



The British Amateur Television Club

CQ-TV

No. 255 – Spring 2017

The Portsdown Project

The Portsdown so far...

A user's experience of the build

Portsdown Filter-Modulator Board -
Construction and Testing

Portsdown Filter-Modulator Board
Modifications

**ATV on TV - The day TX Factor
came to visit**

G8LES Link Video recorder integration

GB3ZZ Experimental Inputs

**Es'hail-2 Ground Segment
Planning Meeting**

A high performance ATV upconverter

... and all the regular features

The BATC Shop

<https://batc.org.uk/shop/>



BATC DTX1 Digital TV Transmitter

MPEG-2 encoder and DVB-S modulator

- ▶ Self contained unit - computer not required.
- ▶ Composite and S-video input
- ▶ 2 audio channels
- ▶ Single PCB design
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- ▶ Size: 165mm wide; 120mm deep; 55mm high
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- ▶ -5 dBm output
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- ▶ RS232 control port
- ▶ Includes TS Dock PCB free of charge!



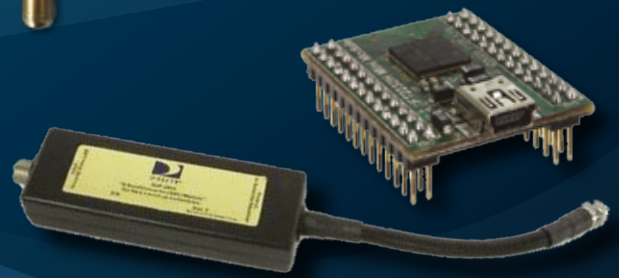
Available from BATC shop

- ▶ DTX1 DATV transmitter PCB complete with case and front panel
£459 including postage

Specification subject to change without notice

▶ The Portsdown Project

- ▶ Filter Modulator - Blank PCB and ready Built
- ▶ Preprogrammed SD card
- ▶ Local oscillator filter - blank PCB
- ▶ 4-Band decode - blank PCB
- ▶ GPIO breakout board - blank PCB
- ▶ MiniTiouner USB receiver
- ▶ Blank PCBs for BATC projects
- ▶ Hard to get components at cost plus prices
- ▶ Programmed USB modules
- ▶ 70cms upconverters



... plus: Renew Membership and Badges & Sundries

<https://batc.org.uk/shop/>



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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.

From the Chairman...

Wow, 2017 has been pretty busy so far in BATC land!

Since launching the Portsdown transmitter project in the last CQ-TV, the team have working nonstop to finish the software, design yet more boards and get the parcels out to you! In fact, in just 3 months more than 100 users have bought parts and we shipped over 150 orders in March alone! In case you missed the original article and wonder what all the fuss is about, we have printed a summary article in this edition of CQ-TV.



► Finningley Radio Club

We have also found time to organise CAT17, when we will be going back to see our friends at Finningley Radio Club near Doncaster – there will be a program of talks, member's flea market, a demo and test area and this year we will run Portsdown clinic and construction and coding competitions! We'll be publishing more details in the next CQ-TV but it will be great to see all of you again and in particular the new members who've joined us recently.

As many of you know, we have been considering updates to our web presence for a couple of years but have been unable to find the suitable development effort (either volunteer or contractor) to produce a replacement site. The good news is that in January we contracted Inspya Developments to build a new site to replace the main BATC website, the shop, the members' database and members' forum. The site is under development and uses Wordpress and a number of well proven modules such as woocommerce to give us the functionality we require and should be ready for release during April 2017. This will affect all members so please take to time to read the article in this edition of CQ-TV describing the changes.

Despite of all this going on, several of us found time to get on the air during last weekend's activity days and had some great QSOs using DVB-S2. This has the potential to enable us to run full HD on 146 MHz particularly now

Noel Matthews - G8GTZ



we now have an increased power limit of 50 watts ERP – don't forget to apply for your new NoV asap. It was also great to see a number of new call signs on the air and to see activity from 146 through to 10368 MHz.

And make sure you watch TX Factor episode 15 – there's a great piece on ATV including the Portsdown transmitter and the Bristol ATV group using GB3ZZ. TX Factor is watched by the wider Amateur Radio community around the world and this video portrays ATV in a really positive way so will be a great introduction to our hobby – why not take it along to your next radio club meeting and show it and then introduce them to Portsdown – who knows, you could soon have a whole new group of ATVers in your area!

And finally on behalf of all BATC members, I would to wish Frank M0AEU, our editor, and Alison Page, a great day for their wedding on April 8th and send them our very best wishes for future happiness in their new life together. 📺

BATC Portsdown project

A great example of the Worldwide ATV community working together!

The BATC would like to formally acknowledge the team for all their hard work in making it possible.

Evariste – F5OEO

Dave – G8GKQ

Colin – G4KLB

John O'Loughlin

John - G7JTT

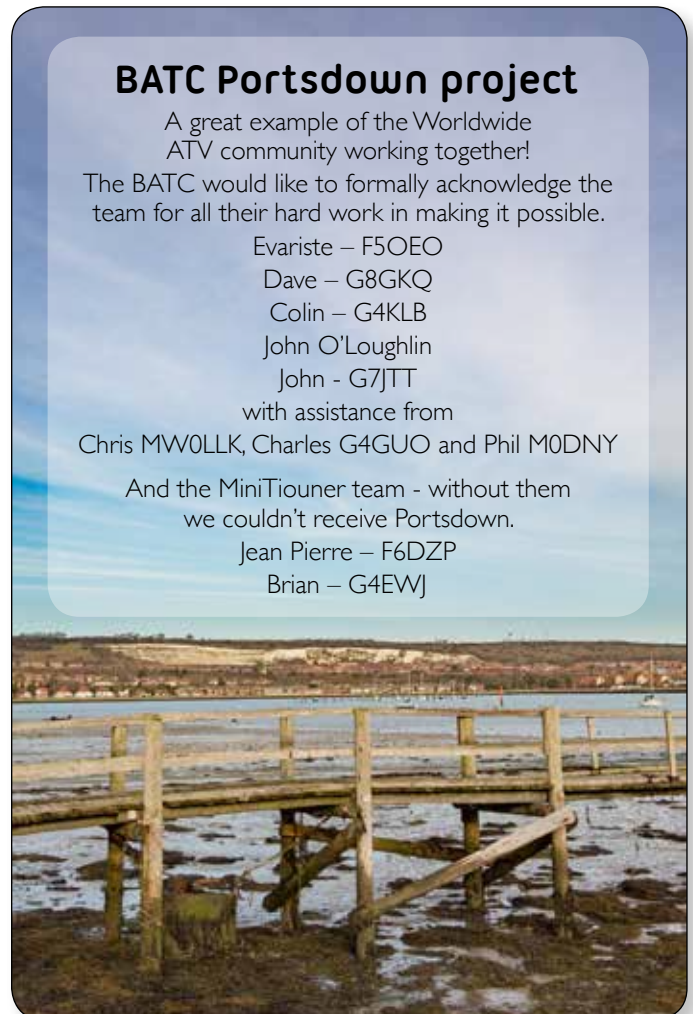
with assistance from

Chris MW0LLK, Charles G4GUO and Phil M0DNY

And the MiniTiouner team - without them we couldn't receive Portsdown.

Jean Pierre – F6DZP

Brian – G4EWJ





Members News

Dave Mann – G8ADM

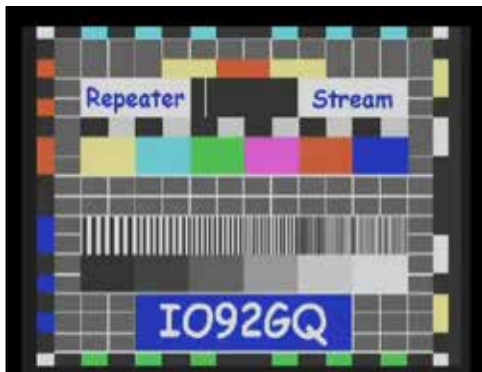
More news please

Please send news to me for the next CQ-TV via my email address shown at the end of the article.

Streaming Only Repeaters

We now have three new repeaters whose output is only visible via the BATC streaming service. These repeaters receive on various frequencies but do not transmit over the air. They can be seen on the BATC stream only. The advantage of this is that they do not need a licence from OFCOM and they can be setup and changed very quickly. Their input frequencies and modes are shown on their streaming page. Look in www.batc.tv click Repeaters and look for their QRA locator as a callsign instead of a G3XYZ etc. Currently we have:

IO9ILC	Located in mid Hampshire.
IO9IWN	Located in North London
IO92GQ	Located in Leicestershire.



If you would like to set up a Streaming Only repeater, please email the BATC committee or email me at my address shown at the end of the article.

To cross reference the QRA locator to a map, see:
<http://no.nonsense.ee/qth/map.html> or
<http://qthlocator.free.fr>

GB3BH

The repeater at Bushey Heath is getting more active with Dave M0SAT and Anthony G7LRQ now operational again. The repeaters 70cm digital input is currently not operational as the 70cm equipment is being updated. Now the weather is warmer this should be complete by the end of April.

RB-TV

The Portsdown DATV project continues to create great interest with a large quantity of kits now sold. See elsewhere in this issue for more information. We will be demonstrating the Portsdown at the Kempton Park Rally – see the rear cover of this issue for the rally details and dates.

Don't forget, as announced in the previous issues of CQ-TV, the cyber membership rates will be increased from April 1st to £8.00 per year with the option of two years for £15.00

That's it for now, please send me any news and information for the next CQ-TV before the end of May to g8adm@gb3hv.com, thanks. 📧

It is with great sadness that we learned of the sudden death of **André Ducros F5AD** who at the age of 72 suffered from a serious illness.

He has been a member of the REF since 1963 and he was known to all our amateur radio community for his numerous works and publications on all technical subjects and antennas.

His call sign is inseparable from the ATV history and activity <http://f5ad.free.fr/>

RIP André.



de François Muller F6AQO

Out now!

TX Factor Episode 15 has a feature on Amateur TV, showing the Bristol Group and the Portsdown Transmitter in action. Watch it now on YouTube

<https://www.youtube.com/watch?v=vUBcHmS9MIA>





Contest and Activity Weekend News

Dave Crump – G8GKQ

IARU Contest 10/11 June 2017

The most important on-air event of the year is the annual IARU ATV Contest which takes place over the weekend of 10/11 June.

The contest starts at 1 pm UK time on the Saturday and runs through until 7 pm on the Sunday, so there is plenty of time to get on the air. The rules allow for “roving” stations, so there is no reason why you should not operate from home on one day, and go out portable on another, or even use multiple portable sites. Just remember to use new 4-digit codes from each location. A quick recap of the rules:



The basic aim is to send a 4 digit code and have it successfully received.

Do remember that the numbers in the 4 digit code

should not be the same or consecutive: 4752 is OK, but 2345 or 2222 are not. The contest rules refer to times in UTC: this is Universal Coordinated Time (the abbreviation comes from the French translation which is internationally accepted). Many of us will know this as Greenwich Mean Time (GMT), which is the clock time in the UK during the winter, but one hour behind in the Summer when we use British Summer Time (BST). This is why the International Contest starts at 1pm and finishes at 7pm for us.

Contest reports use the P scale for reporting ATV signal readability:

The P report is followed by a sequential 3 digit serial number for the contact. For example for your first contact on 23 cm you might send the report P4001, and for the

	Analogue	Digital
P0	No picture perceived	No picture perceived
P1	Synchronisation with very little picture contents	Only occasional blocks visible
P2	Only large images (callsign etc.) perceivable	Sufficient blocks to read callsigns
P3	Picture noisy but some detail resolved	Some blocking
P4	Picture slightly noisy but with good detail and resolution	Occasional blocking
P5	Noise-free picture	Solid picture

second contact P5002. Start from one for each band; if you are unsuccessful in receiving pictures, you can send back a report such as P0003. This ensures that your attempt at a contact appears in the log.

The current rules in full are here:

http://www.batc.org.uk/contests/IARU_ATV_contest_rules_version_2015.pdf

and the logsheets can be downloaded from here:

http://www.batc.org.uk/contests/ATV_contest_log_-_ATV_yourcall_YYYYMMDD.xls

You will need to ‘enable macros’ so that the scoring functions will work.

This year’s contest is being judged by VERON, the Dutch Society, so we can expect strong competition from them. Whilst we may not be able to compete in terms of points, I would like to think we could be competitive in terms of the number of stations active.

The BATC will be awarding certifies for the Best DX using a Portsdown Transmitter, and the best Portsdown to Portsdown Contact; just put a note in with your entry

Please remember to submit your logs to me before Monday 26 June so that I can forward them to the Netherlands for International Adjudication.

Contest and Activity Weekend Calendar

1200 UTC 6 May 2017 - 1800 UTC 7 May 2017:

ATV Activity Weekend

1200 UTC 10 June 2017 - 1800 UTC 11 June 2017:

IARU International ATV Contest

1200 UTC 8 July 2017 - 1800 UTC 9 July 2017:

ATV Activity Weekend

1200 UTC 12 August 2017 - 1800 UTC 13 August 2017:

ATV Activity Weekend

1200 UTC 9 September 2017 - 1800 UTC 10 September 2017:

ATV Activity Weekend

1200 UTC 9 December 2017 - 1800 UTC 10 December 2017:

ATV Activity Weekend

1200 UTC 10 March 2018 - 1800 UTC 11 March 2018

ATV Activity Weekend

ATV Activity Weekend 6/7 May

Your best shot at testing all your equipment for the June contest will be to try it during the May Activity Weekend. Same times as the contest, just no need to exchange 4-number groups or submit logs.

ATV Activity Weekend 11/12 March - Report

Another good activity weekend with the following activity recorded:

Saturday:

Call	Location	Locator
G8GTZ/P	Near Bristol	IO81SJ
G8VPG	Near Bristol	
G3KKD	Cambridge	JO02CF
G1IXF/G1IXE	Near Bristol	
M0SKM	Dunstable, Beds	IO91RV
G0WFT	Dunstable, Beds	
G6AUR	Near Bristol	

Sunday

Call	Location	Locator
G8GTZ/P	Walbury Hill	IO91GI
M0DTS/P	North York Moors	IO94MJ
GW3NWR/P	Rhosesmor, North Wales	
G7JTT/P	Lane End, Hampshire	IO91JA
G4CPE	Upper Sundon, Beds	IO91SW
G3KKD	Cambridge	JO02CF
M1EGI	Barnsley, S Yorkshire	IO93GL
G8VDP	Barnsley, S Yorkshire	IO93GM
G8GKQ/P	Portsdown Hill, Hants	IO90LU
G0MJW	Harwell, Oxon	IO91IO
G4GUO	Worthing, Sussex	IO90ST
G7MNP/P		
G8LES	Alton, Hants	IO90ST
G4KLB	Bournemouth, Hants	IO90BR
M0LCR/P		
M0SKM	Dunstable, Beds	IO91RV
G3UVR	The Wirral, Merseyside	
G0WFT	Dunstable, Beds	
G8VAT/P	Beverley, N Yorks	IO93QT

On Saturday there was a flurry of activity in the Bristol area supporting a TXFactor feature on ATV. Also the Bedfordshire/Cambridgeshire area was busy with 70 cms RB-TV.

Sunday saw at least 19 stations active on 146, 437, 1255 and 10368 MHz.



► MODNY helping G8GKQ as received by G8GTZ on 146 MHz.

G8GTZ/P on Walbury Hill had a couple of 333 KS 32 APSK contacts on 146 MHz, as well as some RB-TV and DATV contacts on 10 GHz. Brian G4EWJ went out with G6NOI and operated as GW3NWR/P from Rhosesmor, North Wales on 10 GHz with some good contacts on both analogue and digital.



► M0DTS/P Operating Position

Further North, Rob M0DTS/P went out to his normal spot on the North York Moors and had a good day, working G8VDP and G8VAT/P. It's good to see some fresh callsigns in the activity listings!



