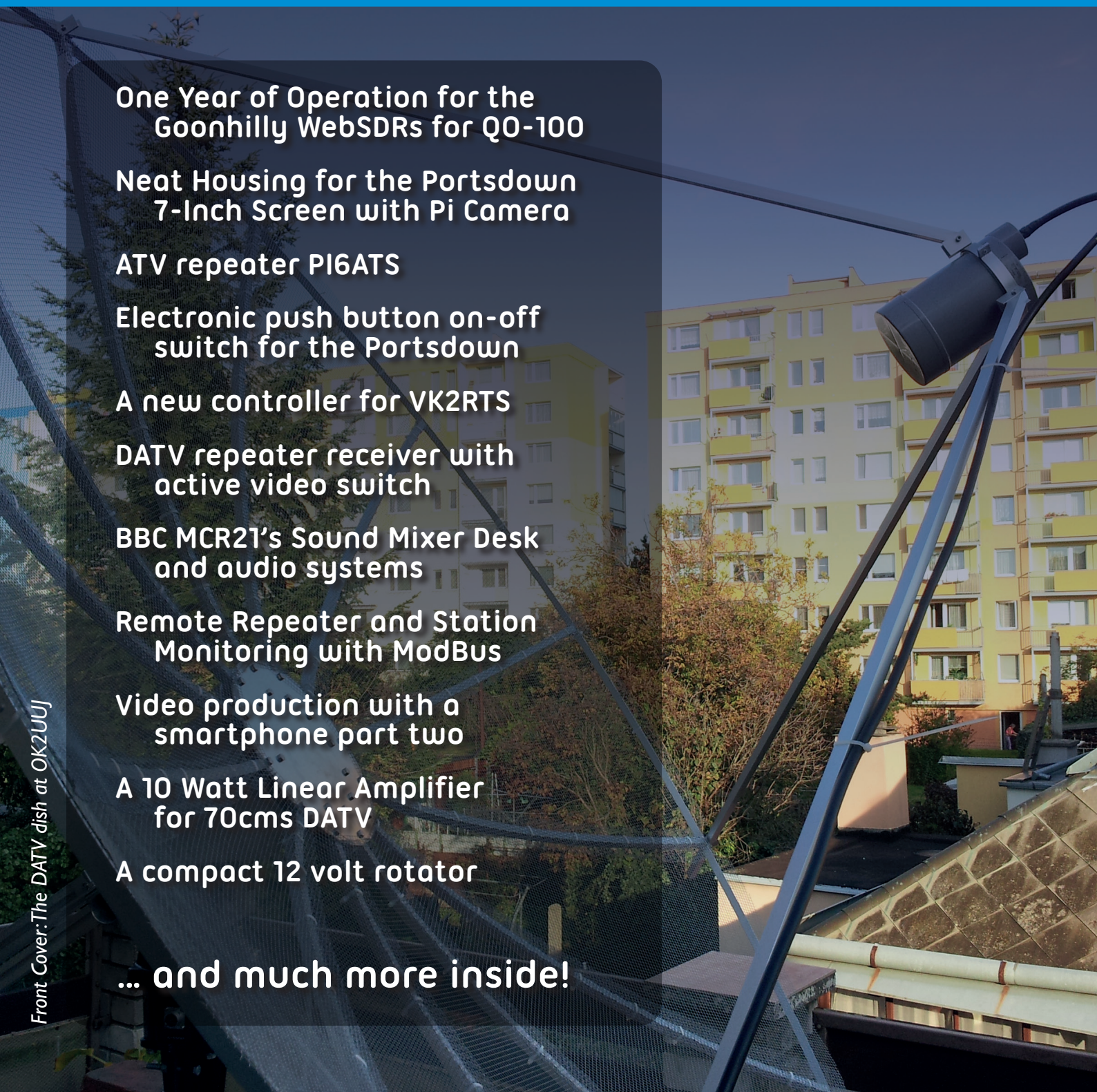
The British Amateur Television Club

CQ-TV

No. 267 – Spring 2020



One Year of Operation for the Goonhilly WebSDRs for QO-100

Neat Housing for the Portsdown 7-Inch Screen with Pi Camera

ATV repeater PI6ATS

Electronic push button on-off switch for the Portsdown

A new controller for VK2RTS

DATV repeater receiver with active video switch

BBC MCR21's Sound Mixer Desk and audio systems

Remote Repeater and Station Monitoring with ModBus

Video production with a smartphone part two

A 10 Watt Linear Amplifier for 70cms DATV

A compact 12 volt rotator

... and much more inside!

