JO21ON	10130
4	G8GTZ	IO91GI/ IO81FD	9423
5	PA1RHQ	JO22MD	9283
6	PA3CGG	JO22ID	9142
7	PE1POA	JO22RF	7829
8	M0DTS	IO94DF/ IO94MJ	7725
9	G8GKQ	IO80WP/ IO80UV	6676
10	PE1MPZ	JO22ID/ JO22NB	6175
11	PA3CWS	JO22RE	6174
12	G1LPS	IO94EQ	5189
13	F9ZG	IN99KC	4717
14	PA3CRX	JO22OF/ JO22QE	4249
15	PE1RQM	JO22RD	3828
16	PE1CVJ	JO22KG/ JO22JF	3472
17	PA7HV	JO21TK	3296
18	HB9TV	JN36GU	3048
19	PA3DLJ	JO20VW	2914
20	PA2TG	JO22FE	2840
21	G4FRE	IO81XW	2720
22	M1EGI	IO93GL/ IO93FL	2370
23	PE1APH	JO21XM	2107
24	F5AGO	JN06DP	1876
25	PA1AS	JO20XW	1606
26	PA0JCA	JO22JG	1446
27	DK7UP	JO30NI	1194
28	HB9IAM	JN36BF	1139
29	I3NGL/3	JN66EB	1082
30	PA7ML	JO22OA	957
31	G7KPM	IO93UM	892
32	G4FVP	IO94FO	755
33	IW6ATU	JN63QN	748
34	PA0RWE	JO22HC	738
35	G4LDR	IO91EC	728
36	G4BVK	IO81RK	714
37	OE6RKE	JN76MU	678
38	G3GJA	IO93TR	674
39	G4KLB	IO80UU	653
40	DC8UG	JO30UH	630
41	PA3GNZ	JO22NB	405
42	M0YDH	IO82QJ	402
43	PA0T	JO33JC	362
44	F6BIG	JN35BW	278
45	G3KKD	JO02CF	234
46	SM0WLL	JO89WF	184
47	SM0VPJ	JO89XK	180
48	SM0OFV	JO99AI	156
49=	IW6DCN	JN63HN	120
49=	SA0CCA	JO89XG	120

51	EA7GLU	IM86SU	100
52	EA7KA	IM86SU	80
53	I6CXB	JN63RO	32
54	EA7CU	IM86SU	20
55	IW6CHN	JN63QP	18

Band Winners:

Band	Entries	Winner	Score
70 cm	37	F9ZG	1517
23 cm	49	PA0BOJ	2800
13 cm	29	PA0BOJ	5415
9 cm	14	PE1ASH	1585
6 cm	23	PE1EZU	2735
3 cm	16	PE1EZU	1725
1.2 cm	11	G4FRE/ G8GTZ	1360
0.6 cm	4	PE1ASH	205
0.4 cm	4	PE1ASH	100

Country Winners:

Nation	Call	Points	Entries
Netherlands	PE1EZU	13095	21
UK	G8GTZ	9423	14
France	F9ZG	4717	3
Switzerland	HB9TV	3048	2
Germany	DK7UP	1194	2
Italy	I3NGL	1082	5
Austria	OE6RKE	678	1
Sweden	SM0WLL	184	4
Spain	EA7GLU	100	3

Best DX:

Band	Best DX		
	From	To	Dist
70 cm	F9ZG	F5AGO	293
23 cm	IW6ATU	I3NGL/3	258
13 cm	F9ZG	F3YX	237
9 cm	G8GKQ	G8GTZ	92
6 cm	M0DTS	M1EGI	109
3 cm	G8GKQ	G8GTZ	92
1.2 cm	G4FRE	G8GTZ	136
0.6 cm	PA3CGG	PE1ASH	15
0.4 cm	PA3CGG	PE1ASH	15

Notes:

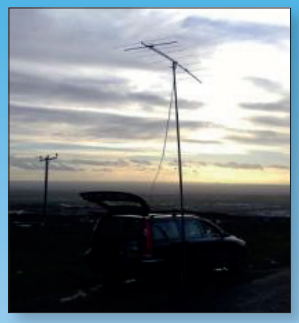
1. There are some very minor inconsistencies in the scores caused by the varied use of 6, 8 and 10-character locators. Where possible, I have equalised positions, even if the scores are a few points different.
2. Thanks to Hans PA0WYS for the excellent scoring software and to Chris PA3CRX for his help and advice.

Dave, G8GKQ

If you took part in the Low Bands ATV Activity Contest please can you submit your logs as soon as possible!

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
- March 14th / 15th 2020 – High band contest
- Oct 19th / 20th – all band activity weekend
- Nov 15th / 16th – all band activity weekend
- Dec 14th / 15th – all band activity weekend



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

OBS and the Portsdown

John McCarthy G7JTT

As you may know the Portsdown has an IPTS in button within the encoder options, I'm going to show two ways you can use this option and take advantage of being able to use Open Broadcaster Software (OBS).

The first option is my original way of doing this, the second is in very early stages and may not be as stable yet as the first but give it a go if you like to experiment.

Software

Firstly the original option – for this you will need to download some software:

- OBS can be downloaded from here ***https://obsproject.com/download*** making sure to download the correct version for your system ie 32bit or 64bit.
- ffmpeg from here ***https://ffmpeg.zeranoe.com/builds/*** again making sure to download the correct version.

  Due to a there being an issues with UDP on the windows version of ffmpeg you will also need to download the ptheads to overwrite the wthreads, these can be downloaded from here ***https://github.com/jaskie/Server/wiki/files/ffmpeg-alternative-builds.7z***
- VLC from ***https://get.videolan.org/vlc/3.0.8/win32/vlc-3.0.8-win32.exe*** again get the right version for your system.

Set Up

On the hardware side of things you need to get your PC to talk to the Portsdown via an Ethernet connection. This can be done simply by plugging in a RJ45 network lead between the PC and the Portsdown direct or via a router. It is also preferable to have the Portsdown on a fixed IP – this can be done by editing the IP settings in the router or adding ip=10.0.0.1 to the end of the text in the cmdline.txt file in the route of the SD card on the Portsdown (first option being preferred). Once this is done and the link is shown to be working we can start to install the software we have downloaded.

Install OBS and VLC to their default locations; next install ffmpeg making sure to install it to C:/ffmpeg. Then unzip the ffmpeg-alternative-builds to a temporary location and copy the contents of ffmpeg-4.0.2-pthreads to C:/ffmpeg/bin over-writing the original files.

Now run OBS and go the profile tab and hit the 'new' button and in the window type 333Ks. Next hit the 'setting' button, then select 'Video' and set the frame rate (bottom setting) to Integer FPS Value and set to 15. Next go to 'Output', change output mode to advanced, go to recording and enter these values:

Type	Custom Output (ffmpeg)
ffmpeg output type	Output to URL
File path or URL	udp:// 230.0.0.11:20000?pkt_size=1316&bitrate=**329610**
Container format description	MPEG-TS (MPEG-2 Transport Stream)
Muxer setting	muxrate=**329610** mpegts_original_network_id =1 mpegts_transport_stream_id=2 mpegts_service_id=1 mpegts_start_pid=300 mpegts_pmt_start_pid=4096 pcr_period=40
Video Bitrate	**180Kbps**
Keyframe interval	50
Rescale output	768x432
Tick the box next to 'Show all Codecs'	
Video Encoder	libx264
Video Encoder settings	preset=superfast x264-params=nal-hrd=cbr:force-cfr=1:vbv-bufsize=1000
Audio Bitrate	32Kbps
Audio Encoder	aac
Now select 'apply' and 'ok'	

This now is the basic settings for 333Ks with an FEC of ½ to change this profile for other settings you need to change the values hi-lighted in red. To do this go to ***http://www.satbroadcasts.com/DVB-S_Bitrate_and_Bandwidth_Calculator.html*** and enter the SR/FEC combination you need, making sure the Roll-off factor is 0.35, FEC frame is 64800 and Pilots are off. When you hit calculate you will need the number from the Netto TS bitrate to calculate the bitrate&muxrate and video bitrate.

Bitrate & Muxrate = (Netto TS bitrate) x 1000000
Video bitrate = (Netto TS bitrate) x 600

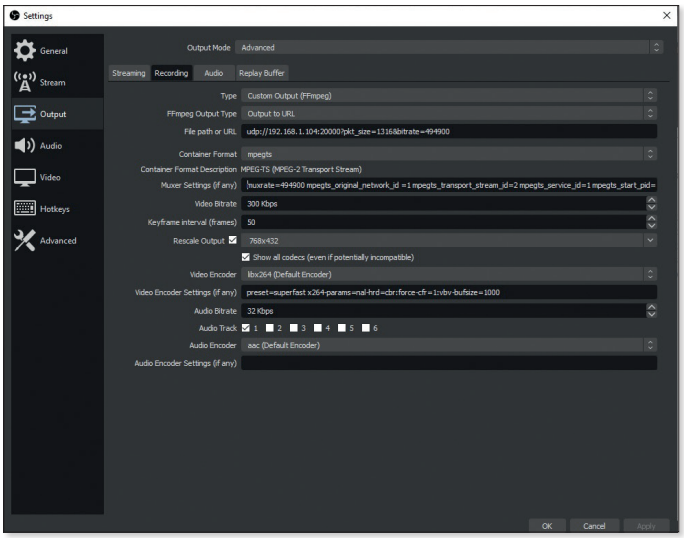
So for 500Ks at 1/2FEC

Netto TS bitrate = 0.4949Mbps
Bitrate & Muxrate = 0.4949 x 1000000 = 494900
Video bitrate = 0.4949 x 600 = 296.94 = 297

What you do now is go to profile and duplicate the 333Ks profile, name it 500Ks and change the settings for the above. Do the same for as many combinations as required. You will also at this point need to set up the scenes and sources to use within OBS.

Next we need to create a batch file – 'right click' on your PC's desktop and select new text document; name it 'OBS.bat'; ignore the windows error and click yes. 'Right click' on this and select edit – now enter the following text remembering to set your Callsign (highlighted in red)

```
@echo off
rem edited By G7JTT May 2019
rem Feb 2019 by Evariste F5OEO - QO-100 Release 0.9 (Completely rewritten)
rem Started from original tool
rem Idea from Portsdown vmix ffmpeg script

rem ======= SETUP ONCE =======

set callsign=YourCallsign
rem Set appropriately
set raspi_ip=10.0.0.1
set ip=%raspi_ip%:10000

rem ======= INTERACTIVE =======

rem --- SR asked only once ----
set SR=333
cls
:promptme

echo ======= Enter SR 333,500 =======

set /p SR="SymbolRate(Ks) (%SR%)"
IF "%SR%"=="333" (SET TSBITRATE=329610)
IF "%SR%"=="500" (SET TSBITRATE=494900)
IF "%TSBITRATE%"=="" (GOTO :promptme)
echo SR=%SR%
echo Muxrate=%TSBITRATE%
pause

rem ======= Launch ffmpeg OBS =======

echo launch ffmpeg OBS
start "OBS to udp/ts" /high ^
C:\ffmpeg\bin\ffmpeg ^
-i udp://230.0.0.1:20000 -c:v copy -max_delay 1000000
-muxrate %TSBITRATE% -c:a copy ^

-f mpegts -mpegts_original_network_id 1 -mpegts_
transport_stream_id 1 -mpegts_service_id 1 -mpegts_
pmt_start_pid 4096 -streamid 0:256 -streamid 1:257 ^
-metadata service_provider="QO-100" -metadata
service_name=%callsign% ^
-flush_packets 0 -f mpegts "udp://%ip%:10000?pkt_
size=1316&bitrate=%TSBITRATE%"
```



You can see the text in blue reminds you of the profiles you have set and the text in green is the parameters for the profiles, so you can edit the text in the blue section for example

```
echo ==== Enter SR 250,333,500,1000 =====
```

And then just add the appropriate line in the green section for example

```
IF "%SR%"=="250" (SET TSBITRATE=123456)
```

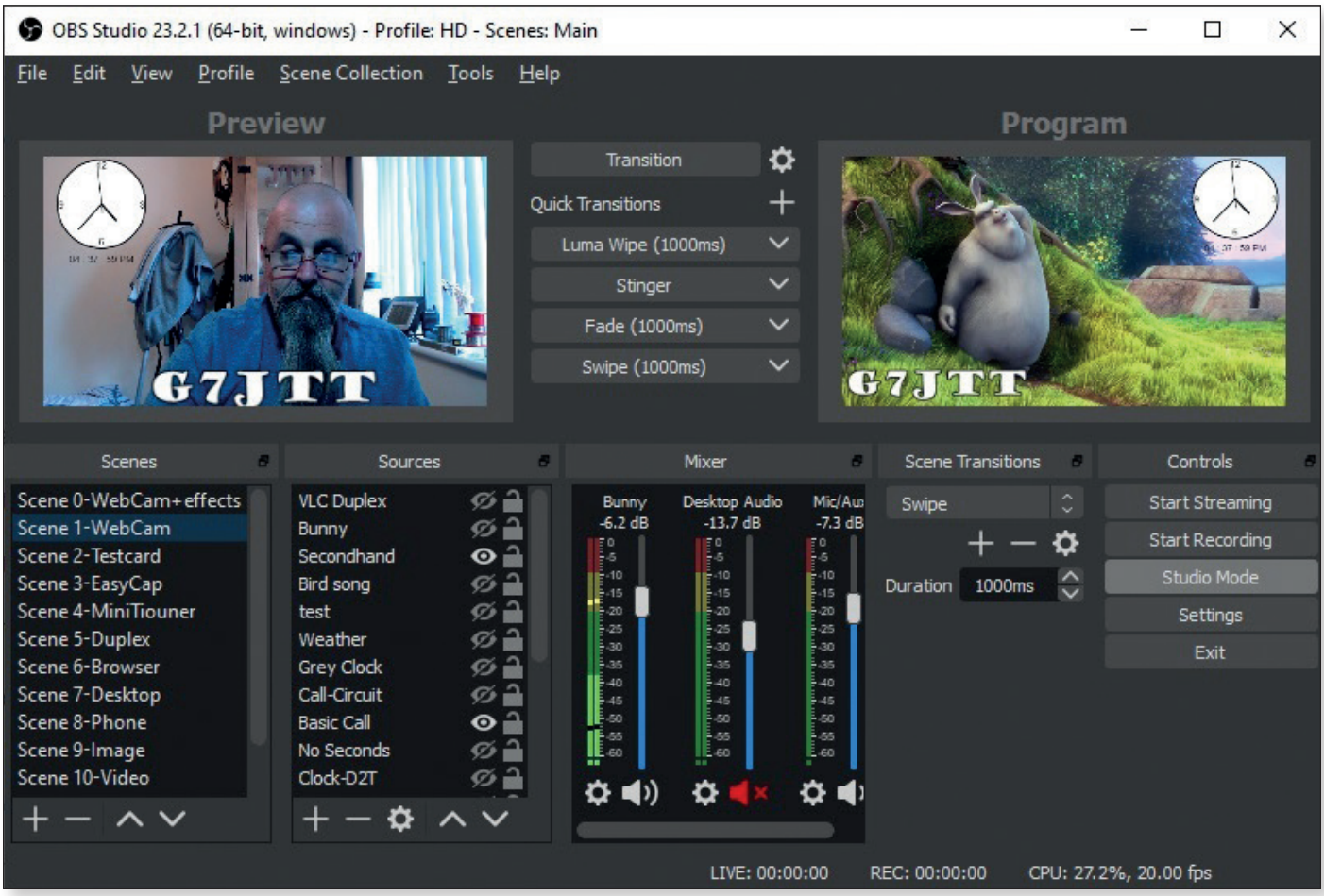
OK now to run it. On the Portsdown screen select 'IPTS in' on the Encoder button, set your frequency; SR; FEC etc. Now start up OBS and select the profile to match the selected SR/FEC on the Portsdown. Next double click on 'OBS.bat' and also select the correct profile – hit any key to continue then click the 'start recording' button on OBS. You should now see the ffmpeg screen displaying frame parameters showing it's now encoding. You are now able to hit TX on the Portsdown and receive a signal with whatever you have selected in OBS. Please note that although most of the above will work on most PC setups some experimentation will be needed to cater for your specific setup.

You can also refer to the wiki at ***https://wiki.batc.org.uk/OBS_-_Open_Broadcast_Studio***

Second method

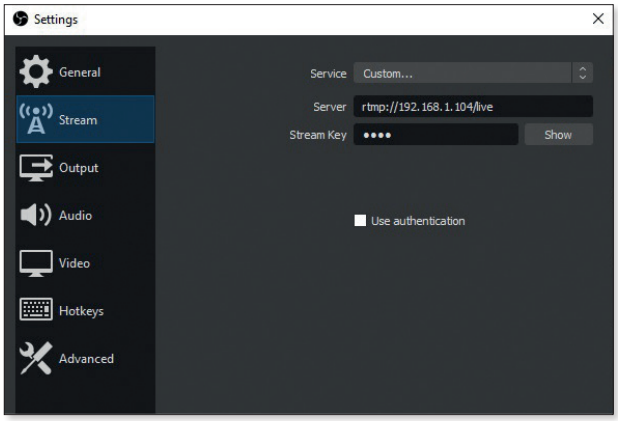
Ok and now for the experimental second option, the idea came after a chat with John GI7UGV who had been using rtmp instead of UDP as an output from OBS. For this option we need to download some more software and setup an rtmp server.

So for the rtmp server we need to download 'Nginx'. I downloaded it from here ***https://github.com/illuspas/nginx-rtmp-win32*** and this version had all the files already setup for the rtmp server. I then installed the files to 'C:\nginx' and created a shortcut to 'nginx.exe' and



placed this in the Windows startup folder so that it is started up with Windows.

Next we need to setup OBS to send rtmp instead of UDP and you do this by creating a new profile then go to the 'settings'. In 'settings' go to 'stream' then set service to custom – for server you need to type ***rtmp://ipaddress/live*** – the ip address is the ip of the PC you have the sever running on. So if your PC's ip is 192.168.1.100 you type ***rtmp://192.168.1.100/live***. For the 'stream key' you can type anything you want – let's say 'g7jtt' (note lowercase). Now go to 'output' and 'streaming', here you need to experiment a little to see what works for you. I set QuickSync H264, target usage Quality, Profile high, Keyframe 20, Async 4 and Rate control CBR.