► G8GKQ/P Operating position

On the South coast, G7JTT/P and I had the first ever Portsdown TX 2-way contact on 146 MHz. 📻



New and renewing members

Rob Burn, Membership Secretary - G8NXG

Historically, as many members would have commenced membership on January 1, this also means that there is an upsurge in subscription renewals around this time of year. Many long-standing members continue to support the

Club and I have also noticed an increase in new members – so thanks to all who appear in our welcome list below. This list covers the period December 2016 – February 2017. 📞

Australia		
Richard Condie	VK2FAFG	Australia
Peter Fauth	VK4NBL	Australia
John Fisher	VK3DQ	Australia
Alex Glinski	VK5ALX	Australia
Robert Loftus	VK2ADG	Australia
Raymond Murphy	VK2ME	Australia
Paul Roper	VK2KZO	Australia
Gary Shipton	VK2CRJ	Australia
New Zealand		
Robin Ramsey	ZL3TCM	New Zealand
Europe		
Richard Posch	OE6OCG	Austria
Eddy Depoortere	ON7PO	Belgium
Luc Halbach	ON6JY	Belgium
Alain Hoslet	ON4AH	Belgium
Leo Hucin	OK2UUJ	Czech Republic
Michel Amiard	F6ANO	France
Christophe Courtachon		France
Patrick Jacquemin	F6EXX	France
Bernard Laplaud	F5DDL	France
Auvray Michel	F1ETU	France
Richard	F5LLJ	France
Lepron Romain	F4HTU	France
Patrick Samson	F6GWE	France
Claude Sarroi	F1DIW	France
Klaus Hirschelmann	DJ7OO	Germany
Jens Schoon	DH6BB	Germany
Claudio Ariotti	IK1SLD	Italy
Marco Cocconcelli	IZ4ISK	Italy
Claudio Marega	I2NDT	Italy
Ottorino Odoardi	IZ6BMP	Italy
Frits Aden	PE1DWQ	Netherlands
Jac Brands	PE0TOR	Netherlands
Paul Veldkamp	PA0SON	Netherlands
Wouter Weggelaar	PA3WEG	Netherlands
Koert Wilmink	PA1KW	Netherlands

Magin Casamitjana	EA3UM	Spain
Terry Cooling	EA3EWO	Spain
Joan Pou	EFC3DBA	Spain
Far East		
Sontaya Kumsan	HS2KSP	Thailand
United Kingdom		
Richard Ainley	G7WIZ	Lincolnshire
Brian Alderson	G3KJX	North Yorkshire
Albert Allen	G4DHO	Staffordshire
Eric Allison	G4JNQ	Norfolk
Tony Ault	G3KTU	Hampshire
Trevor Baker	G4CLE	Lancashire
Brian Bambury		Worcestershire
David Barford	G8KBC	Lincolnshire
Richard Barnes		West Yorkshire
Mike Berry	G1LWX	Gtr Manchester
Andrew Boardman	G7ROM	Gtr Manchester
Paul Bolton	G4CXE	Norfolk
Jeffrey Borinsky		Gtr London
A S M Boyle		Cheshire
Neil Bradshaw	G6UWI	Tyne and Wear
Francis Breame	G8ISI	Hampshire
David Brocklehurst	G4VDB	Derbyshire
Keith Brooks	G0SPH	Cheshire
Phillip Brooks	G4NZQ	Norfolk
John Brown	G0PIA	Gtr London
Dunstable Downs RC	GB3TV	Bedfordshire
Francisco Costa	M0HOJ	Cambridgeshire
Peter Cousins	G4NJJ	Norfolk
Mike Cox	G8HUA	West Yorkshire
Philip Crump	M0DNY	Hampshire
David Crump	G8GKQ	Hampshire
R Dakin		Essex
Neale Davison		Gtr London
David Dawson	G1NEV	West Yorkshire
Andrew Dobson		West Yorkshire
Jeff Easdown	G4HIZ	Kent

Peter Eggleston	G8KGA	West Midlands
R Ellis		Cheshire
David Ellis		Merseyside
Gareth Evans	G4XAT	Kent
Philip Fahey		Gtr London
Sean Finch	2E0SAF	Gtr Manchester
Tim Forrester	G4WIM	Lancashire
Alan Gilman	G4GFD	Gtr Manchester
Andrew Glendinning		North Yorkshire
Norman Green		Gtr London
Malcolm Gregory	G0JYQ	Hampshire
Ray Groom	G4RKP	Suffolk
Barry Grylls	G4ZCN	County Durham
Christopher Hall	G6HTH	Kent
Graham Hankins	G8EMX	West Midlands
Philip Hardiman	G6HSS	Essex
G Harland		Dumfriesshire
James Harris	M0GUR	East Sussex
Antony Heasman	G8GJO	Gtr London
Peter Helm	G8AEN	Lancashire
William Hill	M1BKF	Norfolk
John Hoare	G3PJI	Buckinghamshire
David Hocking	G4FSS	Leicestershire
Chris Holloway	G0GGF	Norfolk
Ray Hughes	G8JBQ	Dorset
Adrian Hurt	G0OJY	Hertfordshire
Andrew Jackson	M1AAS	Merseyside
David Jefferys	G6IWZ	Gtr London
Brian Jordan	G4EWJ	Merseyside
David Kempen	G1NSV	Cornwall
Christopher Kentch	G0FJY	Devon
Mark Kinsey		Somerset
Kevin Knights	G7VNP	Suffolk
Leslie Lea		Oxfordshire
Mark Lee	G6FKN	Surrey
Howard Ling	G4CCH	Lincolnshire
Steve Liptrott	G4EGY	Nottingham
T Lockwood	G4HZN	South Yorkshire
Heather Lomond	M0HMO	Shropshire
Barry Lowe	G1UGJ	Norfolk
Trevor Lumb	G0ARU	Suffolk
Alastair Macarthur	NONE	Staffordshire
Alan Macdonald	M0VLT	Dorset
Peter Major		Somerset
Paul Marshall	G8MJW	Nottinghamshire
Hugh Mash	G8JAO	Worcestershire

Geoff Mather	G8DHE	West Sussex
John Matthews	M0PCM	Cornwall
Robert Christopher Maxwell	G8MKT	Staffordshire
M McDermott	G6NAD	Gtr London
Joseph Mcelvenney	G3LLV	South Yorkshire
R Meakins	G8HKN	Kent
Tom Mitchell	G3LMX	Buckinghamshire
John Morris	G6PEP	Oxfordshire
Peter Myers	G3UWT	South Yorkshire
Denis Nicole	M0CYJ	Hampshire
Michael North		East Sussex
J Oates	G3LZI	South Yorkshire
David Palmer		Norfolk
Howard Parker	G8GUN	Shropshire
David Payne	G8OBP	Leicestershire
Dave Perry	G6JIE	Bedfordshire
Ken Powell	G0PPM	Gloucestershire
Roy Powers	G8CKN	Hampshire
Ivan Prince	G6EZG	Humberside
Nigel Pritchard	G8AYM	Buckinghamshire
Barrie Procter	G8AWN	West Yorkshire
Keith Prosser	GW8TRO	Gwent
Alan Rademaker	M0LTN	Bedfordshire
Brian Roberts	G4VYG	Cambridgeshire
Leslie David Rooks	G3PUO	Lancashire
Duncan Rossiter		Gtr London
Andrew Rudd	G6MRI	Kent
Michael Scarlett	G4CAK	Bedfordshire
John Sim	2E0EDA	Kent
A Slade	G0IJN	Essex
Jim Smith	G7NTG	Northamptonshire
Art Smyth	G3XNE	Devon
C Stanners		Devon
Kenneth Stevens	G4BVK	Bristol
John Stockley	G8MNY	Gtr London
David Swale	G8ETS	Yorkshire
Dave Sykes	G0JOX	Nottingham
Terence Taylor	G8DQD	Bristol
Geoffrey Towler	G4NGS	Essex
John Tritton		Essex
Alan Turner	G0FMU	Gtr London
John Van Dyken	G0SPE	Gtr London
Steve Walsh	G8KUW	Bristol
Ian Waters	G3KKD	Cambridgeshire
K Wevill	G4UKW	West Yorkshire

Chris Wherrett	G4IIX	Yorkshire
Robert Whitfield	G8TSE	Merseyside
Bob Williams	G8MBU	Isle of Wight
P Wright	G3JDM	Staffordshire
D Wroe	G0MXD	Shropshire
Wales		
Brian Davies	GW4KAZ	Gwynedd
David Ellis Jones	GW8PBX	Gwynedd
Phil Longhurst	GW8BVI	Monmouthshire
Peter Mc Farland	GW7BZY	Anglesey
Petrie Owen	GW0KAX	Mid Glamorgan
Chris Tanner	MW0LLK	Anglesey
Derek Whitehead	GW3FDZ	Gwynedd
Scotland		
Pete Anderson		Orkney
Peter Dick	GM4DTH	Lothian
David Taylor	GM8ARV	Lothian

Canada:

A Critchley	
Luc Pernot	VE3JGL

United States:

Endaf Buckley	
William Frovik	N0MNB
Gary Grivna	K0GX
Kevin Hempson	KK6JPN
Robert Minnick	W8ARZ
John Muskopf	KI6IY
John O'loughlin	
William Thompson	N3DC

If you spot a mistake, please get in touch with the Membership Secretary. Similarly, if you have recently joined or renewed membership and expected to see your name here do get in touch.

AMSAT North America Phase 4 Ground Segment Project

Members maybe interested in the AMSAT-NA Phase 4 ground project. This is a project to develop inexpensive hardware for use with a Phase 4 B geosynchronous satellite. The satellite will have a 6 cm uplink and a 3 cm downlink. While the satellite won't be usable from Europe it will be using DVB-S2/S2X which means we should be able to re-use some if not most of their work. A secondary goal of the project is to increase general terrestrial microwave activity and to further that goal they are proposing to use DVB-T2, again something else we could use. Waveforms aside, the project should also lead to more affordable filters and amplifiers for the 6cm

band and filters, down converters and LNAs for the 3 cm band. The entire project is open source, they have already recruited some heavy hitters from the Amateur Radio world to work on it so it has every chance of success. Just as Amateur TV in Europe has benefited heavily from commercial practice I am sure we can benefit from what the Phase 4 ground team are doing, future generations of Hams will thank us. The team lead is Michelle W5NYV.

For more information see <http://www.amsat.org/?p=4945> and <https://github.com/phase4ground>

Thanks to Charles G4GUO for this update.





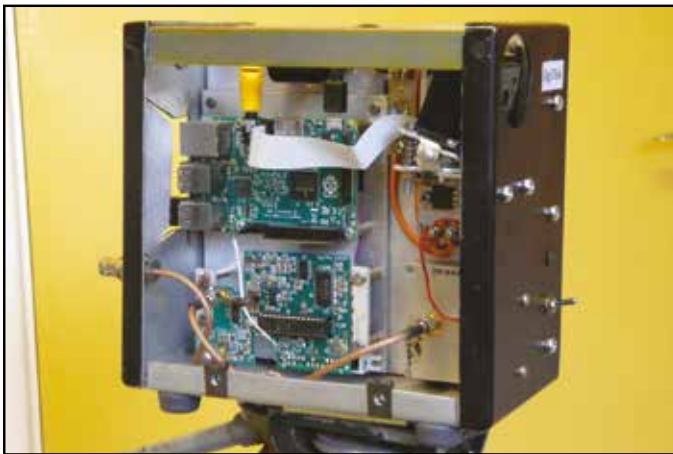
Packaging Digithin

Ian Waters - G3KDD

Digithin, the fore runner to the Portsdown transmitter, was a dedicated RB-TV transmitter based on the Rpi. In this article, Ian G3KDD suggests some ideas for mounting and packaging the Digithin which may also be used for the Portsdown transmitter - Editor

While the Digithin system, with the Rpi camera, is excellent electrically, mechanically it is rather fragile, inflexible and prone to damage, especially when used portable.

These pictures show a packaging arrangement, used at G3KDD, to overcome these shortcomings.



The Rpi 2 model B, connected to the digithin board by a ribbon cable, is housed in a small metal case. This also contains a local oscillator, a 5V regulator and the camera. This views through a hole in the front panel and is mounted on a small P&T head to permit some adjustment. All connections are via plugs and sockets on the back panel. The case has rubber feet for standing on a bench and a threaded bush to permit tripod mounting.



The output is a 70 MHz IF signal at +3 dBm. This connects to up-converters and amplifiers for transmission on 2 m or 70 cm.

A future improvement could be to feed the 12V dc supply via the IF cable.

I would like to thank Arthur G4CPE and Steve M0SKM for their help.

Pictures show interior arrangements, tripod mounting and installed in shack with 2m up-converter with 2W PA and PSU. 📷



The Portsdown Project

There has been a tremendous amount of interest in the Portsdown transmitter with components sold to more than 100 stations in 10 countries including the UK, France, Germany, Spain, Czech Republic, New Zealand, Australia and the USA.

Comments received include:

"Well done BATC... great service... Many thanks"

"I am most grateful to the BATC for producing this new project. I have been off the air for 25 years and intend to return as a result of this project."

"Looks good, just what I wanted to do back when I started with DATV but never got round to it!"

"Many thanks for providing these kit items."

"I am amateur since 1969 and TV'er since the 80's and some years ago I was a BATC member. Now, I have just rejoined and interested in the MiniTiouner and Portsdown project."

Because of this we thought it worth printing an overview of the project to date.

The Portsdown Digital ATV transmitter

Amateur Television has seen many changes over the last 20 years, particularly with the introduction of digital transmission and the availability of the 146 MHz band. The Portsdown transmitter is designed as a project for newcomers and those who were active on 70cms ATV in the 1980 and 1990's and are now looking to return to the hobby.

The Portsdown Project

The aim of the Portsdown DATV transmitter project is to enable an amateur radio operator with little or no knowledge of Digital ATV to construct the hardware elements, load and configure the software and use the system to send live Digital ATV signals across town on existing aerials.

The project involves some basic construction and is based around a Raspberry Pi with a touch screen, an external local oscillator and a filter modulator card. This card is available from the BATC shop as a ready built board or as components for DIY assembly. The outline specification of the project is as follows:

- ▶ Frequency coverage of the 146 MHz, 437 MHz and 23cms ATV bands

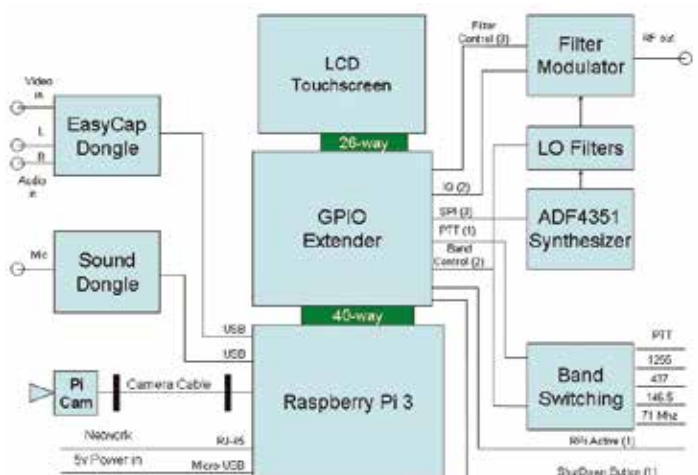
- ▶ Cost-effective stand-alone (not PC based) Digital TV Transmit solution
- ▶ Wide range of Symbol rates from 125 Ks to 4Ms covering RB-TV and DATV modes
- ▶ Modular construction enabling a step-by-step system build and easy trouble shooting
- ▶ Designed to encourage home construction requiring an average skill level
- ▶ Fully documented and supported including easy software installation and upgrades

The project provides an easy way to "get on air" with Digital ATV at a relatively low cost (approx £250) and is capable of all of the commonly used DATV bands and modes, enabling it to be used for cross town QSOs, accessing ATV repeaters and for working the DX using Reduced Bandwidth (RB-TV) modes.

