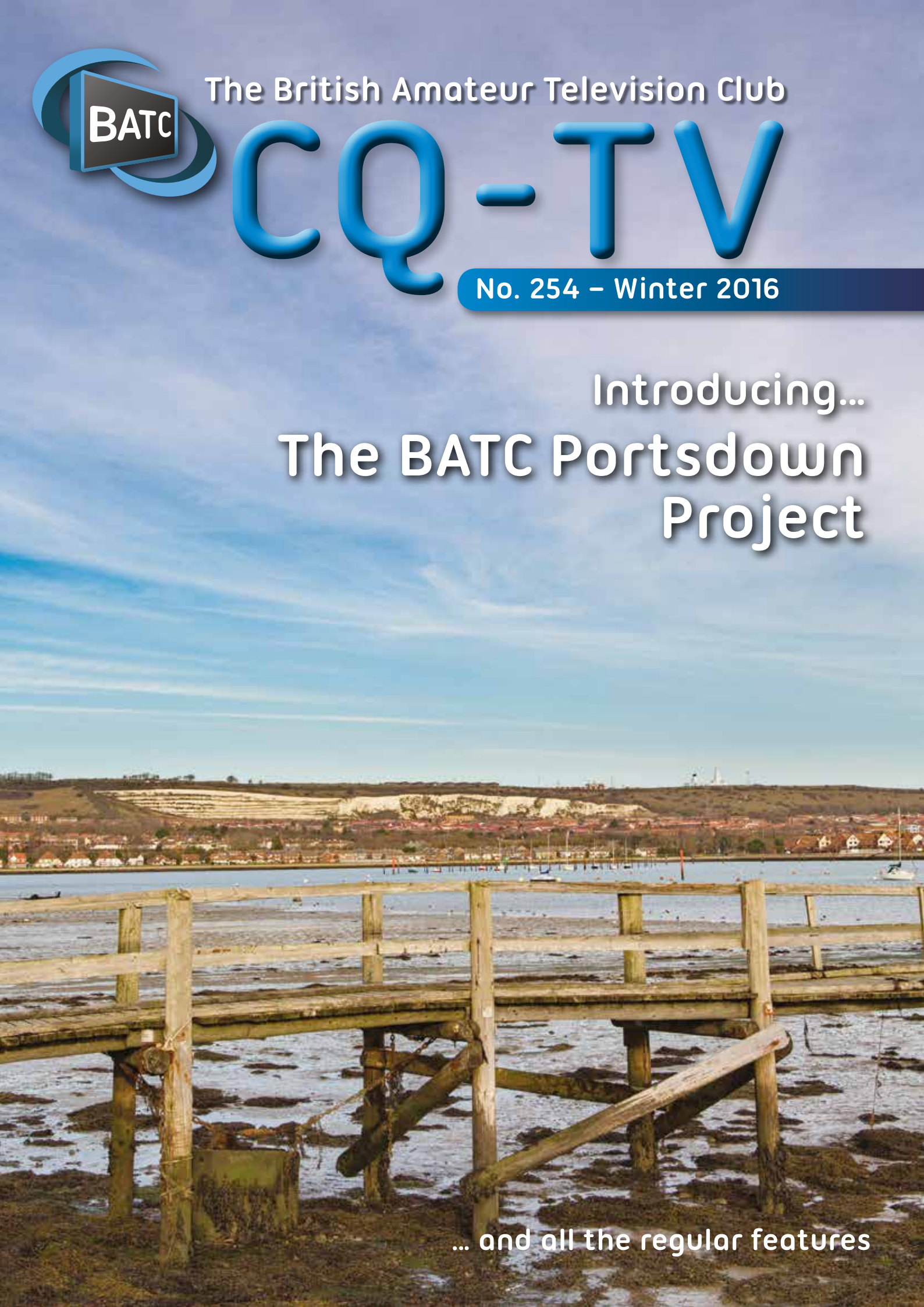
The British Amateur Television Club

CQ-TV

No. 254 – Winter 2016

Introducing...

The BATC Portsdown Project



... and all the regular features

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
- Plug in option for 2nd video & audio channels
- Size: 165mm wide; 120mm deep; 55mm high
- Tunes the 70cm and 23cm bands. Tuning range from 150Mhz - 2Ghz
- -5 dBm output
- Power 500mA at 12 volts
- LCD front panel and keypad control
- RS232 control port
- Includes TS Dock PCB free of charge!

Specification subject to change without notice

Available from BATC shop

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

ATV activity weekend

11 and 12 March 2017

- All bands from 50 MHz to 24 GHz
- Digital and analogue modes
- Repeater and simplex contacts
- Home station and portable certificates for best DX
- Coincides with international ATV activity weekend
- See the BATC forum for more information
- Put it in your diary NOW!

Time to blow the cobwebs off all that gear and get on air!

BATC

CQ-TV 254

Contents:

Printed in Great Britain. ISSN 1466-6790

Cover photograph of Portsdown Hill by Oli Crump Photography

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...

Noel Matthews - G8GTZ

First of all, on behalf of all the committee may I wish you a healthy and prosperous 2017.

2016 was an interesting year in a lot of respects and the ATV community continued to thrive and grow. We had the success of the ARISS Tim Peake Principia project, which, without BATC involvement in enabling both the reception of HamTV and the web streaming, would not have had such an impact and bring amateur radio to the attention of so many people. And at CAT16, we heard about the continued development of a number of initiatives including a new tuner from F6DZP which will cover 140 – 2500 MHz without the need for external upconverters.

Whilst it is great that the ATV community continues to adapt and change, the BATC committee has recognised that it can be difficult for newcomers and members alike to keep up with all the developments and so we are pleased to announce the launch the Portsdown DATV transmitter and receiver project in this issue of CQ-TV.

Developed by a number of BATC members, the Portsdown project sets out to be the definitive ATV project covering both the RB-TV DX modes and the wider bandwidth DATV modes, commonly used on all our repeaters and aims to bring the latest digital technology within reach of ATV operators at a reasonable cost. The Portsdown project will clearly define the hardware and software elements required and comprehensive documentation, including a project handbook, will be provided There will be a dedicated page on the wiki and a page on the BATC forum has been set up to enable an interactive discussion between fellow constructors. We hope you will all get involved in what we believe is a major development to help keep the spirit of ATV alive and on the air!

Also in this CQ-TV you will find the annual BATC report which was presented to the RSGB UK spectrum forum meeting in October – major concerns expressed at this meeting by all parties including the rising noise floor on all amateur bands, the demand for RF spectrum and the relationship with Ofcom. From an ATV perspective, we yet again voiced our concerns about the length of time to obtain ATV repeater NoVs – unfortunately this is primarily due to the delays in Ofcom obtaining the primary user consents and has been further compounded by the move of Ofcom spectrum licensing department to Warrington.

Whilst being a secondary user is not ideal and does cause issues around repeater licensing etc, it does also give us a level of protection which we would not have if we were in a band open to commercial pressures. This is particularly true at 70cms - Ofcom are currently reviewing the use of the UHF spectrum but are not considering any changes between 430 -440 MHz due to MoD being the primary user!

There's a lot going on and at the start of the new year we are looking for more involvement from you! Firstly, why not get involved in the Portsdown project with the aim to get it finished and on the air by our first activity day of 2017 in March – we are always looking for ways to increase the number of stations "on the air" and for 2017 have introduced awards for home and portable stations. Then we could do with more articles and news to include in CQ-TV – there's a lot going on out there but we need to know about it so we can tell the whole ATV community. Finally, we are starting to think about CAT17 and need to know where you think it should be held and what you want to see on the agenda – use the BATC forum to give us your feedback.

And with so much happening you may be wondering what the best way to keep up with the latest news is. Most of the discussion takes place on the BATC forum and an easy way to monitor that is by using the RSS feed – you can either go to ***http://www.batc.org.uk/forum/feed.php*** or cut and paste the url in to an RSS reader such as the RSS feeds tab in Outlook. And if you are on Twitter, immediate notifications of activity can be found by following @BATConline. And if you want some information on any aspect of Amateur Television, the BATC wiki is a great place to look ***https://wiki.batc.tv***

Members News

Dave Mann – G8ADM

BATC Streaming

Our streaming service, ***www.batc.tv***, is very useful for keeping in contact with our overseas members. Most Monday and Tuesday mornings, 8.30 am to 10 am both Gary VK2CRJ and Tony VK7AX can usually be seen from Australia in the Members streaming section. Recently Gary has been using the free version vMix software. This turns your PC into a proper video mixer and can use most forms of transmission, digital and analogue, HD / SD, see P26 of CQTV 253 and ***www.vmix.com***. vMix can also provide a direct streaming output without the need to use the Adobe Flash encoder. This interfaces directly to the BATC streaming service and produces excellent results. Also in the ATV Repeaters section, several Australian repeaters are often active during the UK morning.

Repeaters

GB3TM, Isle of Anglesey, the users of this repeater also often demonstrate vMix.

GB3GG, near Grimsby, are testing a new streaming service with an automatic camera.

GB3BH - Bushey Heath, Hertfordshire - is having its 70cm input improved. There are so many strong signals in and around the 70cm band that it is important to have a very good bandpass filter of under 1 dB loss and about 3 MHz wide tuned to 437 MHz between the antenna and the first stage of the receiver. Such filters can sometimes be found at junk sales or rallies. The picture shows such a filter, donated by Jason M1PRO, compared in size to a spray can. These are normally tuned above 70cm but can be tuned down with the help of a decent spectrum analyser. We will be fitting this to GB3BH in the new year and hope for much improved results. These filters are quite rare so if you see any it would be good to buy them and advertise them on the BATC forum if you have no use for them.

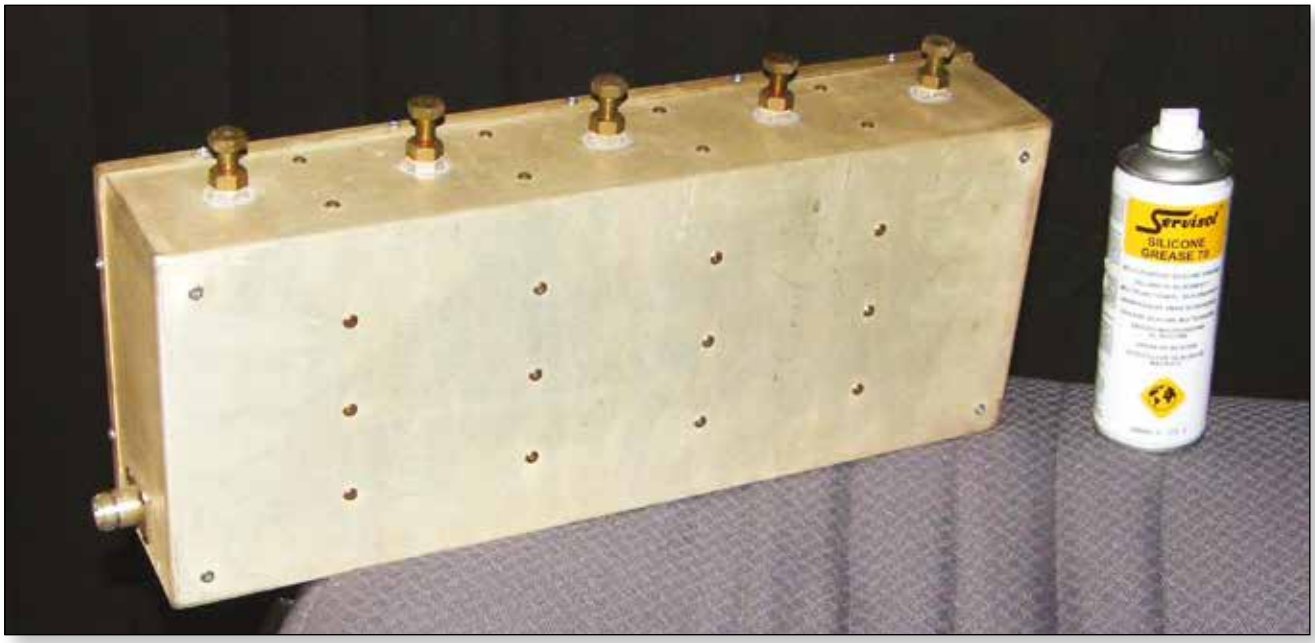
HDTV

There is much talk these days about reduced bandwidth TV, RBTV, because of its long range / weak signal capability. but I still enjoy using proper HDTV. We have plenty of space for HDTV in the microwave bands and maybe also in the 70cm band. I was pleased to see that amateur HDTV was discussed at the ARRL Digital Communication Conference last September. This can now be seen on YouTube and is well worth a look, see this short cut link: ***https://youtu.be/JDTHFFGjsDg***

Es'hail-2 Satellite

Their website now states that this satellite containing an ATV transponder has been put back slightly and is scheduled for launch in the third quarter of 2017. See the details in this column from CQTV 252.

That's it for now, please send me any news and information for the next CQ-TV before the end of February to secretary@batc.tv, thanks.