Front Cover: The DATV dish at OK2UUJ

CQ-TV 267

Contents:

Contributions

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

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

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

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

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

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

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

BATC

BATC Online

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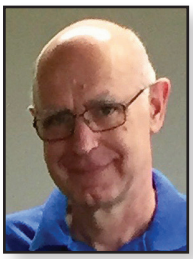
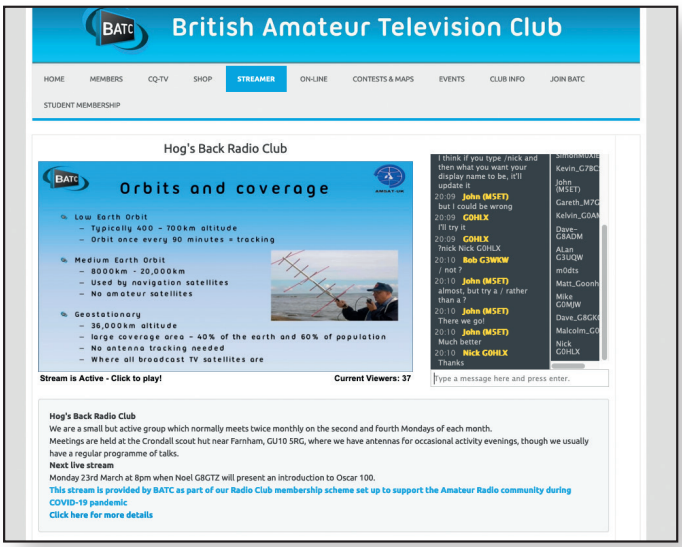


From the Chairman...

Dave Crump G8GKQ

With the nation focusing on the fight against COVID-19, I have been impressed at how our members have been looking to help offset the effects of social isolation.

The main initiative, led by Noel G8GTZ, is the offer to radio clubs the use of our live streaming service to conduct virtual talks, presentations and meetings. We have the capacity and can easily afford the small increase in expenses. I look forward to seeing how this develops and hope that it will bring a few more enthusiasts into amateur television.



We have also started a Thursday "net night" on QO-100 to keep our more active members in touch with each other. It's worth watching, even if you cannot transmit, either directly on 10499.25 MHz, or on the BATC Streamer.

We hope to be able to stage CAT 20 in the Autumn, but will update you nearer the time.

I've been pleased to see how equipment primarily built for use on QO-100 is now being used for contacts on 70 cm and 23 cm. Jim G7NTG has made some great progress with his Monday evening net. As we are unable to leave our homes to meet at present, there must scope for more similar nets across the country.

So my challenge to you all is to think how amateur TV and live streaming can benefit the community at this difficult time, and to get on the air!

73

Dave, G8GKQ

ATV activity weekends and contests

- **April 11/12 & May 16/17**
  fixed station activity weekends
- **June 13/14**
  IARU fixed station contest

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

- **BATC Oscar-100 net**
  Every Thursday night
  - 10499.25 MHz, 333ks DVB-S2, H264

Streamed live at https://batc.org.uk/live/oscar100net

The Listing

new and renewing members

Rob Burn G8NXG

Once again here is the latest in our three-monthly cycle of member listing and as it covers what is probably the busiest period for new/renewing members it is longer than usual; all good to see in my view!

New and perhaps not so new members may not realise that the list only features those members who have either joined the BATC or have renewed a membership subscription within a three month period; for this list the period is December 2019 to the end of February 2020. This timing of each list aligns with publication deadlines published on the inside cover of each edition of CQ-TV.

The rationale for this is to welcome new members and to acknowledge the support of our continuing members. In doing so perhaps also to flag up the possibility that you may be within RF range of another member and thus be able to share interests or arrange a sked of some kind.

This notion might be possible in a densely populated country such as the UK however much less so for our members in larger countries! All is not lost; if you wish to make contact with another BATC member all you need to do is to send the details to me so I can forward your interest to the member.