We decided to give the name "Portsdown" to this significant project in order to recognise the valuable contribution the BATC's previous president G3PYB played in bringing DATV and RB-TV to the ATV community. In particular, it was at his QTH on the side of Portsdown Hill that a meeting was held in Spring 2015 to define the standards for Reduced Bandwidth TV.

The Portsdown transmitter

At the heart of the Portsdown project transmitter is a Raspberry Pi (RPI) version 3 computer running a BATC customised version of the F5OEO rpidatv software. The choice of the RPi is primarily due to the fact that it has an on-board MPEG-4 (H264) encoder and versatile hardware interface (GPIO) capabilities.



Whilst an external PC is required to initially configure the system, a Waveshare touch screen module available from Amazon enables the system to be used without further need to connect up a keyboard and mouse. If the LCD is not available, the system can be controlled in “console mode” using an external PC connected over a wired or wi-fi network.



The Portsdown transmitter will take video inputs from the RPi camera or an analogue video input as provided using an ezcapt type USB capture device – available for less than £10 from online auction sites. Audio input is provided by a USB sound card / dongle and the unit can play video files and test pattern JPEGs directly off the RPi SD card.

Digital modulator

The RPi is used to generate the MPEG bit-stream and the IQ signals, which are sent via the GPIO port to the Filter Modulator card, developed by Colin G4KLB and John O’Loughlin, and is capable of the wide symbol rate range required. This card has been specifically designed for the Portsdown project - blank and assembled PCBs are available from the BATC shop.



► Portsdown filter modulator card

Local oscillator

A local oscillator signal on the required output frequency is generated by a separate module. Whilst any clean oscillator can be used, the Portsdown RPi software is capable of controlling the ADF4351 module, currently available for around £20, to give an output for 146 MHz, 437MHz and 23cms.

Transmitter output

The output from the modulator card is at a relatively low output (+3 to +10 dBm depending on frequency)

and will require subsequent filters and amplifiers, depending on the band and power output level required. Many designs have previously been published and, whilst they will not form part of the Portsdown project, there are links to them on the BATC wiki.



As well as the main filtered output, the Portsdown software has a QPSKRF or “ugly” test mode which directly generates a DATV signal on 437 MHz using the internal RPi clocks. This facility is very useful for initial across the shack testing but has limited functionality and as its name implies, is not suitable for putting directly on air.

On air

The Portsdown transmitter has already been used to transmit full resolution digital TV pictures on TV repeaters and also was used to make RB-TV contacts on 146 MHz in the recent BATC activity day.

Next steps

This article was written as an overview of the project – for more details visit the BATC wiki pages at https://wiki.batc.tv/The_Portsdown_Transmitter and start reading the user guide.

The BATC wiki provides all the information about the project and practical help is at hand from the BATC forum which has a dedicated Portsdown topic.

In Summary

The Portsdown project aims to condense many recent RB-TV and DATV initiatives into one, easy-to-build and get on air project. It aims to bring DATV and RB-TV within the grasp of the average operator who still values some basic hands-on construction and is looking for a project which will deliver the capability to operate on all the commonly used DATV and RB-TV modes at a reasonable cost. 📺

The Portsdown so far...

A user's experience of the build

Mike Edwards – G8CPF



I was beginning to think that my SMD building days were over... 74yrs of age, failing eyesight, unsteady fingers, etc, etc. Then the BATC goes and presents yet another challenge, with even SMALLER pitched devices than ever before – The Portsdown Transmitter!

Well with not a lot better to do with one's days during the winter months, "in for a penny - in for a pound".

I had just successfully sold a pair of KT88s on Ebay, which would entirely fund the whole Portsdown project, so why not give it a go? As soon as the second batch of boards became available in the BATC shop, I jumped in with both feet to acquire one. The board arrived remarkably quickly (well done Noell!), and it was time to commit to getting all the bits to go into it.

The BATC team's decision to provide a Bill-of-Materials list for Digikey is a very helpful one, as it makes ordering the correct parts really easy, and the service from Digikey is second to none. Parts arrived within 3 days!

First sight of those 'op' amps was, I must admit, pretty daunting... the pin pitch on Digilite mixers were scary enough but these were "something else"! Having had some experience in trying to use solder of too large a diameter, and an iron with too large a bit to build a couple of Digilites, I needed to find some kit with more appropriate dimensions.

Fortunately, CPC do a nice little USB powered iron with a very fine tip that is just right for very small SMD components. It even has built in illumination.

<http://cpc.farnell.com/mega-power/msd-086/soldering-iron-5w-usb-480-deg/dp/SD01905>



The use of this iron, together with a good illuminated magnifier, and lots of patience, enabled me to (eventually) successfully mount all of the op amps without inter-pin shorts, or dry joints. Not without a scary moment - I thought I had wrecked one chip by slewing some pins out of line.

A bit of VERY careful 're-profiling' saved the day!

Colin G4KLB once gave some very wise advice... "walk away from it for a while when you get frustrated"! You will soon want to get back to the challenge after a coffee and some fresh air.

So with all of the other (easy) bits on, it was time to apply power for the first time. Always a worrying experience... Will it smoke?... or explode?... I tend always to put a current meter in line for first testing. Time to dig out the old Avo 8 with its built in trip, just in case there is a hefty short somewhere.



Fortunately, no smoke... the current draw looks reasonable and probing appropriate points with an oscilloscope suggests that all is well when hooked up to my trusty Pi2. Some functions were not available at this stage,

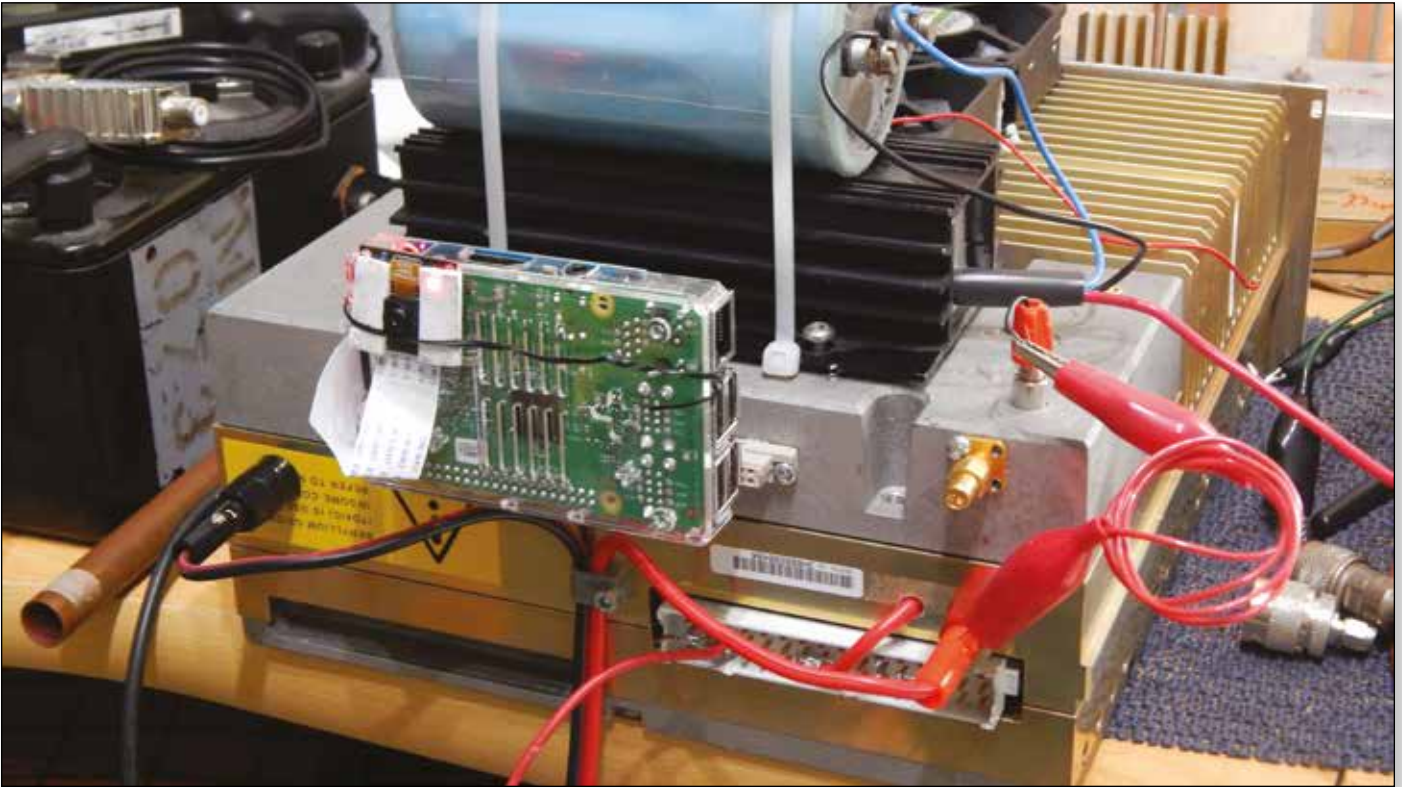
as the software was still under development, but, when driven from my Icom Handheld (via 40db of attenuation) as a LO source, it produces clean constellations on all symbol rates from 2000 down to 333, when being received on a Minitiouner Mk1.

Extended playing eventually ran the battery flat on the Handheld, so I plugged in the charger.

Immediately I noticed a significant drop in received MER value, and a noticeable spreading of the constellation dots around the circumference of the phase circle on Minitioune. 50/100Hz ripple on the power supply of the 'LO' was causing phase modulation of the source, which was degrading the signal quality. A clean power supply for the LO is essential!

Eventually a very nice synthesised LO arrived from China. It is understood that the output of this sort of device is a square wave, so it needs low-pass filtering to prevent unwanted artefacts.

A simple 2nd order LPF was constructed for the 70cm band using a small piece of double sided PCB, 2 x SMA sockets, 2 x 3 turn coils (home wound), 12pf variable cap, and 1 x Low C feed through. The feed through was fitted in the centre of the board, and the SMAs on opposite sides of the board. Coils connected each SMA to the feed through, being isolated from each other by the board.



The variable cap was fitted from the feed through to ground, and adjusted for a rollover of about 500MHz. Quite a clean response was obtained, and MER was even better.

Soon another little board arrived from the BATC. The multiband filter board for the LO – more SMD work! Who is to blame for the non-availability of 'decent' sized components? Well ALL of us of course! We all want our mobile phones etc to be small enough to fit in our pockets (let's not get into 'decent sized pockets!'). So more work for that brilliant little iron – just don't expect it to do large grounded connections... its heat capacity is very low.

Having had, for some years now, an unused Nokia TTRX lying around, I gave some thought about the possibility of building my new Portsdown into its nicely engineered case.

Finding that the main Portsdown board plus synthesized LO and its multiband filter would fit into the easily



removable cast aluminium case at the rear of the TTRX, I proceeded to mount a dual multiway socket in its rear wall, into which I can plug my newly acquired Pi3. It has been found that it is wise to power the Pi from a completely separate supply, as surges produced by switching the PA can cause unwanted re-boots.

So far my Portsdown/TTRX combination will produce approximately 20w of 'fairly clean' 2MS/s DATV on 437MHz – (still working to improve linearity and output power) – enough to just briefly open GB3ZZ for a few seconds the other day from a location only 10m ASL at a distance of some 45km. A mostly sea path where conditions have been noted to depend upon the rise & fall of the tide (2nd highest in the world!).

It would be nice if it was possible to get my second Pi to perhaps do the camera/codec processing and to send it as a TS to my Portsdown/TTRX combination, preferably over a peer-to-peer network for portable use.

Also, it would be nice for /p work to be able to send audio to the Tx via a Bluetooth headset. (Pi3 has built-in Bluetooth).

The Portsdown system is well worth having a go at. The boards are well thought out and of excellent quality – a joy to work with and, with care, will work first time.

Good luck with your build!

de Mike Edwards in Minehead – G8CPF 📻

Portsdown Filter-Modulator Board - Construction and Testing

Dave Crump - G8GKQ



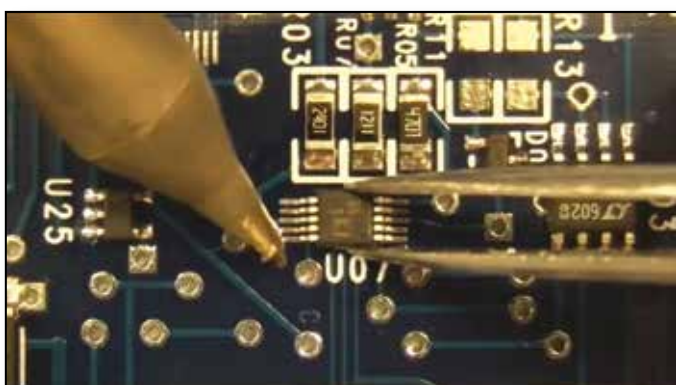
The major homebuilt module of the Portsdown Transmitter Project is the Filter-Modulator (F-M) board. Over 50 Version 1 boards have been sold in the BATC Shop, and although some of the surface mount components appear to be frighteningly small, construction of the board is well within the capacity of most radio amateurs.

How to Build It

Preparation. First make sure that you have the majority of the components. Use the BoM (Bill of Materials) file on the BATC Wiki to order all the components from DigKey or a similar supplier. Don't forget solder, solder wick and flux. There is no need to wait for every last resistor – you can start building as soon as you have all the integrated circuits. Order the components for the Version 1A modifications, so that you can fit these at build time.

Workplace. Set up your workplace with a clean bench area (so that when the surface mount components flick across the bench, you can find them). Make sure that the lighting is bright, and that you have some form of magnifier. Take anti-static precautions – the PCB, soldering iron, solder and you should all be safely grounded.

Education. Watch Colin G4KLB's excellent video (link below) on mounting surface-mount components, and perhaps practice a little on an old off-cut of PCB material.



Organisation. Print a copy of the component list and the layout and then identify all the components. Start by soldering the integrated circuits (larger to smaller) and then work your way around the board leaving any large vertical components (such as plugs and sockets) until last. Cross off each item on the component list as you solder it. Take frequent breaks – you will find that you get tense!

Inspection. Before you even think about putting power on the PCB check it with the magnifying glass for any shorts or poor joints. If you are worried that you might have bridged 2 tracks or pins, check them with a modern test meter – it should not damage the integrated circuits. Look at the high resolution photograph on the Wiki https://wiki.batc.tv/File:2-3_Filter-Modulator2.jpg to compare the board with a known good one.



Testing

Power-up. Use a variable voltage power supply with a good current meter. Set the voltage to its lowest setting and slowly wind the voltage up to 5 V (9 V if you have fitted the regulator) observing the current meter. If the current drawn exceeds 300 mA, there is a fault that needs finding. Most assembled boards seem to draw about 230 mA. If this is OK, disconnect the power again.

Functional Test. Now wire up the F-M board to the Raspberry Pi (RPI) and the local oscillator source, and power-up again. Then select transmit on 1255 MHz, at 2 MS (with IQ as the output mode). You should have already checked that the local oscillator is on the right frequency (if not, do it now). Make sure that you have connected the signal returns for the digital inputs as these are isolated from the board ground plane.

Your first check should be the power output. This will be about 3 mW at 1255 MHz, or nearer 10 mW at 437 or 146 MHz. It does not matter if you can't measure it exactly – just that there is some power coming out.

Next, try receiving the signal by using attenuation on the output of the board, or by putting short aerials on the

output of the board and the input of your receiver. If you get a decoded picture, you can move on to more comprehensive testing. If not – see fault-finding below.

Comprehensive Test. The comprehensive test that was used for the shop-sold pre-assembled boards is reproduced below.