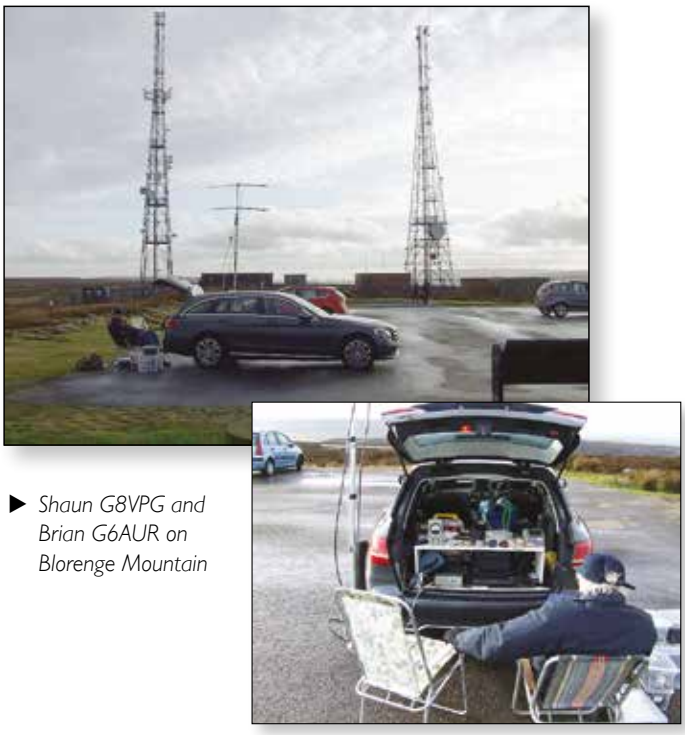
Contest and Activity Day News

Dave Crump – G8GKQ

ATV Activity Weekend 10/11 December

This turned out to be one of the best activity weekends for a few years. Initial plans were for a number of portable stations to go out on the Saturday, but as the weekend approached, it became clear that the weather forecast (and tropo forecast) was far better for the Sunday. Through social media (are you following @batconline on Twitter?) and the BATC forum, fresh plans were made for the Sunday. The table shows the stations that let me know that they were involved.

Shaun G8VPG went out with Brian G6AUR to Blorenge Mountain near Abergavenny and managed to work G8GTZ/P on 146.5 MHz to reclaim the 2-way distance record at 185 km. They also worked Ivor G1IXF in Bristol and Brian G3NWR/P on Clee Hill.



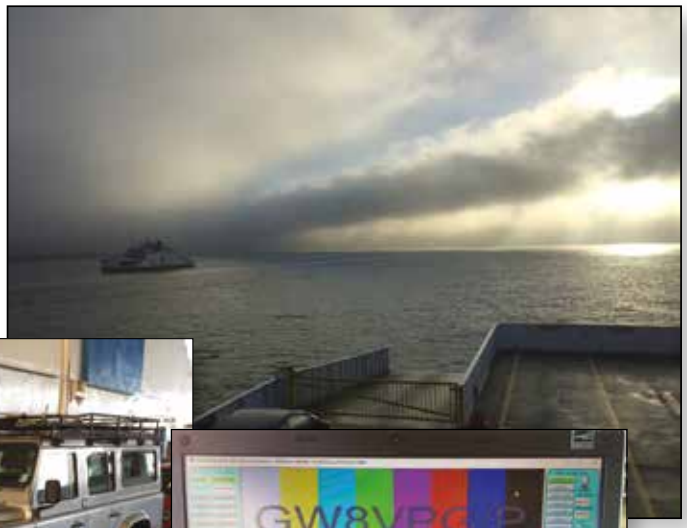
▶ *Shaun G8VPG and Brian G6AUR on Blorenge Mountain*

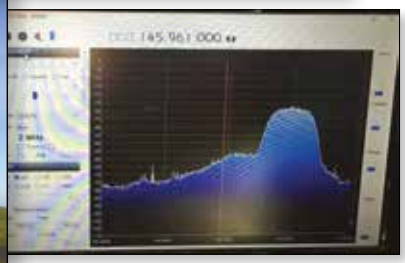
Call	Location	Locator
G8GTZ/P	Ventnor, Isle of Wight	IO90JO
M0DTS/P	North York Moors	IO94MJ
GW8VPG/P	Blorenge Mountain	IO81LS
G3NWR/P	Anchor, Shropshire	IO82KL
G3NWR/P	Clee Hill, Shropshire	IO82QJ
G7JTT/P	Lane End, Hampshire	IO91JA
G8DKC	Coalville, Leics	IO92IP
G4CPE	Upper Sundon, Beds	IO91SW
G3KKD	Cambridge	JO02CF
M1EGI	Barnsley, S Yorkshire	IO93GL
G8VDP	Barnsley, S Yorkshire	IO93GM
G4FVP	Darlington	IO94FM
G4ZCN	Hartlepool, Cleveland	IO94JP
G1LPS	Kirk Merrington, Durham	IO94EQ
G1IXF/G1IXE	Bristol, Avon	IO81RL
G0MJW	Harwell, Oxon	IO91IO
G4GUO	Worthing, Sussex	IO90ST
2E0XAY	Leicester	IO92KP
G8LES	Alton, Hants	IO90ST
G4KLB	Bournemouth, Hants	IO90BR
G3UEQ	Worthing, Sussex	IO90TT
M0SKM	Dunstable, Beds	IO91RV
G8ADM	Pinner, Middx	IO91TO
G7GNA	Waterlooville, Hants	IO90LV

Brian G4EWJ went out to 2 sites Anchor, IO82KL and Clee Hill. Operating from Clee Hill as G3NWR/P, he managed to set a new 146 MHz distance record by receiving Noel G8GTZ/P from the Isle of Wight at 220 km. Although Brian's signal was visible on a spectrum analyzer with Noel, and appeared to be strong enough, no decode was achieved.

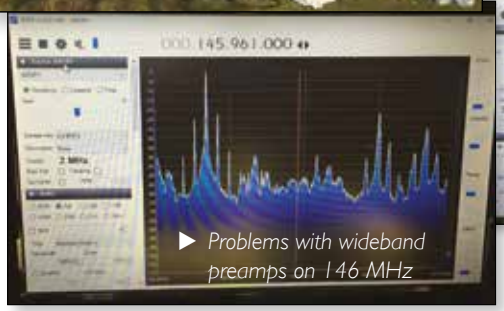
Contest and Activity Weekend Calendar

1200 UTC 11 March 2017 - 1800 UTC 12 March 2017	*ATV Activity Weekend*
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*

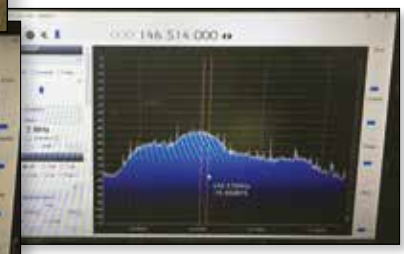




▶ *A good signal from G4KLB on 146.5 MHz*



▶ *Problems with wideband preamps on 146 MHz*



▶ *A weak, unreadable signal from G3NWR/P at 220 km*

I went out with Noel G8GTZ to the Isle of Wight on the Sunday. We caught the 9 am ferry and were on-site by 1045. As ever, site selection was a compromise between height and proximity to other transmitters. Once set-up, we managed contacts on 146 MHz, 437 MHz and 10 GHz. The 10 GHz contact with G7JTT/P 48 km away at Lane End proved to be the easiest of the day – pictures were over 10 dB MER each way on initial settings of the dishes without adjustment. Other highlights included a one-way to F9ZG on 437 MHz and establishing new one-way and 2-way records on 146 MHz. Once again, we had problems with modern wideband preamps. The older tuned preamps proved to be much more sensitive in a hostile RF environment. An AirSpy proved to be very useful in diagnosing these issues.

Awards

Provisional recommendations for the awards
(as the closing date has not yet passed) are:

- **Best DX RB-TV contact**
  (one or 2-way, bandwidth < 800 KHz)
  G8GTZ/P – G3NWR/P 146.5 MHz 333 KS/s 221 km
- **Best DX Digital TV contact**
  (one or 2-way, bandwidth > 800 KHz)
  No claims as yet!
- **Best DX Analogue TV contact**
  (one or 2-way, FM or AM)
  M0DTS/P – M1EGI 1255 MHz FM 107 km

ATV Activity Weekend 11-12 March 2017

The next scheduled ATV Activity Weekend is on 12/13 March 2017, so you've got plenty of time to finish your new transmitter or receiver and ensure that you get on the air!

Ad Hoc Activity Days

Please keep an eye on the BATC Forum to hear about any ad hoc activity days. Details also tend to be posted on Twitter (@batconline) FaceBook (British Amateur Television Club (BATC)). You can see the latest tropo forecasts on F5LEN's website:
http://tropo.f5len.org/forecasts-for-europe/

New and renewing members

Rob Burn, Membership Secretary - G8NXG

This is our welcome page for new and renewing members. We present a list that highlights joining and renewing members intended to acknowledge your support of the BATC. In line with that published in CQ-TV 253, this list continues and covers much of the three month period from September to the end of November

Australia:		
Bevan Daniel	VK5BD	Australia
Mark Harris	VK3EME	Australia
John Kessner	VK3ATV	Australia
John Lukey	VK2ZUH (VK2JG)	Australia
Colin Matten	VK2KCM	Australia
Europe:		
Joël Lebon	ON4LJ	Belgium
Jan Poppeliers	ON7UX	Belgium
Guy Gounel	F1BFZ	France
Pierre Roussiere		France
John Good		Ireland
Jaap Zondervan	PA0OLD	Netherlands
Pedro Meneses	CU2FH	Portugal
Miguel Escalante Naranjo	EA7UH	Spain
Josep Martínez	EB3DYB	Spain
Far East:		
Hiroshi Matsumoto	JA1SYK	Japan
United Kingdom:		
Jim Arnott	G1WKK	Hampshire
Norman Bambridge	G8PLL	Somerset
Philip Benest		Lincolnshire
Keith Bennett	G8AVV	Co Durham
Paul Bicknell	G8KFW	West Sussex
Bill Boyd	G4BID	Hampshire
Karl Brazier	G7AFT	Hampshire
Graham Cheater	G4FUA	Avon
Neil Connor	M6CUE	Berkshire
Robert Dyer	G1XIE	Hampshire
Steve Edwards	G3AGW	West Midlands
Alexander Forsyth	G6BJB	Lancashire
Paul Haworth	G6OWI	Lancashire
Anthony Horsfall	G4CBW	Staffordshire
Richard Horton	G4AOJ	Surrey
Derek Hughes	G7LFC	Lancashire
Derek Latham	G6HXL	Lancashire
Steve Marshall	M0SKM	Bedfordshire
Paul Newman	G8UDI	Lincolnshire
Shaun O'Sullivan	G8VPG	Avon
Martin Perrett	G8LCE	Cornwall
Stephen Pettitt	M0MOI	Northamptonshire
Jeremy Powell	M0JLP	Nth Yorkshire
Kay Pullan	G8NZR	Yorkshire
Zalam Rathore	2E0JSR	Lancashire
Maurice Richards	G3WKF	Cornwall
Don Roomes	G0RQL	Devon
Leonard Stockwell	M1DPE	Essex
Peter Stonebridge	G8ZQA	Suffolk
Nigel Swann	M1NAS	Leicestershire
David Thomas		Essex
Stephen Thompson	G8TNA	Cornwall
Eric Thorley	G0JBR	Merseyside
Julia Tribe	G0IUY	Hampshire
Simon Tribe	G0IEY	Hampshire
Arthur Turner	G4CPE	Bedfordshire
Lee West	G4TNX	Essex
James Davies	GW6JWD	Credigion
Graham Felton	GW0FEM	Angelsey
Bob Todd		
United States:		
David Bush	KC5UOZ	
Gary Oaks	KB9VGD	
Tim Shroyer	KH6N	
David Stepnowski	KC3AM	
Wayne Strickland	W9BBB	
Updates:	**(call sign)**	
Peter Green	G60BI	Devon

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.

News from Germany

Klaus - DL4KCK

New QTH DB0QI near Munich

Ernst, DJ7DA

On November 9 2016 we received our licence document for ATV repeater DB0QI at the new site Vierkirchen near Dachau. The basic change against the old site in Munich is the allowed bandwidth for our DVB-T output on 436 MHz: instead of 2 MHz it is only 1 MHz now. So all receivers (USB stick or stand-alone) for the old output of DB0QI are useless now. HiDes (from Taiwan) has a new DVB-T receiver in stock that is capable of 1 MHz bandwidth - the HV-122-TV. We have done some testing, video and audio reception works ok - the new exciter at DB0QI has 1 MHz BW.

New ideas for HamTV

The ARISS meeting minutes for August 16, 2016 cover the discussion about using a Raspberry Pi computer board to generate video to feed the ISS Digital ATV transmitter. An idea was proposed by Jean-Pierre Courjaud F6DZP for using Raspberry Pi at the transmitting ground stations for generating a H264 video stream that modulates a DVB-S or DVB-52 carrier. His report was distributed to the ARISS team on August 12, 2016.