Anyway, over a couple of years or so you would have a good idea of who is within reasonable RF distance and don't forget that the Portsdown users map is also available on the website.

As the warmer weather is on the way opportunities to go out portable should have become possible… all now subject to your local rules on the terrible Corona virus. I guess that most will operate from home as is now the situation for the activity weekends. Anyway, many thanks for your support of the Club and do let me know if you spot a mistake.

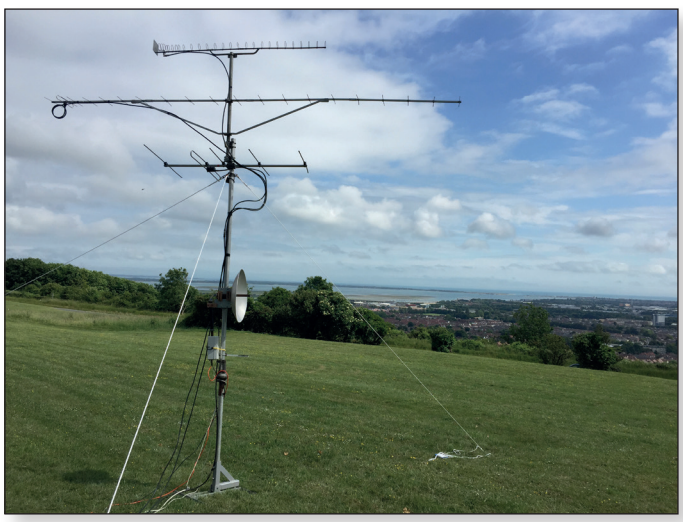
Australia		
Terry Manley	VK2JY	Chipping Norton.
Keith Rainbow	VK6JT	Dianella
Mark Jessop	VK5QI	Hillbank
Don Morris	VK5ADM	Hyde Park
Paul Roper	VK2KZO	Linden
Andy Salmon	VK3XKA	Lysterfield
Brian Riley	VK4ABZ	Narangba
Stephen Rapley	VK2RH	Newtown
Michael Baldock	VK5MCB	Port Pirie
Graham Wiseman	VK5EU	Two Wells
Peter Gibson	VK3AZL	Vermont
Roger Jordan	VK5YYY	Whyalla
Alex Glinski	VK5ALX	Whyalla Playford
Austria		
Josef Waser	OE3JWC	Neuhofen/Ybbs
Klaus Kitzmantel	OE5KKP	Weilbach
Belgium		
Etienne Nisolle	ON4KEN	Braine-le-comte
Alain Van Cauwelaert	ON7AVC	Brussels
Eric Van Offelen	ON5TA	Brussels
Robert Robyn	ON5AF	Bruxelles
Roland De Beukelaer	ON4RDB	Diest
Jean-Paul Chevalier	ON7BL	Dour
Luc Halbach	ON6JY	Esneux
Patrick De Troy	ON2AC	Geel
Pierre Decamps	ON8GE	Heppignies
Denis Goffaux	ON4MU	Ixelles
Christian Dumortier	ON1RC	Melle
Canada		
Wayne Getchell	VE3CZO	Ottawa
Luc Pernot	VE3JGL	Ottawa
Czech Republic		
Leo Hucin	OK2UUJ	Olomouc
Denmark		
Hans Rasmussen	OZ1CMV	Maaloev
Michael Wehnert	OZ5WU	Naestved
Mogens Johansson	OZ3BB	Rødby
France		
Brenguier Gérard	F1BUY	Brignoles
Christophe Courtachon		Corquilleroy
Patrick Jacquemin	F6EXX	Dijon
Claude Sarroi	F1DIW	Gagnac / Garonne
Bruno Lequeu	F1MPE	Saint Jean de Boeuf
Laurent Calis	F4FDW	Sarralbe
Hervé Chadelat	F1UPL	Sementron
Guy Lemoine	F4DAI	St Christophe Du Ligneron
Patrice Soutoul	F1GIU	St Orens
Michel Amiard	F6ANO	Tournan-en-Brie