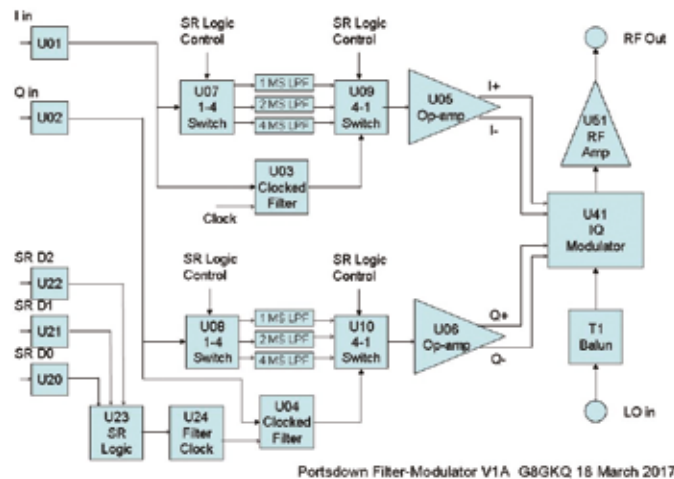
Settings	Measure	Acceptable Range	Result
1255 MHz 333 KS	Supply Current	200 – 250 mA	
1255 MHz 333 KS	MER	>24 dB	
Adjust RV1 and RV2 for best MER here. They do interact. Do not touch them again!			
1255 MHz 333 KS	Power Output	2 – 5 dBm	
1255 MHz 1000 KS	MER	>24 dB	
1255 MHz 1000 KS	Power Output	2 – 5 dBm	
1255 MHz 2000 KS	MER	>24 dB	
1255 MHz 4000 KS	MER	>24 dB	
1255 MHz 125 KS	MER	>24 dB	
1255 MHz 250 KS	MER	>24 dB	
1255 MHz 500 KS	MER	>24 dB	
437 MHz 500 KS	Power Output	>7 dBm	
146.5 MHz 500 KS	Power Output	>7 dBm	
71 MHz 500 KS	Power Output	>7 dBm	

All MERs were measured with a Sharp tuner and MiniTioune V0.6d in DVB-S mode.

This list was designed to be the minimum amount of testing to prove the full functionality of the board. There is no need for any of it to be done on a home-built board, but it is provided as a guide for you.

Fault-Finding

If you do not succeed in decoding your signal in the functional test, here are some things to check after basic supply voltage checks. You should refer to the circuit diagram on the Wiki and the Block diagram below.



RF Path. With more than 100 uW of LO drive, check that you have an RF output of at least 2 mW on 1255 MHz, or 5 mW on 437 or 146. You should get this output regardless of any other inputs. If not, check for faults through T1, U41 and U51.

I and Q Signal Paths. For 1, 2 and 4 MS SRs, using an oscilloscope, compare the I and Q signals along the signal path. There should be a 5V square wave at the output of U01 and U02, and about 0.6V p-p through the selected L-C filter and at the input to the IQ modulator. Check that similar waveforms are present at lower SRs either side of the clocked filter U03 and U04. There should be complementary I and Q signals (0.6V P-P around 0.7V bias) present at the test points I+, I-, Q+ and Q-.

Filter Clock. With SRs under 1MS selected, you should see the filter clock waveform at the output of U25 and on the clock inputs to U03 and U04.

Switching Logic. Check that the switching signals on the 4-way switches U24, and U07 – U10 change with different transmit SRs.

Final Performance

The achievable performance is published on the Wiki. You will notice that the digital filter gives a really sharp “square” spectrum at low SRs, whereas the LC filters for 1MS, 2 MS and 4MS are much softer. The first shoulder for these higher SRs is between -35 and -40 dB compared to the main signal; however, that is still a very low power density compared to an unmodulated carrier.

If All Else Fails

If you are still having trouble with your Portsdown System, and have checked the FAQ on the Wiki, post a question with as much information as possible on the BATC Forum about it. Lastly, you can look at the Portsdown Users' Map (linked below) to see if there is anybody else near you who might be able to help you out. 🗺️

Links:

- Surface mount soldering demo by Colin, G4KLB: <https://www.youtube.com/watch?v=LSy3r85QB4E>
- FAQ: https://wiki.batc.tv/Portsdown_transmitter_FAQ
- BATC Forum: <http://batc.org.uk/forum/viewforum.php?f=103>
- Portsdown Users' Map: <https://drive.google.com/open?id=16rtNSajLvCfc4wsbj9p3M6pkua4>



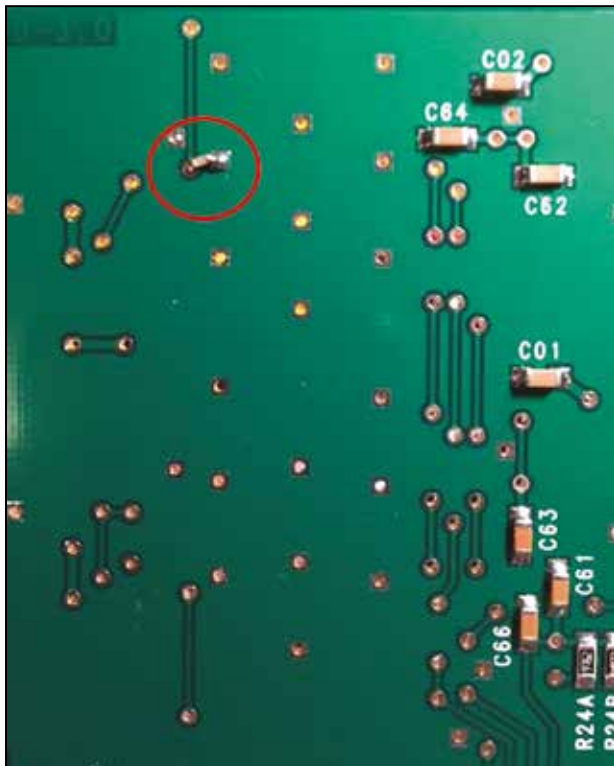
Portsdown Filter-Modulator Board Modifications

Dave Crump - G8GKQ

Recent experiments have identified some improvements that can be made to the first batch of PCBs supplied for the Portsdown Filter-Modulator (F-M) board. These initial Portsdown F-M PCBs (sold before mid-March 2017) are known as Version 1 boards and the modifications enable further improvements to the transmitted spectrum. The unmodified boards are OK to use on-air as any spurious emissions are about 50 dB below the main transmission, and the modulation “shoulders” will generally be in-band. These modifications further clean-up the transmitted spectrum, and reduce the level of the “shoulders” at SR1000 and above. The modifications also equalise the levels between low SRs (RB-TV) and higher SRs (1000 and above). All pre-assembled boards are sold with this modification already incorporated.

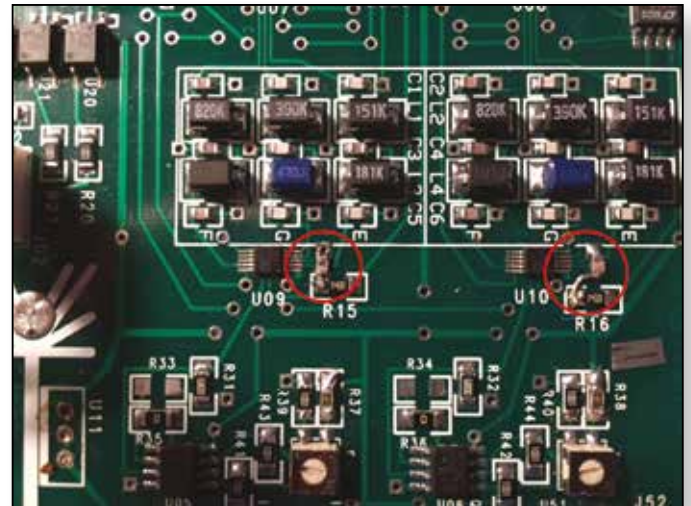
Modification 1, to reduce breakthrough (around 130 - 160 MHz) of the harmonics of the filter clock:

Solder a 10n chip capacitor on the underside of the PCB between the +5v rail and ground near U10. The capacitor needs to be fitted between the thru-hole which feeds pin 5 of U10 and the adjacent square ground pad on the underside of the board. The capacitor is visible in the upper left of this photo.



Modification 2, to reduce filter clock breakthrough on the I and Q signals:

Solder 270 pf capacitors (chip or discrete) between the downstream ends of R15 and R16 and ground on the top side of the board. These capacitors form simple low pass filters with R15 and R16 to reduce clock breakthrough from the switched-capacitor filters. There is a convenient (square) ground pad just “north” of R15 and R16. A short wire link is required if using a chip capacitor adjacent to R16. Both are visible in this photo.



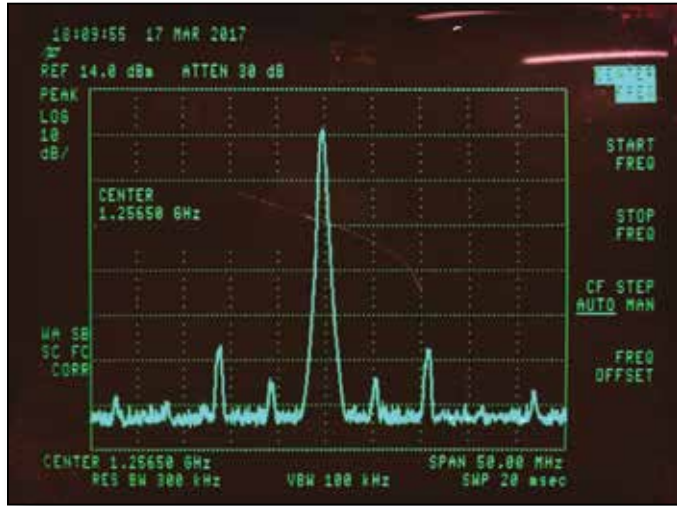
Modification 3, to reduce the level of the drive to the IQ modulator at higher SRs (1000 KS and above).

The original design slightly overdrove the IQ modulator at higher SRs, resulting in higher than necessary “shoulder” levels and differing power output depending on SR selection. This modification reduces the drive amplitude, but also affects the modulator balance and may require some “tweaking” of resistor values.

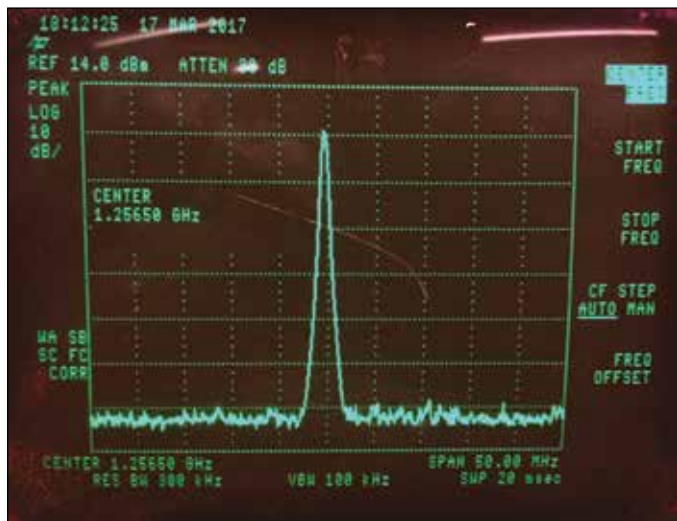
First, R03 and R04 (both 2400 ohms) need to be removed and replaced with 3300 ohm resistors. This reduces the I and Q levels to within the modulator specification but upsets the phase balance. Then, R05 and R06 need changing from 4700 to 3900 ohms to restore the balance.

If (and only if) you find that the MER is poor after this modification, try adjusting RV1 and RV2. If the adjustment improves matters, you may find that a parallel resistor on R05 or R07 (for the I channel) or R06 or R08 (for the

Q channel) may be required to align the phase balance point with that set for the lower (<1000K) SRs using RV1 and RV2. None of the 40 boards that I have modified have needed this modification, but it will depend on component tolerances.



► 1255 MHz 333 KS/s Transmitted Spectrum before Modification



► 1255 MHz 333 KS/s Transmitted Spectrum after Modification

Version 2 Boards

These 3 modifications have been included in the PCB design for Version 2 of The Filter Modulator board which is soon to be available in the BATC Shop. 📦

Some photos of the team modifying and testing the Portsdown Filter-Modulator Board ready for sale in the BATC shop



ATV on TV - The day TX Factor came to visit

By the time you read this you should have all seen the latest edition of TX Factor which featured an introduction to ATV, the BATC Portsdown transmitter, and the workings of Bristol's own GB3ZZ.

The 15 minute segment took most of a day to record so here's a glance behind the scenes of the day.

Anyone who works in the TV business knows planning is the key to a successful production and we thought we'd nailed it ahead of the big day.

Little did we know the local council were planning to dig up the A4 on that Saturday right in the middle of the village we were recording.

The plan was to meet at Shaun, G8VPG's QTH in Saltford, located between Bristol and Bath, for a 10am call, but myself, Bob, and Mike got stuck in the traffic which felt like it stretched between the two cities.

When I arrived Shaun was busy making the tea and Noel and Dave were nervously unpacking all the goodies they were going to show including the Portsdown transmitter, which was carefully packed in a padded bag.

We've all seen the pictures of it but seeing it in the flesh really showed what a masterpiece of engineering the Portsdown crew had come up in a relatively short period of time.

Other than a couple of small ICs the board looked quite achievable even for a relatively ancient G8, with the help of a magnifying glass and a bright light.

Once Bob and Nick, the cameraman, arrived they wasted no time in getting set up in our impromptu studio in the conservatory.



Ian Parker – G8XZD



As the two cameras were set up checks were done on the microphones and the lighting ahead of the recording.



As someone who is normally is the other side of the camera asking the questions we sometime forget how daunting it can be being on the

receiving end but Bob had that knack of being able to put Noel and Dave completely at ease.

While this was under way Mike was upstairs in Shaun's shack rehearsing the next segment of the show where he'd explain what ATV involved including demonstrations QSOs with Viv and Ivor, and Brian through ZZ.



Once the first interview was over Noel, Dave and myself made a beeline for a local supermarket to buy some sandwiches before heading up to the /P location as planned.



So what could possibly go wrong?

Well the narrow little country lanes were all extremely busy with locals trying to avoid the roadworks.

Luckily Noel's Land Rover was big enough it always seemed to get the right of way through the narrow lanes.

A few moments later we got to the location by the side of a normally quiet road. But someone had beaten us to the spot.

Undeterred we pulled in and ate our sandwiches while waiting for the family in the car ahead to finish their picnic.

Eventually they moved on and we got to park up on level ground and away from the thick mud.

It didn't take long to set up the /P station. The plan was to transmit back to Shaun's house on 70cm using the Portsdown.

We knew it was working because we managed to wake the 437MHz receiver at ZZ, which we were receiving full strength on Minitioune connected to a yagi aerial on the ground and vertically polarised.

The plan was that Bob and Nick were going to come out and film this end of the contact while a locked-off camera recorded the proceedings at Shaun's end.



Because they were in bigger vehicles the route they took was slightly more round about rather than risking scratching them on the narrow lanes we came along.

We waited for the others to arrive while reflecting on the merits of how to construct a multi-band Minitioune and how to box it up for portable operation.

Meanwhile there appeared to be a bit of a misunderstanding over the scale of the hand-drawn map, how far along the road, and through how many mini roundabouts they had to travel.

But with the help of 2 metres and some local knowledge we talked them in without further ado, even recording the shot of Bob driving past on minitioune as a .ts file.

With everything set up, Noel explained the workings of the

station to Bob, stopping every few moments while the camera repositioned to get the best shots.

Finally the Portsdown was switched on and up popped Shaun on the 2m talkback saying he was receiving very good pictures from the raspberry pi camera.

Bob seemed genuinely impressed and the next day he emailed saying he was going to have a go at ATV himself. So one new convert already!