Discussion: Jean-Pierre Courjaud had brought this idea to a Ham TV Technical (HTT) meeting for using Raspberry Pi to generate a H264 video stream. Raspberry Pi is used in the United Kingdom for DATV on 2 meters. Gaston Bertels ON4WF termed this a cost effective solution, probably easy to work on, many people and schools would be able to receive video from the ISS, and he inquired if this idea was proposed for the Paolo Nespoli IZ0JPA flight next year. Jean-Pierre Courjaud related that Paolo Nespoli had asked about it, and the team hopes he could use it if the idea is presented for review to the ARISS-International Technical Evaluation & Support Committee and approved by ARISS Delegates.

Jean-Pierre Courjaud explained that Raspberry Pi could be a solution for two things – first, the webcam could be used instead of the onboard ISS camera, and second, signals received by schools could be transmitted back to the crew. Frank Bauer KA3HDO felt the astronauts would like this. Dave Taylor W8AAS asked about the type of receiver schools would need and how signals would be uplinked. Jean-Pierre Courjaud clarified that schools would have a narrowband ATV receiver that uses a USB dongle; this would bring the signal to the Surface Pro computer that Paolo Nespoli plans to fly on ISS, and modified mini-tutioune software would decode the uplink signal received from the L-band antenna.

Dave Taylor inquired what new hardware would have to be tested and certified for flight. Jean-Pierre Courjaud said that Nespoli plans to take the Surface Pro, and to be tested and launched would be the USB interface that would work with the L-band antenna and serve as an L-band receiver with the Surface Pro. During Nespoli's mission the mini-tutioune software could be uploaded to his Surface Pro. Oliver Amend DG6BCE planned to share the meeting discussion with Emanuele DíAndria I0ELE and ask him and the committee, because the project originated with AMSAT-Italia, to give the plan, including what must be tested and launched, to Mark Steiner K3MS, chair of the ARISS-International Technical Evaluation & Support Committee.

Read the full ARISS Meeting Minutes August 16, 2016 at ***http://www.ariss.org/meeting-minutes/august-2016***

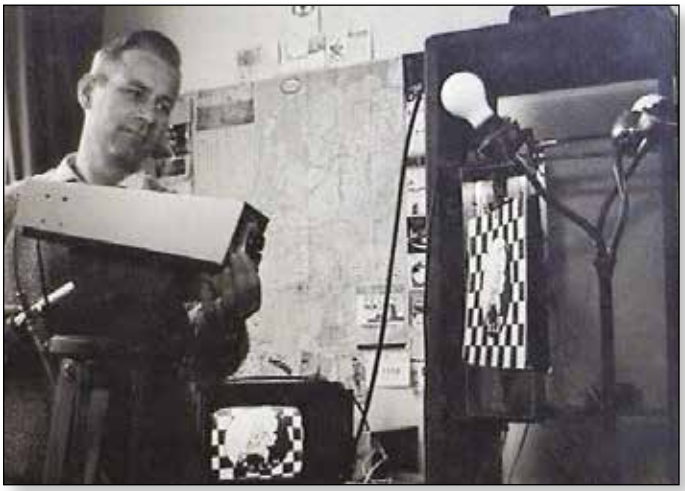
Amateur radio pioneer Arthur Lambriex, ON4FIN

Klaus, DL4KCK

Arthur, ON4FIN, was a colleague of Uwe Kraus, DJ8DW, at the well known company Philips in The Netherlands some decades ago. These days he found old documents of his early ham radio activities and sent it to me by e-mail.

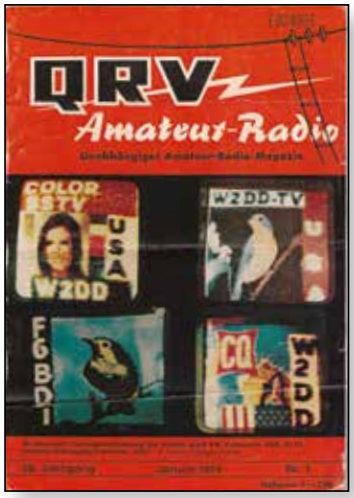
First steps in ATV

In June 1956 Arthur succeeded in a first AM-ATV fast-scan contact under his call PA0LAM to another radio amateur near by, his self-made video camera is shown in a photo from 1962:



Color SSTV pioneering 1972

The german DIN-A5 ham radio magazine QRV from January 1974 (Koerner publishing company was rivalling CQ-DL by DARC) reported about the "very first contact Europe - USA in color SSTV" on 1.1.1973 between W2DD and F6BDJ. Devices used were a self-made analog Slow-Scan-TV converter with P7 long-persistent phosphor picture tube from RADAR installations (also used in the commercial ROBOT SSTV monitor) and a color photo camera with red, green and blue filters subsequently put between them (frame sequential) for multiple exposure records. As the chemical film had to be developed, some operators used a Polaroid-Camera for a faster full-color result.



For production of frame sequential color SSTV pictures a modified black-and-white video camera with the usual scan rate of 8 seconds for one frame containing 120 lines and 120 pixels put out audio varying between 1500 Hz (black) and 2300 Hz (white). This sound was recorded on audio tape and repeatedly played back to the TX input in an SSTV QSO. Regular 1200 Hz synchronizing bursts at each line and frame start helped to tune the distant shortwave SSB receiver onto the correct QRG. This way Arthur as PA0LAM had a direct contact to W.H.DeWitt, W2DD, on April 9 1972 already, when he recorded WA2DD's color SSTV picture and transmitted it back to USA.

On April 30 1972 Arthur transmitted his first self-made color SSTV picture in return to WA2DD, who mentioned that in a five pages article on that mode in CQ magazine of September 72.

Meanwhile Arthur is working in Belgium (retired) as ON4FIN with modern computer SSTV software like JVCOMM by Eberhard, DK8JV, enabling better picture quality and resolution. Digital storage on PC hard disk simplifies the picture exchange enormously, compared to those early days...

Other ATV magazines are available!

From Germany, TV-Amateur 183 has recently been published.

More details:
www.agaf-ev.org/

The BATC Portsdown DATV project

Introduction

Amateur Television has seen many changes over the last 20 years, particularly with the introduction of digital transmission and reception and the ATV community has developed tools and products, to take full advantage of these changes. Because of this, the hobby is seen as being at the forefront of technology and this has directly resulted in the granting of additional spectrum to the amateur radio community in the UK.

The rapid pace of change has seen a number of generations of digital equipment and projects being made available – DigiLite was significant as the first self-build, and the DTX1 made digital-capable equipment available "off the shelf". More recently, the introduction of Reduced Bandwidth (RB-TV) has generated a requirement to develop new versions of many of the system components, and we have seen a number of articles in CQ-TV describing modules which can be used together to form an RB-TV system.

However, all these changes and the various RB-TV projects can be confusing, not only for those currently involved in the hobby, but particularly for newcomers and those who were active in the 1980 and 1990s on 70cms using AM, and are now looking to return to the hobby.

With this in mind, the BATC Committee decided that it was time to put together a DATV definitive project which offered an easy way to "get on air" at a relatively low cost, covered most of the common modes and involved some basic construction to give the "I did that" feeling.

To initiate the project we drafted a specification which included:

- Symbol rates to include the Reduced Bandwidth (RB-TV) modes and "normal" DATV modes
- Frequency coverage of 146 MHz, 437 Mhz and 23cms
- Cost-effective stand-alone (not PC based) Digital TV Transmit solution
- Flexible receive solution based around readily available software
- Analogue video input to allow use of camcorders and mixing desks
- Use of commonly available components and modules
- Modular construction enabling a step-by-step system build and easy trouble shooting
- Designed to encourage home construction and requiring an average skill level
- Fully documented and supported including easy software installation and upgrades

The Portsdown Project

We decided to give the name "Portsdown" to this significant project in order to recognise the valuable contribution our 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 RB-TV – see CQ-TV 247, page 17.

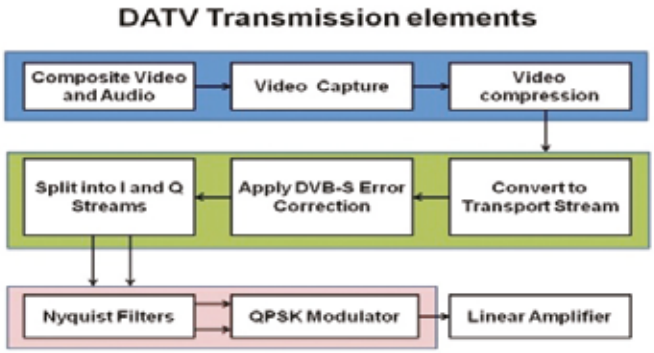
The aim of the Portsdown project is to enable an amateur operator with little or no knowledge of Digital ATV to construct the hardware elements, load and configure the software and use the system to send live Digital ATV signals across town on his existing aerials. It will include the new DX RB-TV modes and the ability to receive and transmit to local repeaters using the more traditional 2 and 4 Msymbol DATV modes.

The Portsdown project will clearly define the hardware and software elements required and comprehensive documentation, including a project handbook, will be provided. Additionally, a dedicated web page (wiki) and a forum discussion area, to enable an interactive discussion between fellow constructors, will be maintained.

Oli Crump Photography

Tight version control will be used to ensure that the software is relatively bug free and any new features and updates will only be released after being fully tested by the project team.

Hard to get components such as tuner modules, together with pre-programmed micro-SD cards, will be made available through the BATC shop.



DATV system elements

A DATV transmit system is made up of a number of key elements:

- Video encoder – digitises and compresses the video and audio signals down to a bit rate which can be transmitted in a radio channel.
- Conversion of that bit stream in to a transport stream and add error correction.
- A QPSK modulator to modulate the carrier frequency with the bit stream from the encoder.
- Digital capable RF filters and amplifiers.

Portsdown Project Transmitter

At the heart of the Portsdown project transmitter is a Raspberry Pi (RPi) computer running a BATC customised version of the F5OEO rpidatv software. The RPi will preferably be a version 3 unit (approx cost £30) although the Model B and version 2 will work with reduced performance and functionality. The choice of the RPi is primarily due to the fact that it has an on-board MPEG-4 (H264) encoder and the versatile hardware interface (GPIO) capabilities.

The RPi is used to generate the MPEG bit-stream and the IQ signals, which are sent via the GPIO port to a new modulator card capable of the wide symbol rate range required. This card has been developed by Colin G4KLB and John O'Loughlin specifically for the Portsdown project.

A local oscillator signal on the required output frequency is generated by a separate module. Whilst any clean oscillator could be used, including the Ultram modules sold for use in the Digilite project, 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.

The output from the modulator card is at a relatively low output (0dBm or 1 milliwatt) 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 will be links to them on both the wiki and project handbook.

The F5OEO 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 available in the Portsdown transmitter as it 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.

Whilst an external PC will be required to initially configure the system, a touch screen interface on the RPi enables the system to be used without further need to connect up 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.

As well as using the optional RPi camera as a video source, the unit can play video files and JPEGs directly off the RPi SD card and an analogue video input is provided using an ezcap type USB capture device – available for less than £10 from online auction sites.

Portsdown Project Receive System

Whilst it was felt important to develop a standalone transmit system which did not need a PC or keyboard and monitor to operate, a receive system clearly requires a monitor to view the received signal and it was therefore felt a PC-based receive system would be acceptable.

The excellent Tutioune receive software from F6DZP already exists and is used by many ATV operators for both RB-TV and DATV reception and it was decided to adopt this for the Portsdown project – the software has many diagnostic tools and enables recording of the incoming digital signal as well as remote web reporting of the received signal. Over 200 sets of parts of the hardware required to work with the Tutioune software, known as Minituner, have been sold through the BATC shop and will also be used in the project. The current tuner module made by Sharp has limited frequency coverage and requires a separate L band up-converter when used on 146 MHz or 437 MHz.

However, the Portsdown project receiver will be based around a new tuner module or NIM from Serit which covers a much wider frequency range and enables reception on 146 MHz and 437 MHz without external receive converters. An adaptor card is required to interface between the new tuner and the minituner PCB and this and the new Serit tuner will be available from the BATC shop. Of course suitable filters and pre-amps will need to be used before the tuner to enable anywhere near adequate performance – many designs have previously been published and whilst they will not form part of the Portsdown project, there will be links to them on both the wiki and project handbook.

Project Cost

One of the Portsdown design briefs was to try and use as many commonly available components as possible. Doing this helps keep the build cost to a reasonable level and increases the chances of re-use of redundant modules, such as camcorders and even Raspberry Pis which were bought with the aim of learning to programme but are now languishing in the cupboard! If all components were purchased it is envisaged the cost of the Portsdown transmitter, including touch screen LCD and analogue video input, would be less than £175 and the receiver can be constructed for around £75.

Timescales and next steps

A large quantity of Serit tuners have been ordered from Hong Kong and are expected to be available in the BATC shop in the next 8 weeks. The Portsdown project modulator card is in the final stages of development and blank PCBs are expected in the same timescales and all other components are available from regular suppliers now.

So we suggest you add an RPi 3, camera, touch screen LCD and ADF 4351 module to your shopping list, watch the forum / wiki for updates and if you already have a mini tuner, download the first version of the Portsdown software and experiment with the QPSKRF or "Ugly" test mode across the shack.