The Bitrate is the same figure you work out from the first example for the video bitrate and lastly for OBS go to the video tab and set output resolution to an appropriate size for the symbol rate you are using. Lastly edit the script that we created in the first example, scroll down to the end and change the UDP input address to the rtmp one.

So for example

-i udp://230.0.0.11:20000 -c:v copy -max_delay 1000000 -muxrate %TSBITRATE% -c:a copy ^

To

-i rtmp://192.168.1.100/live/g7jtt -c:v copy -max_delay 1000000 -muxrate %TSBITRATE% -c:a copy ^

And that's it, you need to start the script first then start OBS streaming and you will also notice that audio is received first with video arriving a few seconds later on your received signal. I hope this will help those who want to use OBS with the Portsdown and I'd like to thank everyone who has help me along the way.

All the best, John G7JTT

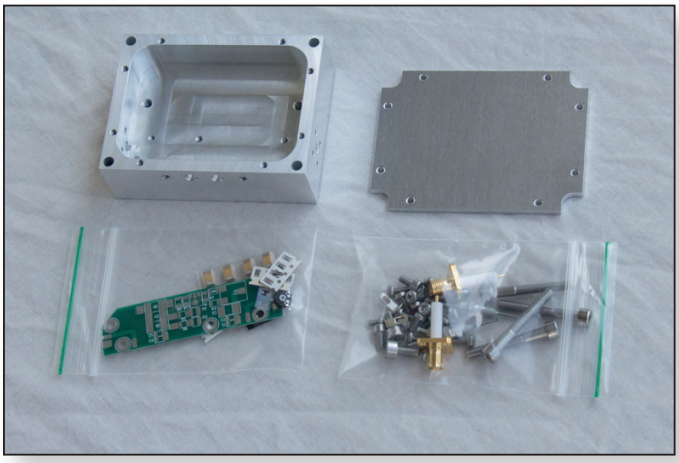
Using Mitsubishi MOSFET power modules with PE1RKI kits

Clive Reynolds G3GJA

I have several sources of DATV signals to transmit with but they are all 10mW or less output. The BATC DTX1 is the lowest output at -5dBm and needs to be amplified up to a few watts to drive my 70cm LDMOS 300 watt and 250 watt LDMOS 23cm linears such that they will produce 40-50 watts of DATV to the antennas. I also wanted an amplifier for 2m that would give 8 watts out of DATV on 146.5MHz; that power level with the 9 element Tonna will get me to the 50watts ERP limit of the NoV.

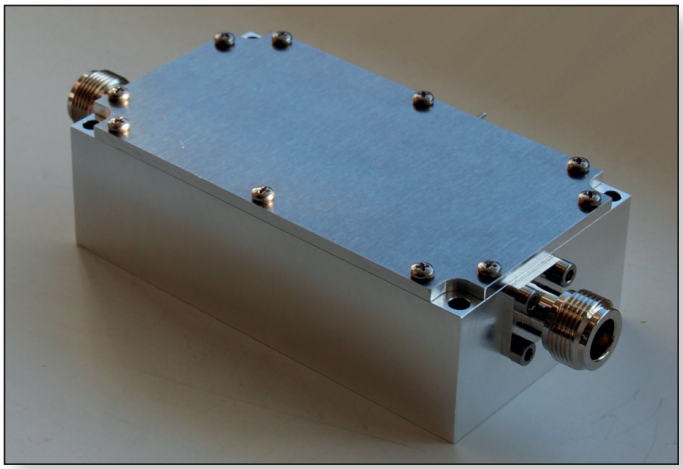
I started looking for the best method to get around 35dB gain and up to 8 watts output. I tried several wideband MMICs on G4DDK boards, a 2watt driver chip, the G4BAO driver amplifiers and various combinations of these to get the gain required but I was never able to get near the power level I wanted without serious spectral regrowth. I wanted to get this sorted fairly quickly and whilst looking for a similar solution for a different project, the rebuild of GB3EY, I found the kits that are the subject of this article.

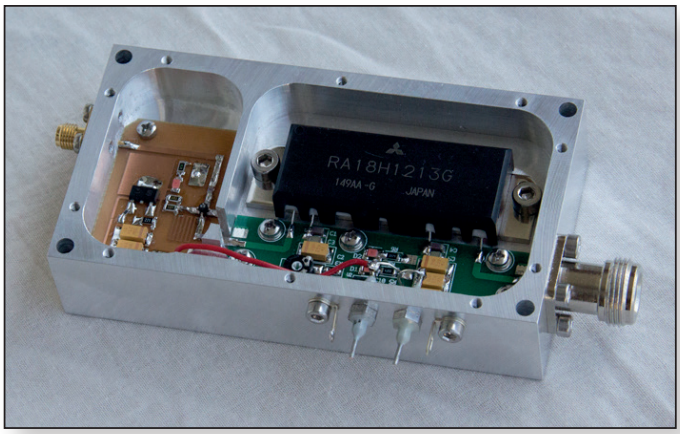
A relocation of the GB3EY repeater was finally approved after a four-year wait in the summer and one of the conditions of the new NoV was that the repeater had to be converted to digital. This meant a rebuild of the transmitter for GB3EY was needed and as the old bipolar Mitsubishi brick used on the FM repeater was in a very poor state it was decided to start from scratch. A look at Bert Modderman's website[1] found suitable gain blocks to get from around a milliwatt up to the 12 watts needed.



Whilst looking around the site I came across the hardware kits for the RA series of Mitsubishi MOSFET power modules. I had seen reports that these were usable for DATV so I then looked for the modules to go into the kits.

The usual first call on the Internet to eBay found some from a supplier called Enigma but better still, a Google search found their website[2] where the prices were cheaper than those on eBay.

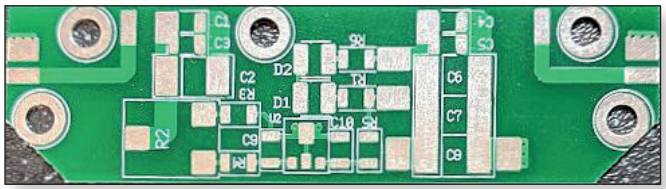




An order was placed with Bert PE1RKI for of one of his 75 watt amplifiers for 23cms with a built in circulator and a RA18H1213G amplifier with a built-in pre-driver that would be the transmit chain for GB3EY and three Mitsubishi module kits for myself. At the same time I ordered 60 watt modules from Enigma for 2 metres and 70cm and the 18 watt module for 23cms.

Another search on eBay found some undrilled 150mm x 125mm x 50mm black anodised aluminium heatsinks[3] that allegedly have a thermal resistance of 0.7/C. On arrival the weight of three in the box seemed to confirm that rating. The order from Bert had arrived and I started to assemble the Mitsubishi module amplifiers and ran into a problem. There was no documentation to go with the hardware kits and more surface mount components than there were places to put them on the PCB.

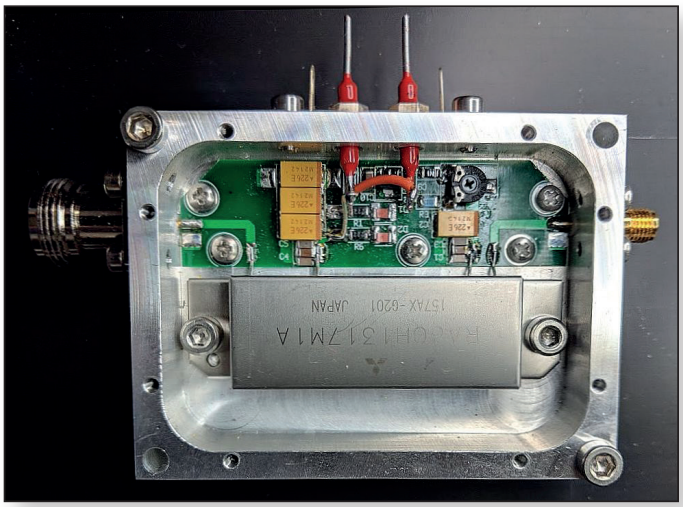
I couldn't find any documentation on Bert's website so I lifted the lid off GB3EY's driver and made a note of the component placing. I had a strip of four 100pF capacitors that still didn't have a home but I decided to use two of them as additional decoupling for the bias and power pins by squeezing them alongside C1/C3 and C4/C5.



Parts placement

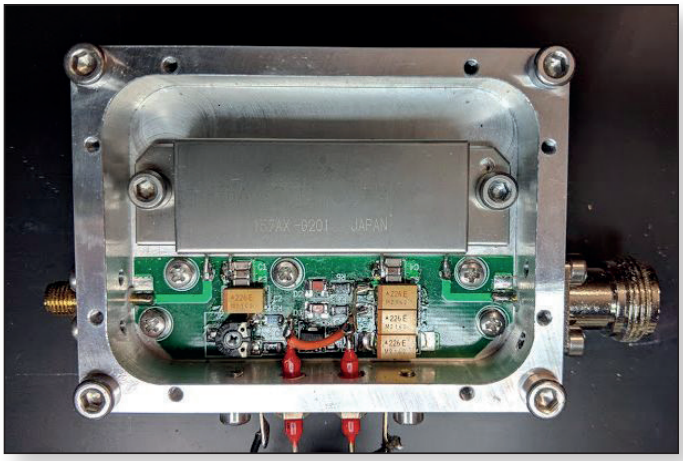
C1, C4, C9, C10	47nF
C3, C5	1nF
C1a, C4a	100pF (squeeze in between C1/C3 & C4/C5; see below.)
C2, C6, C7, C8	22µF tantalum
R1, R6	2K2R
R2	2K5R trimpot
R3	10KR
R4, R5	240R
D1, D2	Red LED (check polarity with digital multimeter first; end that has red meter lead when lit is the anode that goes to R1 or R6)
U1	7805 regulator (place on pads between C9 & C10)

The two feedthroughs supply 12v power to the pads between R1 and C6/7 for bias and R6 and C5/6 for the main module power feed.



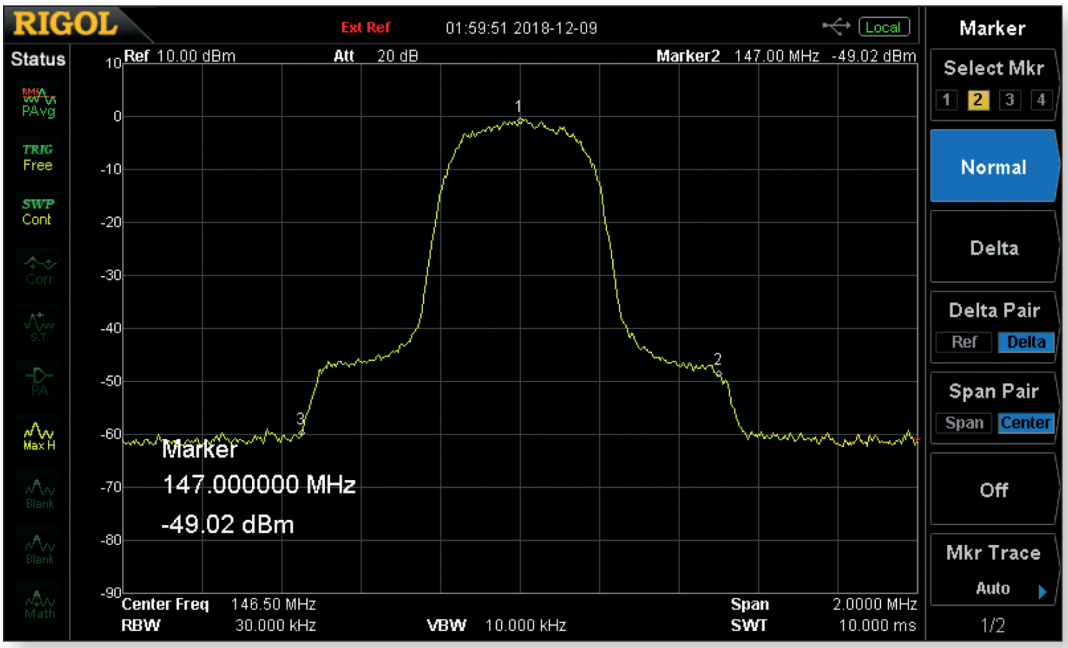
▶ *Completed 2m amplifier*

When mounting the module, do not use excessive force when tightening the bolts at either end of the module. Mitsubishi recommend between 0.4 to 0.6N/m which is really not much torque at all. Fortunately, I have a torque screwdriver but if you are using an Allen key be careful! The modules are easily damaged by overtightening. Use a thin smear of heatsink paste on the base of the module. I usually put it on in as a couple of thin lines from the tube and then work it over the required area with the shaft of a screwdriver before placing in the box. Carefully firm the module down and then pull the module out to check that the heatsink paste has been distributed evenly. If you're happy with the result replace the module and gently fix in place with the short M4 bolts.



▶ *Completed 70cm amplifier*

The heatsink was carefully drilled with a 3.3mm bit and then tapped to take the 4mm stainless steel capped bolts supplied. Only two were supplied for each of the kits and for each of the GB3EY amplifiers, so some more were ordered from Bolt World (4). £3.39 bought 30 carriage paid. The heatsink needs to be flat, such that when you lift the amplifier off the heatsink you feel the suction. Before

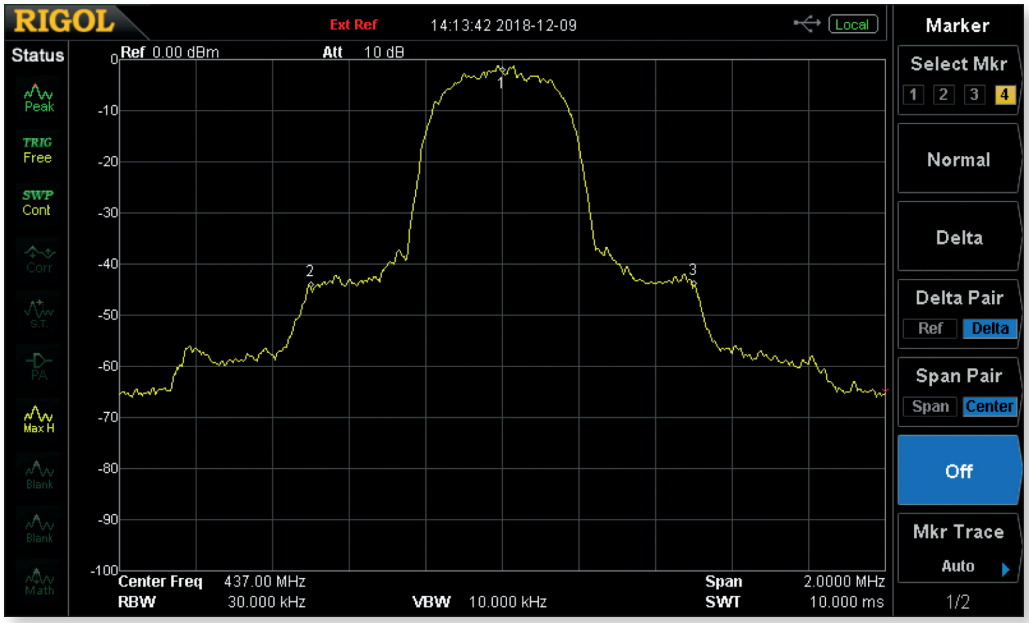


fitting the bolts, thin smear of heatsink paste was applied on the underside of the amplifier and lifted off, rotated 180 deg. and firmed down until a very thin even coat of paste covered the amplifier.

The amplifiers were then tested with a DATV signal derived from a Portsdown system using a RBDATV modulator instead of the usual BATC filter / modulator board. The tests were done with a symbol rate of 333kS/s at 146.5 and 437MHz.

The top plot shows the shoulders to be -49dBc at +/- 500kHz (markers 2 & 3) with 8 watts output. Power was measured with an HP 478 head and a HP 432 power meter. This was obtained after tweaking the bias pot for the best result. The 2m module seems to have better linearity than the 70cm module and the bias pot doesn't have a great deal of effect as it is increased beyond 3.5v. The most pleasing aspect is that coupled to a 10dBd gain antenna it will give the maximum 50w ERP allowed by the NoV, allowing for feeder loss, without any further amplification.

Not as good as the 2m module, but still with over -40dbC shoulders at 8w output, the 70cm module is more sensitive to the bias adjustment. There appeared to be a 'sweet spot' at about 3.66v where the shoulders were minimised as shown above. Possibly a bit of crude pre-distortion being applied?



Overall, I'm very pleased with the results so far and they look very professional with Bert's superb engineering. At 87.50 Euros for the kit plus a module and a heatsink the amplifiers work out at about £136 each including carriage, more if you can't find a good heatsink on eBay and are forced to buy new. Just the 23cm amplifier to do now…

Reference

1. ***http://www.pe1rki.com/amplifiers.html***
2. ***https://www.enigma-shop.com/index.php?option=com_content&view=category&id=105&Itemid=179***
3. eBay item 401303716090 or similar
4. eBay item 111882700122 or ***http://www.boltworld.co.uk***

Telling the Story of MCR21

Rob Burn G8NXG

In a southern part of the UK known as the South Downs National Park lies the small village of Amberley. About a mile away and next to the local railway station is an extinct chalk quarry and lime works – these days this site is now the Amberley Museum and it was here that the launch of the MCR21 Project took place.

Amberley Museum is huge – an open-air industrial heritage museum of 36 acres, "dedicated to showcasing and preserving the working past of the South." The Museum features over twenty main areas of exhibits from around 150 years ago up to the present day. It can take a day or two to absorb all of this and since the Museum leans to nostalgia, communications and transport it was chosen for the launch of the MCR21 Project.

MCR21 is an OB van, developed in the 60s as a self-contained BBC OB van equipped with four cameras and control units, plus sound and vision mixers. It first entered service in 1963 and later in1969 refitted for the then new colour TV service. Eventually it was made redundant in1979 and sold privately.

That was not the end of the story. Brian Summers, the new owner was (and still is!) a stalwart member of the BATC so MCR21 entered a new lease of life as a demonstration vehicle for amateur television, and was exhibited at various rallies around the UK for a number of years.