Once everything was "in the can" Bob, Mike and Nick headed back to Cornwall while we packed up the Land Rover and returned back to base for tea & cake and to reflect at the end of a very enjoyable day. 📺



CAT17 – Sept 9th and 10th

- ▶ 2 day program including talks and demos
- ▶ Fix it, test and measurement area
- ▶ Members flea market
- ▶ RF and specialist traders
- ▶ Portsdown construction competition

**Finningley Amateur Radio Club –
Sandtoft DN8 5SX**

- ▶ Just off M180
- ▶ 5 minutes from Robin Hood International Airport





G8LES Link Video recorder integration

Mike Saunders – G8LES

These PVR's or Hard Disk recorders are very useful to record repeater activity and have a good still frame facility to enable a screen grab.

I am using an LG RHT497H and they are still available on Amazon and it replaces an old Philips VC2000 tape based VCR which we mechanically wore out.

We no longer therefore need the valid video line from the tape player when it was in search mode.



They do need to be left on to be available to the remote commands and the power saver turned off, so a UPS is required if a minimal number of buttons are to be used to drive it.

Otherwise Power on and HDD buttons are required although it seems to remember that AVI is selected.

In HDD mode it will automatically play the last recording made on pressing the play button which is a very useful feature.



Also to get it to record the next signal accessing the unit it needs to be on to receive the record command.

Here is the remote control, the white buttons plus the record button are required to "remote the remote".

Kit configuration recommendations.

Place a time and date stamp overlay box in between the Rx video feed and the recorder so that clips have time and date overlaid.

If recording digital RX only, nothing else needs doing on the video path.

Analogue is trickier and a signal or sync re-processor is required on the end of the analogue receiver before the signal goes through the system,

which I have to my own design. This enables the time and date stamp to lock to a weak signal, and for the recorder to function correctly. More later on reprocessing.

Recording begins on repeat mode start, and is gated with sound squelch on the basis that the analogue signal will not be worth recording if it has no detected sound.

A P5 with no sound will still open the sound squelch, as there is now little noise present and it is a noise quietening squelch.

The functions required are

- [if !supportLists]1. [endif]Skip next
- [if !supportLists]2. [endif]Skip previous
- [if !supportLists]3. [endif]Fast Forward
- [if !supportLists]4. [endif]Fast Reverse
- [if !supportLists]5. [endif]Play
- [if !supportLists]6. [endif]Stop
- [if !supportLists]7. [endif]Pause
- [if !supportLists]8. [endif]Record

As the old HV menu system now the G8LES link has 8 functions per menu this is ideal.

A stop is automatically issued at the end of repeat mode by menu 6 VCR control.

One more circuit is required that is to take the recording line and put it through a 5-minute timer circuit which issues an automatic stop command after 5 minutes.

We also have a line on the old HV electronics called No Off. This effectively disables the timer when the RSGB news is on and is a Vic 20 I/O command from the software.

Effectively this says in the basic program if $T1\$ > 09:30$ and $< 09:40$ and antenna = south, then Poke (the IO location) to set the data bit to on. That buffered line is used to defeat the 5-minute timer for a long record.

Clearly this line in the code can be altered to suit local timings.

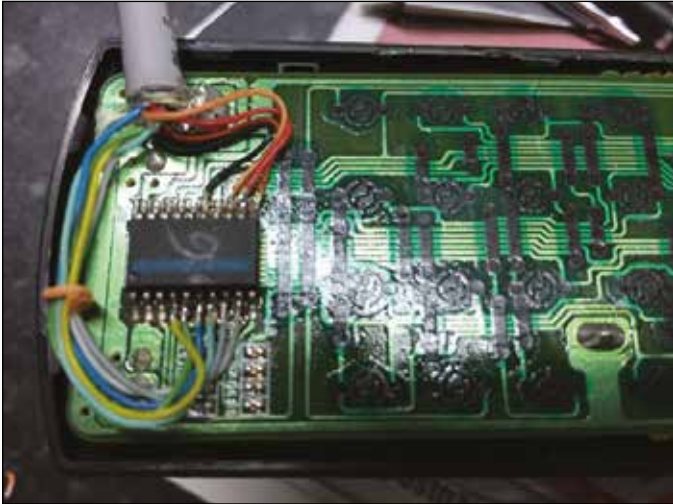
Modifying the remote controller; -

They are difficult to open but open them you must to achieve what you need.

Scrape off the solder resist on the tracks leading to the

buttons you want to remote. With the case off the battery is automatically removed. Using a resistance DVM identify the pin on the controller chip the track leading away from the button goes to. You will not be able to use the bleep function on the meter as some tracks have resistive hop over links (black strips in picture) bridging other tracks, but a reading of less 50-200 ohms is correct.

Having identified the pins on the chip attach a multicore screened cable from the remote controller chip to a relay PCB.



Before you finish make a note of which way round the IR LED is oriented on the circuit board and remove it. Add wires from wherever the fixed position the remote control is going to live, so you can attach the extension wires to the IR LED, finally positioned above and pointing at the front panel of the PVR next to the IR sensor: (one side is VCC + the other side is electrically pulled down by the chip which produces bursts of waveform when a button is pressed).

Remove sufficient plastic on the remote controller top case to allow the outer jacket of the cable to exit the case.

Add a wire to the battery supply positive, which will be powered up from the relay PCB.

Close up the remote control and snap the case back together.

This controller does not use column and row scanning it is just DC levels.

Create a relay Board that closes the contacts across the wires that you have identified in the testing and connected to the chip.

In my case it was the following chip pins

Common 1 = pin 6

Common 2 = pin 12

Stop = pins 4 and 13

Play = pins 5 and 12

FFWD = pins 7 and 12

Skip Left = pins 8 and 12 (Previous recorded clip)

Skip Right = pins 9 and 12 (Next recorded clip)

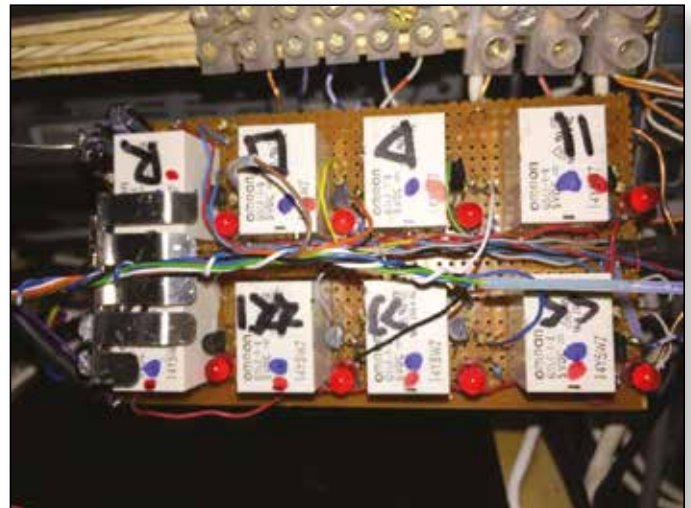
Pause = pins 11 and 12

FREW = pins 12 and 6

Record = pins 15 and 6

BC327 PNP transistors operate the relays with a catching diode across the coil, coil grounded one side and the collector connected to the other end of the coil, emitter to plus 5V. 5K6 resistor from base to +5V, 5k6 to controller board which issues a TTL active lo for function active. Open Collector TTL drivers recommended.

The Relay board. The 5volt regulator has some cooling attached. The control cable to the repeater menu system goes over the top from the left, the cable to the PVR remote controller is near the board and goes off to the right. A status LED is there across the relay with a 220ohm resistor in series to help with any fault finding.



Currently the G8LES link needs the G8LES shack on to receive as it has no independent antennas excepting the 12 element Tx Yagi on the end of the LDF550 on a critically positioned pole in the garden.

It is planned to put 4 off 17dBi 23cm plate antennas up outside on the centre chimney (unused GB3HV 23cm Tx antennas as it is now Tx-ing on 3.4GHz) each with its own preamp, auto switching, with the 2metre & 70cm white stick, courtesy of Roy G8CKN

Receive on 1285 analogue or Digital, (auto switching) Tx to HV "new" on 1248Mhz analogue or digital, but digital as default.

It wakes up on 432.7625 with a DTMF Zero plus star, but it will be defaulting to 434.325 in future when I swap the wires round on the 70cm phone Rx. Again at present it

uses the masthead preamps and beams so the main shack has to be on for that.

Zero + Star on 70cm resets and wakes the power on contactor. That DTMF decoder is located in the 2M 70cm Rx box which is powered all the time.

Another Star will put up the main menu and enable the Tx line. As soon as the NDS Encoder has booted a Tx picture will appear (about 20 seconds). The G8LES Link stream will show what is going on.

The menu system is 8 by 8 from one DTMF decoder, which is mixed from 70cm Rx and 23cm audio.

The 11 lines from the DTMF decoder go to each menu card Euro card. Keys 1 to 8 as well as 9, 0, and #, and repeater ident, making 12 lines in all.

A latched 8-way TTL buffer with enable, is turned on each card by pressing the number key.

That generates a menu active line which disables the 7 other menu buffer chips. The active menu has that line negated to enable itself.

Pressing DTMF button one calls up the menu 1 Eprom from the extension Eprom board attached to the BATC test card generator, so the user sees the available on screen choices. The Maplin sound generator card also has a bank of eproms which are similarly selected giving the user audio feedback as well, speaking menu 1 function 2 for instance.

Functions such as viewing test pages or receiver inputs are latched on using a simple flip flop (7474), and are cleared with the 9 key which takes back to the sub menu. The Main Menu is accessed from a menu via the # key.

It is also possible to select the Rotator menu by keeping the band selected Rx function on with the link menu 8, by using the menu hop button also #.

A repeater ident card clears all menu settings except for digital or analogue Tx switching, antenna manual selection, and VCR and Receive overlays the latter being generated by the BATC test card generator selected Eprom and genlocking it to the incoming signal.

Finishing repeat mode cancels manual antenna selection and it goes back to auto search.

Selecting an antenna manually will put the unit into repeat even if there is no signal.

9 key cancels latched functions, # key goes back a menu, 0 key cancels the menu, and if there is no Rx it shuts down.

The signal reprocessor, also has as part of it a colour burst regenerator both of which genlock to the incoming

signal by using line, frame and 4.433619MHz colour burst flywheel oscillators. The incoming video is black level clamped and sliced so that it sits on the newly generated syncs and burst. This then allows clean syncs to be fed to the test card board to use it as a genlock caption overlay.

The Antenna auto selection card has 4 main automatic choice inputs:

- ▶ Valid syncs present from sync detector.
- ▶ Frame lock present detected by reprocessor
- ▶ P grade in volts.
- ▶ Repeat mode on.

4 outputs East, South, West, North preamp supplies, +5V

The reprocessor P meter measures 4 blank lines during the equalising pulses at the top of frame and samples the noise during that time window. It rectifies that noise amplifies the result and 5Volts is a P0, Zero volts is a P5. The amplifier has various controls which equalise the curve. This is also fed into the Vic 20 analogue port which generates a P grade after transmission.

The Antenna selection card has a simple shift register which cycles round the antennas. On receiving valid syncs the shift register is allowed 5 more steps (2 extra antennas to make sure).

Once syncs are received a Pgrade is logged by holding a charge on a capacitor, and each antenna with valid syncs on sets a latch.

As syncs appear on various antennas a bleep tone for about one second is generated as the syncs first appear which is relayed on the main sound output. This ceases once the syncs are constant but reappears on fading where the syncs go on and off.

When the scan is complete the P grades stored are compared by level comparators and the resultant data is presented to a look up table in an eprom, which turns on the appropriate antenna with the best signal. Repeat mode is then requested of the computer which brings up the ident and switches to the receiver having preselected the best antenna.

A P5 carrier on one antenna will be ignored.

The frame lock signal increases the antenna dwell time in the 2 seconds per antenna scan where no frame lock is achieved and as soon as frame lock is achieved the P grade is valid and it can move on to check the next antenna. If no frame lock is achieved on any antenna but the sync detector is active, it will make best choice by analysing the noise in the main frame and comparing the results.

Fading signal mode. If access is made in 3 successive attempts then the software will hold repeat mode open on a long timeout and if no further repeat requests are seen (gated with valid sync present), then it will go back to ident followed by last logged P grade to display the result.

The card will hold repeat mode request on for 3 seconds. If no repeat mode on is received from the Vic 20 then it will go back to scanning the antennas.

Manual menu selection of an antenna stops the shift register, overrides the look up table and puts the unit into repeat request mode, just as if an antenna had automatically been selected. Valid syncs are not required in this mode.

The new GB3HV has this functionality built into a PIC chip on the analogue receive side on 23cm ready to be tried, it is all to move to a 1U rack with the antenna PIC, and reprocessor cards all in one unit, so that is yet to be put together.

Finally, for now the G8LES Link remotely controlled pan and tilt with a masthead 70cm preamp is working just needs a weatherproof camera case, with a car headlamp wiper and 70cm Yagi to go on there and that will go outside with the 23cm antennas, any offers?

The pan and tilt had a nasty fault on there. The cable plug had the plastic broken down so the lens heater supply was causing the camera to tilt down as they were voltage breakdown shorted together. Fixed by replacing the plug.



More on the G8LES Link project anon 

Happy soldering
Mike G8LES

Could you help with the Scouts' JOTA 2017?

Jamboree-on-the-Air (JOTA), the Scout Movement's largest annual event with over 150 countries and a million participants worldwide, celebrates its 60th anniversary in 2017.

Les Mitchell, G3BHK, had the idea of allowing Scouts to 'meet' each year over radio after seeing the World Jamboree taking place at Sutton Coldfield. He realised it wasn't always possible for them to travel to distant lands to camp together. JOTA is always held on the third full weekend in October - this year, the 21/22nd.

In the UK many local Groups and Districts organise their own special event station for the weekend, to contact other Scouts around the world, and just around the corner. The Scout Association has 9 activity centres around the UK, and this year 3 of those will be hosting JOTA stations - Gilwell Park in North London; Youlbury near Oxford; and Woodhouse Park in Bristol.

How can you help?

For the 60th anniversary we'd like to link as many JOTA stations as possible with ATV as well as the normal voice and data modes. Of course ATV at a JOTA station is nothing



new! But with many ATV groups around the country, and utilising the repeaters and the BATC Stream it would be great to get the Scouts presenting their own TV shows to showcase the activities their Groups take part in.

So if you are near a repeater and your group, or your own station, would like to help the Scouts link up visually this year, please contact me directly so we can put you in touch with a local group taking part in JOTA.

Thank you!

Frank Heritage, M0AEU

Lead Volunteer:

JOTA at Gilwell Park, Youlbury and Woodhouse Park

Contact: frank@2lo.info



GB3ZZ Experimental Inputs

Shaun O'Sullivan – G8VPG

This year marks the thirtieth anniversary of GB3ZZ, the Bristol ATV repeater. GB3ZZ has provided 30 years of continuous service with only a few very short periods of down time; quite remarkable when you consider that it is an amateur project. Over the years, it has been developed out of all recognition to the very simple device that was switched on in 1987.

Perhaps the greatest change happened two years ago, when we switched over to digital modulation. The output frequency remained 1316MHz, but we now transmit a two channel multiplex (GB3ZZ Ch1 & GB3ZZ Ch2) using a DTX1 running 4ms/s, DVB-S, MPEG2, FEC1/2.

Channel 1 is the main through video channel and uses about two thirds of the available bit rate. Channel 2 is fed by an 8 channel scanning switch, which transmits a variety of information pages. Some of these are house keeping, like the temperature of the PA heatsink, whilst others are there to assist the user. For example; the primary 1249 & 437MHz inputs have a second receiver set to display the signal condition page, to enable users to gauge the quality of their signals.

The switch to digital modulation has been a great success and the coverage of the repeater has improved. There is a zone where the old analogue FM signal used to deteriorate, but where the digital signal now provides a solid picture. During our various portable expeditions, we have been surprised where it is possible to see GB3ZZ.