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 ATV 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 communally used DATV and RB-TV modes at a reasonable cost.

A Portsdown Raspberry Pi-based DATV Transmitter - Introduction

Dave Crump - G8GKQ

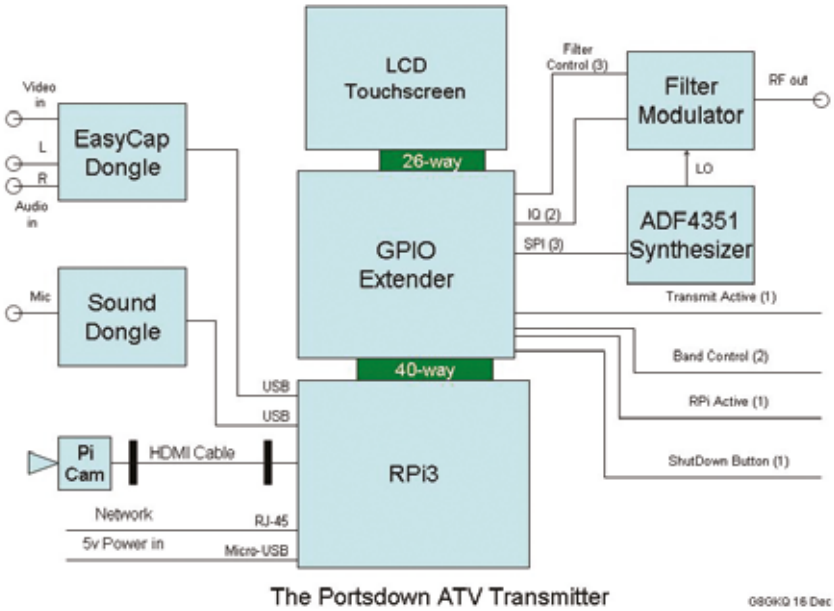
Previous articles in CQ-TV have described the DigiThin RB-TV transmitter based on a Raspberry Pi (RPi) and its camera. The availability of faster versions of the RPi (particularly the RPi 3) has made it possible to build a DATV transmitter based on the RPi. This article introduces a new BATC Project to build a relatively cheap DATV transmitter. Some PCBs and components will be made available through the BATC Shop; commercial sources will be identified for other components.

The core capabilities of the transmitter include:

- Coverage of the 71 MHz, 146 MHz, 437 MHz and 1255 MHz bands.
- Transmits pictures from the RPi Camera, composite video input, stored test patterns or video files.
- DVB-S Symbol rates from 125 to 2000 KS/s.
- FEC values from 1/2 to 7/8.
- MPEG-2 and H264 modes.
- Audio channel available in some modes
- TouchScreen or computer control.
- About 1 mW output.

The original software, written by Evariste F5OEO, has the potential for additional capabilities which have been retained where possible, but will not be explicitly supported in the BATC project.

The block diagram of the transmitter is shown below.



The Portsdown ATV Transmitter

System Description

The RPi, which controls all the peripherals as well encoding the digital video signal, is used without an HDMI display or keyboard. An external network-connected computer is required for a one-off set-up procedure, but after that all operation is controlled through the LCD touchscreen. It is not possible to properly control the system as designed by connecting a keyboard and conventional HDMI display directly to the RPi.

The external RPi camera provides one picture source, and a cheap USB sound dongle provides an audio input to complement the camera. Alternatively, composite video can be input through an "EasyCap" video grabber. Images, videos or a bouncing ball test card can also be selected.

The touchscreen LCD display is designed to sit directly above the RPi, plugging into the GPIO pins. As we need access to some of these GPIO pins, an extender card is used to break out the connections.

An ADF4351 synthesizer is used to generate the local oscillator signal. It is capable of generating frequencies between 34 and 4400 MHz (!), but the modulator used in our application limits the useful frequency range to 70 – 1350 MHz. Control signals for the synthesizer are generated by the RPi and tapped off the extender card.

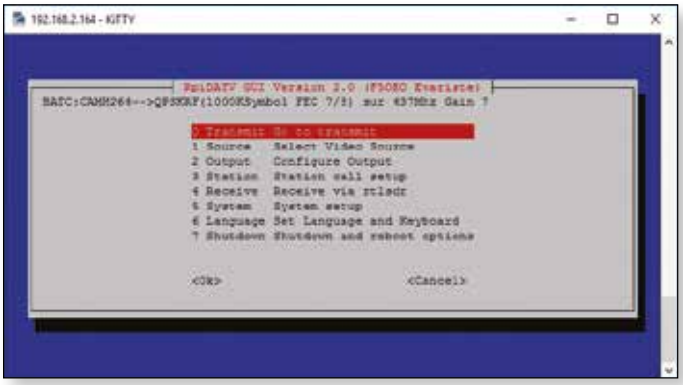
The filter and modulator unit has switchable filters for the I and Q signals; the switching signals are generated by the RPi on 3 GPIO lines. The PCB for the filter and modulator will be available from the BATC shop.

One of the GPIO lines goes high when transmit is selected; 2 more lines provide an indication of which band is in use. These 3 lines can be used to drive subsequent switching and power amplifiers.

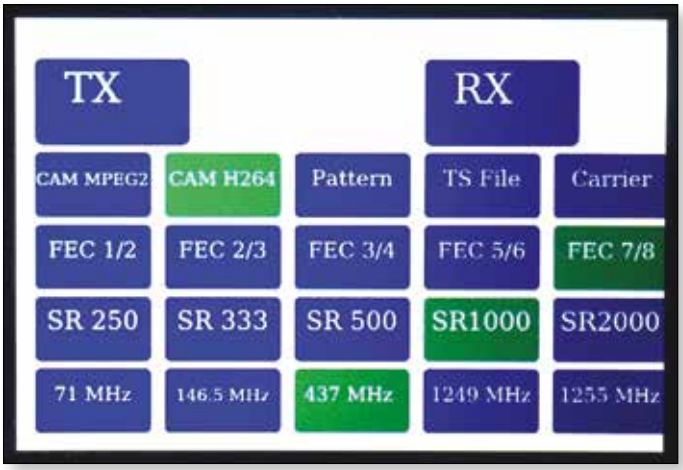
It is also possible to connect a pushbutton to command the RPi to shutdown gracefully, rather than simply disconnecting the power. An LED provides an indication that it is safe to cut the power. Whilst RPis usually survive being powered down whilst in operation, older memory cards can be prone to corruption in this situation, and use of a shutdown button minimises the chances of such problems.

Operation

The transmitter is designed to be operated in one of 2 modes: Console or Touchscreen. Initial set-up must be performed in Console mode.



In Console mode, the RPi is controlled through another computer using the network connection. From there a Menu system can be used to configure all the transmission parameters (symbol rate, FEC, frequency, video source), and also to configure the on-board wi-fi and set up the touchscreen to start immediately when power is applied to the RPi. Alternatively, you can choose not to fit a touchscreen, always use Console mode.



Once configured, the Touchscreen can be used as the only controller – no other computer is required in normal operation. After selection of the transmission parameters on the screen (use a plastic "pencil" it is more accurate than your fingers), TX can be selected. In most modes, a slow refresh version of the transmitted image will appear on the screen. To cease transmission, simply touch the screen again.

Filters and Power Amplifiers

The output from this transmitter is about 1 mW and contains a number of spurious signals. Bandpass filters will need to be used for each band, and then linear amplifiers used to increase the power. These are outside the scope of the project, but have been described in recent issues of CQ-TV.

Additional Features

The software build includes a number of additional features that the BATC team will make best efforts to maintain, but they are not part of the core project at this stage. These include an in-built DVB-S receiver using an external RTL-SDR dongle, and also the ability to send encoded video to a number of other destinations over USB or the network connection. Once the core software has reached a high standard, we hope to bring these features on-board with help from our members.

Software Support

The software required for the project is already available for download from GitHub, but it is planned that the BATC shop will stock Micro-SD cards ready-programmed with working software. As new features are developed by members and incorporated into the core build, a simple update process can be used to add them.

User Community

A dedicated topic on the BATC Forum will provide a facility for the user community to share their experiences and help newcomers with the project. Remember, the project is only as good as those who contribute – the core team of designers is small and overworked, so please help by contributing your ideas and experiences. In due course, full construction information will be published on the BATC Wiki.

Further Information

Two further articles in this issue will introduce the hardware and software required for the project. Hopefully, lessons from the early builders will be published in CQ-TV 255.

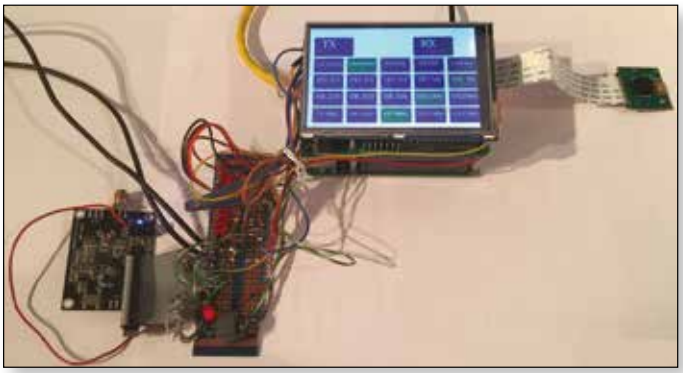
Weblinks:

- Software on GitHub: ***https://github.com/BritishAmateurTelevisionClub/rpidatv***
- BATC Forum Topic: ***http://batc.org.uk/forum/viewforum.php?f=103***
- BATC Wiki topic: ***https://wiki.batc.tv/The_Portsdown_Transmitter***

Constructing the Portsdown Raspberry Pi-based DATV Transmitter

Dave Crump - G8GKQ

This article describes the hardware and interconnections required for the Raspberry Pi (RPi) based transmitter. Not all the hardware is required before the transmitter can start to be tested – an incremental approach is described here to allow constructors to gain confidence as they assemble the parts. Each component is described in turn and a list of components, with suggested suppliers, is provided at the end of the article.



Raspberry Pi 3 and Micro-SD Card

The first item required is the Raspberry Pi 3 and a Micro-SD card. You will also need a 5v power supply for the Raspberry Pi, and a low resistance Micro-USB supply lead (some cheap ones are not so good). You can either purchase a pre-programmed SD Card from the BATC Shop, or purchase a good quality card (such as an 8GB SanDisk Ultra) from another source. Follow the instructions on GitHub (see the software article in this issue) to log-in to your RPi from another computer and launch the Console Application.

At this stage, you can set your callsign and locator, so that these are transmitted correctly. You can also go into the autostart menu and configure the RPi to start a Console when you log-in.

Raspberry Pi Camera and Extension Lead Kit

The RPi camera gives excellent results, but only comes with a short ribbon cable to connect it to the RPi. It is possible to use some higher quality HDMI leads (the ground connections all need to be made) to extend the camera lead. Kits are available to connect a female HDMI connector to the RPi camera connector, and another female to the camera, allowing the use of domestic 1, 2 and 3m HDMI leads.

Once you have connected your camera, you should be able to transmit in QPSKRF mode. Select the H264CAM as a video source, select QPSKRF Output Mode (with the default gain setting) and go for 250 KS/s symbol rate with a frequency of 437 MHz. Put a short wire on pin 32 of the GPIO as a transmit aerial, and select "Transmit". On a 437 MHz RB-TV receiver, you should see the signal. This mode is also known as "ugly" mode because the transmitted spectrum is awful; however, it provides a very good way of checking that you are making progress.

GPIO Extender Card

In the completed unit, there are 13 signals that need to be routed in or out of the GPIO interface on the RPi. Buying an extender card early in the project reduces the chance of damage to the RPi and allows these connections to be made safely. The card must break out all 40 pins of the GPIO, and have another connector on top for the LCD display. The recommended card (see below) needs an additional extending 40-way socket with long pins to clear the USB connectors on the RPi. Some other cards do not have the socket on top – these would only be suitable if you do not plan to use a touchscreen display.

LCD TouchScreen

The touchscreen is required to control the transmitter without the use of another computer. The supported touchscreen is a 3.5 inch diagonal Waveshare Raspberry Pi LCD. This is available from a number of suppliers for

just under £20. It uses a resistive touch panel and has a resolution of 480*320. Other touchscreens may be supported in the future, but this is the screen that has been used for all the BATC's testing so far.

Before installing the touchscreen, go into System Setup and set the display type. Then go into the Auto start menu and set the RPi to "Boot-up to Touchscreen Display". Power-off, connect the screen and restart. You should be presented with the touchscreen menu. If you need to access the Console, simply log-in as before across the network, press ctrl-c, and then enter the same command as you first used to access the menu.

Composite Video Capture Device

The transmitter performs well with a USB-connected "EasyCap" dongle to capture PAL composite video. There are at least 4 similar devices being marketed under this name on eBay, each with different chipsets, but so far all have been made to work. Some need configuration to select the phono plug video input rather than the S-VHS input. Information about this can be found on the BATC Forum.

Audio Capture Device

Again, eBay provides a good source for very cheap audio capture USB dongles, which can provide an audio input to go with the RPi camera.