Sadly, the ravages of time became all too evident and the time had arrived when 'something must be done!' After deliberations with fellow enthusiast Nick Gilbey the decision was made to form a charitable trust, the Broadcast Television Technology Trust, to own and restore MCR21 to its former glory. A grant from the Heritage Lottery Fund coupled with contributions from like-minded individuals has enabled the project to take off; so to garner public awareness Amberley Museum was used for the launch of the project.

The launch exhibition was set up in 'Humphrey's Barn' at the museum and made available for public display on 17th and 18th of August. The trust (BTTT) was fortunate to secure the services and sponsorship of West Ent Ltd and Horizon Integration by supplying display equipment and crewing. Equipment from MCR21 was on display, the vision mixer together with Pye Mk IV and MkVII cameras, which are similar type to the Mk VI used in MCR21, plus a CCU. Visitors were able to have a go at operating one of the vintage cameras.

MCR21 volunteers fielded questions but also asked what visitors thought about the mini-exhibition. Information telling the story of MCR21 and the history of BBC TV Outside Broadcasts was featured on 16 display boards set around a corner of the barn. This was combined with a couple of monitors featuring vintage TV footage, which also included a recent clip of the local BBC Southern News output where Brian made his TV debut, describing the plans for MCR21.

One exhibit designed to attract younger folk was a G-gauge model railway (G for garden!) The real reason for it being there was to replicate the operation of a 1930s TV camera – modern style. In those days the viewfinder was optical and presented a picture which was upside-down. The challenge was to follow the train around its track using a mocked-up upside-down monochrome viewfinder – needless to say the youngsters accomplished this test well ahead of the oldsters!

Considering that the technology on show was from a bygone era it was evident that it appealed to many visitors of all ages and hopefully this exposure to the project will result in greater interest and contributions of time, materials and equipment. The trust continues to appeal for support in all forms, in particular for equipment and early TV recordings.

About The Broadcast Television Technology Trust

The Trust was formed to preserve broadcast television equipment for future generations and engage the interest, particularly of young people, in the technology that was used to televise great events in the twentieth century. Preservation includes any associated equipment, documentation, recordings and images.

Further study, contacts and links:

(leads to many hours of TV nostalgia!)

https://mcr21.org.uk/

https://bttt.org.uk/

http://www.tvobhistory.co.uk/

brian@mcr21.org.uk

Video Fundamentals 19

Video switching using diodes

Brian Summers G8GQS

In this edition we will look at switching methods used in the BBC's MX1/501 vision mixer designed over half a century ago in 1962! This was a long time ago, but it marked a significant step forward in the design of mixers and may well be the first example of the use of electronic switching with semiconductor diodes. This was a big improvement over mechanical switches.

Most of this was written as a description for the BBC's vision mixer type MX1/501 for the MCR21 restoration project, but many of the principles still apply today. Diodes are still used for switching, often in RF circuits, but the field effect transistor as part of an integrated circuit is the usual device today. The point to note is the "T" arrangement shown is still used with FETs in place of the diodes.

The MX1/501 mixer

The BBC designed this mixer in 1962 for installation into the 10 new "Main Fleet[1]" outside broadcast vans. It has 10 input channels, 6 are for synchronous sources and 4 can be switched to Sync or non-sync[2]. Cuts, mixes, wipes, inserts, and split fader operations are possible.

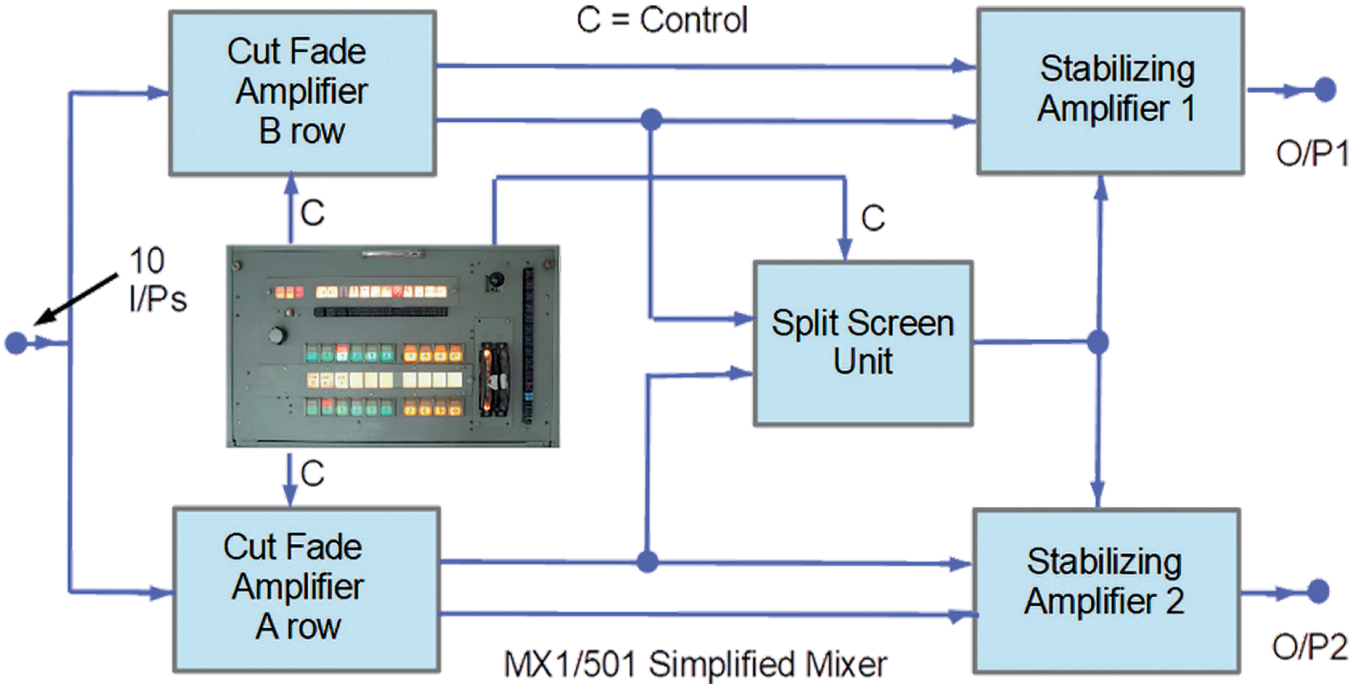
For the first time this is a fully solid state mixer for the signal path using transistors and diodes as the switching elements. Relays and solenoids are used for the bulk of the controlling logic. The design was quite advanced for the time, other manufacturers[3] were still using relays as the switching elements. The design was later adapted for colour working and was installed in a further 12 CMCRs[4] as well as many studio installations. It was in use into the early 1980s - a remarkable span of 20 years.

In the diagram, the 10 inputs go to both Cut-Fade Amplifiers, the selected input is connected to the stabilising Amplifier which clamps the signal and corrects any errors in the sync and blanking. There is also the option of the Split Screen Unit which can do Wipes, Inserts and has the ability to Key-in a caption.

There are two stabilising Amplifiers, a main and reserve with a changeover switch. The mixer is so arranged, with dual power supplies, so that it can continue to operate with reduced facilities in the event of a fault.

Each illuminated mixer button can have up to 4 coloured lamps which light to indicate the button status.

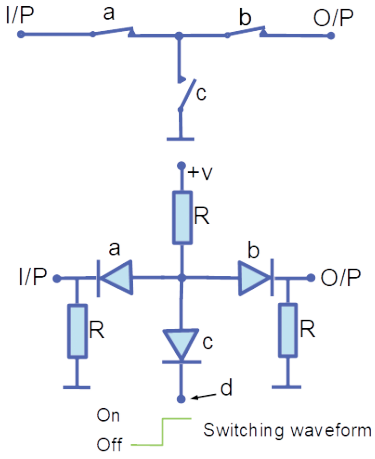
When a button is pressed it releases the previously selected button and with the field pulse activates the diode switch to operate in the blanking period after the sync pulse. This timed cut-in-blanking switch operation is to eliminate or minimise, any picture disturbance on switching.



Diode Video Switching

The electronic switching of the video using diodes is VERY fast, much faster that the previous generation of mixers using mechanical switches or relays.

In the idealised top diagram, switches a & b are closed and switch c is open. The video is passed from the input to the output. Opening switches a & b and closing c blocks the video signal.



The lower diagram has a very much simplified representation of the Diode switch.

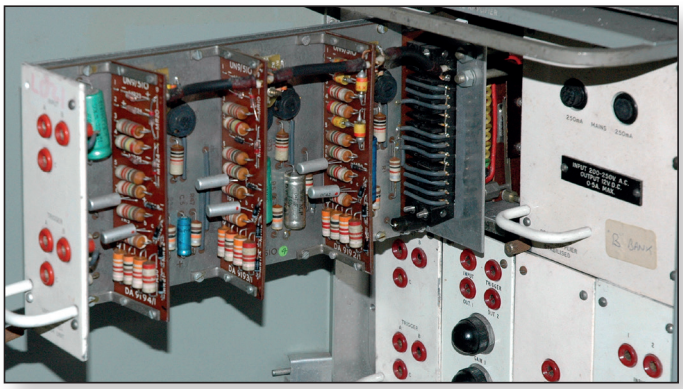
Diodes have a low resistance when forward biased and a high resistance when reverse biased.

When the switching waveform at point d is high (on) current flows through the Rs and diodes a & b forward biasing them to low resistance. Current does not flow though diode c and it has a high resistance. The video is passed to the output.

When the switching waveform is low (off) the current is diverted through diode c, now low resistance and diodes a & b are reverse biased and high resistance. The video path is blocked.

This is a most simplified description of the diode electronic switch, the real ones have 9 diodes and 2 transistors in each of the twenty switches plus a number of other components common to all circuits.

The Mixer electronics are arranged in 6 plug-in removable crates, each crate containing a number of individual



modules. There are two AM1/504 Cut Fade Amplifiers each containing 6 modules and a power supply. The extended module is a UN9/510 three channel switch. It has 3 sub boards each is a single diode video switch. The complete Cut Fade Amplifier unit has the following modules:-

- UN9/510 3 channel switch x 3
- UN9/509 single channel switch
- AT3/501 fader module
- AM5/506 2 channel amplifier
- PS2/503 stabilised power supply.

The other main plug-in crates are the UN4/501 Split Screen unit, the UN3/502 Control Unit, two AM18/503 Stabilising Amplifiers all fitting in a CT3/4 cabinet and the Producers Control Panel PA/507 fitting on top. For studio use the PA/507 could be 300 ft away from the mixer unit.

1. Pye called them Main Fleet OB vans
2. Non-synchronous sources can't be mixed to and only crash cuts are possible.
3. A "Modern Relay Vision Mixer", G.E. Partington, Marconi, IEE paper 4037, June 1963. Received 11 May 1962.
4. CMCR = Colour Mobile Control Room.

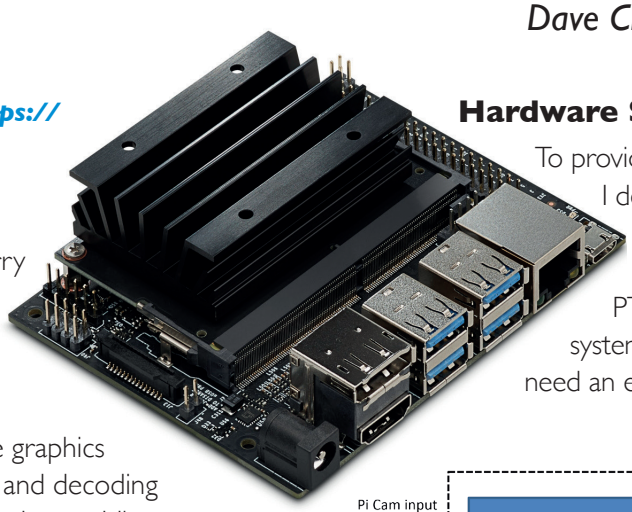
The photo, taken at the mini-convention at Finningley 2019, shows the QO-100 demo station setup by G4HIZ.

Left to right can be seen Rob M0DTS, David G4EEV and Jen G4HIZ. Behind the camera was Jen's other half, Joan 2E0HIZ.

73
Jen G4HIZ

The Jetson NanoBox

Dave Crump G8GKQ



The NVIDIA Jetson Nano (***https://developer.nvidia.com/embedded/jetson-nano-developer-kit***) is a small computer not unlike a Raspberry Pi. It has similar interfaces (network, USB, CSI2 Camera input, HDMI and GPIO) but the key difference is that it includes an advanced hardware graphics processor capable of encoding and decoding H264 and H265 standard video. It runs Ubuntu Linux software and costs just over £100.

A number of enthusiasts have been using the Jetson Nano with the LKV373A V3.0 video extender (available from eBay for about £30) to capture and encode HDMI video sources at high definition for subsequent transmission. The Jetson will also accept input from a Raspberry Pi camera (the later V2 only – not the V1) and can be programmed to take video from a C920 Webcam.

Evariste F5OEO has developed software to integrate the LimeSDR Mini enabling the Jetson to be the heart of a complete DVB-S or DVB-S2 exciter capable of full HD H264 or H265 encoding at symbol rates from 33 kS up to 2 MS.

This article describes a hardware solution for incorporating the Jetson Nano into a DATV transmitting station – the software will be covered in a future article.

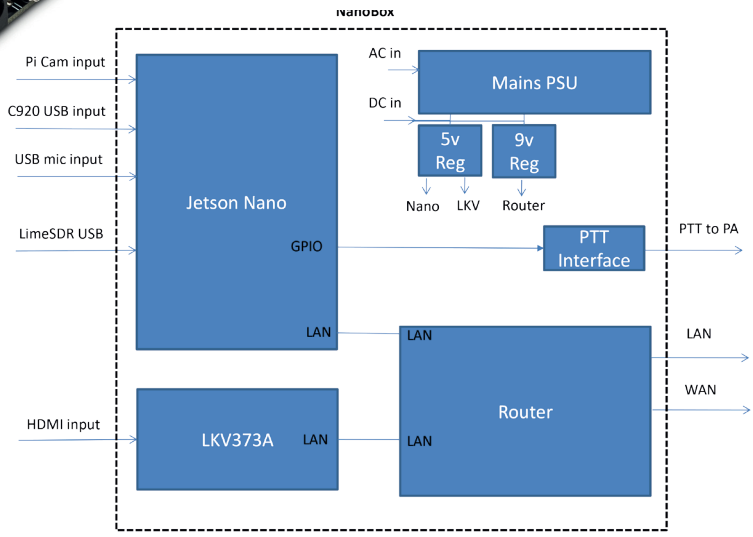
Challenges

The Jetson does not include a touchscreen interface, so either needs to be controlled using a connected screen, mouse and keyboard, or over the network from another computer.

Secondly, the LKV373A captures HDMI video and sends it out over a network connection using broadcast UDP. Some home routers cannot handle broadcast UDP and to feed the signals to a Jetson a suitable network hub or switch is required.

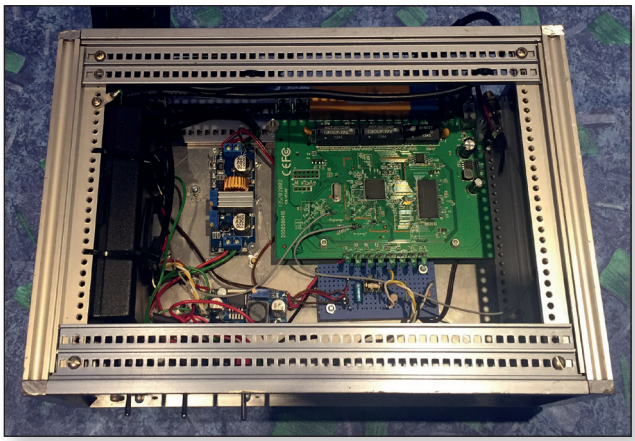
Hardware Solution

To provide a convenient compact solution, I decided to build the Jetson, LKV373A and a compatible router into a single box with a power supply and PTT switching. This means that the system is self-contained and does not need an external network or router.



The router I chose was a TP-Link TL-WR841N "300Mbps Wireless N Router"; I tested a number of routers and only some would handle broadcast UDP. I then took the router out of its plastic case and mounted it so that all the connectors were accessible from the back panel. I also extended the WiFi aerial coaxes to 2 panel-mount RP-SMA sockets on the back panel.

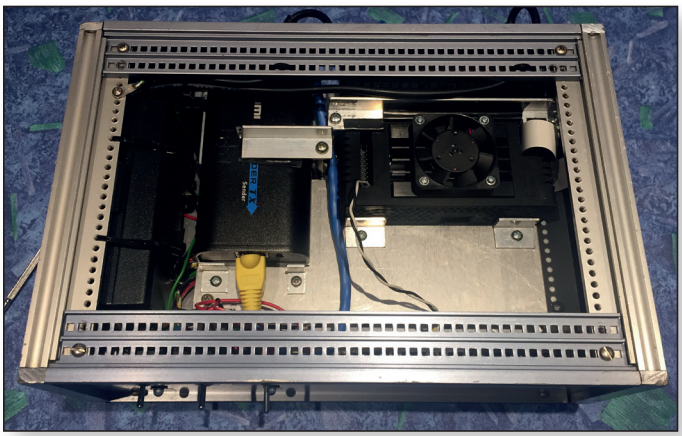
You can see the router mounted along with the 2 power supply regulators and the PTT interface on the lower layer of the chassis here.



I used a surplus (19v) laptop power supply as an AC adapter and fitted 2 eBay switching regulators – one for 5v (powering the Jetson Nano and the LKV 373A) and one providing 9v for the router. I also made provision for the use of an external 12v DC supply.