Over the past two years, perhaps the main theme of ATV experimentation has been reducing the bandwidth of the transmitted signal. How much can bandwidth be reduced whilst retaining an acceptable quality of picture? How does reducing bandwidth enable transmitted power to be decreased and range to be increased? Developments like Digithin, Minitioune, DATV Express and now the Portsdown project have arrived with remarkable speed and have really started to transform the way we operate ATV.

In Bristol, we have a small, but very active ATV community and we have been experimenting with all of these new pieces of equipment. We thought that to assist testing, it would be useful to provide additional experimental inputs to GB3ZZ. We have developed two of these and they are described in the following.

Two Metre RB-TV Input

Another development over the past couple of years has

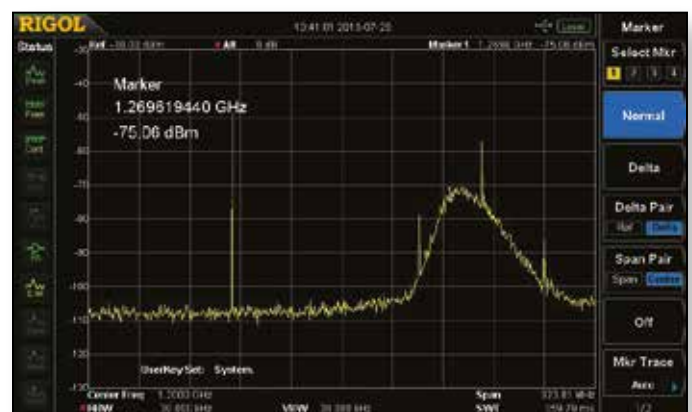
been the availability of extra spectrum from 146-147MHz. This is provided under the terms of a Notice of Variation available to full licence holders and has to be renewed annually on 31st October. It quickly became apparent that it would be possible to transmit Reduced Bandwidth TV (RB-TV) on this band with a symbol rate of up to 333ks/s, resulting in a signal bandwidth of about 500kHz. Digithin in combination with the Raspberry Pi was the transmitter that most of us cut our teeth on, but we had to wait a while for a new usb connected receiver system with which to receive it. Fortunately, Jean-Pierre came up trumps with Minitioune, which is now the standard for RB-TV reception.

The GB3ZZ 2m RB-TV input is centred on 146.5MHz, 333ks/s, DVB-S, FEC7/8, codec H264. We have not enabled sound so that all of the bandwidth is available for video. The receiver is a standard BATC Minitiouner using the Sharp NIM. It is necessary to convert the 2m signal

up to the tuning range of the tuner. For this, we have used a commercial upconverter; the Kon146-1100, which is available from Roberto DGOVE in Germany. There are a couple of important considerations to bear in mind when using this device;



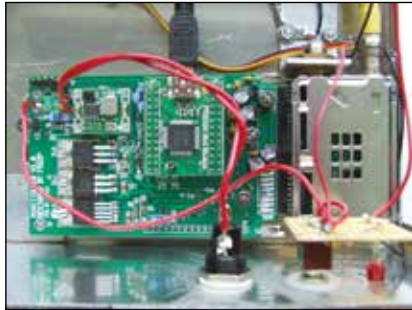
- The 146.5MHz input frequency is converted up to 1276.5MHz by the Kon146-1100 upconverter from Roberto DGOVE. This unit includes a low noise amplifier and good bandpass filtering.



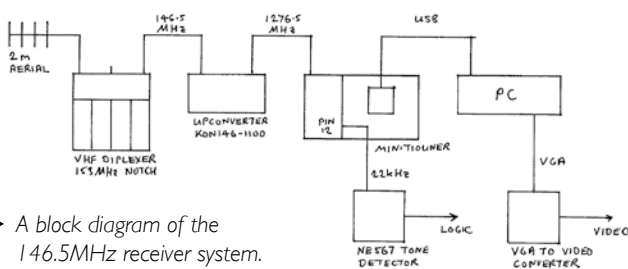
- The output of the Kon146-1100. The large peak on the left is the local oscillator at 1130MHz. The bandpass characteristic may be seen, with a peak near 1276.5MHz, together with some undesirable mixer products at 20MHz intervals.

1. It is powered via the co-axial output socket from the receiver. Whilst the similar Kon 70-900 for 437MHz upconversion draws 150mA, the 2m model draws 300mA. This is in excess of the standard polyfuse rating on the Minitioune board and it needs to be replaced; we have used an old fashioned wire fuse in a front panel mounted holder.

► The GB3ZZ 146.5MHz input uses a standard BATC minitiouner. Note the on board polyfuse is replaced by a panel fuseholder.



2. The upconverter offers a choice of four local oscillator frequencies; 1100, 1115, 1130 & 1145MHz, selectable by jumpers on the pcb. It is important to use 1130MHz, because this places the output at 1276.5MHz, the peak of the bandpass filter characteristic; you will lose gain if you use the other frequencies.



► A block diagram of the 146.5MHz receiver system.

The 2m input aerial is a 4 element Wimo beam, pointing in a South Easterly direction. We chose this aerial and direction because it favours the location of the most active 2m experimenters, including the cluster along the South coast (but have they accessed it yet...?!). We use a VGA to composite video converter to provide a video signal for the repeater transmitter. This transmits the whole Minitioune page, so users can see the MER etc. of their input signal. There were two remaining issues to resolve;

1. All of the other repeater inputs used a commercial satellite receiver with a lock lamp. This lights up upon receipt of a valid signal and thus provides a way for us to trigger the repeater logic. How to do this with Minitioune? Luckily, Minitioune provides a facility to output a 22kHz tone on receipt of a valid signal. Peter G8DKC found that this signal is present on pin 12 of the NIM module. It was thus a simple matter to construct a phase locked loop tone detector based on an NE567 chip, which drives a relay to trigger the logic.

2. The second problem was particular to the GB3ZZ site; we share the site with a paging transmitter operating on 153MHz. This completely flattened the 2m RB-TV input when it transmitted. We solved this problem by employing a VHF diplexer, which was originally set up for two channels, one above and one below 2m. We found that by ignoring the aerial input, and using all four cavities in series, tuned to 153MHz, we could get a notch in excess of 70dB deep at 153MHz, with a loss of under 1dB at 146.5MHz. This has solved the pager problem and might be of interest to anyone who suffers from pager breakthrough.



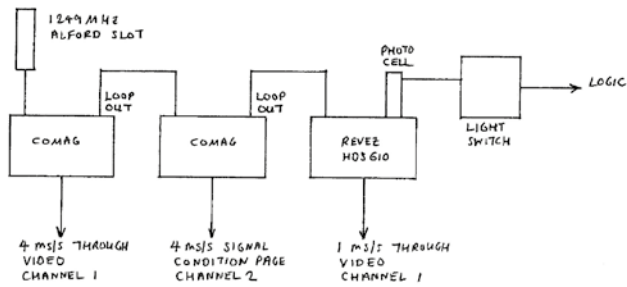
► A VHF diplexer similar to the one we used to provide a deep notch on the pager frequency of 153MHz. The central aerial socket is left open circuit and all cavities tuned in series.

How well does the 146.5MHz RB-TV input work? My home QTH is a 14km obstructed path from GB3ZZ, and using a 4 element Tonna at about 5m above ground, I can access it with 300mW. I have also accessed it when out portable on the Blorenge Mountain in South Wales. Using a PC based receiver system in a repeater is not ideal, because power cuts and other computer misbehaviour does result in crashes from time to time, but this is an experimental feature and users accept it as that. As I write, version 0_6d of Minitioune has just been released. The configuration ini file has been updated to allow automatic selection of DVB mode (DVB-S or DVB-S2). We will shortly update the repeater software so that the 2m RB-TV input will function on either DVB-S or DVB-S2, with a wider range of FEC's.



► The repeater output from the 146.5MHz input with myself accessing it at a distance of 14km.

1249MHz DVB-S2 Input



► A block diagram of the 1249MHz GB3ZZ receive system. Filters & pre-amps are not shown.

At CAT16 last year, Dave G8GKQ gave us an excellent talk about the forthcoming satellite Es'Hailsat2, which is now expected in early 2018. One point that registered with me was that DVB-S2 modulation has a 2dB advantage over DVB-S.

A notable feature of the past year has been the continuing success of the DATV Express transmitter board. I believe this is largely due to the release of the Windows control software. I was one of those put off by the need for a Linux computer and now difficult to obtain video capture hardware. In contrast, the Windows software is easy to use, in conjunction with the free version of Vmix or direct video capture using an EZ Cap type device.

The latest versions of the DATV Express software provide full support for DVB-S2 modulation and so thoughts began to form in my mind; can we try reducing bandwidth on 23cm by using DVB-S2, thus enabling lower transmitted powers to be used, greater range but similar picture quality?



► The Revez HDS610 DVB-S2 satellite receiver used for the experimental 1249MHz DVB-S2 input to GB3ZZ. This receiver will operate at 1ms/s and go up to 32PSK.

We obtained an inexpensive DVB-S2 satellite receiver from Ebay, a Revez HDS610. This had the all important lock lamp and has quite an interesting specification. It will receive DVB-S or DVB-S2, and will handle QPSK, 8PSK, 16PSK & 32PSK, selecting the correct parameter automatically. It will also operate happily at 1ms/s. Incidentally, I have tested quite a few satellite receivers in the past year, and all of them will go down to 1ms/s (but no lower) even when the specification says 2ms/s.

Tests across the bench showed that it worked well at 1ms/s, codec H264, in all DVB modes and PSK's. It was decided to try it at GB3ZZ. This was quite easy, because the repeater has two 23cm receivers with loop through outputs, both

of them Comag's. The first is the main through video receiver, the second is used for the signal condition page on channel 2, and the Revez was looped onto the output of this one. A photocell was fixed over the lock lamp to operate a light sensitive switch and trigger the logic. The receiver was set up for 1ms/s, codec H264, and it was left to select DVB mode, PSK & FEC itself. The repeaters standard Alford slot aerial is used.



► Both of these satellite receivers will operate at 1ms/s with DVB-S2 & DVB-S. The Freesat v7 is currently available on Ebay for less than £30 and operates from 12V. The Icecrypt is an older model, but a very fine, sensitive receiver.

At home, I set up the DATV Express to operate on DVB-S2, 1249MHz, 1ms/s, codec H264, FEC3/4, QPSK and 192kb/s sound. My aerial is a single 28 element Wimo beam at about 8m above ground. The path is 14km obstructed. It was clear straight away that not much power was needed! By juggling with various attenuators, I established that I could send a steady signal into GB3ZZ with just 250mW. When I switched back to 4ms/s DVB-S, I needed 3W to access the repeater. This represents an improvement in excess of 10dB. I believe this is a very significant result with implications for anyone on the fringe of a repeater coverage area, for Dxing and for the satellite uplink budgets.

We found that using 8PSK made video motion much smoother with little loss of sensitivity. 16PSK and in particular 32PSK required much more power and we didn't really see any improvement in video quality, probably because the free version of Vmix limits the video resolution available at the source.

These tests have been really interesting and demonstrate how quickly ATV technology has developed over the past 2-3 years. The ability to reduce bandwidth, reduce power, increase range and maintain picture quality has impressed me! I wonder what we will be writing about in three years time?

I would like to conclude this article by paying tribute to my co-conspirator Ivor Green G1IXF! Ivor is the GB3ZZ licence holder and engineer and during the course of these experiments has made several dozen visits to site as we struggled with various problems. None of this would have been possible without his great help and enthusiasm, which has been constant throughout the 30 year history of GB3ZZ (assisted by Viv G1IXE of course!). 🗨️



BATC website development

Noel Matthews - G8GTZ

As many of you know, we have been considering updates to our web presence for a couple of years but have been unable to find the suitable development effort (either volunteer or contractor) to produce a replacement site. The good news is that in January we contracted *Inspya Developments* to build a new site to replace the main BATC website, the shop, the members' database and members' forum.

The site is under development and uses Wordpress with a number of well proven modules such as woocommerce to give us the functionality we require and should be ready for release during April 2017.

What's new?

As well as updating the rather tired look of the current website, the main reason for the development is to upgrade our membership database and shop – those of you who have experienced password problems will know we have to manually reset log in details for every new user - in fact I got interrupted whilst writing this article to do one! And that is just the tip of the iceberg of problems that Brian, Rob and I have to resolve every week.

The new shop will use the woocommerce plug and enable us to be much more flexible in pricing and the way we present products for sale – it will also print postage labels and enable us to do reports on the various products we sell. Finally, it will streamline the club book keeping, which is currently done by Brian on a massive spreadsheet!



Will it affect me?

Yes, it will – all the changes are listed below, but hopefully most of them will be seamless



Main website

Clearly all the user data from the main web site / members' database will need to be migrated to the new platform. We are hopeful that this, including passwords, can be done seamlessly and you will be able to use your existing user name and password on the new site.

In the worse case where we cannot migrate the passwords, all members will receive an email requesting them to log in to the new site using a special link in the email. This will invite you to reset your password and unlike the current site you will then be able to login without any problem.

BATC Members forum

All the existing forum posts and threads will be migrated across to the new forum. However, as the forum will be integrated in to the main site, you no longer need a separate login and will use your main website user name when posting.

This means that you may have a different user name on the forum but you will be able to continue posting on live threads under your new user name. It also means that whilst everyone will be able to view the forum, only paid up members with a valid log in will be able to post and start new topics.

The BATC.TV Streamer

The new streamer has been the largest part of the project and has been developed by Phil M0DNY and will offer HD and mobile streaming using HTML5. However, whilst the user interface and streaming engine is complete and has been used for CAT16 and other special events such as the ARISS contacts, the administration back end is not yet finished.

This means that we will continue to use the current batc.tv streamer and all channels will be available as normal. However, as users will no longer be able to log in to the current main web site all admin tasks such as changing the HTML on the page will have to be done on request.

Note we will not be able to change a member's chat nickname or the option to allow guest chat log-ins as they only appear on the member's option page and not general administrative screens.

It is hoped the full transition to the new streamer will be completed in the next few months.

BATC wiki

The BATC wiki will not be affected by these changes – it is already hosted on the new server and only has a few members who log in to edit content and so it was decided to keep it separate from the main website.



DXspot

DXspot.tv will not be affected by these changes. It is planned to update the site in the near future and we may be able to integrate it with the main site login at that time.

Support

We are hoping there will not be too many problems but if you need help, we will be setting up a dedicated topic on the members' forum where we or other members can help you or you can contact us using this email address:


support@batc.tv 

Relocation of the John Lawrence Valve Collection

The Valve Collection is part of the National Valve Museum www.r-type.org and was previously housed at HMS Collingwood. It has now been transferred to the Internal Fire-Museum of Power at Castell Pridd, mid-Wales SA43 2JS. Further details and opening hours from www.internalfire.com

The collection, made by John Lawrence GW3JGA over the last 70 years, contains over 200 radio valves from the 1930's, through the WW2 period to the present day. The valves range from miniature and microwave types to domestic versions and includes large transmitting types.

Picture shows John Lawrence GW3JGA alongside part of the valve collection in the Radio Room of the Internal Fire Museum.

The Radio Room also houses the Amateur Radio Station GB3MOP 





Es'hail-2 Ground Segment Planning Meeting

Dave Crump - G8GKQ

On 14/15 January 2017, G8GTZ and G8GKQ were hosted by AMSAT-DL at the Es'hail-2 Amateur Radio Ground Segment planning meeting in Bochum, Germany. The aim of the meeting was to ensure that the ground stations will be in-place and suitably equipped to support the commissioning and use of the 2 amateur-use transponders on Es'hail-2.



The Bochum facility, which is AMSAT-DL's HQ, hosts a 20 metre dish inside a Radome and numerous outdoor dishes. A 3 metre dish and a 2.4 metre dish are being sited just outside of the Radome for use with Es'hail-2.