Synthesized Local Oscillator Source

The ADF4351 integrated circuit can provide an output anywhere between 34 and 4400 MHz. Small PCBs with the IC and a reference oscillator are available from China through eBay. Be careful to buy the ones with black PCB lacquer and the 5x2 way connector – the green ones with the in-line connector have a reputation for being re-badged ADF4350s which do not have the same frequency range.

Filter and Modulator Board

The IQ filter and modulator board is in the final stages of development. When ready for release, PCBs will be sold by the BATC Shop. The challenge has been to design a board that will cope with symbol rates from 125 KS/s to 4 MS/s. The development board can be seen below.

▶ *Summary of GPIO connections*

Usage	BCM	Wpi	Name	Pin	Pin	Name	wPi	BCM	Usage
3.3v			3.3v	1	2	5v			5v
	2	8	SDA.1	3	4	5v			5v
	3	9	SCL.1	5	6	0v			0v
DigiThin	4	7	GPIO 7	7	8	TxD	15	14	DigiThin
0v			0v	9	10	Rxd	16	15	DigiThin
LCD	17	0	GPIO 0	11	12	GPIO 1	1	18	DigiThin
S/D LED	27	2	GPIO 2	13	14	0v			0v
S/D Button	22	3	GPIO 3	15	16	GPIO 4	4	23	LCD
3.3v			3.3v	17	18	GPIO 5	5	24	LCD
LCD	10	12	MOSI	19	20	0v			0v
LCD	9	13	MISO	21	22	GPIO 6	6	25	LCD
LCD	11	14	SCLK	23	24	CE0	10	8	LCD en
0v			0v	25	26	CE1	11	7	Touch En
4351 LE	0	30	SDA.0	27	28	SCL.0	31	1	Band LSB
4351 CLK	5	21	GPIO 21	29	30	0v			0v
4351 Data	6	22	GPIO 22	31	32	GPIO 26	26	12	I out
Q out	13	23	GPIO 23	33	34	0v			0v
Band MSB	19	24	GPIO 24	35	36	GPIO 27	27	16	Filter LSB
Filter NSB	26	25	GPIO 25	37	38	GPIO 28	28	20	Filter MSB
0v			0v	39	40	GPIO 29	29	21	TX LED

PTT and Band Switching

Pin 40 of the GPIO goes high when transmit is selected. The signals on pins 28 and 35 can be used for band switching:

Frequency		Pin 28	Pin 35
< 100	(71 MHz)	Lo	Lo
100 – 250	(146 MHz)	Lo	Hi
250 – 950	(437 MHz)	Hi	Lo
950 – 4400	(1255 MHz)	Hi	Hi

Care should be taken to properly buffer these 3.3v signals from relay transients.

When the facility is enabled (not by default), Pin 15 signals the RPi to shutdown cleanly. It is held low by a pulldown resistor in the RPi; when taken to 3.3v through a pushbutton it will command the RPi to shutdown. The signal on pin 13 can be used to illuminate an LED through a current limiting resistor. This LED illuminates when the RPi is active, and extinguishes when the software has shutdown and it is ready for power-off.

References for Component Sources

- Raspberry Pi 3: CPC Farnell
  http://cpc.farnell.com/mksp2-raspberry-pi3
- Raspberry Pi Camera: CPC Farnell
  http://cpc.farnell.com/raspberry-pi/rpi-8mp-camera-board/raspberry-pi-camera-board-8mp/dp/SC14028
- SanDisk Ultra 8 GB Micro-SD Card: Amazon
  https://www.amazon.co.uk/s/?ie=UTF8&keywords=micro+sd+8gb+ultra
- Rpi Camera HDMI Lead Extension Kit: tindie.com
  https://www.tindie.com/products/freto/pi-camera-hdmi-cable-extension/
- GPIO Extender Card and connector:
  willowcomponents.co.uk
  Raspberry Pi Breakout Board
  http://www.willowcomponents.co.uk/product-page/7d382ed0-de03-100e-04c3-8c06473b0c1f
  and Raspberry Pi 40 way GPIO connector
  http://www.willowcomponents.co.uk/product-page/4d96fcdc-1984-e661-e590-df8c14e5a2fd
- 3.5 inch Waveshare Raspberry Pi LCD
  Product website:
  http://www.waveshare.com/3.5inch-rpi-lcd-a.htm
  Amazon: ***https://www.amazon.co.uk/Waveshare-Raspberry-Resistive-Interface-Rapsberry-pi/dp/B00OZLG2YS***
- EasyCap Composite Video Capture Device: Source from eBay:
  http://www.ebay.co.uk/sch/EasyCap-Computer-Video-Capture-and-TV-Tuner-Cards/3761/bn_1842738/i.html
- Audio Capture Device: Source from eBay - for example:
  http://www.ebay.co.uk/sch/Laptop-Desktop-Accessories/31530/i.html?_from=R40&_nkw=usb%20audio%20adapter&_dcat=75518&Channels=2%252E0&rt=nc&_trksid=p2045573.m1684
- ADF4351 Synthesized Oscillator: Source from eBay
  Remember to go for one of the black boards with the 5x2 connector.
  http://www.ebay.co.uk/sch/i.html?_from=R40&_sacat=0&_nkw=adf4351&_oac=1

Software for the Portsdown Raspberry Pi-based DATV Transmitter

Dave Crump - G8GKQ

The core software for the Raspberry Pi (RPi) TV transmitter has been written by Evariste, F5OEO. Other contributions have been made by numerous developers and it is a great example of an open-source project. Most of the source code is available on the BATC GitHub repository, but some of the code is downloaded from other sources.

The potential capabilities of the hardware and software combination are very diverse and maintenance of the totality of the software is beyond the resources of the project team, so only a subset of capabilities will be actively supported. As most of us are TV enthusiasts rather than software enthusiasts, every effort has been made to make the configuration menu-driven. However, there are a few operations that require the use of the Linux Command Line. Do not be alarmed – these are simple cut and paste exercises, and full instructions will be provided.

Rather than provide detailed instructions here that might become outdated, this article will provide a broad outline of how to get the software up and running and then how to configure and use it. The detail will be posted on the BATC GitHub (Git Hub is an open-source software collaboration website), with the latest software. You will require an application to check the IP address of your RPi when it first boots up, such as "Advanced IP Scanner" and an SSH Terminal application such as "Putty".

The BATC GitHub can be found at:
https://github.com/BritishAmateurTelevisionClub/rpidatv

Downloading and Installing the Latest Software

Although Micro-SD cards with the latest software will be made available from the BATC Shop, a number of members may want to build their own. The process is not difficult. You can skip this section if you have purchased a Micro-SD card from the BATC shop.

- You will need another computer with a means of writing an image to a Micro-SD Card. The use of Win32DiskImager is recommended for writing to the card.
- First download the supported Raspbian Jessie Lite (that's the operating system) image from the ***raspberrypi.org*** website. This may not always be the latest version, as each new version needs compatibility testing. At the time of writing the required version is dated 2016-11-25. You will then need to unzip the file, and you will end up with a file with a .img file extension.
- Use Win32DiskImager, or a similar program, to write the file to your Micro-SD card. To enable you to log-on when you first start your RPi, you need to create an empty file in the \boot directory. To do this, open the Micro-SD card for viewing in Windows Explorer and open the \boot directory. Create a new empty file called ssh by right-clicking, selecting New, Text Document, and then change the name to ssh (not ssh.txt). You should get a window warning about changing the filename extension. Click OK. If you do not get this warning, you have created a file called ssh.txt and you need to rename it ssh.
- Now eject the Micro-SD card from your PC and put it into your RPi. Connect the RPi to the same network as your PC, and turn it on. After it has booted up, use the IP Scanner to find the IP address of your RPi.
- Open Putty (or another ssh terminal application), enter the IP address of your RPi and open a connection. At the logon prompt enter the default username of pi and the default password of raspberry. You may be prompted to change the password at this stage – even if you are not prompted, now is a good time to do it by typing "passwd" and enter.
- Now you need to download the rpidatv installer, modify it to be an executable program and then run it. These 3 lines can be cut and pasted from the GitHub instructions. The installation will take a few minutes and should offer you a reboot when it has finished.
- After the reboot, log-in again and the console menu will start automatically.

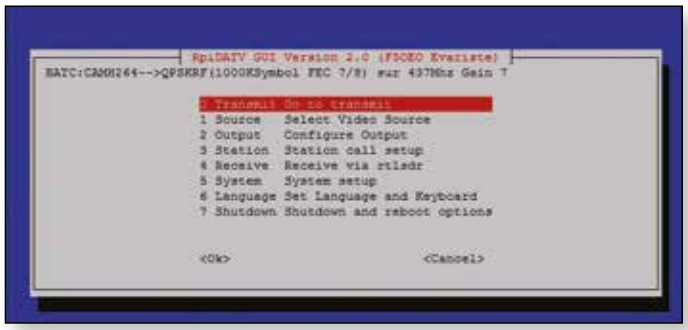
You are now at the same stage as if you had purchased a Micro-SD card from the BATC Shop.

Setting Up the Software for your Station

The software is intended to be controlled in one of 2 modes: through the console, or by the use of a touchscreen. Either way, the initial setup needs to be conducted on the Console. If you have purchased a Micro-SD card from the BATC Shop, you will need to:

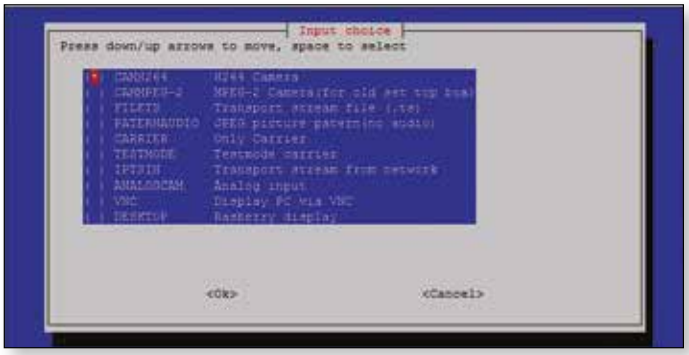
- Using a network lead, connect the RPi to the same network as your PC, and turn it on. After it has booted up, use the IP Scanner to find the IP address of your RPi.
- Open Putty and enter the IP address of your RPi and open a connection. At the logon prompt enter the default username of pi and the password given to you with the card. The console menu will start automatically.

This runs the menu.sh program, and tells it to start at the main menu (if the second "menu" is omitted, it will enter the console, but go straight to transmit).



As a minimum, you need to configure the following menu entries:

- **Source**. Press the down arrow once and then Enter to select the "Source" menu. Press the up and down arrows to highlight the source that you are using and then the space bar to select it (don't forget this!). Then press Enter to make the changes and return to the main menu.



- **Output Symbol Rate**. Select the "Output" menu and then Symbol Rate. Enter the symbol rate in KS/s. Some sources and output modes do not work at high symbol rate – this is one of the first parameters to change if you are having problems.

- **Output FEC**. The default FEC is 7/8 – you can change this is if you want.
- **Output Mode**. Again select the desired option using the space bar. Currently, only IQ (using the default pin selections for the BATC modulator and filter board) and QPSKRF at an RF gain of 7 (for testing with an "ugly" signal directly from pin 32) are actively supported.
- **Output PID**. Set the PID PMT to 255. This will ensure that the video PID is 256 – the BATC standard.
- **Output Frequency**. Set the output frequency for your ADF4351 synthesizer here. If using "ugly" mode, set 437 MHz.
- **Station**. In the station menu, you can set your call and locator. The callsign is used to identify the digital transmission, and the callsign and locator are used in the test card overlay.
- **System Setup**. It is important that you set your display type first here, so select Display. If using the Waveshsare touchscreen, select it with the spacebar and press enter. If you want to continue with the console, make sure that Console is selected.
- **System Setup Autostart.** After you have selected the display type, you can select how you want your RPi to start up. The first 4 options require you to log-in using a console before anything happens, whereas the last 3 do not require a console. TX_boot starts transmitting at power-on, so does not even require a touchscreen. Display_boot is the recommended setting which will start up the touchscreen straight away.
- **System Setup Additions.** It is hoped to add other options in the System Setup menu as the software is developed.
- **Language**. The menu language can be changed to French (or back to English) from this menu.

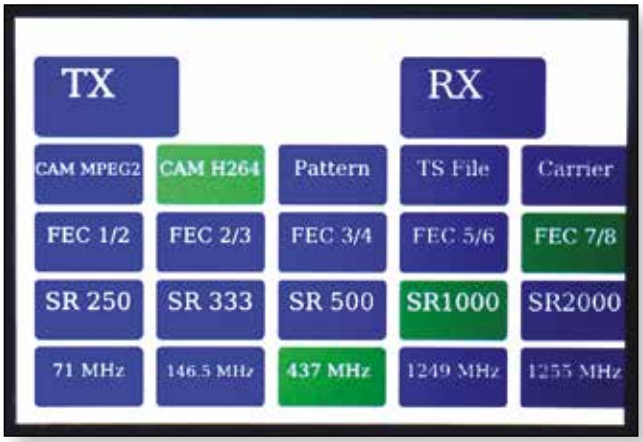
For a number of these changes, a reboot is required for them to take effect, so go into the Shutdown menu and select Reboot. Alternatively, you can exit the menu system by pressing tab twice and Enter twice, and then type:

```
sudo reboot now
```

Depending on what autostart option you selected you may have to log-in again to select transmit.