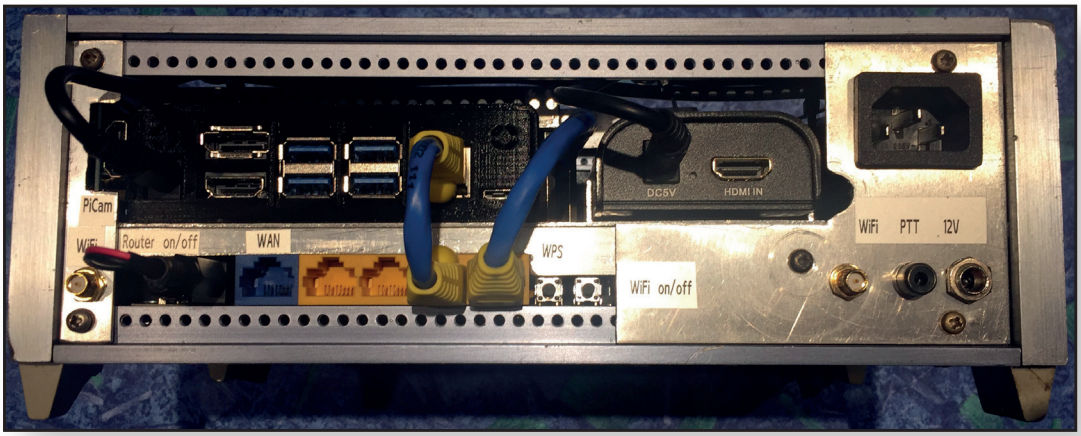
The PTT interface uses an opto-isolator and a driver transistor with a miniature relay, because unlike the Raspberry Pi, the GPIO outputs on the Jetson are very prone to noise-induced switching.

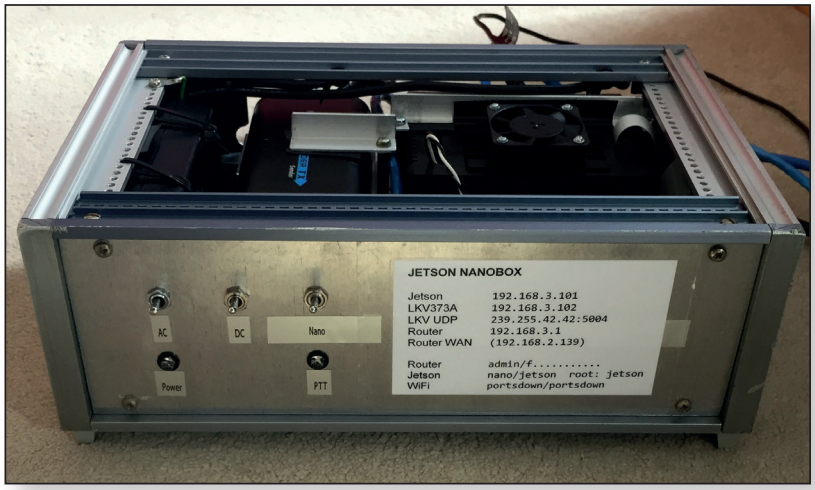
The upper layer of the chassis contains the LKV373A and the Jetson. The Jetson is in a 3D-printed case for protection and has a cooling fan fitted that is quiet enough to run continuously. Both units are mounted so that most of their connectors are available at the back panel.



The DC supply to the Jetson and LKV373A is independently switched from the front panel as they only seemed to work reliably if turned on after the router had fully booted.

The back panel is busy, but functional, exposing all the network and USB ports, together with the LKV373A's HDMI input and an HDMI socket for a Pi Cam.





The front panel is simple with power switching and PTT indication.

Configuration

I set the router to use the 192.168.3.* subnet so that it did not conflict with any of my other networks. The Jetson and LKV373A both get their IP address through DHCP. I also set the WiFi so that it was available if required.

The Jetson can be controlled through ssh by a computer connected to any of the LAN ports on the router; however, this exposes the broadcast UDP from the LKV373A, so I also set up ssh (port 22) forwarding from the WAN port of the router to the LAN. This means that it is possible to connect the WAN port to a home network and control the Jetson from any computer on that network.

Jetson Control

Control of the Jetson through the ssh command line is not very user friendly, so the latest version of the Portsdown software has been modified to enable selection of some Jetson Configurations from the Portsdown Touchscreen. This is still being developed and is not yet a fully supported aspect of the Portsdown capability.
Some details have been published on the BATC Wiki (***https://wiki.batc.org.uk/Jetson_Nano***), but I hope to provide a full guide to the software aspects of this project in the next issue of CQ-TV.

LNB power supply with current limit for MiniTiouner

Colin G4KLB

A number of people on the BATC forum have reported their Serit tuners are no longer outputting the LNB voltage from one of the F sockets. The cause is inevitably an open circuit inductor (L101 or L102) after the output has been accidentally short circuited. After destroying a second one during the heat of a contest, it was decided that some protection would be advisable.

I have contacted Serit and they told me that the part fitted is a SDCL 1608C56N 56nH 300mA 0603 inductor. I have replaced my damaged ones with Farnell part number 1748778 (56nH, 600mA, 0603 inductor) DigiKey 732-1765-1-ND

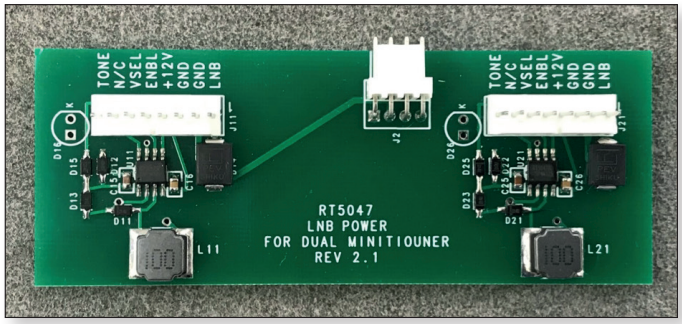
The existing protection in the BATC v2.0 MiniTiouner is F2 MF-R050, a 500mA PPTC Resettable Fuse. Even if you fitted a smaller one it would take too long to operate to protect the small inductor.

Jean-Pierre F6DZP used a RT5047 device on the MiniTiounerPro, two on the MiniTiounerPro2. The RT5047 not only adds short circuit protection but also generates 13V, 18V from your 12V supply. It has a provision for 22kHz DiSEqC on a BATC MiniTiouner v2.0. I looked at how that was implemented. While investigating I came across the excellent work of Pierre F5XG ***https://f5xg.jimdo.com/atv-datv/datv/télé-alimentation-minitiouner/*** At F5XG's request, Jean-Pierre F6DZP has added support for this in his Minitioune software from V0.8 onward. This just needs to be turned on in the .ini file. Look for this near the bottom of the file:

```
;================================

; MiniTiounerV2_BATC extensions

[MiniTiounerV2]

; si vous avez ajouté un module avec le chip de gestion LNB RT5047 / if you have added a RT5047 module for LNB 13v 18v

;V2LNBmodule yes or no

V2LNBmodule= yes

;================================
```

We needed to find a space to fit the board in the standard BATC v2.0 MiniTiouner enclosure, after some consideration it was decided to use the same method as the main board and slide it in the top.

A PCB was designed that fits perfectly and has several user options depending on requirements.



The 13V, 18V and 22kHz can be software controlled or via switches. Optional fault LEDs illuminate when the device is in protection mode. They can be fitted on board or brought out to panel LEDs. If the 2 ports share the same settings only one shared circuit needs to be populated. The one in the photograph is configured to have LNB A under software control and LNB B under manual control. The PCB can also be cut in half and mounting holes drilled for other installations.

The RT5047 should prevent damage to the Serit inductors from short circuits as the protection cuts in very quickly the only caveat is the case when the current drawn is over the 300mA and under the RT5047 pre-set current limit of 550mA, but we have yet to find a scenario that needs as much current as that. If you have one, the inductors should be upgraded.

Construction

Construction is relatively straight forward, the RT5047 has a pad underneath that must be soldered from the underside of the PCB by feeding solder through the vias provided for the purpose.

Wiring to the board can use the recommended Molex headers, screw terminals or direct connection.

The PCB is available from the BATC shop and circuit diagram and parts list is available on the BATC Wiki ***https://wiki.batc.org.uk/Serit_LNB_DC_supply***

A 250 Watt amplifier for Es'Hail-2 DATV

Jim Smith G7NTG

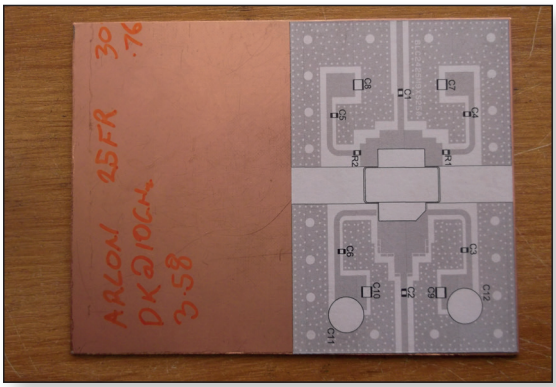
Having built an amplifier based on a Spectrian 60W amplifier board from "pyrojoseph" and realised that it limited me to a maximum transmit symbol rate of 500 kS at a pinch, I did some research and found that an Ampleon device designed for microwave ovens at 2400 – 2500 MHz would probably fit the bill.

Although ready-built modules are available as a single stage from Digi-key ***https://www.digikey.co.uk/products/en?keywords=BPC2425M9X250Z*** which has 18dB of gain and costs £213 plus postage etc.., and a double stage version with a lot more gain from RMW ***https://tinyurl.com/y2pjtxk6*** for about £400, I decided to just buy the device and make my own PCB using the test fixture design as shown on the data sheet pdf ***https://www.ampleon.com/documents/data-sheet/BLC2425M9LS250.pdf0.pdf*** for the transistor from Ampleon which is a BLC2425M9LS250 and is available from Digi-Key for about £65.

This proved to be the best course as I later bought a single stage module which proved to be very unstable on DVB-S2

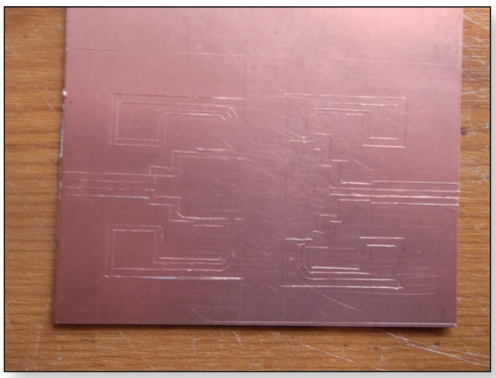
Making the PCB

I happened to have a little PCB material suitable, some Arlon25FR 0.762mm thick with 38um copper cladding both sides, which is practically the same as the ROGERS 6035HTC (same dimensions) that is recommended by Ampleon.



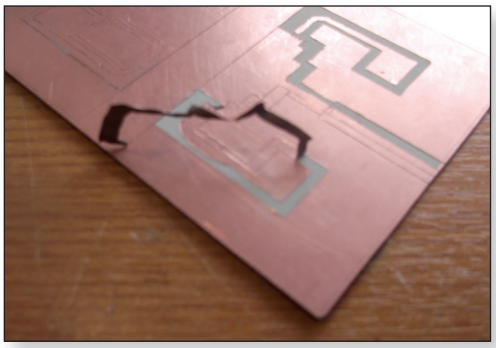
▶ *The self adhesive label stuck to the PCB material.*

I printed out the PCB drawing and adjusted the print scaling until the dimensions were correct then printed onto an adhesive paper label. I then stuck the paper label onto the PCB material and carefully cut along the lines with a sharp scalpel.

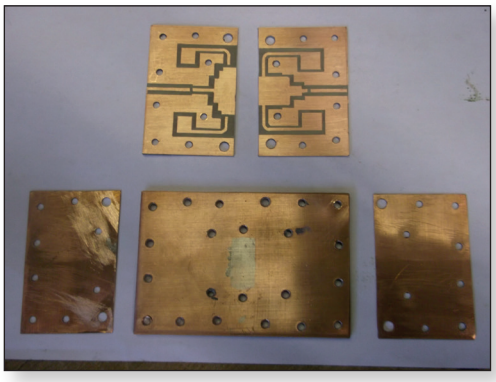


▶ *After scoring the lines through through the label with a SHARP scalpel*

I then peeled off the paper and then, again using the scalpel, peeled off the unwanted copper.

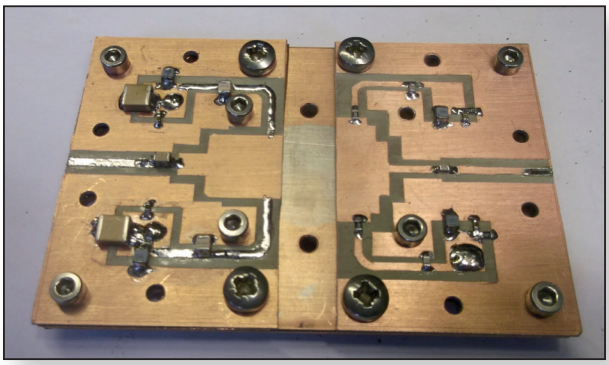


▶ *Peeling the copper from the board after lifting the ends with a scalpel*



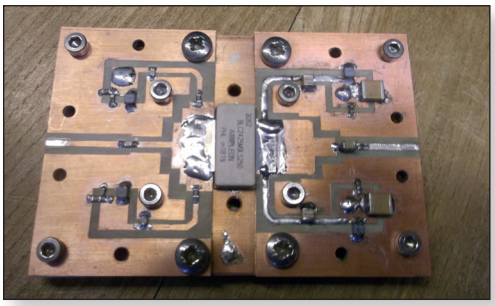
▶ *The cut and drilled PCB, heat spreader and 0.5mm copper spacers.*

The cut PCBs were then mounted on a piece of 3mm copper plate with another 0.5mm copper plate under each PCB to raise the top track up to the level of the transistor tabs to avoid getting the baseplate/heat spreader milled.



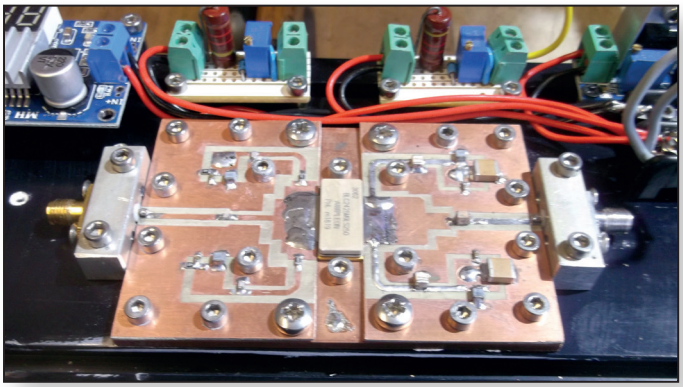
▶ *The components soldered to the assembled PCB*

The whole unit was the carefully drilled and four of the holes tapped M4 to hold the PCBs in the correct alignment while the other holes were drilled 3mm right through to allow for mounting bolts to the heat sink. A piece of 2mm aluminium the same size was drilled through at the same time to provide a heat sink drilling jig.



▶ *The power transistor soldered to the heat spreader and PCB*

Note that I did not use any through plated vias so drill in about the same positions that I used.



▶ *The pallet bolted down to the heat sink with 18 M3 screws and the connector blocks fitted.*

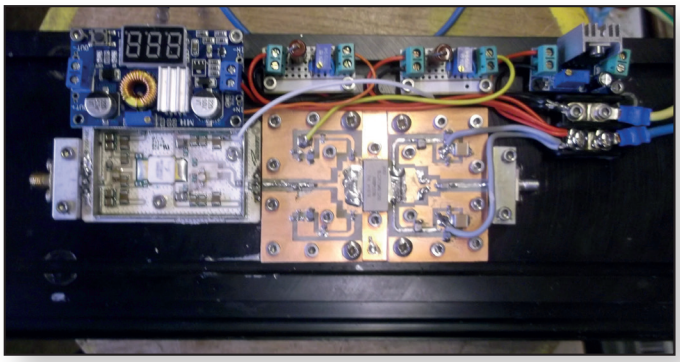
The components were then fitted as shown on the transistor data sheet with the addition of a 47k resistor to earth from one of the gate supply input pads to guard against static. The electrolytics were replaced with 10uf 50v ceramic smd caps as the electrolytics got very hot in use. I also added some extra decoupling capacitors on the main and gate supply pads to ground. These were 270pf ATC.

The power transistor was then soldered to the heat spreader using a little solder paste and fixing the heat spreader in a vice, then heated FROM UNDERNEATH with a blow lamp until the solder paste became molten and bright then removed the heat and allowed to cool slowly. A small drop of solder paste was put on the heat spreader near the transistor to indicate when it was hot enough.

Once the module was cool enough to touch the transistor tabs were soldered to the PCB, and then checked with a continuity tester to make sure there were no shorts to earth. The 47k resistor will show a reading on the tester but not a short if all is ok. DON'T USE AN OHM METER – TOO MANY VOLTS ON SOME OF THEM! The module will now be safe to handle with little fear of static damage. I have never had a transistor failure using a blow lamp but you could use a hotplate instead if you preferred. I had a tiny blob of solder cause a short to earth on the gate so I unsoldered the Mosfet using the same method, cleaned away the excess and soldered it back on.

Connection blocks were then made from 3/8" square aluminium and drilled carefully so that the SMA centre pin just rested on the PCB track.

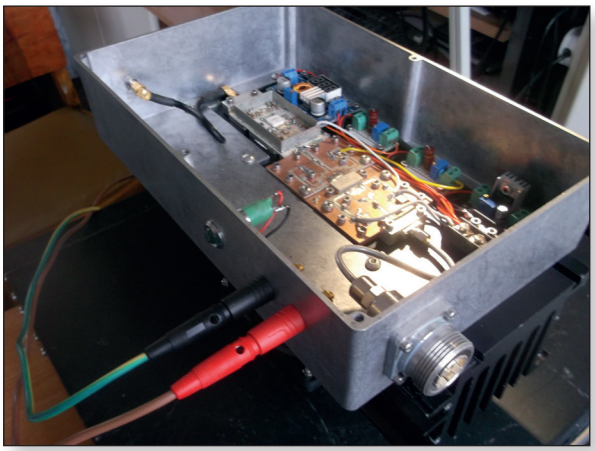
A LARGE heat sink was the selected (mine is 310mm x 120mm x 90mm) and the aluminium jig was used to drill and tap it. The heat spreader should be near the centre of the heat sink. Other holes were drilled and tapped for the fan supply PCB and the gate bias PCB.



▶ *The driver amplifier fitted to the heatsink.*

The heat sink needs a large noisy high power fan to keep it cool as it has to dissipate up to 250 watts and makes a nice room heater!

I used an old re-tuned Andrew 2.2GHz module as a driver which gave about 13dB gain and 20W max output although the power amp can be used with an external driver amplifier.