The following Qatar Amateur Radio Society (QARS) and AMSAT-DL groundstations are planned:

- ▶ Es'hailSat Control Centre in Qatar
- ▶ QARS HQ in Doha, Qatar
- ▶ AMSAT-DL Station in Bochum, Germany
- ▶ Wurzburg Club Station in Germany
- ▶ A mobile AMSAT-DL Unit in Germany

The AMSAT-DL groundstations will use custom-built SR-Systems equipment for video encoding, modulation, demodulation and decoding. The AMSAT-DL team were impressed with the DATV Express and Portsdown transmission equipment and MiniTioune Receiver demonstrated by Noel and I. There was a real desire amongst the AMSAT-DL team to encourage amateur TV transmissions both from simple DVB-S equipment and from more complex equipment running modes such as DVB-S2X.

An additional receive-only web-based spectrum viewer (with a chat facility) for the wideband transponder will be hosted by the BATC.

After handover of the transponder, an amateur DVB-S2 video beacon signal will be transmitted through the transponder, either from Qatar or Bochum. This beacon will not occupy the full bandwidth of the transponder. Exact transmission times will be scheduled to support the user community; the need for the beacon may reduce as more users become operational.

The BATC team now have a very good understanding of how the DATV transponder will be monitored and managed, and the BATC Spectrum Viewer will be an integral part of the process. We also plan to discuss the construction of a UK 'mobile' groundstation with AMSAT-UK.

The latest information suggests that Es'hail-2 will be launched by Space-X sometime during 2018. In the meantime, there are Ku Band transmissions from Badr 4 in the same orbital slot (26 degrees East), so you can check that you will have clear line of sight to the satellite. 📡





Video Fundamentals 10

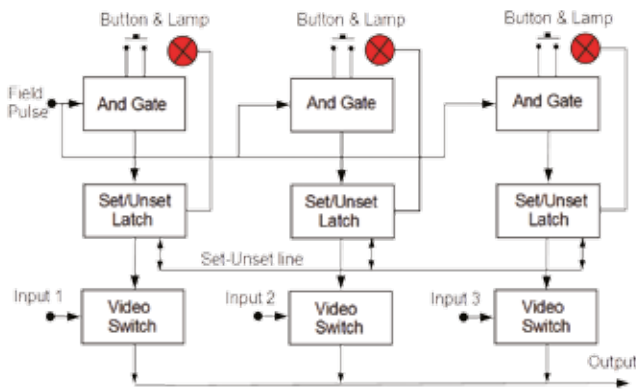
Studio Systems - The Mixer

Brian Summers G8GQS

Last time we looked at genlocking, synchronisers and how they might be used with vision mixers. This time I will explain more of the features of vision mixers (switchers!).

Cut

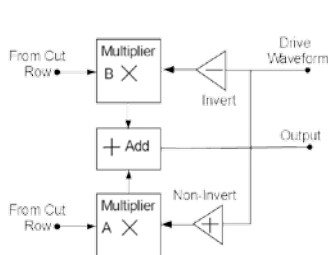
The simplest mixer operation is the cut, a switch between two inputs. Traditionally this was an electronic switch² driven by one of a row of buttons, for minimum picture disturbance, the operation was timed to operate in the field blanking period.



► Simplified diagram of 3 way switch arrangement showing the and gate with field pulse and switch inputs to set the latch which then un-sets the previously set latch.

Mixing

Mixers are arranged as two or more cut rows, the outputs of each row being mixed together. This can be done in different ways, simplistically two opposing potentiometer are used, but a better application is to use variable gain amplifiers. These can be thought of as a pair of opposing multipliers, the input being multiplied by a variable voltage which controls the output level.



If the “drive waveform” is say, 5volts DC, multiplier A output will be the A input signal x1 and multiplier B will be the input signal x0, no output. During a mix the drive waveform goes

from 5volts to 0 volts and A is off and B is the output.

The duration of the mix is controlled by the rate of change of the voltage waveform applied to the multipliers determines the time for the mix to happen.

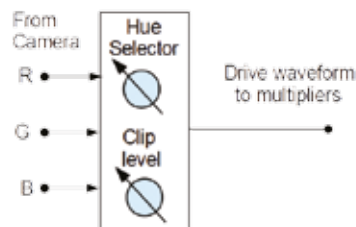
Wipes

Once we are using multipliers to do our mix, we can do other types transitions at this point. By controlling the waveform on and off at line rate during the picture period we can do a wipe between the A and B cut rows. By controlling the slope of the edge of this waveform the wipe can have soft edges. A further refinement is the use of a border to the wipe junction.

CSO or Chroma Key³

This technique generates the switching waveform from the camera video, the well known “blue or green screen” backdrop providing a keying waveform signal for the switch between the foreground camera and a second camera, the background.

There should be controls on the mixer panel to select the exact hue for the backdrop colour and a level control to select the switching point. These can be quite critical to set and better results can be gained by using the full bandwidth component⁴ or RGB output of the camera rather than the PAL output. This is because the colour information in PAL is reduced in bandwidth and the colour edges are inherently “fuzzy”.



The BBC produced a special unit “6 Colour Overlay Processor UN26/523” to improve the CSO results. Known to its users as a 6-Axis switch.

It is important to light the backdrop well and evenly. Reflected light from the backdrop should not illuminate the foreground subject as this will give an odd looking coloured fringe. A further refinement is mixing in the subjects shadow from the backdrop, quite tricky to do but can add realism.

Multi-bank mixers

So far we have only considered a two row or one bank mixer, larger mixers have 2 or more banks. To the A & B rows, C & D and even E & F are added each pair having a mixer and then re-enter the lower rows. This means that you might do CSO on rows C & D re-entered on to row B and then mix or wipe this to a different camera on row A.

DSK

A Down Stream Keyer allows captions to be added over the complete mixer output, i.e. as a “top” layer. It will have similar features as the main mixer; fading, timed fading, all round black edging, even wipes.

A Fill and Key signal is provided by the character generator; the Key signal cuts a hole⁵ in the picture that is filled by the Fill signal. Character generators can be very sophisticated, with many options for fonts, drop shadows, moving banners and so on.

In broadcast use the DSK is often left “live” and the captions are activated by the graphics operator often flying or rolling in all under the control of the Key signal.

Preview or auxiliary rows

A mixer often has extra cut rows, these can be used to feed a preview monitor, an iso VT recorder input, audience monitors. An important use for an aux row is as a engineering monitor so that the quality and timing of the mixer inputs can be assessed.

Cues or Tallies

Often overlooked in amateur set-ups but essential in a proper production environment. The mixer should provide a closing contact to operated the cue lights on the camera and also the preview monitor in front of the mixer:

Digits!

All of the forgoing makes no mention of analogue or digital. In an analogue mixer there is linear path through the mixer were different processes happen in sequence. Once you are in the digital domain the control surface presented to the human operator is very similar; cuts, mixes etc. but the underlying process is not necessarily so sequential in operation. Much is down the the design of the hardware and software. As mentioned before in fundamentals number 7⁶ the use of digital processing requires greater bit depth to avoid artefacts.

Still stores

Once in the digital domain more mixer effects are possible an easier to implement. It is simple to grab a still and store it under a button for later use.

Picture in Picture

P-in-P is reasonably easy to do along with 2 dimensional effects like a push wipe. More complex DVE⁷ transition like flips, rotating cubes and wrapping into curved shapes require more processing power as the pixels have to be mapped onto the new surface and are these the reserve of separate processing units or large powerful mixers.

Big mixers

Mixers come in all shapes and sizes from computer based ones with touch screen selection trough to very big ones which would be at home on the Star Ship Enterprise, indeed a GVG⁸ vision mixer appeared in “Starwars” on the “Deathstar”.



These large mixers are capable of doing more than one program simultaneously having the flexibility to have an outputs from each bank with or without a DSK, it is common the have a “clean” output pre DSK so that perhaps the captions can be added elsewhere in a different language.

On the subject of mixer ergonomics, if you spend any length of time mixing, perhaps a live program you quickly realise the need for nice big buttons with a positive feel to them. They are often illuminated and change colour as to the function.

This is a current HD mixer with SDI inputs, it has many functions for small broadcast operations. There is a 1U electronics crate with it.

Pre-set or flip flop

The simple way of operating a mixer is to select the first source on row A and the second source on row B, you then mix between them. Now the active row is B and you can cut to another picture on this row. This can lead to confusion as to which is the active row? In preset operation it works much like the above, except at the completion of the mix the A & B rows “flip” over and the A row remains the active row for cutting on and the next mix is “pre-set” on the B row. This mode can work better in a busy situation. 🗣️

- 1 The word “switcher” is used in place of “vision mixer” in other parts of the world.
- 2 Or in the early days a mechanical switch or relay.
- 3 In the UK the BBC used the term CSO or Colour Separation Overlay and the ITV companies used the term Chroma Key.
- 4 This can be a analogue or digital output, SDI is component by numbers but watch out for compression
- 5 Another multiplier based fast mix
- 6 Video Fundamentals 7 dealt with camera processing and digital arithmetic.
- 7 DVE = Digital Video Effects.
- 8 GVG = Grass Valley Group, a well respected USA manufacturer of TV equipment.

A high performance ATV upconverter for 4m, 2m and 70cm

Clive Reynolds - G3GJA



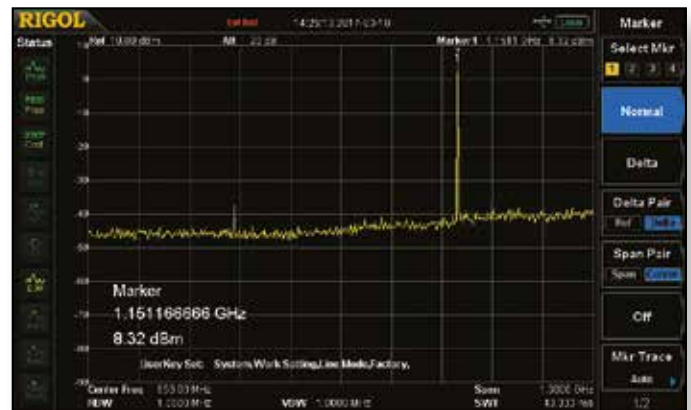
This article is the result of a need for an upconverter to use with the excellent Minitioune USB DATV receiver, using the Eardtek or Sharp NIM, to extend its range to 4m, 2m and 70cm. Although I have a couple of the modified SUP2400 CATV upconverters, that work reasonably well for 70cms, I wanted something that would also do 4m and 2m.

As supplied the Eardtek NIM tunes 950MHz to 2200MHz and the Sharp 650MHz to 2450MHz. The Serit NIM that is now available tunes down to 144MHz but an upconverter is still needed for 4m or if you don't want to upgrade your existing Minitioune receiver with a Serit NIM for the other bands. Additionally the Serit is reported to be sensitive to input impedance at VHF and overall not as sensitive as the earlier NIMs.

A previously suggested route for 2m was to use the front-end of a PMR receiver but they're not exactly state of the art or readily available. Thoughts started to jell when rummaging through the 'it will come in useful one-day box' for something unrelated when I came across a G4DDK001 local oscillator board primarily intended to be used as a local oscillator source for a 23cm to 2m transverter. This design dates back to the late 1980s but it turned out to be a bit of a classic and its low noise Butler overtone crystal oscillator has been replicated in many later circuits.



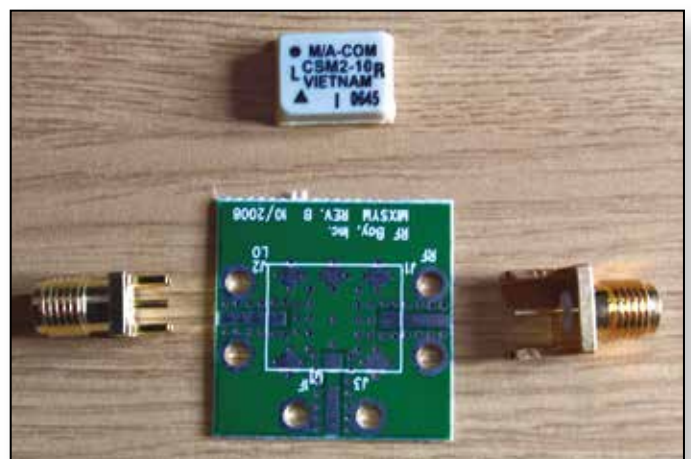
My G4DDK001 board had been built up and then modified with a crystal that provided a 23cm signal source but a check of my crystal stock located the original 96MHz unit which was fitted. A couple of noisy trimmers in the multiplier stages were replaced and with realignment I got a fairly clean +8dBm on 1152MHz. The output was certainly as good as the spectrum shown in the RSGB Microwave Handbook Vol 3¹ where the circuit and PCB layout can be found.



► G4DDK001 output spectrum

That level happens to be just right for a number of common mixer local oscillator inputs. However, most of the common passive mixers are intended for use in down converters which often means that the IF port doesn't have a useful range that extends up to 1600MHz or beyond as required for upconverting using the IF outputs above the local oscillator, i.e. from 1223 to 1589MHz, but it's perfectly acceptable to use the low side IF outputs that extend from 1081 to 715MHz. That allows the use of mixers with a 1GHz IF limit with a low side output for 2m and 4m for the Eardtek tuner and all three bands with the Sharp.

A trawl on eBay found some surface mount CSM2-10 mixers from MACOM from a seller in Denmark that have a frequency range of 10 – 2000MHz on all three ports. More searching found a board to mount it on⁶ (and even a milled aluminium housing if desired from the same seller) from the USA and SMA connectors from China.



► Mixer components before assembly

That source of mixers has dried up but the MAMXES0001 is available⁷ and a board⁸ for low side use. eBay searches also found a ready assembled mixer based around an Analog Devices ADL5350¹⁰.



► Chinese ADL5350 active mixer from eBay

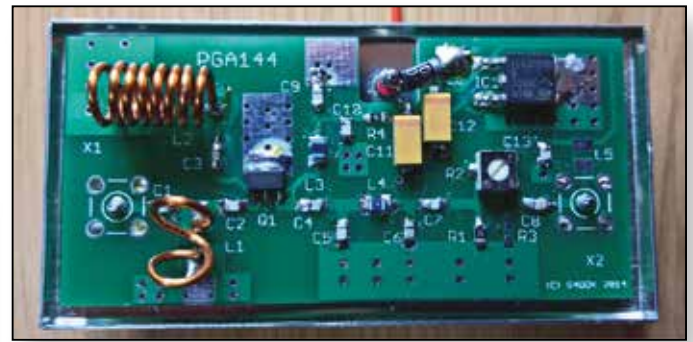
This is an active device and requires a DC supply. I ordered one from China for comparison purposes and because it is a convenient ready to use module fitted with SMA connectors. A passive mixer⁹, ready assembled, is available from Canada suitable for low side IF use.

I then looked for suitable front-ends. Fortunately, Sam G4DDK markets pre-amp kits² with tin-plate boxes for 2m and 70cm based around the PGA103 device from Minicircuits.



► G4DDK's PGA103 2m pre-amp

Incorporating bandpass filters and notches (Band II for the 2m version and 2m for the 70cm variant), they have sub 1dB noise figures and around 18dB gain³. A bonus is that they have an amazing strong signal capability with the IP3 at over +10dBm, and the kits are easy to assemble with care.



► 70cm pre-amp uses the same board as the 2m

G4DDK also sells a small kit based around the PGA 103⁴ to make up a low-noise broadband amplifier. With a gain of over 20dB, a sub 0.5dB noise figure and an IP3 of over +10dBm it makes a great second stage amplifier.

I started assembly with the mixer. Careful placement is need to ensure the pads of the device match up with the PCB tracks and fairly hot iron will ensure the solder wicks under the mixer pads.