Touchscreen

If you have configured the software to autostart with the touchscreen, you should not need to log-on from an external computer to control the RPi. All the basic operations can be controlled from the touchscreen.



Useful Commands

The following commands might help you if you end up stuck at the Command Line:

`/home/pi/rpidatv/scripts/menu.sh menu`
starts the menu system.

`/home/pi/rpidatv/bin/rpidatvgui 1`
starts the Waveshare touchscreen.

`Ctrl-c` exits from the touchscreen and gets you back to the Command Line.

`sudo reboot now`
safely reboots the RPi.

`sudo shutdown now`
safely shuts down the RPi (before power off).

`ls -l`
lists the files in the current directory

`cd ~`
moves you back to your home directory

Further Information

You should check the BATC Forum for further information on the latest software. Please also contribute to the discussion to help others.

HamTV Update

Noel Matthews - G8GTZ

Principia schools conferences

As a finale for the Tim Peake "Prinicipia" mission, in November 2016 the UK Space Agency organised 2 schools conferences in Portsmouth and York with over 600 students attending each event and 2,500 people booked to attend a public open day at York. Most students were from schools involved in the STEM outreach programs and as well as presenting their work from the project to Tim, they had an opportunity to visit a large number of technology related displays.

The ARISS team attended both events and set up a green screen studio where students (and teachers/parents!) could have their picture taken with Tim inside the ISS!

We processed and emailed out over 400 pictures during the 2 events and it gave us a great opportunity to talk to students and parents about the ARISS project and amateur radio in general.

At the York event, G8GTZ and G3VZV also had the opportunity to meet and talk briefly to Tim about his mission and the role the ARISS contacts played in wider STEM outreach program – he commented that the amateur radio station, including HamTV, was very easy to operate and hoped it would play a greater role in future missions.

▶ *Graham, G3VZV and Noel, G8GTZ exchanging notes with Tim KG5BVI*

Goonhilly

Although Tim Peake's Principia mission is completed, French ESA Astronaut, Thomas Pesquet, KG5FYG, is now on board the ISS on his mission entitled "Proxima". He has a number of ARISS schools contacts organised during his 6 month mission. It is planned to use HamTV for some of these contacts and Satellite Applications Catapult and Goonhilly Earth Station have kindly agreed to the continued use of the 3.8 metre GHY99 dish to receive the HamTV transmissions.

▶ *GHY99 dwarfed by Arthur in a view taken from GHY6*

The dish had been refurbished during the summer and so the ARISS team recently visited Goonhilly to re-commission the HamTV receive system - initial testing showed that the realignment of the dish has improved low elevation reception and it is likely that the time a locked video signal is received will increase by around 1 minute.

The ARISS dashboard, written by Phil M0DNY, is available at ***https://hamtv.batc.tv/dashboard/*** with ISS tracker, a dish cam and updated Tutioune monitor display is available. Note that the dish does not track every orbit but only when requested by the ARISS for testing or when a contact is planned.

Unfortunately, it has just been announced that due to problems with the VHF transceiver in the Columbus module, ARISS contacts for the foreseeable future will be either on UHF or, if the ground station does not have UHF capability, then the contact will be made using the VHF equipment in the Russian module. If the latter method is used, then HamTV will not be available.

My Station

Tony Hornby - G1HBD

ATV from a small space at home

For those who know me, you'll know that my ATV operating is from one of two places: my home and my blue van. It's from my home that I want to talk about here; a small shack space my family call 'Dad's room', which is 178cm x 159cm (70"x 62").

The most common question I'm asked from radio friends, who have visited over the years, is how I've managed to squeeze so much into such a small space. Designing, building and adapting my unique, and rather tiny, shack is what I am going to tell you about here.

It all started in 1986, when we as a family decided to have an extension to our house. Obviously excited about the extra space I was also pleased to have the opportunity to incorporate a purpose built room for my radio gear. However, in the end I had to choose between a bigger shack or a bigger garage and unfortunately the bigger garage won.

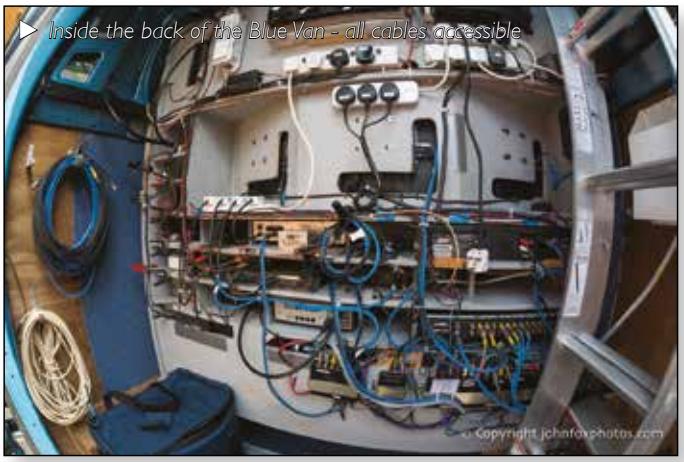
Luckily I didn't have as much equipment back then, but things changed when I discovered ATV. It wasn't until 1998 that I decided to expand; when I had to find space for my amateur radio equipment, the new ATV stuff, video recorders, TX and RX, cameras and monitors.

I was looking for a way to fit all my acquired equipment into my limited space. It was also going to be used as storage for a large amount other stuff, such as CDs and DVDs, a two draw filling cabinet, computer, monitor, printer and all the other bit and bobs I have accumulated over the years. I have no idea where it all came from?! As you can imagine this project was not going to be easy.

A really important part of this refit was that I wanted to hide all the cables and make this limited space look, if nothing else, tidy. Most of you will know that when you start hiding things, especially cables, you can have problems when things go wrong down the line. Trying to find the source of the problem usually means dissembling half the shack, which is something I've had to do on a couple of occasions in the past. Whereas in my blue van I can easily access the cables by opening the rear doors, in my shack I haven't had the same luxury.

Manufactures don't standardise so I also had to measure every piece of equipment, then draw everything on graph

▶ *The main shack in a 'small space' - not a single cable visible!*



Inside the back of the Blue Van – all cables accessible

paper to get some idea of how it was all going to fit together; radios in one area, power in another and TV/ video equipment in another. I found that the equipment that was long in length had to be positioned on an angle in one corner, where depth was less of a problem. This was often the radios.

With my plan ready to go I then had to think how to construct my design. I decided the best way create my new layout was to build the whole thing in the garage and then install it in the shack space. This was a good way of making sure everything fitted together perfectly. Although building everything around my motorcycles and all the other usual garage stuff did make the process quite difficult.

Doing it this way meant I could measure the length of the power and coax cable to each piece of equipment. I also found that bringing all the antenna cables into the shack at the same place helped. I had 8 RF, 1 rotator and 1 elevator cable, but I have still only used 4 of the RF cables. The other 4 are spare but I thought it was better to install extra than to add more later. The thing to remember is always leave enough power and coax+ AV cable to each piece of equipment. That way , if you need to change something later it can be done without disturbing anything else.

The refit, which I thought might take a couple of weeks actually turned out to be several, as I was doing it in my spare time between working for British Airways. Also, as usual, some ideas are great on paper but unfortunately they never quite work in reality as during the fit I decided to change a couple of things around.

When you think you have all the equipment in the right place it's important to take pictures and mark all the cables. If you don't do this you might have a lot of head scratching moments when you come to reassemble.

Also, something I found useful, was to bring all the mains power to a master switch for instant on/off.

Over time things change and no more so than amateur radio and ATV equipment. As as result my shack has changed a lot since those days back in the nineties; from analogue to digital, and CRT to flat screen.

I've been told my shack looks much bigger on TV than in real life. I didn't do this consciously but I installed a camera on a folding arm coming out from the door, pointing back into the shack, which gives a sense of space. I've also used the folding arm idea in my blue van, which some of you might have seen at rallies around the south. I last took it up to the 2016 BATC Convention at the RAF Museum Cosford, near Telford.

Lighting and camera angles are important I recently installed overhead LED lights but found that a florescent strip-light was best.

Making the shack more interesting was done with the help of old CQ TV and other radio related magazines, which I seem to have collected rather a lot of over the years. I decided to cut out the most colourful front covers and use them on a blank wall as an interesting backdrop. Also, this way, I get to see the magazine covers that would normally have remained hidden away in a cupboard somewhere gathering dust.

There's not much more I can tell you about my small space. I could tell you about every piece of equipment but may be I'll save that for another time. For now, I hope this insight into my little shack might give you some big ideas of doing something of your own.

73 de Tony G1HBD, from a small space

BATC report to the RSGB Spectrum Forum – October 2016

The Amateur Television Community continues to drive innovation in spectrum use and the last 12 months has seen the continued adoption of Reduced Bandwidth RB-TV transmissions and experimentation with DVB-S2 modulation modes.

The use of DVB-S 333Ksymbols in a .5MHz bandwidth has been adopted on 146 MHz and 2 way contacts with high quality MPEG4 video have been achieved over 180Kms despite the 25 watt erp limit. This means transmissions are 40dB down on a typical SSB station and has proven to be the limiting factor in achieving greater distances.

However recent tests with DVB-S2 and higher order modulations have shown the potential for even greater distances and experiments continue to confirm the initial findings of around 2dB gain over DVB-S. DVB-S2 has also been used by stations experimenting with higher bit rates and has proven that High Definition signals can be transmitted within reasonable bandwidths on the 23cm band.

RB-TV has also been used on 70cms band where the higher erp means 200+ Km is possible and experiments have been carried out on 3cms where the current longest QSO stands at 93 Kms using modified narrow band equipment.

BATC continues to support and drive these initiatives with a program of awards and grants and the use of the BATC shop to purchase and stock otherwise difficult to source components. In order to counter the declining operator numbers BATC has awarded a number of prizes for contest winners and have introduced a 3 monthly activity weekend timed to coincide with activity weekends in neighbouring IARU countries.

Early signs are that activity is starting to increase with up to 15 stations active on recent activity weekends and 11 entries in the June IARU contest up from zero in 2015!

▶ ***The RSGB Spectrum Forum members, taken at their meeting on the 29th October 2016***

Amateur Television from the ISS

The UK ATV community provided significant support to the ARISS HamTV project to ensure live pictures were received for the first time during the schools contacts.

Several ATV operators also proved it was possible to overcome the significant challenges to receive the non-standard DVB-S signals at their home stations.

TV Repeaters

Currently 36 TV repeaters are licensed with primary outputs on 4 bands. 3 are listed as non-operational (2 due to loss of site) and 2 have never been on air since receiving the NoV with one group losing their site during the lengthy NoV process!

The lengthy delays in repeater licensing are having a significant impact on the ATV community - there are currently 6 units awaiting NoVs with 3 units waiting over 1 year and the GB3EY application has been in the system for over 2.5 years despite the CAA approving the requested frequencies 18 months ago.

The Bands

134 GHz

M0DTS has recently transmitted ATV signals on 134 GHz – perhaps a new band for portable ATV operation.

24 GHz

G1LPS and M0DTS have built ATV equipment for 24 GHz, a band which is used throughout Europe by ATV operators, and submitted the first UK entry for the band in to the June IARU contest.

10 GHz

Activity continues on the band with several repeater inputs / outputs active and new repeater licenses are being applied for.

5.6 GHz

As part of the PSSR program an input on 5.665GHz has been approved for GB3KM. The frequency was chosen to enable the use of readily available FM ATV equipment designed for drone downlinks. Hopefully the proposed changes to the band will not affect the future use for ATV operation.

3.4 GHz

2 more repeaters are now on air in the ATV sub segment with 2 MHz wide DVB-S transmissions. Reports continue to confirm that the band performs better than 2.3 GHz, mainly due to lack of interference and the availability of C band LNBs making it easy to build an effective receive system.

2.3 GHz

There are still 2 units with outputs operating on 13cms, one of which has an input in the new 2390 – 2400MHz sub band and digital output on 2326 MHz. Now the impact of PSSR has been understood we are looking at the potential of applying for more units on the band.

1.3 GHz

Most ATV activity continues to take place on 23cms but we are once again seeing significant delays in the repeater NoV process.

It should be noted that although we have a policy that all new 23cms repeater applications use digital outputs, analogue FM is still a very important mode on 23cms and provides an easy and cost effective way for newcomers to experience the hobby. The BATC continues to support its use and encourages groups to ensure all repeater applications include an analogue input.

70cms

The use of DATV continues to revive interest in 70cms and tests with the new RB-TV mode shows signs of even greater DX potential

146 MHz

The ATV community has risen to the challenge of using 500 KHz of the new band for RB-TV use - this initiative has shown that the amateur community can still innovate and has helped RSGB increase the profile of the radio amateurs as innovators with Ofcom.

However, a significant number of operators have made a large investment in both time and money to achieve the results on 146 MHz RB-TV and it is of concern that, with less than 2 weeks to the expiry date, there is no indication that the NoVs will be renewed.