▶ *The unit fitted in a box with a 7.16 output socket.*

A power supply was made using three cheap 12volt 30amp units from eBay, each turned down to 10.67 volts and wired in series with a 20 amp schottky diode connected reverse biased across the output of each power supply to protect them against short circuit.

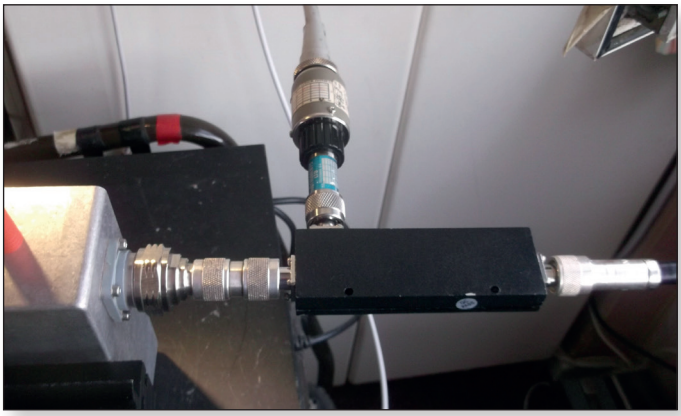
▶ *The power supply.*

Note that the gate bias is external to the pallet so a simple variable voltage from 0 to about 5 volts needs to be supplied. I initially tried an LM317 regulator board as supplied on eBay but found that hysteresis was a problem, so opted instead for a small veroboard circuit using a dropper resistor, zener and 20-turn preset of about 5k which worked better. I set the idle current (Idq) to 1 amp.

When tested the amplifier was first snowflake tuned at low power which only gave me about an extra 0.5dB but every little helps! At full smoke the amplifier gave me 330 watts saturated and 250 watts in the more linear region for 432 watts input power (58% efficiency).

The main power amplifier pallet has a gain of about 17.5dB up to 200 watts and then it starts to roll off as the device nears saturation. The complete unit that I built with a driver has an overall gain of 31dB up to 200 watts.

I used RG402 semi-rigid cable and a very good quality (expensive) Radiall SMA soldered connector to link the output to the 7/16 panel socket that I used and this RG402 cable got hot! Even the LDF2-50 Heliax cable to the load got warm so don't use anything smaller – it will fail!



▶ *The power measurement setup using a 30dB directional coupler and 20dB attenuator giving 1kW F.S.D on the 10mW range of an HP432A power meter.*

For testing I used a Patch antenna hung out of the window and a 30dB directional coupler with a further 20dB attenuator to connect it to my HP432A power meter. I don't have a dummy load of that power rating that will work at 2.4GHz and I don't think many people could afford one!

Conclusion

In conclusion, the amplifier has performed very well via Es'Hail-2 at symbol rates up to 2000 kS on DVB-S2 QPSK and FEC 2/3. At this symbol rate, it delivers about 210 watts to my 1.2 metre prime focus dish to equal the power level of the beacon.

I have since installed a 1.8 metre dish which only requires 100 watts for the same signal.

It is difficult to say how much the project cost me as the only significant costs were the transistor and the power supplies. The rest came from rallies, scrapyards, my junk box, donations from friends and items like the copper heat spreader and bolts came from ebay. The PCB material will present the biggest challenge to any prospective builder so good luck!

I have since built 2 more amplifiers with carved PCB's and one with a commercially produced PCB and all have worked very well and been used for transmitting via Es'Hail-2 with great success.

There is a group for the construction of this PA – ***DATVPA@groups.io*** with lots of ideas there and also the gerber files (kindly supplied by Ampleon and modified by Bob G6KMM) in case anyone has deep enough pockets to order another batch.

Portsdown Newsletter

Dave Crump, G8GKQ

It is six months since I wrote the last Portsdown Newsletter which described the introduction of the LimeSDR Mini. Although the LimeSDR is a great step forward, it did introduce some minor problems.

LimeSDR Limitations

I did most of the LimeSDR testing using a Pi Cam as the video source, and this worked seamlessly; however, I did not pick up some major problems in using the C920 or EasyCap, because I only tested with symbol rates and FECs that happened to work. Some subsequent research revealed that these were in the minority. The table below shows which combinations work (green) those that work for a while (amber) and those that don't work at all (red).

SR	FEC	Pi Cam	EasyCap	Test Card	TCAnim	C920 Webcam
1000	1/4					
	1/2					
	3/4					
	9/10					
500	1/4					
	1/2					
	3/4					
	9/10					
333	1/4					
	1/2					
	3/4					
	9/10					
250	1/4					
	1/2					
	3/4					
	9/10					

Apologies to those who spent hours chasing down this fault. Evariste and I are making progress on a solution, but it is not an easy problem to solve.

The other limitation introduced was the maximum symbol rate of between 1 MS and 2 MS. I am pleased to report that we do have a solution to this and I have now demonstrated the LimeSDR Mini generating a 5 MS signal. The solution involves a set of custom gateware for the LimeSDR Mini, so I need to make modifications to the Portsdown system to manage gateware on the LimeSDR Mini before I can include it in a software update.

Recent Changes

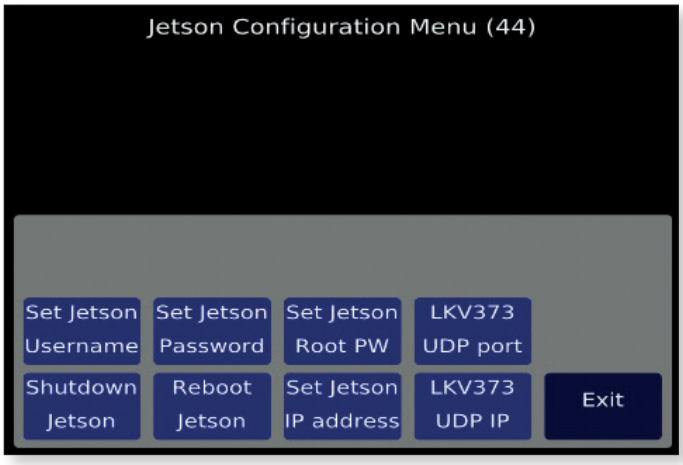
Most of the changes to the Portsdown code in the last 6 months have been minor bug-fixes to make the transmitter behave correctly or more intuitively. However, 2 major new areas of functionality have been started.

The first is Portsdown support for the LongMynd receiver. As described elsewhere in this issue, a Linux-based receive software for the MiniTiouner hardware has been developed and this is being integrated into the Portsdown. Three new menus have been added to enable control of the receiver and an additional configuration file is used to store the receiver settings.

The second new feature is support for remote control of an NVIDIA Jetson Nano. The Jetson Nano, when properly configured (this will be described in an article in the next CQ-TV) can be controlled as though it was simply an additional output device on the Portsdown. The difference is that all input devices (cameras, microphones etc) need to be connected to the Jetson Nano, not the Portsdown.

The Jetson Configuration Menu has been added to configure the Portsdown to correctly program the remote Jetson Nano. Note that if the remote Jetson Nano is not detected (unsuccessful ping), the Shutdown and Reboot buttons will be greyed out.

A number of Portsdown users are using Open Broadcaster Software (OBS) to input video to their Portsdown. As there are very few Portsdown settings that need to be changed for this, there is no explicit support for OBS in Portsdown, but I am happy to accept user requests.



The LimeNET Micro

The LimeNET Micro is described elsewhere in this issue – a single board with a Raspberry Pi and a LimeSDR. This hardware is now fully supported by the Portsdown software and provides a simple hardware solution for building a Portsdown.

The Raspberry Pi 4

The Raspberry Pi 4 was announced with a great fanfare a few months ago. I was looking forward to using the increased processor speed and hardware H265 decoder for Portsdown and particularly for the new receiver. However, as part of their continuing progress, the Raspberry Pi foundation dropped support in the Raspberry Pi 4 for the (10-year old) OpenVG protocol which is used to draw all the button menus on the Portsdown.

I have had an apology from one of the developers for dropping support without notice, but that does not alter the fact that I have over 18000 lines of code that need re-writing to migrate the Portsdown to the Raspberry Pi 4.

The good news is that the Raspberry Pi 3+ will remain available for another 5 years at least. That should give me time to come up with a solution!

User base

In the last newsletter I reported that there were more than 350 Portsdown Users. I am pleased to report that the figure has now increased to over 400. All I need to do now is to persuade all those users to actually get on the air. You know who you are!

RSGB ATV promo video

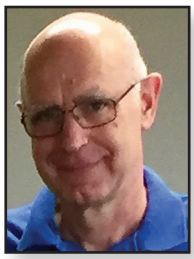
The RSGB is currently filming a series of promotional videos showing a number of different aspects of the hobby.

Peter, M0SWN, has been out filming ATV in action at a number of locations including Phil M0DNY showing his QO100 portable uplink, Colin, G4KLB, Shaun, G8VPG and Noel, G8GTZ, operating DATV on 146MHz and Dave, G8GKQ demonstrating the Portsdown.

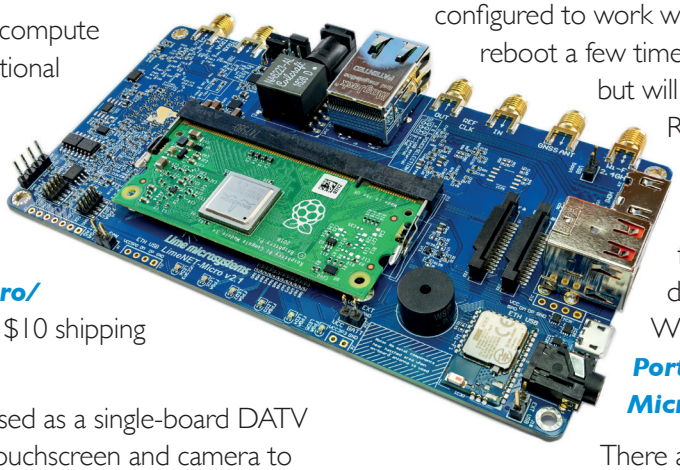
The video will be available on the RSGB website and will be a great introduction to ATV to show to other radio amateurs and clubs.

The LimeNET Micro – a Single-board DATV Transmitter

Dave Crump G8GKQ

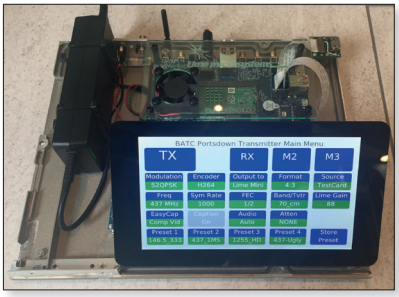


The LimeNET Micro effectively combines a LimeSDR Mini and a Raspberry Pi 3+ in one unit.



It actually uses a Raspberry Pi compute module 3+ rather than a traditional Raspberry Pi 3+, but the functionality is the same. The complete unit is available from CrowdSupply in the USA ***https://www.crowdsupply.com/lime-micro/limenet-micro*** for $329 plus $10 shipping plus UK import duty.

The LimeNET Micro can be used as a single-board DATV transmitter – it only needs a touchscreen and camera to be added to make it into a fully-fledged Portsdown.



Use as a DATV Transmitter

A standard Raspberry Pi 7 inch screen should be used with the LimeNET Micro. I recommend using a long (30 cm) ribbon cable to connect the screen to make the mechanical arrangement easier. Note that it is not possible to use the 3.5 inch Waveshare screen with the LimeNET Micro.

There is a socket for a Raspberry Pi Camera ribbon cable on the LimeNET Micro, but this only works with the later Pi V2 cameras. I extended this socket out to an HDMI connector to enable the use of camera extension leads.

The RF output and network connections are at the rear of the board with the network, USB and 3.5mm jacks at the right hand side. The board is powered with 5v either from the micro USB connector or a 2.1mm power barrel – selected by jumpers. I chose the power barrel having had too many issues with voltage drop in micro USB connectors and leads in the past. Do however exercise caution if you use these connectors to supply other voltages in your shack!

There are 2 compatible versions of the Raspberry Pi compute module. The supplied CM3+ has 8 GB of on-board eMMC storage. This eMMC storage can be programmed in a similar way to the Portsdown SD Card, and I will post programming instructions on the BATC Wiki when these have been tested. The CM3+ Lite (supplied with some early evaluation LimeNET Micros) uses an external SD Card. The standard Portsdown SD Card is configured to work with a LimeNET Micro; it will reboot a few times to load the correct drivers, but will then start up just like a standard Raspberry Pi Portsdown.

The Portsdown output should be selected to LimeSDR Mini for normal operation. More details can be found on the BATC Wiki: ***https://wiki.batc.org.uk/Portsdown_with_the_LimeNET_Micro***

There are 2 USB sockets on the board; these can be used in the same way as USB sockets on a standard Portsdown – for example to connect a USB microphone dongle, an EasyCap or a MiniTiouner.

Additional Features

The LimeNET Micro has an on-board GNSS (GPS+) receiver and some GPIO outputs from the FPGA. There is potential for automatic update of the displayed locator in the Portsdown. I also hope to implement delayed PTT switching on the GPIO in a future software release.

Of course the LimeNET Micro has the same receive system as the LimeSDR Mini; I have not even touched on the capabilities included there.

The SDR portion of the board can be configured to be accessed directly from USB, so that it behaves similarly to a LimeSDR Mini, enabling connection to external processors (such as the Jetson Nano).

The on-board frequency reference has better performance that that supplied with the LimeSDR Mini or LimeSDR USB. An advantage over the LimeSDR Mini is that the selectable frequency reference input is from an easily-accessible SMA connector at the back of the board; a buffered output is also provided.

Summary

If you are looking for a single-board DATV transmitter with lots of expansion potential, then the LimeNET Micro is a very neat solution which can take advantage of all the Portsdown development.

Spectrum Matters

September 2019

144MHz threat defeated

As you may be aware, the 144 - 146MHz band has been the subject of a recent French proposal for it to be used for non-safety of life aeronautical use. This is one of a number of World Radio Conference proposals that WRC-19 would need to agree that would set the agenda for the next four year cycle - which would culminate in 2023 at WRC-23.

Thanks to major events, efforts by RSGB, and other IARU member societies, who prepared papers laying out the counter arguments, the 144 MHZ band was withdrawn from the French proposal, although adjacent VHF bands remain in scope. Whilst that threat appears to have receded, a careful watch will be maintained in case it re-emerges during the WRC-19 discussions.

23cms under threat

However, the situation for 23cms is not looking so good. The problem is that we use 23cms on a secondary user basis with the 'Radio Navigation Satellite Service' and 'Radiolocation Service' having primary status. The latter has traditionally meant sharing the band with major air traffic and military radars, but more recently the European Galileo satellite navigation has begun to enter service within the 1240 – 1300 MHz band.

Unfortunately, during the development of the system, problems were experienced with two German ATV repeaters with outputs in 23cms causing problems to Galileo control/calibration receivers. The ITU regulations state that "secondary" services are duty bound not to cause interference to the primary band services and as a result the European authorities are taking steps to ensure protection for the millions of Galileo receivers as the service rolls out worldwide.

Consequently there is now a proposed agenda item for WRC-23 to consider the measures needed to protect the Galileo Navigation System from amateurs. To support this, the ITU would be undertaking studies during next year to evaluate what global regulations need to be put in place to meet the non-interference requirement. It should be noted that the draft resolution that will guide these studies currently excludes the removal of the existing amateur secondary service as an option.

The IARU and RSGB agree that some action will be needed by the amateur service but has been pushing back on the proposals for a WRC-23 agenda item as there is an alternative activity under way to carry out the studies at a European level. This is a better alternative as it will keep the studies away from the political and unpredictable ITU-R arena, and may produce a better outcome for the amateur service.

How will this affect ATV on 23cms?

Unfortunately all this means the future for 23cms is uncertain as the outcome of the studies could mean severe power / bandwidth restrictions between 1240 and 1300 MHz which would almost certainly impact our repeater input and ATV simplex channels.

The good news for the UK is that our extended band between 1300 – 1325MHz is not currently under threat. However, the impact on the rest of the band means it is likely the band plan will need to be revised to include other modes / applications and this may well mean reducing the bandwidth available for ATV repeater output transmissions.

We will continue to support the RSGB and IARU and will report back to our members as and when there are significant changes to report.

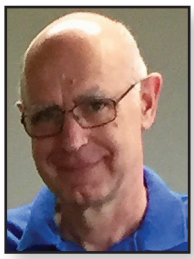
Ofcom impressed with DATV experiments

On a more positive note, at the recent liaison meeting RSGB gave Ofcom an update on Reduced Bandwidth DATV experiments. They were very impressed with the reports of amateurs using H265 encoding to transmit real time high quality pictures using 66 kilo-symbols in a bandwidth of 80kHz.

And finally the message for all amateur radio operators is we know Ofcom and other regulators monitor activity on our bands (and our websites), so it really is a case of use them or lose them…

The LongMynd Receiver on the Portsdown

Dave Crump G8GKQ



There has been an aspiration to develop a Linux alternative to the popular MiniTioune software for a number of years, but the expertise, resources and information required was not available. One issue was that the Serit tuner interface specification was covered by a non-disclosure agreement, but also there were no volunteers to spend the many hours required to write the software.

About a year ago, Heather M0HMO volunteered to make a serious attempt to write the software required, and she managed to obtain the required data about the tuner. After many hours of work Heather has now published some software, written in C that will compile on Linux, that interfaces to a standard BATC MiniTiouner board and provides a transport stream output and some status information.

Heather's software does not have all the bells and whistles of MiniTioune; it does not expose the ability to tweak as many tuner settings as implemented by Jean-Pierre in his software. Neither does it have a graphical interface; it runs from the command line in Linux, and outputs the received transport stream to an application such as VLC for display.

This 'C' receive software is called LongMynd after the hill on which some of the early ideas took shape during an ATV activity day and is available on GitHub at ***https://github.com/myorangedragon/longmynd.***

I will let Heather tell the story of the software development in another article. This article describes its forthcoming integration into the Portsdown.