► Assembled mixer

With the mixer LO port connected to the output of the G4DDK001, I tried injecting a -10dBm signal on 146.5MHz into the RF port and sure enough the analyser found a -20dBm signal on 1298.5MHz, a 10dB conversion loss. I then changed the signal generator set to 437MHz and found the corresponding IF signal on 1589MHz. Both of these IF frequencies are ideal for the Minitioune and similar results were obtained with IF frequencies low of the oscillator.

The next stage of testing involved using the RBDATV modulator and a Raspberry Pi3 running the Portsdown software with the output attenuated to -40dBm in place of the signal generator. The mixer IF port was fed to the Minitioune RF input and good pictures were received on both 2m and 70cm, both high and low of the oscillator.

Another local oscillator board was tried from a scrapped 1980s LMW 23cm transverter. Although it doesn't use

the low noise Butler crystal oscillator of the G4DDK design it does have more filtering and an extra amplifier at 1152MHz so the 576MHz multiple of the 96MHz oscillator in the output is unmeasurable whereas it is a noticeable, but not worrying, -50dB down on the wanted output of the G4DDK001 board.



There is no difference in the performance of the converter when the oscillator boards are swapped when looking at the wanted products but overall the LMW board produces less unwanted mixes and that might help when operating portable near broadcast sites.

Other oscillators with outputs around +10dBm can be used such as the ADF4360 boards from Richard G8BY1⁵, specified for 1152MHz which have a near ideal output of +8dBm. The ADF4350 or ADF4351 units from eBay can be used too with a MMIC buffer amplifier and the matching control board.

The mixer and local oscillator chain was then linked up with the PGA144 pre-amp and the PGA103 broadband second stage. Overall conversion gain is 35dB which is enough to ensure that the MiniTioune does not degrade the signal to noise.



As an experiment the 2m horizontal beam was pointed at the Wrotham beacon some 170 miles away and connected to the pre-amp input whilst flat conditions prevailed. The upconverted 1296.430MHz signal was just visible above the noise floor on the analyser in a 100Hz bandwidth; that would seem to be a good result.

The Chinese manufactured ADL5350 mixer 'development board' mixer¹⁰ was then tried and worked satisfactorily but it should be noted that there were significantly higher levels of oscillator and RF input signals on the IF output because it is not a balanced mixer as most of the passive devices are from Minicircuits and MACOM. Some of the passive devices are double or even triple balanced for reduced unwanted IF port products but the ready-made ADL5350 claims good linearity and IMD performance so the plug and go aspect might persuade some to use it but I'd be wary of using it adjacent to broadcast transmitter sites.

To use with the MiniTioune the oscillator frequency is entered into the offset box and then the receive frequency entered in the box above; the software works out what the NIM should be tuned to so that it works with your oscillator frequency.

A 4m front end based on the G4DDK pre-amp for 2 metres is under development but good results can be obtained by connecting the antenna to the input of the broadband second stage provided there are no strong out-of-band signals. 📡

1. Microwave Handbook Volume 3, pp232
2. <http://www.g4ddk.com/Products.html>
3. <http://www.g4ddk.com/PGA144Build2.pdf>
4. <http://www.g4ddk.com/PGA103amp.pdf>
5. <http://www.gb3ut.co.uk/adf4360.htm>
6. eBay item 150202587903
7. eBay item 180575677715
8. eBay item 150202588411
9. eBay item 282367689682
10. eBay item 272395975556

► Breadboard test layout

Turning Back the Pages

A dip into the archives of CQ-TV, looking at the issue 48 years ago.

Peter Delaney - G8KZG

CQ-TV 67

The main news in CQ-TV 67, December 1968, was about the Club's activities in attending the RSGB Exhibition, and a report on that year's BATC Convention.

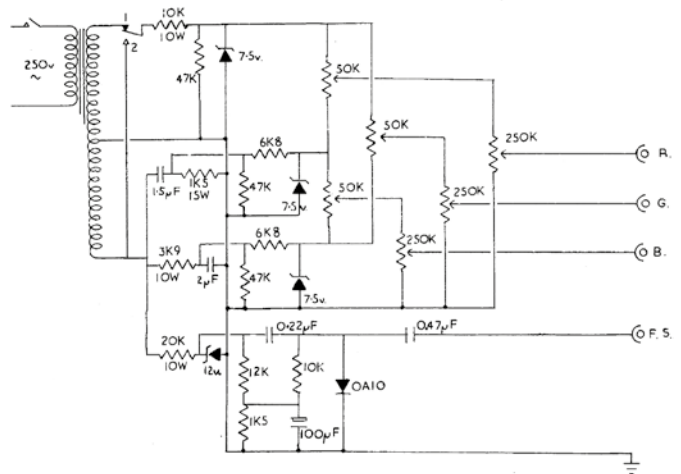


The Club stand at the RSGB event, held in the Royal Horticultural Hall in London, was shown on the cover of the magazine. The Club was "well represented with the usual array of cameras and equipment" - although unfortunately some of it was not available at the start. It was stuck in a Mini on the A40 which had 'unaccountably broken its clutch'. There were 2 cameras, 2 monitors various other pieces of equipment, such a test signal generator, with which to open the show, as well as 'examples of all current camera tubes'. Even then, things were not 'going to plan'! Nobody could work out where to plug in the mixed syncs to one of the cameras --- until it was realised that its processing amplifier was missing. Peter Blakeborough came to the rescue with his transistorised camera, which was said to give much better results as the FET in the head amp was producing noise free pictures. The pulses for the displays were provided by a transistorised generator built by Tom Mitchell. The Mini repaired, the equipment it was carrying was added to the display - including a remote pan and tilt head for Bob Tebbutt's camera, which was popular with visitors.

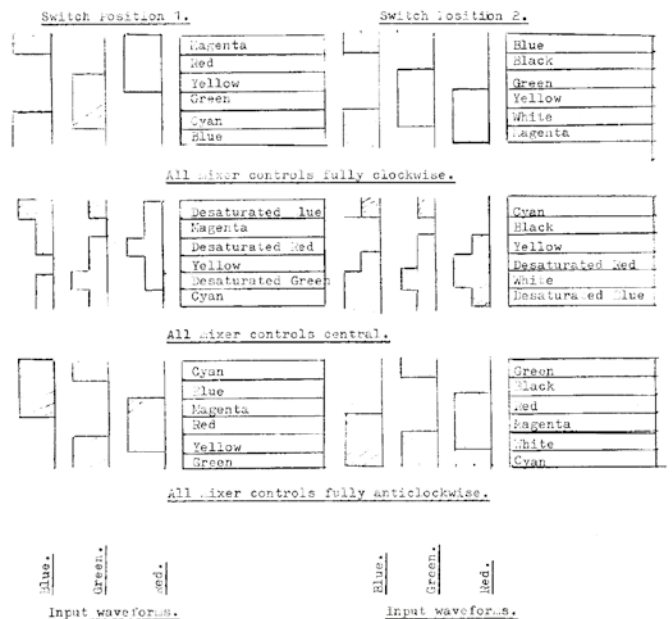
150 people had attended the Club Convention - also held in London. A display of member's equipment showed the video, transmitting and slow scan aspects of amateur

television. The lecture programme featured 'Slow Scan Television' - by Grant Dixon, 'A Vidicon Camera Yoke' by John Tanner, and 'Amateur Video Recording' by Gordon Sharpley.

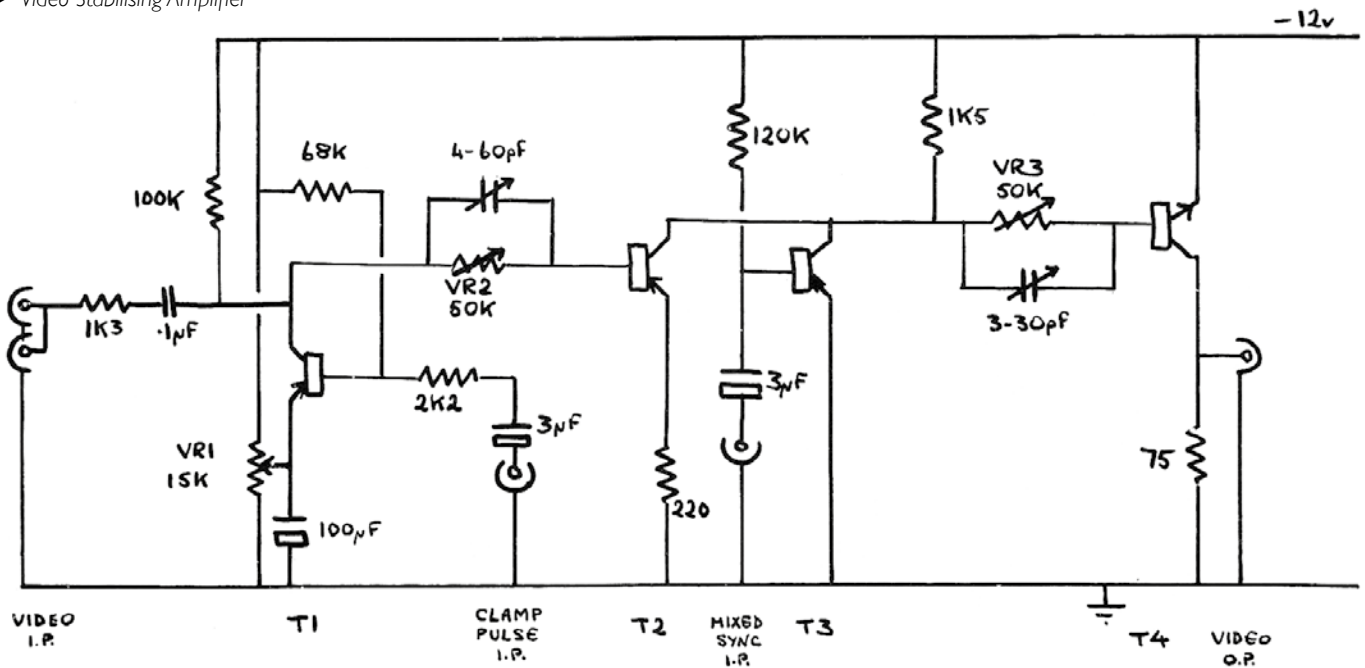
The technical articles in this edition were all standard video related. A "simple colour bar generator", by M Lewis, used a mains transformer to produce three sine waves each 1200 out of phase (2 by phase shift networks from one winding, the third from another winding 1800 out of phase to the first).



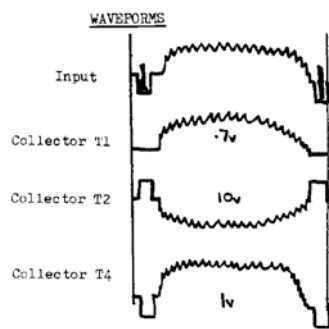
The zener diodes converted the signals to square waves, which could then be mixed to produce the output signals to feed to a monitor, along with a negative going spike to act as a field sync signal. Being derived from the 50 Hz mains, the bars were horizontal. The chart indicated the various colour patterns possible in switch positions 1 or 2.



► Video Stabilising Amplifier



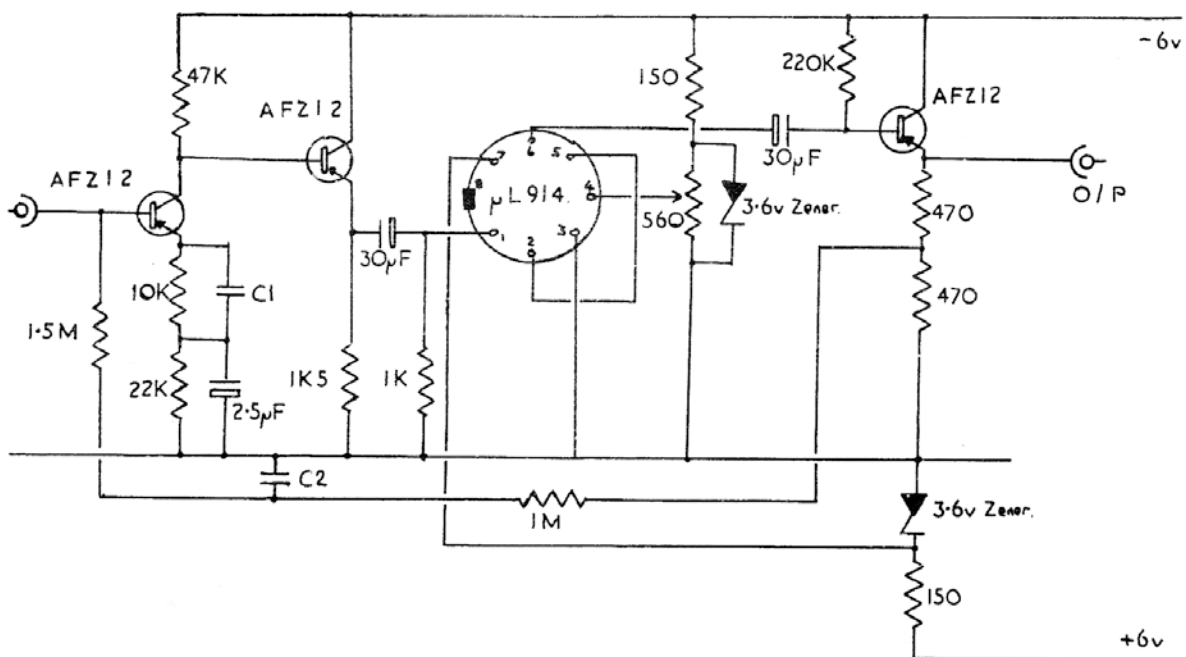
A video stabilising amplifier built by David Taylor used T1 to clamp the incoming video, before being amplified in T2, before sync pulses were added at T3. Typical waveforms in the circuit were given to aid setting up - the two variable capacitors were adjusted for best high frequency response, Vr3 set the gain of the output stage, T4, and Vr2 set the video gain, and V1 the ratio between picture content and sync amplitude.



Following an article in CQ-TV61 (and shown in this series in CQ-TV248) about the Fairchild range of integrated circuits, the magazine included a design for a camera head amplifier using a μ L914. The input transistor was run at a very low collector current, to reduce noise, and together with Tr2 formed an impedance transformer to drive the μ L914, which provided most of the amplification, before the Tr3 output stage.

As often has happened, Club members were trying new technology, and finding alternative methods to those used in broadcast television to produce the results wanted.

► IC based Camera Head Amplifier



The British Amateur Television Club



The club provides the following for its members:

- ▶ A colour magazine, CQ-TV, produced for members in paper or .pdf (cyber membership) formats.
- ▶ Web site – where you can find our online shop stocking hard to get components, software downloads for published projects and much more.
- ▶ A members forum at www.batc.org.uk/forum/ for help, information and the interchange of ideas.
- ▶ A video streaming facility at www.batc.tv which enables repeaters and individual members to be seen worldwide.
- ▶ An annual Convention held in the UK where you can meet other members, visit demonstrations and listen to lectures.
- ▶ Meet other club members at the BATC stand at local rallies across the country.
- ▶ The **BATC Wiki** for all the details of systems and projects for all things ATV. <https://wiki.batc.tv/>



www.batc.org.uk



BATC

Out and About

RadioFairs



Rallies and events in 2017 with an ATV stand: (subject to change)

9 April.	NARS, Blackpool	www.narsa.org.uk
30 April	West London.	www.radiofairs.co.uk
6 May	Eastbourne Rally	www.serf.org.uk
20 May	Norden, Rochdale.	www.radars.me.uk
21 May	Dunstable Downs RC	www.ddrcbootsale.org
18 June.	Newbury.	www.nadars.org.uk
25 June	West of England.	www.westrally.org.uk
16 July.	McMichael Radio Rally.	www.mcmichaelrally.org.uk
13 August	Flight Refuelling	www.frars.org.uk
9-10 September	BATC Convention, Finningley	www.batc.org.uk
29-30th Sept.	National Hamfest.	www.nationalhamfest.org.uk
5 November	West London	www.radiofairs.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.