70 MHz

As a direct result of the 146 MHz work, a further allocation of 1 MHz was gained at 71 MHz. At least 4 operators have applied for special permits to operate on the new band and it is anticipated that tests will commence as soon as these are received.

Cyber membership rates and how to get the printed paper CQ-TV

In order to cover our increased on-line hosting costs (we use approximately 10 TB of bandwidth every month) we have decided to increase the subscriptions for cyber membership to £8 from 1st April 2017. The subscription for the printed copy will not increase and remains excellent value at £20 (UK) but is under review for a possible increase in 2018.

Whilst cyber membership is still excellent value, did you know it's easy to get your CQ-TV in printed hard copy as well as the pdf format? When you renew your membership, simply select the printed magazine option and you will get a printed magazine posted to you as well as the pdf version emailed directly to you.

If you have paid for advance cyber membership and still have some time to run, you can still change to receive a printed copy. Simply email the membership secretary ***memsec@batc.tv*** stating your membership number. He will then email back to you the additional payment needed which you can do by bank transfer.

Video Fundamentals 9

Genlock & Reference signals

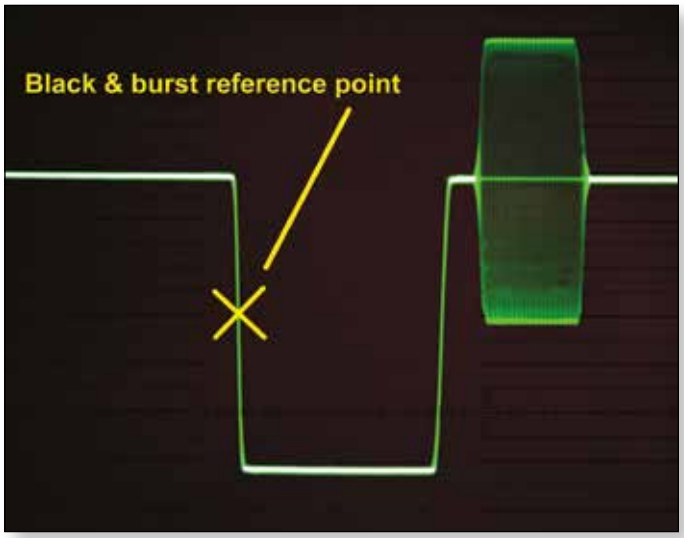
Brian Summers G8GQS

This month we are going to look at the ways of combining picture signals and why it can be difficult.

Genlock

If you have just the one camera, it's scanning rates are independent and free running. This is not a problem if it goes directly to the transmitter or recorder provided that the rates are within the capture range of the receiving device (TV set etc.). When you have more than one camera or wish to add captions, both devices have to run at the same frequency and be in phase.

The old solution to this was to have a master oscillator, usually in the Sync Pulse Generator [1] (SPG) and to send drive signals to each camera or device. These drive signals were then timed, with delay lines, so that the picture signals arrived at the mixer synchronously. This meant that you could mix between cameras or add captions, or graphics, without disturbance.



► *The Black & Burst line waveform*

The distribution of 4 monochrome pulses and 3 colour pulses, making 7 drive signals in all meant a lot of cables and the timing of them was very tedious and solutions using a single cable were tried. The distribution of "Black & Burst" or colour black was found to be the best solution.

This signal was literally a complete 625L picture with no picture ie, colour black.

All the information needed by the camera, could be extracted from a B&B reference and the timing was much simpler with just one signal to adjust or delay to time the camera to the mixer.

The waveform illustration shows the B&B line sync pulse, the field period waveform is the same as for the normal picture field period. The reference, or trigger point, is half way down the leading edge of the sync pulse, if there is any noise or hum on the waveform it can lead to errors in the genlocking.

► *Genlock & adjustments on a typical camera*

If the timing adjustment was external to the camera/caption generator/computer this was called "Locking" and if the adjustment was internal to the device it was called "Genlocking". This was a more complex arrangement with the camera having it's own internal SPG which genlocked to the reference signal. As technology progressed this internal SPG/genlocking became commonplace and is still in use today.

Adjustments were still needed to time the camera, controls for H (line sync) timing and subcarrier phase being common.

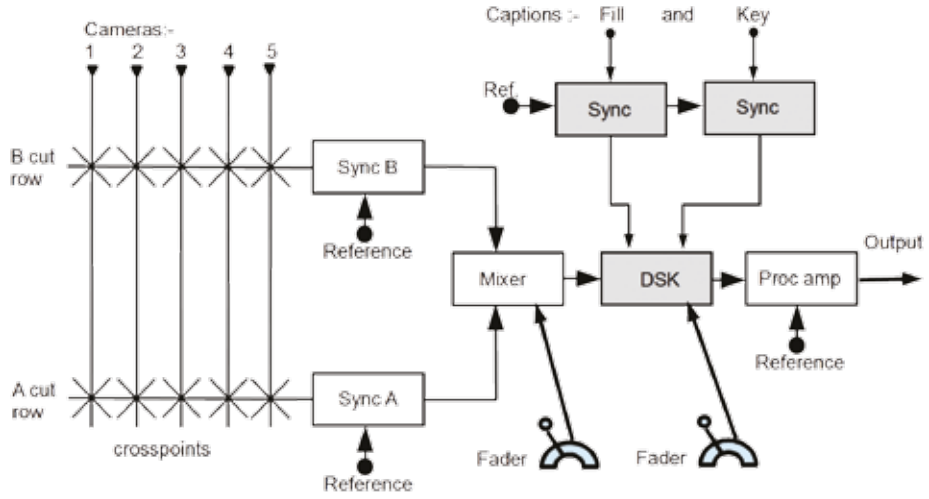
A difficulty with PAL was CSH phase [2] which if wrong could lead to a subcarrier difference and a possible picture shift sideways. This led to complaints from the VT department who's machines objected to the error.

Depending on the Genlock input circuitry it is often possible to Genlock to a reference signal that has picture information in it, colour bars maybe. A stationary image is less likely to be problematic.

Synchronisation

One handy way of dealing with an "unlocked" signal was to synchronise it. Put simply the incoming unlocked picture was digitised and clocked into memory as it arrived. The synchroniser was genlocked to the local B&B and the picture was read out of memory with the correct timing for the mixer.

As things progressed and mixers became more complex the synchroniser moved inside the mixer. Now with a 2 bank mixer, a synchroniser was needed on each bank



▶ *Simplified diagram of a 5 input mixer with optional DSK*

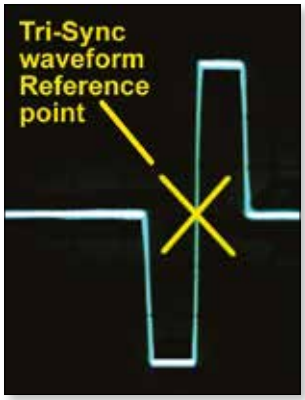
so that the now synchronous pictures could be mixed/chroma-keyed etc. Depending on the sophistication of the synchroniser there could still be disturbances when cutting on one bank or the other. The synchroniser needing to have more memory to accommodate the cuts between sources with different timing. As with all things it could be done, or done well!

The solution being a synchroniser on each input. Easy to do now but very complex even a few years ago. In practice once the video has been digitised the following processes, mixing, DSK [3] etc. would all be digital, a D to A converting the final output to analogue. A point to watch is the number of bits used, at least 8 are needed to prevent visible artefacts.

Whilst it is now easy to have a mixer with synchronising inputs it does add to the delay through the mixer which can be an uncertain amount and this lead to problems with sound and lip sync. Because of this, it is still the broadcast practice to genlock and time the video inputs to the mixer which might have as many 48 inputs . Much easier than with PAL because the SDI mixers have a bigger input window of perhaps 2 or 3 lines. Short in sound terms but long for video.

Tri-Syncs

When HD arrived the PAL B&B reference was commonly used, convenient and readily available, but not a very satisfactory solution. B&B contains the now unwanted colour information and as the 625L signal is SD the line sync pulses are wrong for HD.



▶ *The Tri-sync or three level reference waveform*

The solution to these problems was a new reference signal "Tri Level Syncs" here there is a negative and positive pulse with the reference point on the fast rising edge between the -/+ pulses. The fast edges and the correct number of reference points did much to reduce the "Jitter" on the HD SDI signals. It also has the advantage of no DC component as the pulses are symmetrical about 0v.

It should be noted that while B&B came in two line standards 625 & 525, Tri Syncs have more variants for the multitude of different HD standards.

There is a brief outline of Tri-Syncs on Wikipedia [4]

A "YouTube video" [5] It's American, so 525lines. Pity about the music.

This Tektronix document[6] has a much more comprehensive explanation.

Disclaimer

These short monographs are intended to be a short and superficial look at various topics, much is simplified or left out altogether. Further study is recommended! Whilst there is much information on the web, and there are many books about TV to choose from. The "TV & Video Engineers Reference Book" by Jackson & Townsend (1991) seems very comprehensive for analogue and orientated towards the broadcast TV side, rather than the more common TV receiver books. It's well worth while having a few good books to refer to.

References:

1. A monochrome SPG produced:- LD line drive, FD field drive, MS mixed syncs, and MB mixed blanking. Additional pulses from a colour SPG, BG burst gate, PS, pal switch, SUB subcarrier, and optionally B&B black & burst. An inconvenient total of 7 pulses.
2. SCH phase, Subcarrier to Horizontal (line sync) phase. The pal signal is normally taken to be a 4 field system, but taking the SCH phase into account it is actually an 8 field system before it is an exact repetition.
3. DSK = Down Stream Keyer, a method of adding captions or graphics after, or over, the mix.
4. Wikipedia Tri-Syncs: ***https://en.wikipedia.org/wiki/Tri-level_sync***
5. YouTube video: ***https://www.youtube.com/watch?v=qqmbrt17DjE***
6. Tektronix document about timing. ***http://www.tek.com/dl/20W_18580_0_0.pdf***

Gilwell 24 - 2016

Frank Heritage - M0AEU

During the weekend of the 8/9 July 2016 over 3,000 Explorer Scouts aged between 14 and 18 years old, gathered at the national Scout Headquarters and campsite, Gilwell Park to take part in a 24 hour non-stop activity weekend. This is an annual event at the 110 acre campsite and Scouts come from all across the UK to take part in a variety of adventurous, challenging, creative and technology based activities – such as climbing archery, shooting, white water rafting, scuba diving, and even a trapeze act, 60 foot up in the air!

The activities are divided into various zones - International, Adventurous, Creative and Technology. The technology zone includes a variety of the latest tech, along with some old favourites and includes flight simulators, gaming consoles, laser etching, a 30 seat Internet cafe and the amateur radio station - GB2GP.

This year for the first time, one room was turned into a television studio, complete with a green screen and auto cue; remote controlled television cameras and full editing facilities for the content generated, Groups of Explorer Scouts came into the studio throughout the 24 hours to learn a bit more about television production, as well as to demonstrate their skills in front of the camera presenting the weather. A fiendish script had been prepared to test their knowledge of the geography of the British Isles but some of the most entertaining takes were when they wrote their own scripts and changed the green screen backdrop! As always the youth of today demonstrated they can be very creative!

The event also included a main stage and arena, for the opening and closing ceremonies and for a number of acts and demonstrations throughout the 24 hours. One of these included a high-altitude balloon launch by Phil, M0DNY and another was by the emergency services, demonstrating what they do at a road traffic accident... Convertible anyone?

All of the stage activities were covered with a couple of cameras, mixed live with a Blackmagic ATEM TV studio and relayed to two large LED screens either side of the stage. The whole show was then streamed out over the BATC server for viewers not able to be at Gilwell Park to follow the event. The balloon launch was tracked and the images displayed on the main screens - this year the balloon almost made it all the way across the channel, eventually washing up a few weeks later on a Dutch beach and was sent back to Phil. The photos can be seen here: ***www.flickr.com/philcrump2/***

More information about Gilwell Park - GB2GP can be found here: ***www.gb2gp.org.uk*** and about the annual Gilwell24 event here: ***www.gilwell24.info***

Turning Back the Pages

A dip into the archives of CQ-TV, looking at the issue 48 years ago. *Peter Delaney - G8KZG*

CQ-TV 66

At the time when CQ-TV was issued, in 1968, the standard way for amateurs to transmit video and audio was to use separate transmitters. In order to allow these to feed into the same aerial, Ian Waters, G6KKD/T, had developed a clever combining unit, for use on the 70cm band. The basis of the design, Fig 1, was a ring of co-ax cable with sections in multiples of ¼ wavelength (taken at the average of the audio and video channels). R1 and R2 were high Q quarter wave resonator drums, shown in detail in Fig 2. The T junctions were made from tin plated steel (ie cocoa tins!) formed to shape with a special tool - Fig 3s and 4 showing the details. The ballast load was formed of about 100 ft of high loss (ie low quality) co-ax cable, with a terminating resistor across the end.