Portsdown Integration

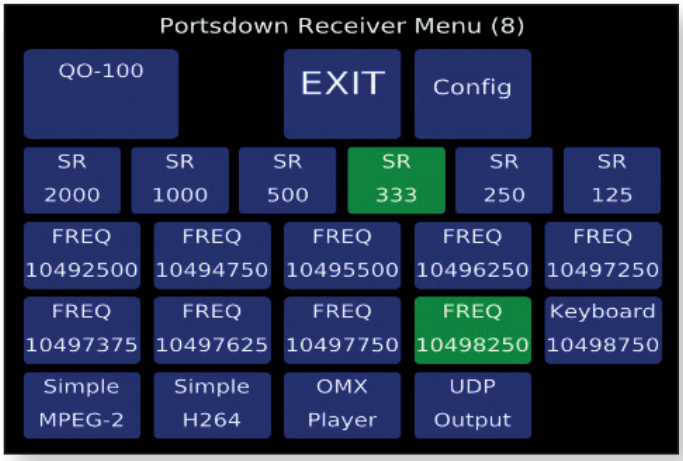
There has been a basic DATV receive capability in the Portsdown right from the start. This used an RTL-SDR dongle and LeanDVB software to receive and display strong DVB-S signals, but has never been good enough for serious off-air use.

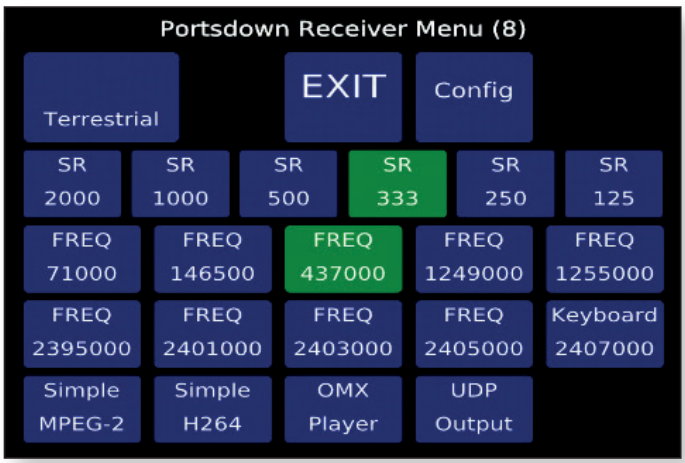
The reason why the LongMynd development is significant is that is allows us to implement a receiver into the Portsdown system using the existing MiniTiouner hardware which has good enough performance for it to be used as an off-air receiver.

The basic LeanDVB capability remains in Portsdown, but if you connect a standard MiniTiouner to the RPi USB port, the control screen for the LongMynd software is displayed when selecting "RX".

Receiver Menus

There are 2 control modes for the receiver: QO-100 and Terrestrial. The difference is that an LNB offset is applied in QO-100 mode and different preset frequencies and preset SRs are displayed in each mode. You can toggle between the 2 by pressing the QO-100/Terrestrial button on the top line.





There are 6 selectable SRs and 10 selectable frequencies. The 10th frequency also allows easy manual amendment of a frequency.

The bottom row of buttons starts the receiver in one of 4 modes:

Simple MPEG-2. This is a video-only only display mode that uses the Raspberry Pi's hardware MPEG-2 decoder to display any MPEG-2 signal. This mode is only available if you have purchased the MPEG-2 decoder licence (available at £2.40 per Raspberry Pi from ***http://www.raspberrypi.com/mpeg-2-license-key/***). You will probably only need this license if you are decoding terrestrial signals

from repeaters and other stations running older MPEG-2 encoders. Very few stations use MPEG-2 on QO-100. There is no audio available in this mode.

Instructions on entering the MPEG-2 Licence key can be found on the BATC Wiki: ***https://wiki.batc.org.uk/Lean_DVB_receiver#Entering_the_MPEG-2_License_Key***

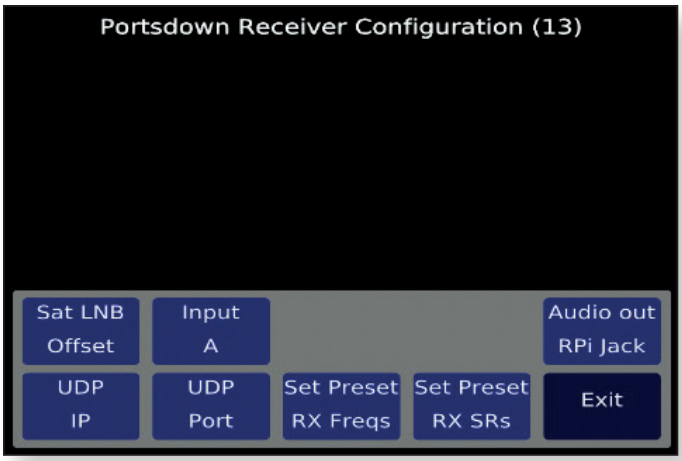
Simple H264. This is a video-only only display mode that uses the Raspberry Pi's hardware H264 decoder to display any H264 signal up to and including 1280x720. It is the fastest mode to initially display H264 signals, but has no audio.

OMX Player. OMX Player is a video and audio player for H264 signals. It takes slightly longer to initially display a signal than "Simple H264" but provides the audio track as well.

UDP Output. In this mode, the received transport stream is sent over the network to by UDP to an external display. The external display can be a Windows PC, Linux PC, iPhone or iPad. This is currently the only way to display H265 video as the Raspberry Pi 3 does not support hardware H265 decoding (the Raspberry Pi 4 does, but it does not support the Portsdown Menu system).

Configuration

The "Config" button on the Receiver menu brings up the configuration options for the receiver.



The Sat LNB offset button enables the entry of the exact LNB offset for QO-100 mode. This is in kHz and assumes a low side LO. For example, mine is set to 9749786, which is the average frequency (over normal temperatures) of my PLL LNB LO.

The next button enables the selection of LNB input A (the top one) or LNB input B (the bottom one). The receiver audio output can be switched between the RPi 3.5 mm jack and a USB audio dongle with the right hand button on the top line.

The IP address of the device used for display of the UDP stream should be set using the UDP IP button; the port is set using the UDP Port button.

The first 9 preset receiver frequencies can be set after selecting "Set Preset RX Freqs". The 10th button can be programmed directly from the main receiver menu. The 6 preset SRs can be set from the "Set Preset RX SRs" button. Both of these menus take notice of the QO-100/Terrestrial selection on the main receiver menu to display the required frequencies and SRs for amendment.

Operation

Having selected the Frequency and the SR, selection of any of the 4 receive buttons will initially display the Portsdown Logo with overlayed receive parameters. Although the parameter display capability is still being developed, the idea is shown here with the parameters in the black box at top left.

In UDP mode these parameters will remain displayed. With OMX Player, the parameters are hidden as soon as a picture is displayed.

In the Simple H264 and Simple MPEG-2 modes, the parameters continue to overlay the picture once it is displayed. Touching the area of the parameters toggles them on and off.

In any mode, touching the screen anywhere other than the parameter box stops the receiver and takes you back to the main receiver menu.

Note that currently, when a transmission ceases, the frame just freezes. Touching the screen will take you back to the receiver menu. If the receiver crashes, touching the screen will take you back to the main Portsdown menu. Only very occasionally will a crash require a reboot to reset the Portsdown.

The receiver automatically selects DVB-S or DVB-S2 and will also select the correct FEC; neither of these parameters needs to be entered.

Limitations

It is very early days in the development of this capability on the Portsdown, so do not expect a capability as good as MiniTioune which has been developed over a period of 6 years.

Currently, the receiver is unable to display the QO-100 beacon on the Portsdown; it is thought that this is because it is Full HD (1080p), as other 2 MS signals at 720p have successfully been displayed. The beacon can be viewed through UDP mode in VLC.

H265 signals will not be displayed on the Portsdown screen; however, they can be viewed using VLC on another device looking at the UDP stream.

It is not currently possible to display the Program ID or Service Provider data that is typically used for callsign. This can be examined in the "Codec Information" if VLC is being used for viewing.

If a signal is being viewed at a set frequency and FEC, the receiver needs to be stopped and started again before it will display a signal with a different FEC. However it will display identical signals without restarting.

Conclusion

This is very significant development for the Portsdown system and brings us closer to having a DATV transceiver in a box. However it is just the beginning for this receive software - which I am confident will improve over time.

It is an open-source software effort, all published on GitHub, and even as I write this I see suggested improvements to the code being published. You can help by improving the code, or making suggestions for improvements to the user interface. The software will be integrated into the next Portsdown update in late September.

My thanks to Heather and all the other BATC members who have made this software possible.

The LongMynd Receiver

Heather Lomond, M0HMO

Introduction

The amazing success of the Portsdown Transmitter has, for a while now, been in need of a complementary open source DVB-S/S2 receiver that will run on the Raspberry Pi alongside the Portsdown code.

The obvious choice for the hardware was the MiniTiouner by Jean-Pierre F6DZP. Most ATV enthusiasts already have the PCB (if not, it and the hard to get components, are available from the BATC shop), and the Serit NIM on this board is one of the more capable of the DVB-S/S2 receivers.

Other design goals include reducing the power consumption over the Windows solution (longer battery life), providing a much faster initialisation and lock sequence than the Windows solution, allowing remote display operation (such as a smartphone or tablet), fully documented Open Source code for the tinkerers to get stuck in, flexible USB interfacing so that multiple (or even many) pieces of MiniTiouner hardware can be installed and individually addressed, simplified user interface to allow people to get up and running quickly, full trace based error reporting and of course, to be able to run on a low power platform such as the RPI 3B+. Another important goal was to future-proof the code. So it has been designed with options to use the second demodulator, second tuner, the newly announced second USB interface and so on. Finally, it needed to be robust enough to handle low quality cables and always detect errors rather than hanging or crashing.

So, here it is. All the design goals have been met, Dave G8GKQ has integrated the code into the Portsdown Menu System and it is already attracting Open Source interest with additions and enhancements coming in in the first week of going live.

How to download and install it

The simplest way to get the code is to upgrade your Portsdown to the latest version, once Dave has issued the update in late-September. This is all that you need to do. If you want to amend or study the software, the rest of this article will provide a more detailed view of the insides of the software and how it operates stand-alone.

For those wanting to get your hands a little more dirty, the files and minimal test harness are available from github:

https://github.com/myorangedragon/longmynd

I welcome input from anywhere on anything, so please submit patches or just email me directly with suggestions, changes etc.

To install the code on your machine with the full GIT repo information you need get into a terminal window and type:

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

If you don't already have libusb installed you will need to get it with:

```
sudo apt-get install libusb-1.0-0-dev
```

And (thanks to Phil M0DNY for this mod) if you want to run LongMynd without root privileges, make sure the MiniTiouner is unplugged and type:

```
sudocpminitiouner.rules /etc/udev/rules.d/
```

You are now ready to compile it with a simple

```
make
```

Installing the git repo is recommended if you want to make changes to the code as it vastly simplifies reporting your changes back to github and having them incorporated in the next release.

How to run it

To get a feel for what it can do, type (from the source code directory):

```
man -l longmynd
```

This will give you a list of all the command line options. This list is reproduced at the end of this article.

If you have the Portsdown installed, then the example test harness (go.sh) can be run by simply typing:

```
sudo ./go.sh
```

It is worth taking a quick look at this example in order to get the syntax correct for operation of the various programs and how they interact.

Operational Overview

As a minimum, when you run the program, you need to tell it the frequency (in kHz) and Symbol Rate (in kS) that you are trying to demodulate. For example to look for a signal at 436868 kHz and 250 kS:

```
sudo /home/pi/longmynd/longmynd 436868 250
```

The code will then connect to the MiniTiouner NIM via a USB driver and use the supplied information to set up the 1000+ registers in the NIM and start searching for a video stream. It will automatically search over a range of frequencies and symbol rates centred on the ones you specified, it will also search all the usual puncture rates and try both DVB-S and DVB-S2 so there is no need to specify these.

While it is searching, various useful information is sent out to allow the user to monitor the progress of the search. In order to provide a simplified API for developers, this data is sent to a Linux FIFO in an efficient manner so is not easily human readable. It contains such information as constellation data, carrier frequency being tried, Symbol rate being tried and so on. Once it has locked onto a transport stream this status information will also include demodulation type (DVB-S or S2), BER, Viterbi error rate and more. More on this feature later.

Once the demodulator has locked onto the transport stream, TS data will start to flow from the MiniTiouner to the host machine (RPI). This data must then be routed to a video displaying program either through a second Linux FIFO if running it all on the host machine, or over a UDP socket to a displaying program on another machine on your network.

Note that the program does not create the FIFOs it uses so this needs to be done by the execution program (or script).

USB interface options

With no USB command line parameters, the program will search for the first MiniTiouner that it can find on the USB networks of the host machine. If the –u option is specified then the code will use the specified USB bus and address parameters to locate which MiniTiouner to use in a multi hardware system.

Video Output Options

If you do not specify any display switches on the command line then the TS will be sent to another Linux FIFO called longmynd_main_ts. This can then be displayed by one of the many Linux display apps such as omxplayer or hello_video.bin (the latter being used with ts2es which extracts a single elementary stream from the transport stream).

One of the options available on the command line is to route this video to a UDP socket on your network instead of via a FIFO. This is done with the –i option which takes a network address and port number. For example, to send the TS to a machine at 192.168.1.9 and port 1234 you would use:

```
sudo /home/pi/longmynd/longmynd -i
192.168.1.9 1234 436868 250
```

On the host machine, programs such as VLC can be used to display this UDP stream. An example stream name for VLC is:

```
UDP://@:1234
```

Where the 1234 is the port specified in the longmynd –u option. It should be noted that communications over Wi-Fi for this type of data can be problematic and a wired network solution is to be preferred.

FIFO Interface

The name of the status message FIFO can be changed using the –s option on the command line. If this is not specified then the status messages will go to a FIFO named longmynd_main_status.

If using the TS FIFO then its name can be changed by using the –t option

Hardware Options

One final command line option allows the user to swap over which F-Type connector on the NIM is being used. By default the signal is applied to the top F-Type (furthest from the PCB) but if you specify the –w option then the code will search for a signal on the lower (bottom) F-Type.

Status Messages and the Test Harness

The status messages are designed to be machine readable. The test harness simply dumps these to the screen using the program fake_read. The important message is the State (ID=1) which will tell the user what the software is doing and what it has found. Here is the specification of the status message and what they mean.

The status fifo is filled with status information as and when it becomes available. The format of the status information is:

$n,m<cr>

Where:
n = identifier integer of Status message
m = integer value associated with this status message

The values of n and m are defined in the documentation. Further information about the software structure is published on the BATC Wiki ***https://wiki.batc.org.uk/LongMynd_Receive_Software***

Where Next

There are many features still to add. MER is the most obvious omission, but that should be coming soon. Support for the second USB card is also in the pipeline along with some power consumption tweaks. Feel free to request features or even write them yourself!

The G4WIM PA controller

Tim Forrester, G4WIM

Introduction

This project came about as a result of needing to remote control and monitor a 2.4GHz power amplifier for the QO-100 satellite up link.

In the case of G4WIM the amplifier is at the end of 75 metres of cable directly beneath the feed point of a 1.2 metre dish, so running to and from the shack to the PA was not an option.

Over time it has evolved from a simple controller which relied on either 0, 5 or 12 Volts being sent up the coax to set off, standby or transmit modes into a multi-purpose design.

The resulting system can be configured in three ways:

1. Full remote control of the PA and shack monitoring of vital signs – using radio link.
2. When PA is in the shack, local control and monitoring - no radio link.
3. Remote control of PA by means of DC down the coax – no radio link or remote monitoring

The most likely use cases are 1 and 2. However there are also other temperature sensing options as described below.

For simplicity the radio link could be replaced with simple RS232 line transceivers if so desired.

In this article I refer to the PA with associated control and telemetry hardware as the MASTER and the remote display / control in the shack as the SLAVE.

When used as #2 above there is no SLAVE and the MASTER serves as control and display.

The design was initially conceived for a Pyro Jo PA which needs 24V DC bias to activate it and a thermistor was used to measure PA temperature.

Subsequently it was modified to provide a temperature compensated bias for LDMOS FET's and accommodate other types of temperature measuring sensors.

MOST IMPORTANT, if you are using LDMOS FET PA DO NOT install or use the 24V DC power module as it will instantly destroy the FET.

Basically for the LDMOS FET use the temp compensated bias circuit and for the Pyro JO PA use the 24V DC device – one or the other NOT both. See schematics for more detail.

The design uses the same PCB in all cases, which is available from the BATC shop, but populated slightly differently for each of the three use cases above.

Full documentation including schematics and layout is provided on the ***BATC wiki: https://wiki.batc.org.uk/G4WIM_PA_controller***

For each use case firmware works differently and is jumper selected as mentioned below in temperature measurement section.

In all cases it allows monitoring of the following analogue signals

- Vdd, 100mV resolution
- Idd, 100mA resolution
- PA temperature, 0.1C resolution thermistor or 0.3C resolution with LM34DZ.
- Bias voltage, 10mV resolution for LDMOS, 1V for Pyro Jo
- RF power (forward or reverse but not both – depends on HW implementation)
- Fan status on or off
- Standby status on or off

Note, *if RF power is not being monitored then the RF power sensor input on pin 1 of J3 must be connected to ground to disable the function. Normally RF power will only be shown when on transmit and above a certain threshold.*

Overall System Description

Note, in all use cases the MASTER needs a low power 12V power supply to maintain operation of the control circuits, plus a relay switched 12V (Pyro Jo) or 32V (LDMOS) power supply for the main power amplifier. See the schematics.

In its most basic form with just the MASTER in use, sending 5V up the coax cable by means of a power injector at each end will result in turning on the main PA power supply.

The DC control voltage doesn't necessarily have to use the coax with injectors, instead a separate DC connection would also work but has not been tested so maybe prone to noise pick up.

Increasing the voltage to 12V will result in turning on the PA bias ready for transmit and activating the cooling fans.

The control circuits monitor and act as follows

- Vdd – if too high inhibit or shut down (PJ limit 14V, LD limit 34V)
- Idd – if too high shut down (PJ limit 12A, LD limit 15A)
- Temp – if too high (65C) inhibit or shuts down, but keeps fans running till safe temp (45C) is reached
- When going from transmit to standby the cooling fans keep running for 4 minutes
- When going from transmit to off or standby to off everything is shut down including the cooling fans.
- Monitors gate bias voltage for the LDMOS FET
- Monitors RF power using an external RF detector.

The various thresholds are set in the firmware and easily changed. If an LCD is installed at the MASTER then the status of the amplifier is displayed.