Germany		
Jürgen Teichmann	DL7QX	Aspach
Stephan Sastalla	DH6MCE	Bad Salzuflen
Marinus Jacobs	DJ0MBA	Bad Schwalbach
Oliver Dr. Welp	DL9QJ	Bendestorf
Christian Rossmann	DG0LD	Burgheim
Ralf Siegmund	DF9JB	Duisburg
Martin Huetter	DH0DAB	Gevelsberg
Jörg-Michael Kamla	DK3VK	Goslar
Michael Becker	DD4MB	Hannover
Andreas Meier	DO7EN	Hennigsdorf
Peter Ehbrecht	DL4AS	Hildesheim
Frank Lohse	DL2JFL	Limbach-Oberfrohna
Thomas Stiefl	DL6RCG	Marktredwitz
Kurt Gothe	DF1KG	Meppen
Michael Rademacher	DG8YP	Münster
Mennicken Claus	DK1UP	Neresheim
Holger Gramsch	DH1HGM	Oer-Erkenschwick
Josef Schmitt	DK6RS	Pentling
Heinz Robert Stehr	DK7ZM	Schwalmtal
Juergen Graetsch	DK8AP	Seesen
Franz-Josef Rechin	DL5VG	St. Ingbert
Manfred Brandt	DO3MBS	Staßfurt
Manfred Bachmann	DK5FA	Wildeck
Heiko Hinke	DL1HTY	Zeitz
India		
Saravanan Vadivel	VU3OBR	Salem
Ireland		
Aengus Cullinan	EI4ABB	County Galway
Ian Mcmullan	EI4DP	Greystones
Mark Bannon	EI1HAM	Mullingar
Italy		
Claudio Ariotti	IK1SLD	Casale Monferrato
Piero Forno	IK1IYU	Montegrosso d'Asti
Giulio Zanon	IV3GCH	Pordenone
Maurizio Bazzoni	I3YBD	Verona
Malta		
Mansueto Grech	9H1GB	Mqabba
Netherlands		
Rusty Salemink	VE3HKS	Aalten
Reinoud ter Braake	PE1CYM	Assen
Jelle Meintema	PE1AEE	Drachten
Frank de Wilde	PH2M	Hazerswoude-Dorp
Tonnie Luijerink	PA3GLL	Losser
Bert Fidder	PE2TV	Rijssen
Frits Aden	PE1DWQ	Rohel
Hendrik Oosterhuis	PA3GYK	Rosmalen
Jan Booi	PE1JB	Surhuisterveen
Rody Korthout	PD2RVK	The Hague
G Prak	PA2GP	Tynaarlo
Jan Roos	PD0HNI	Zoetermeer
New Zealand		
John Nettleingham	ZL1TTK	Kati Kati
Norway		
Kyrre Sollund	LA7ERA	Tomasjord
Poland		
Rafał Hańderek		Wilkowice
Portugal		
Pedro Meneses	CU2FH	Azores Isl.
Jose Assuncao		Carcavelos
Slovakia		
Juraj Buliscak	OM0XA	Poprad
Spain		
Magin Casamitjana	EA3UM	Castelldefels
Arnau Perello	EA3FNT	Girona
Miguel Escalante Naranjo	EA7UH	Hinojos
Antonio Fernández	EA4LE	Las Rozas de Madrid
Oscar Tebar Serrano	EA4HEW	Madrid
Jesus Mª Diaz Marticorena	EA2WM	San Sebastian
Sweden		
Jan Andersson	SM0OFV	Solna
Thailand		
Sontaya Kumsan	HS2KSP	Rayong
United Kingdom		
C Davies	GW7HAE	Aberystwyth
Leslie David Rooks	G3PUO	Accrington
Nicholas Borrett	G8NXB	Ashtead
George Miller	G6WWY	Axminster
Nigel Pritchard	G8AYM	Aylesbury
Chris Holloway	G0GGF	Aylsham
Gordon Robb	GM8KXF	Ayr
Robert Best	GI3VAF	Bangor
Paul Read		Banstead
Bryan Oliver		Barnet
Jon Evans	G8AGJ	Basingstoke
Bryan Steele	G0BDK	Bedford
Norman Hunter	G8DQN	Billericay.
Jim Anderson	G0MPP	Bingley
Gail Spencer	G4XCP	Birkenhead