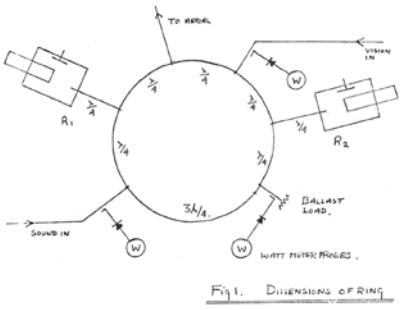


Fig 1. Dimensions of ring

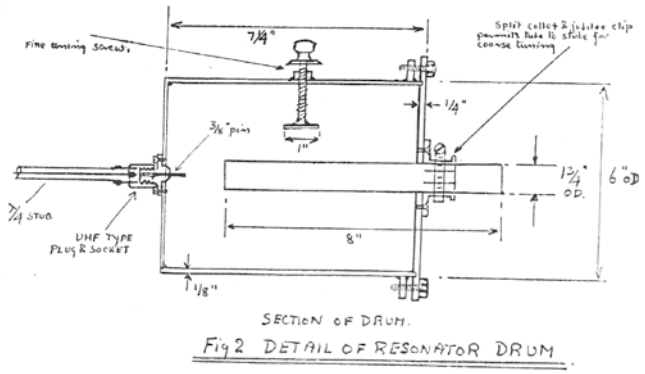


Fig 2 Detail of resonator drum

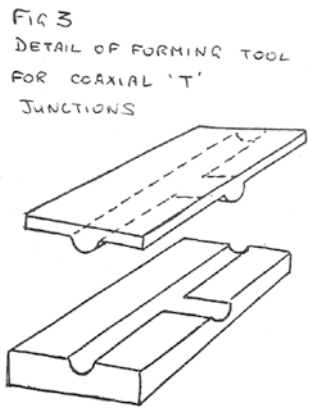


Fig 3
Detail of forming tool for coaxial 'T' junctions

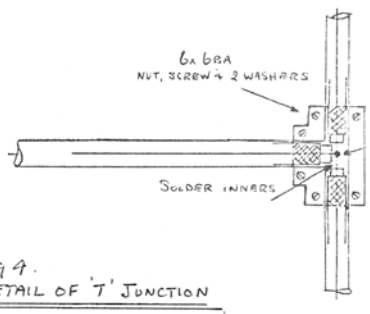


Fig 4.
Detail of 'T' Junction

Monitoring probes (fig 5) could feed a power meter and also picture and waveform monitors. The design was such that the signal from the sound transmitter could pass both ways round the ring, and would be in phase at the aerial,

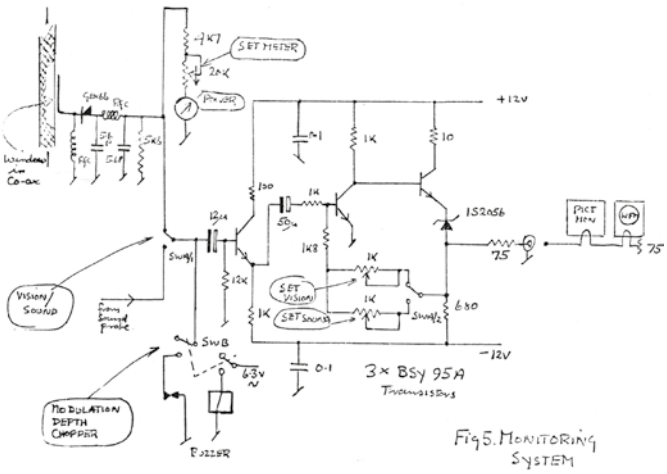


Fig 5. Monitoring System

but out of phase at the vision transmitter, and also out of phase at the ballast, so little energy was lost there. The resonator drums were tuned to the sound transmitter frequency, and at the T junction end of the quarter wave stub presented a high impedance to the audio transmission frequency. However, at the vision transmitter frequency, the effect is to make the T junction appear as a near short circuit, reflecting the signal with a 900 shift, and then a further shift due to the sections of the ring - the clockwise and anti-clockwise parts of the signal arriving at the aerial feed having had the same overall phase shift so adding together. The clockwise and anti-clockwise parts of any remaining vision signal would be out of phase at the sound transmitter feed. The path lengths round the drum were also such that any vision transmitter signal not reflected would be in phase at the ballast load, and so absorbed by the latter. Figures 6 and 7 showed the performance of the unit.

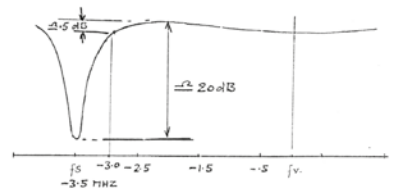


Fig 6 Typical insertion loss/frequency from vision TX to aerial

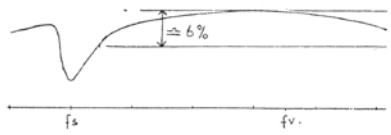
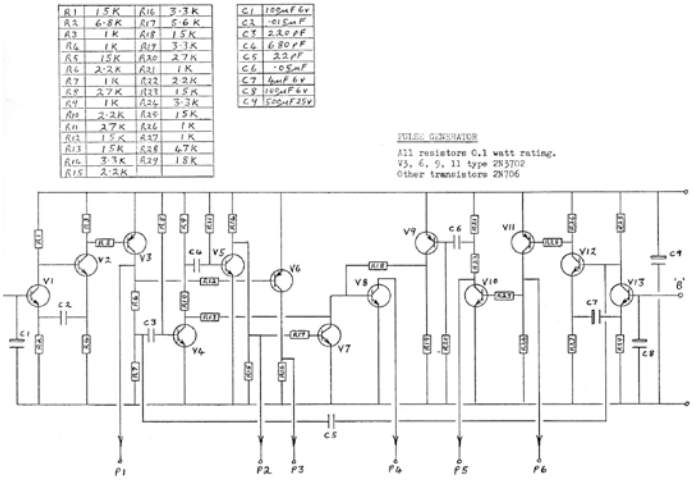
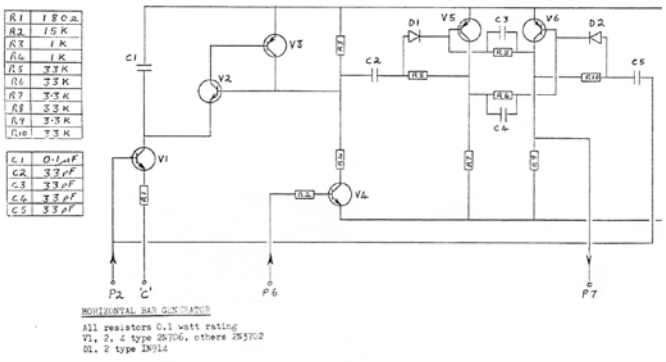


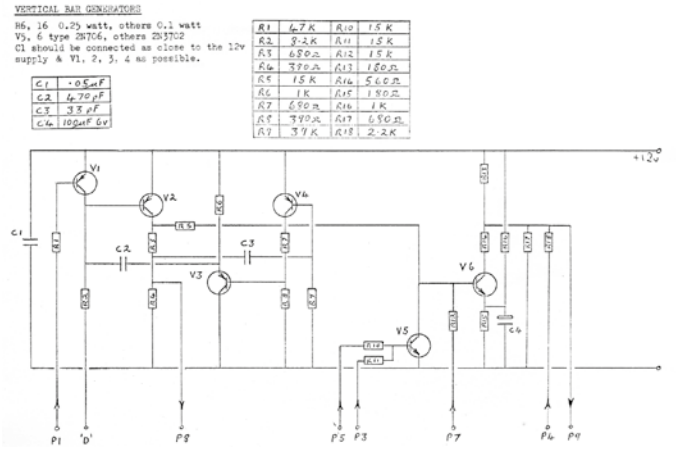
Fig 7 Typical plot of vision input impedance / frequency



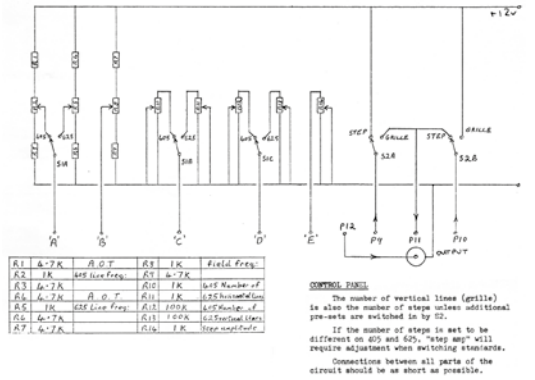
The other main article in issue 66 was video, rather than rf based. Virtually no equipment was available 'off the shelf' for television amateurs in the 1960s, so even test equipment had to be home constructed. The grille and step-wedge generator described by B Pethers was switchable for use on either 405 or 625 line standards - both still in use for broadcast tv in the UK. It produced a set of sync pulses, a grille of vertical and horizontal bars, and a step waveform. The pulse generator, Fig 1, used a multivibrator, V1 and V2, to generate line frequency blanking pulses, buffered by the next 2 stages, whilst V12 and V13 produced comparable field pulses - the feed via C5 ensuring that the field frequency was a sub harmonic of the line rate. Composite sync pulses were available at the collector of V8. The horizontal bar generator (Fig 2) took in

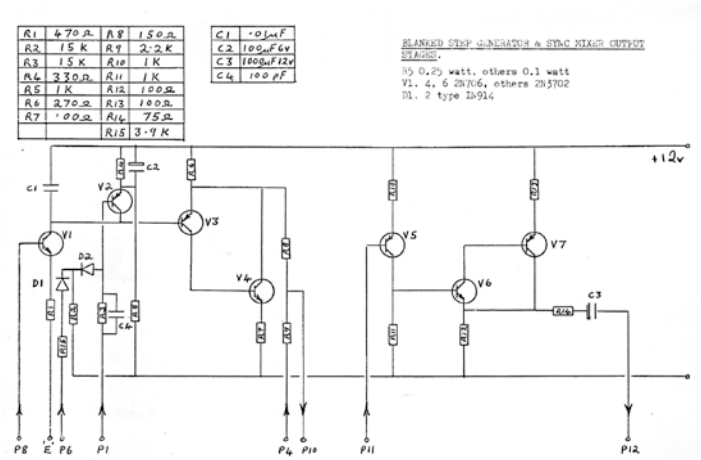


line sync pulses at P2, and produced a positive pulse every few lines (set by the voltage at point C) at the collector of V3. These were inhibited by field blanking at P6. V5 and V6 were a bistable, triggered by the positive pulse from V3, and reset by the line sync from P2's trailing edge - so that a pulse at P7 was nearly a line long, with its edges within the blanking period. The vertical bar generator, Fig 3, had an astable formed of V2 and V4, (the frequency set by the voltage at point D), inhibited by the line pulses at P1 to ensure the pattern was locked to line frequency. V6 was then turned on by either the vertical bars via R5 or the



horizontal bars at P7, sync pulses added via P4, to give a negative going video signal at P9. The control panel, Fig 4, to select the various controls, and also the grille or step-wedge signal, which was generated by the left hand part of Fig 5. This had the vertical bar pulses at P8 applied to V1 to charge C1 at each bar, and discharged by blanking pulses at P1 and P6. The feedback pair V3 and V4 had a high impedance to prevent loading of C1, with sync pulses being added via P4 and P10. The output from the control panel at P11 was then inverted by V5 before the V6 and V7 output stage.



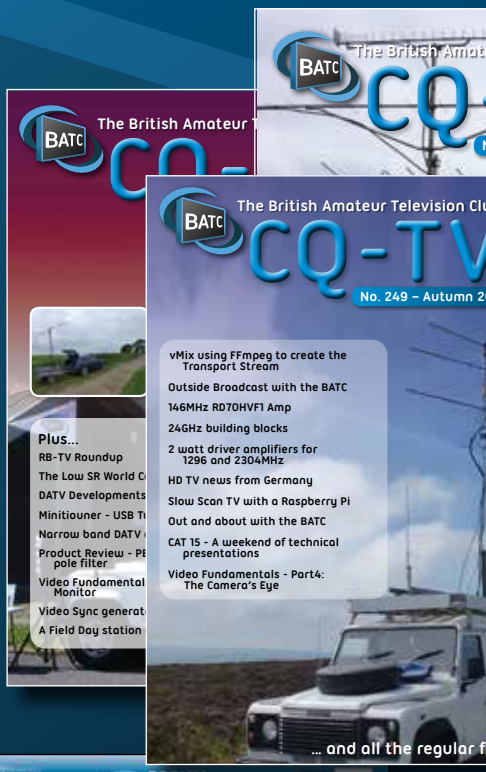


Amongst other snippets of news was noted the installation of an amateur tv station by the BBC Ariel Group at Shepherds Bush. With an e.r.p of 3kW 'for any standard', the station had a separate room for a studio with a vidicon camera, whilst it was hoped to add telecine facilities 'in a few month's time'. The magazine also noted that the BATC Convention would take place in London in September, at the IBA Conference Suite - the cover had the picture of the previous Convention that had been in CQTV61.

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 new **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

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***
18 June.	Newbury.	***nadars.org.uk***
25 June	West of England.	***www.westrally.org.uk***
14-16 July	Friedrichshafen.	***www.hamradio-friedrichshafen.de***
16 July.	McMichael Radio Rally.	***blog.radarc.org***
13 August	Flight Refuelling	***www.frars.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.