The LCD is optional at either end.

There is no currently no shut down limit on the RF power measurement.

I suspect most users will be build the full remote control / monitoring system #1 above.

In this case the radio link (which uses a nRF905 and Atmel nano) will take priority over the DC control voltage on the coax. Further if the radio link should vanish for more than 3 seconds the PA drops back to off mode and instead looks at the coax voltage for control signal.

As mentioned previously the same PCB is used at both ends and populated as required for the preferred mode of operation and type of PA. The same firmware is used at both ends but operates based on the settings of LK3 and LK4.

PA protection limitations

This design monitors key parameters (temperature, supply voltage, supply current, bias voltage and RF power) – however it should not be relied on to prevent damage to the PA caused by overdriving it, or power supply failure, as the response time is too slow.

The monitoring functions are more for confidence that everything is working as it should, however if any parameter should exceed the safe limits as defined in the firmware the PA will shut down.

For example if the PA is too hot or the Idd too high or Vdd too high.

Currently the RF power indication is calibrated for a simple 1N4148 detector diode attached to the isolator reflected power load which is a -30dB attenuator. Thus any reflected power is measured and safely dissipated. The accuracy of this measurement is not guaranteed as it is not temperature compensated plus there will be uncertainty with regard to the -30dB attenuator and other factors – nonetheless it will provide indication of any issues with the antenna match.

Temperature measurement options

To select a given temperature measuring sensor, there are two user selectable links (LK3 and LK4) which are intended to be solder bridged to select one of three temperature measuring modes (Mode 1 thru' 3).

Mode 4 with both LK3 and 4 in place sets the unit into slave mode.

No solder link in place = 1
Solder link in place = 0

Mode	LK3	LK4	Operation
1	1	1	Master LDMOS PA using thermistor for temperature measurement
2	1	0	Master LDMOS PA using 10mV/F sensor (LM34DZ)
3	0	1	Master PJ PA using either built in or external 10mV/F sensor (LM34DZ)
4	0	0	Slave mode no temperature sensing device needed.

Note several temperature sensor options are possible with mode 1 using an inexpensive thermistor sensor likely being the most popular and the look up table can be adjusted as required to match the thermistor.

Modes 2 & 3 use the same sensor as in the Pyro Jo PA but it costs £3.18 plus VAT as it is laser trimmed for accuracy and requires no calibration. However due to its lower output voltage and resolution of the ADC the displayed temperature will change in 0.2 or 0.3C steps there may also be a small temperature offset caused by the 5V ADC reference not being exactly 5V, typically +/- 50mV which is actually better proportionally than the internal atmega 328 ADC reference.

Communications protocol for the radio link

The radio link uses an nRF905 and Atmel nano – this solution is a copy of this design ***http://blog.zakkemble.net/nrf905-avrarduino-librarydriver/comment-page-1/*** but with minor code changes. It is very easy to build / modify using the Arduino environment.

Basically it provides a wireless UART link running at 4800 Baud and can operate in either the 433MHz, 868MHz or 915MHz bands. The nRF905 modules as supplied are tuned for the 433MHz band, if operation in any other band is required the matching components will need changing.

Within the wireless UART Arduino sketch, the baud rate, unit address, power output and operating frequency are easily set. My firmware originally set the frequency to 433.900MHz which is a popular frequency and as a result there were collisions with other devices, so I changed to frequency to a less popular one but still inside the 70cm band.

The only minor code change required is to remove the "TO" time out message being sent. If this line is not commented the atmega 328 thinks the link is still good as it's getting traffic.

Comment out line 110 as per below:

```
if(timeout)
// Timed out
        {
                Serial.println(F("TO"));
                break;
        }
```

Wireless Serial Link Arduino code is found here: ***https://github.com/zkemble/nRF905/tree/master/arduino/nRF905/examples/wirelessSerialLink***

The protocol between the MASTER and SLAVE is very simple it relies on a 'heart beat' of either 250mS or 15 second interval generated by the MASTER. When the system is dormant (ie slave controller turned off) the heart beat from the MASTER is every 15 seconds to minimise radio traffic. When the system comes out of dormant mode (effectively off) and enters either standby or transmit mode the heart beat changes to every 250mS to give a more real time response.

This means at power up the MASTER sends the status of all its parameters as an ASCII string over the radio link and updates its LCD then periodically (every 15 Seconds) while in OFF mode repeats the transmission .

If no response is received from the SLAVE within 3 seconds it assumes no RF remote control and defaults to monitoring the coax voltage. It continues to beacon every 15 seconds.

At the SLAVE end if a valid message is received from the MASTER then the parameters are displayed on the LCD and the SLAVE replies with either ASCII 'O' for off, 'S' for standby or 'T' for transmit.

There are two toggle switches on the SLAVE one for standby on / off and another for transmit on / off.

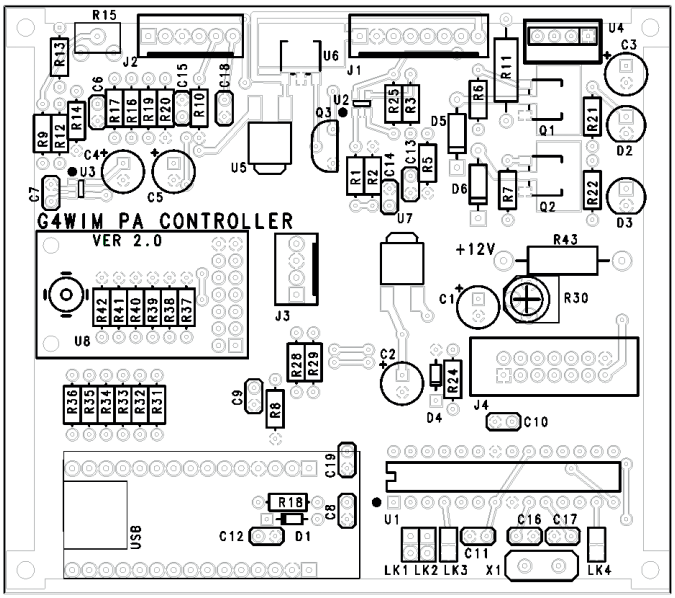
On successful reception of the command from the SLAVE the MASTER acts accordingly based on which character is received and sets the heart beat to 250mS so increasing the response and LCD update frequency.

If the SLAVE should fail to receive a valid signal from the remote end for more than 3 seconds it displays "No PA Connection".

When used in standalone MASTER mode and the controller is in OFF mode the display is updated every 15 seconds. Once the unit is set to standby or transmit the heart beat update rate changes to 250mS much as it would if the SLAVE was in operation.

All UART communications are interrupt driven and derived from the master 250mS interrupt timer in the MASTER PA unit. Thus when MASTER and SLAVE are working together changing the timer in the MASTER unit also affects the response time of the SLAVE.

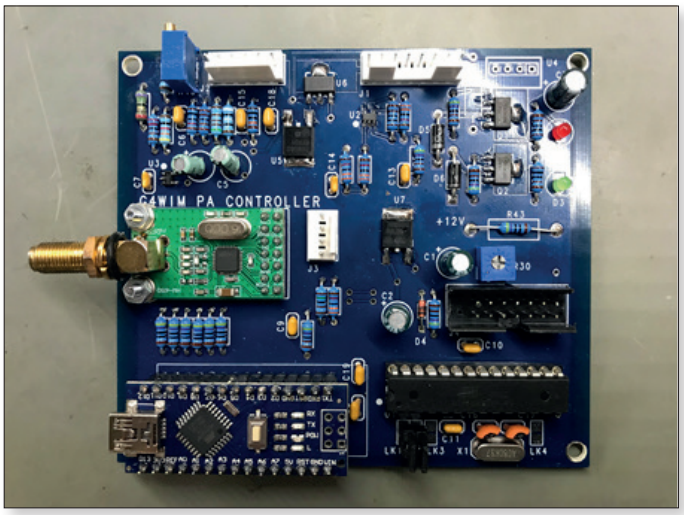
Circuit description



There is nothing novel in this design, more a collection of apps notes and other information available on the web, so I'm not going to go into great detail.

As the design is a composite it is not as integrated as it could be – for instance there is a dedicated Atmel Nano controlling the nRF905 and an Atmel 328 monitoring and controlling the PA. This means that removing the nRF905 and Nano does not affect the operation of the 328 when working as a stand alone MASTER in the shack.

The LCD is driven in parallel mode which consumes seven IO pins rather than using the TWI interface (the R/W is not actually used in this implementation). The reason for using parallel is the TWI interface blocks two of the ADC inputs on the 328 and LCD 'bit banging' was too slow.



A more integrated design would use a single 328 for both the nRF905 and PA control combined with an external analogue mux for the ADC.

The LDMOS bias is an exact copy of the Ampleon reference circuit.

The main PSU on/off relay also powers on a 120mm AC cooling fan which runs all the time when in transmit or standby modes – primarily to draw cool air into the PA enclosure.

When the MASTER is off 240V AC is fed to a small heater which keeps damp at bay.

This relay also has a second pair of NC contacts to remote control a Meanwell PSU if that brand of PSU is in use.

The 12V supply for the MASTER control logic should be rated at 2 amps or more to provide sufficient current for any 12V DC cooling fans and or external PA pre-drivers in use.

The PA current sense is across a 0.01 ohm resistor and each ampere through it causes U2 to generate 10uA of sink current – thus 10A makes 100uA sink current or 3.3V across R2 at the ADC input.

The ADC is set up for a 5V reference or 4.88mV per bit – thus for example 10 Amps equates to a count of 676.

Note *– the use of an 8MHz crystal on the Atmel 328 is mandatory to ensure the UART works reliably over the entire temp range. The internal 8MHz RC oscillator of the 328 may work ok at ambient but will fail over the extended temperature required.*

So if you're programming your own 328 remember to set the fuse for external 8MHz crystal and no div 8.

Firmware

The code for the nRF905 and Atmel Nano is written in Ardunio and is available here. ***http://blog.zakkemble.net/nrf905-avrarduino-librarydriver/comment-page-1/***

The code for the Atmel 328 is written in C and makes extensive use of control flags and uses look up tables to handle converting the ADC readings to meaningful data.

The typical accuracy of Vdd and Idd measurements is to within 200mV and 200mA – if better accuracy is required then either the hardware needs trimming or the look up table adjusting.

As mentioned above temperature measurement is accomplished by one of two methods with the 10mV/F being the most accurate.

The cooling fan on / off thresholds are easily set in the firmware, typically PA over temp at 65C and recover at 45C. See appendix A for details.

Build Instructions

I'm not going into the minutia of how to build this system, but will point out a few salient issues and lessons learned.

- The design is predominantly through hole for ease of construction and reliability.
- Surface mount parts are only used for the voltage regulators, power switches, and op-amps – best to install these first.
- All other passives are through hole.
- Note, for space saving some parts fit under the nRF905 so fit these first as well.
- It is also suggested the Atmel Nano and Atmel 328 are fitted to the PCB by means of IC bases such that they can be removed for re-programming as new features are added to the firmware.
- The 0.01 ohm current sensor resistor is mounted on external solder tags to handle the current and temperature rise.
- The SMA connector on the nRF905 can be changed to a right angle type to ensure it fits inside a die cast box.
- The MASTER bias temp sensor transistor may need some RF filter components if it is exposed to high RF field strengths. Failure to filter this part may result in the bias voltage increasing with increasing RF power thereby defeating the purpose of temperature compensation.
- With the above RF issue in mind I would recommend installing the MASTER PCB in a filtered die cast box with no LCD fitted.
- The full bom and options are on the BATC wiki.

Support

It is assumed that anyone building this design is familiar with micro controllers and C and will be able to understand / modify the code to fit their needs.

Due to other commitments I will not be able to customise the code for individual users but will as time permits fix any bugs found and add extra features such as RF power limits. The code is built using Atmel Studio 7.0 with optimisation set to -0s, and fuse settings for external 8MHz crystal and no divide by 8.

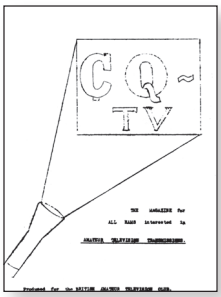
The code should build with no errors or warnings.

Turning Back the Pages

A special anniversary look at CQ-TV over the last 70 years

Peter Delaney - G8KZG

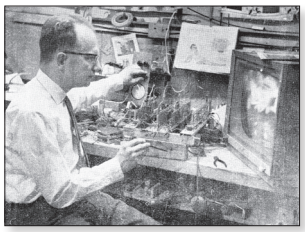
BATC was formed 70 years ago. To save Mike Barlow, the founder, from having to keep writing out the same details to help each member wanting information, he began sending 'Circular Letters'. However, for these to go from one member to the next took quite a while, and so the idea of a CQ-TV magazine sent to all members at the same time came into being in the October of 1949. The editor introduced it by saying "Hi there OMs, here is number 1 of what I hope will be a series of issues of your mag. Note that I say your mag - well, so it is… I'm sorry this has taken so long to be produced, but I've had some trouble in obtaining spares for the duplicator." Mike added that the time between each issue of the magazine would "depend on how much material you blokes send in … please note that I must have contributions from every one of you - what you are doing, how and why you're doing it, results obtained, etc. A few notes, an article, circuit diagrams, photos… so ring write or QSO anything you have".



That first edition had a report on the trade exhibition held earlier in the year at Olympia, where Marconi demonstrated one of their new 625 line cameras, but they had altered it to work on 405 lines so as "not to embarrass the B.B.C…" (who were the only broadcast tv channel in Britain at the time, and using the 405 line system broadcast on the vhf band). The magazine also had 'news from members', under the heading "What the other bloke is doing".

Very few amateurs had a television camera at that time, which is not surprising as the magazine mentioned that camera tubes at the time cost around £660 - (around £23,000 at today's values). Surprise was expressed that, considering that expense, the design of a professional camera at that time did not include a circuit to inhibit the camera tube supplies should the scanning circuits fail. The first issue also included an 'activity map', with members from Plymouth in the south west to Merseyside and Flamborough Head in the north of England, although licences were not yet available to allow amateurs to transmit 'fast scan' television in Britain.

Mike Barlow was to edit the first 35 issues (Alwyn Sockley assisting with the last of those), until John Tanner took over for issues 36 to 50, and so it fell to him to write, in CQ-TV 41 "This edition of CQ-TV marks the tenth anniversary of the magazine. The first edition was published in November 1949 and consisted of several duplicated sheets stapled together. Since then the club has expanded and the circulation of CQ-TV has increased from under 20 copies to around the 600 mark. It is hoped that sometime next year CQ-TV will take on a 'new look' and appear as a printed publication. The number of editions per year is limited by the amount of material available for publication, so if you could find time to write a description of some item of equipment, then each edition could be enlarged or an extra edition published." (Some things never change!). In mentioning the Radio Hobbies Exhibition, John commented that the first of a series of technical publications would be available (this one was on the basics of slow-scan television), and that "in due course a complete series of these publications will be available to enable club members to obtain information on different subjects without having to refer to back copies of CQ-TV". (These were the precursor to the popular club 'handbooks').



The front cover had a picture of Professor Henrik de Waard, one of the club's founder members, helping with the testing of the timer unit for a 'BATC sync generator', designed by Mike Barlow that formed the major technical article. The block diagram (Fig 1) showed the idea, with

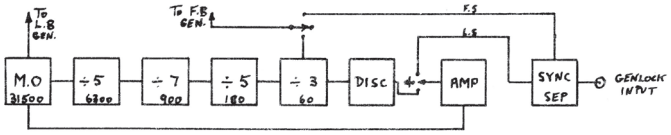


Figure 1: Block diagram

values for 525 line 60 field working (Mike was by that time working in Canada), but details were given for 625 or 405 line 50 field working as well. The divider stages were formed of step counters (Fig 3), in which each incoming pulse passed through the diode to charge

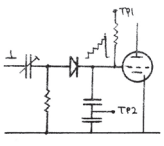


Fig.3: Typical step counter showing alternative test points.

the capacitors until the voltage stored on them caused the valve (transistors had yet to appear in CQ-TV) to conduct and discharge the capacitors.

The back cover carried a 'newsflash', relating to the 'First Transatlantic Amateur Television Transmission'. This had taken place on November 22nd 1959, at about 3 pm, when 'Pluff' Plowman, G3AST, received a direct slow scan transmission, via 29.5 MHz short wave. The signals were recorded onto magnetic tape. Although the picture quality was described as 'poor', the tuning wedge and WA2BCW's callsign could both be recognised, and the event was said to be an "all-time ATV first" and "a milestone in the development of amateur television activity."

The 'What the Other Chap is Doing' page had reports from members in Brentwood, Cambridge, Chelmsford, Devon, Essex, Bristol, Ross-on-Wye, St Albans, Welwyn Garden City, and Yeovil - and from Cyprus, France, Ghana, New York, Nigeria, Ohio and Western Australia - the 600 members were widely spread around the globe!

Production had slipped somewhat during the next decade, so that by the time of its 20th birthday in November 1969, CQ-TV had only reached number 68. The editor since issue 61 had been Andy Hughes but due to work taking Andy abroad, this particular edition was edited by Mike Bryett. Of the 18 pages inside, one was the committee list, and 12 of the rest were contributed by John Lawrence, GW6JGA/T. These included the first of his 'Circuit Notebook' series, which was to run to over 100 articles - always practical and useful ideas and circuits. The topic for this article was 'Mixed Syncs', making use of a circuit that generated a pulse shorter than the pulse driving it. Fig 1 showed the idea, and the waveforms involved. John then showed a practical application in Fig 2 using a pair of these to produce the front porch and line sync pulses. The waveforms were at Fig 3. The input at 'a' had the negative going edge at the start of

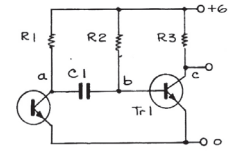
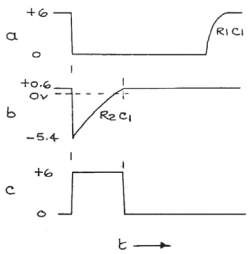


Fig 1.



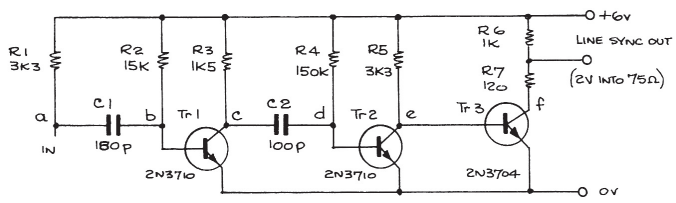


Fig 2.

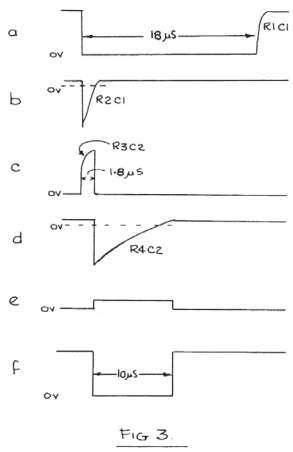
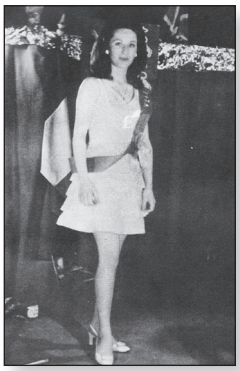
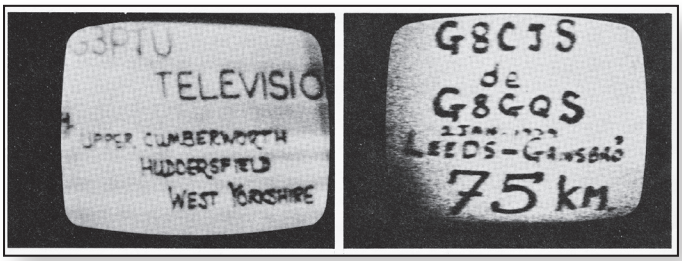


Fig 3.

line blanking. The output of the pulse narrower formed of R1, R2, C1, Tr1 and R3 would produce a pulse at 'c' - the falling edge being the end of the front porch. The second pulse narrower, formed of R3, R4, C2, Tr2 and R5 then used this falling edge to produce a positive going line sync pulse at 'e', which was then inverted to produce the output at 'f'. There was also a report of an International Convention of Amateur Television at Armentieres, in northern France - at which 'Miss Amateur Television was photographed.



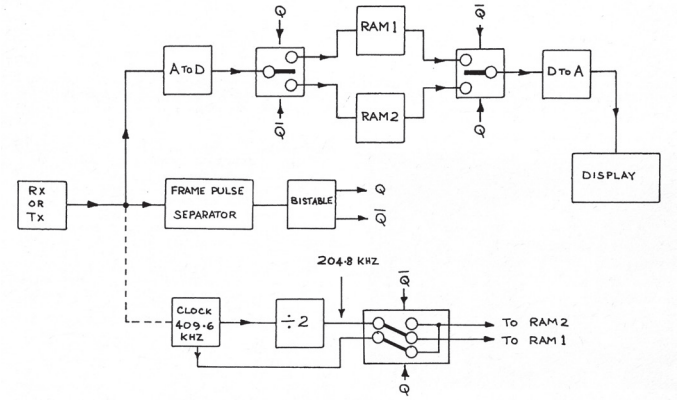
The 30th anniversary came with CQ-TV 108 in October 1979 - which was to be the penultimate one edited by Andy. The regular "TV on the Air" column, compiled by John Wood, featured screen shots of picture exchanges by amateur stations in Yorkshire and Lincolnshire.



On the left is that received by G8CJS in Leeds from G3PTU in Huddersfield, whilst on the right is a similar transmission sent to G8CJS over a 75 km path from G8GQS in Gainsborough. The exchanges were made on 70 cm, G8GQS using a 4CX250B as the final amplifier stage. David Long, G3PTU, had also written to suggest a repeater for amateur television could be established in the 10 GHz band - very forward thinking for the time. Trevor Brown, G8CJS, went on to become the BATC Chairman for many years, whilst G8GQS became (and remains) the Club's Treasurer.

Narrow Band Television was 'the preferred name for low definition tv' wrote Doug Pitt, a keen user of the mode. The advantage was that it used a much reduced bandwidth to transmit pictures (long before the present 'reduced bandwidth' modes were developed). One of its disadvantages was that by reducing the picture repetition

rate, there was a noticeable flicker. Doug noted that cinemas overcame this by having a shutter interrupt the light path so that a stationary picture flashed on the screen several times. The eye and brain interpreted this as being a picture of higher repetition rate, and so the flicker effect disappeared. His proposal was to create a similar effect using computer memory. One bank of RAM would be in write mode whilst the other was read out twice,



creating the illusion of double the frame rate - or even developing it to produce four times the picture rate. Also in this CQ-TV 108 (which, like 68, did not mention the 'birthday') was an update to the P100 project, named after the CQ-TV that the design first appeared in. This was a sync pulse generator designed by Tom Mitchell, using the then new TTL ics, for which pcbs were made available to members through 'Club Sales' - a facility that was to grow to offer a range of specialist boards and parts over the next 25 years.

Andy was followed as editor by Lewis Elmer and Mike Crampton, who each produced one issue, before John Wood took over from CQ-TV 112, with Mike Wooding as an assistant editor for a while. Mike then took over as editor with issue 144. He was able to give CQ-TV 148, the 40th birthday issue in November 1989, something distinctive - a full colour picture on the front cover. This

was an aerial view of Harlaxton Manor, in Lincolnshire, which was to be the venue for the forthcoming Club Convention the following May. There was also a colour signal reporting chart on the back cover, and the magazine also had more pages than usual - 88 A5 sized. The articles ranged from base-band video circuits, an explanation of the working of the image orthicon camera tube, computer applications for atv (caption generation being a popular use - handling full resolution live video was to be some way in the future), test equipment, rf circuits and atv 'on the air'.

Although transmissions on the 70 cm band were well established, moves were being made to higher bands, and detailed construction details

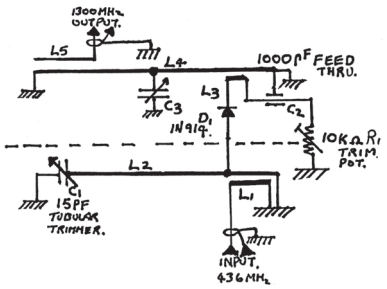


Fig.1 Equivalent Circuit.

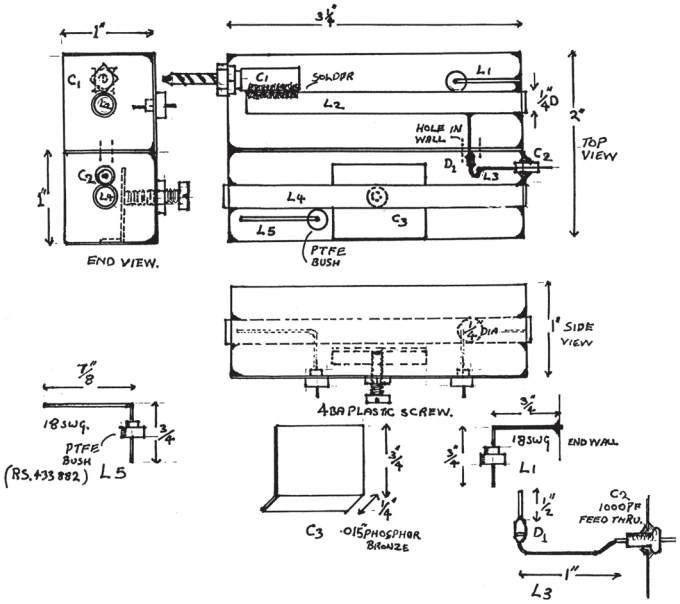


Fig.2 Construction Details

were given was a tripler circuit, which could take use a small crystal controlled 70 cm transmitter and output a test beacon signal on 1300MHz. As can be seen from the drawings, there were just 4 conventional components, everything else being fabricated from pcb material or sheet metal and tube.

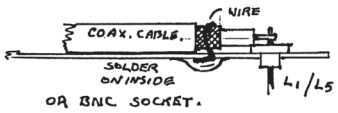
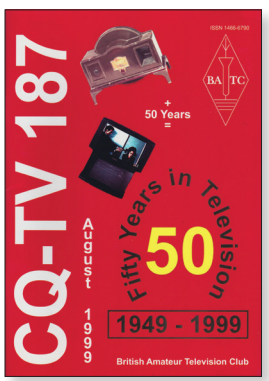


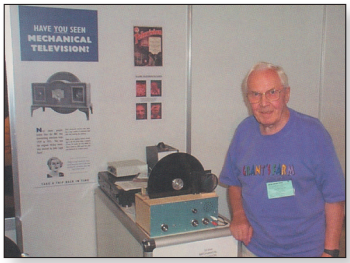
Fig.3 Input & Output Connections

It was during Mike's editorship that the magazine moved to having a full colour front cover (from CQ-TV 155) - largely paid for by selling the rear cover space (also, of course, able to be in full colour) for advertising. After editing issue 168, Mike handed over to Chris Smith for 4 editions, and Trevor Brown edited the next 5, before the long reign of Ian Pawson from issue 178. Ian changed the page size from A5 to A4 from issue 185, enabling diagrams and photographs to be reproduced to a larger size.

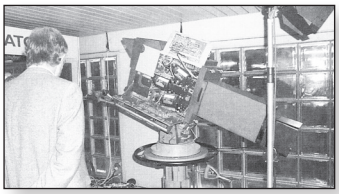


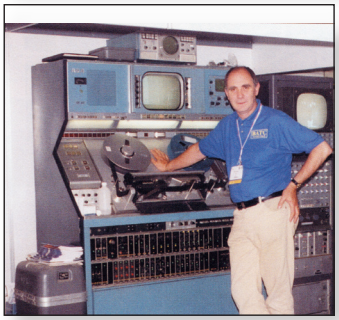
The Club was now approaching its golden jubilee, and this was marked by having a "Fifty Years in Television" cover for CQ-TV 187

in August 1999 - being 64 A4 pages made it the largest up to that time (and over budget!). Inside were given details of the Club Convention and 50th Anniversary Dinner to be held as "Shuttleworth '99", and the following issue (188, 50 years on from the first) reported on that event.

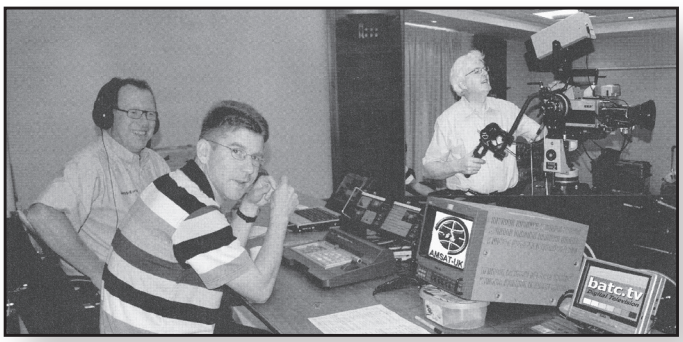


Amongst the displays was one on "Mechanical Television" put on by Grant Dixon. Grant had been the Club's long-serving first Chairman (who had remained on the committee until 1981). By the end of the 20th century, much circuitry was becoming miniaturised, and what used to take several chassis full of valves to do could be achieved in a micro-chip - but not every member was looking to 'keep things small'. Outside the exhibition hall at Shuttleworth were Richard Harris's ex BBC video recording truck (on the right), and parked ahead of it Paul Marshall's former Southern ITV full outside broadcast vehicle, built on a 36ft coach chassis, fitted out with Marconi colour camera channels etc. Although the British Amateur Television Club, it has long been respected in professional circles, and CQ-TV 188 also had a report on that year's International Broadcasting Convention, held in Amsterdam. The Club had mounted a display - Grant showed his 32 line mechanical televisor, and a four tube Marconi Mk 7 colour camera - by then over 30 years old - attracted a lot of interest. The 'piece de resistance', though, was a fully working ex broadcast RCA quadruplex video recorder, which used 2" tape. Trevor Brown, the Club Chairman, is seen stood alongside it - which will give some idea of the size (and weight) of it - and the logistic challenges in transporting it to and fro, never mind the hours spent in restoring it to working condition.





Ian remained editor until issue 215, when Brian Kelly took over for 4 issues, and then Chris Smith returned for a longer spell holding the editorial pen, from CQ-TV 220 to 240. By the time of the diamond jubilee in 2009, the magazine was being printed on a better quality paper, which gave a much better reproduction of the diagrams and - in particular - photographs. Issue 225, in the February of that year, had "Happy Birthday 60th" on the front cover, information about the celebratory event to be held that summer, and number 100 of John Lawrence's Circuit Notebook series. Issue 227 had a photograph on the front cover of the 'ceremonial cutting' of a special 60th birthday cake made by Jill Marshall. The Club had also been represented at a recent AMSAT Colloquium, in which not only was amateur transmission through satellites discussed, but BATC was able to televise it, via the internet, to a world-wide audience. (and generating 'goodwill' with other parts of the amateur radio community at the same time). Graham Shirville - for very many years BATC representative on 'spectrum matters', is seated on the left, and Brian Summers, BATC Treasurer is on the right (with an AMSAT member, Ivo Klinkert, seated at the desk). At that event, a feed was taken from Tilman Glotzner's Quadrocopter - a radio controlled flying camera platform. BATC members have long been ones to experiment and innovate, and this pre-dates the present 'craze' for camera equipped drones. But BATC was much more 'forward thinking' than that! CQ-TV 127 carried a report of the Club Convention at Crick in 1984, at which Brian Parkin, G1EGD, displayed his home-brew



model helicopter, with a miniature TV camera and 70 cm transmitter. Nobody there suspected how that idea might take off in the future.

The issue of the magazine that came 60 years after the first, 228, had a memorable picture on the front cover. Back in the winter 1958, the BATC outside broadcast vehicle 'Matilda' was featured on the BBC's Panorama programme, and in November 2009, Paul Marshall was featured on the BBC's Antiques Road Show programme, showing some of his collection of Marconi cameras.

Following Chris Smith's tenure, the next edition, 241, was edited by Noel Matthews and Dave Mann, and then Frank Heritage, the current editor, took over from number 242. Improvements in printing technology now enable the magazine to have colour throughout, and is a professional looking publication, with clear diagrams, covering a wide range of television related topics. In its early years it was all valve based circuitry, but the Club has kept up with - and sometimes led - developments, and software as well as hardware feature in CQ-TV's pages. Over the years, on-air matters and contests, video and rf circuits and techniques have been regularly covered, as well as the history and restoration of vintage television equipment. Searching the pages will also find coverage on 'non-electronic' aspects of television as well, such as the optics in front of the lens, or the graphics of test cards and the like.

One aspect of CQ-TV, though, remains unchanged from issue number 1. It cannot exist without input from BATC members, so, just as Mike Barlow wrote 70 years ago, the current editor might still say "please note that I must have contributions from every one of you - what you are doing, how and why you're doing it, results obtained, etc. A few notes, an article, circuit diagrams, photos… so ring; write; email or QSO anything you have!"

All CQ-TV issues from number one are available for download at https://batc.org.uk/cq-tv/cq-tv-archive/

ATV at Chalon-sur-Saone fayre

On September 7th a meeting of the different associations (dance, sports, art, scientific and so on…) from Chalon-sur-Saone in Eastern France took place. As five of us (F1UPU, F4CGD, F1EFW, F5PJG and F1AMU) are ATV operators we decided to demonstrate ATV.

We showed digital mode on 2396 MHz with an Adalm-Pluto transmitting with DATV Express a video signal from a Logitech Cam C922, a RTL-SDR V3 and SDRAngel receiving at 690 MHz and up to 2396 MHz by transposing with an Outernet MoRFeus @1706 MHz. During the demonstration, the Mayor of Chalon-sur-Saone, visited our project of teaching these advanced technologies to the students located in our city and around.

Beside this event, we are studying actually the different ATV modes (specially the digital one). I've made a special course in our club, F6KMF, to understand how all of that is working. For this year 2019-2020, we will teach this mode at our members and study the implementation with GNURadio, as example.

As an aside, F1UPU and myself, F1AMU, are implementing a stand alone amateur station which transmit in COFDM (DVB-T) mode on 2396 MHz (in progress).

To conclude, the next step is to be associated with the local webtv, ChalonTV, to show via QO-100 the members' experiments of a meeting named "The Science Town", on the 9 and 10 of November 2019.

The British Amateur Television Club

Out and About

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

2019

27-28 September	National Hamfest	www.nationalhamfest.org.uk
11-13 October	RSGB Convention	https://rsgb.org

CAT19 - South UK - Saturday November 9th

Didcot. See BATC Forum for full details.

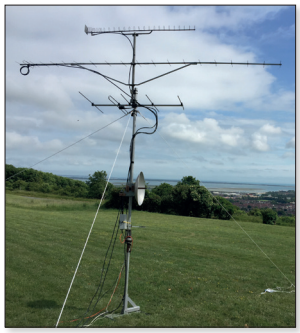
2020

9th August	FRARS	www.frars.co.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 Weekends

1200 UTC 19 October 2019 – 1800 UTC 20 Oct 2019 – all bands

1200 UTC 16 November 2019 – 1800 UTC 17 Nov 2019 – all bands

1200 UTC 14 December 2019 – 1800 UTC 15 Dec 2019 – all bands

Activity Contests

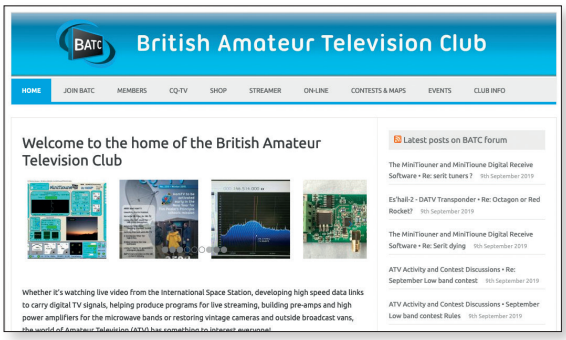
0001 UTC 21 December 2019 - 2359 UTC 1 Jan 2020 - Christmas Repeater Contest

1200 UTC 14 March 2020 – 1800 UTC 15 Mar 2020 – BATC High Band Contest

1200 UTC 13 June 2020 – 1800 UTC 14 Jun 2020 – 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/



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