Brian Jordan	G4EWJ	Birkenhead
Andrew Jackson	M1AAS	Birkenhead
Keith Prosser	GW8TRO	Blackwood.
William Horn	G4GPD	Bodmin
Andrew Boardman	G7ROM	Bolton
Geoff Mackrell	GW3KAX	Boncath
Derek Blake		Braintree
Geoffrey Towler	G4NGS	Brentwood.
Petrie Owen	GW0KAX	Bridgend
Darren Hobbs	G8PVG	Bridgwater.
Peter Major		Bridgwater
Ken Stevens	G4BVK	Bristol
Gareth Evans	G4XAT	Bromley
Trevor Lumb	G0ARU	Bury St Edmunds
Darren Coe	G7SDC	Bury St Edmunds
Phil Longhurst	GW8BVI	Caldicot
Brian Summers	G8GQS	Camberley
Ian Waters	G3KKD	Cambridge
Barry Cope	G7EKI	Canterbury
Murray Niman	G6JYB	Chelmsford
David Brocklehurst	G4VDB	Chesterfield
Richard John Cariss	G7ACD	Church Stretton
David Long	G3PTU	Cleckheaton
Mike Cox	G8HUA	Cleckheaton
Marc Brown	M0ITB	Colchester
Phil O'Ryan	G8WWF	Congleton
Dave Burkin	M0VMC	Cottenham
Alan Ash	G3PZB	Cowes
Alan Reeves	G4ZFQ	Cowes
David Pickford	G8TNE	Derby
John Raybould	M0IVJ	Derby
Paul Driver	M0XZT	Dewsbury
Mel Jackson	G8EOP	Dewsbury
Peter Myers	G3UWT	Doncaster
David Sawyer	G2DS	Droylsden
Barrie Spink	GM0KZX	Dumbarton
Archie Douglas	GM4HVM	Dunfermline
Dave Williams	G8PUO	Eastbourne
Allan Mitchell	G3YJZ	Enfield
Duncan Rossiter	G7VVF	Enfield
Brian Bambury		Evesham
Bob Thornton	G3WKW	Fleet
Howard Ling	G4CCH	Gainsborough
Bob Fisk	G7AVU	Gainsborough
Peter Wilson	G0FVG	Gresham
Jeffrey Akines	G8XXI	Grimsby

John Ferrier	G0ATW	Grimsby
Philip Crump	M0DNY	Guildford
Chris Payne	G4OWL	Guildford
Nicholas McIntyre	M0NMC	Gunnislake
Paul Marshall	G8MJW	Harby Notts
John Van Dyken	G0SPE	Harrow
Bob Barnes	G4BGQ	Harrowbarrow
Ian Daniels	G4VTD	Hassocks
Sally Dixon	G7UCL	Havant
Andrew Rudd	G6MRI	Herne Bay
Kenneth Griffiths	G3WIC	Heswall
Andrew Dickson	G8DJF	High Wycombe
John Hoare	G3PJI	High Wycombe
Alastair Nussey	G7VIV	Highbridge
Geoff Rhodes	G3XDE	Hitchin
John Brown	G0PIA	Hornchurch
Clive Reynolds	G3GJA	Hull
Barrie Procter	G8AWN	Ilkley
Jim Smith	G7NTG	Kettering
Matthew Willis		Kidlington
Andrew Sturt	G8SIK	Kingston-upon-Thames
Nick Osborne	G4JEI	Lancing
Ian Bailey	G8PQY	Leeds
Sarah Elliott	M1SJE	Leicester
Alan Gilman	G4GFD	Leigh
Barry Day	G3WIS	Leigh
Phil Seaford	G8XTW	Leighton Buzzard
Ronald Sherrard	GI3VAW	Limavady
Robert Scarfe	G4TUK	Little Melton, Norwich
Paul Bicknell	G8KFW	Littlehampton
Peter King	G6BOK	Liverpool
David Ellis		Liverpool
Peter Mcfarland	GW7BZY	Llangefni
David Jefferys	G6IWZ	London
Vic Brown	G3SDQ	London
M McDermott	G6NAD	London
Ray Groom	G4RKP	Lowestoft
Robert Saunders	G6OUA	Luton
Ronald Claridge	G7DBT	Luton
Christopher Hall	G6HTH	Maidstone
Andrew Thomas	G0SFJ	Market Harborough
Gordon Shorley		Market Harborough
Ashley Burns	GW0UXJ	Merthyr Tydfil
Tom Mitchell	G3LMX	Milton Keynes

John Wlggins	G8KUZ	Newcastle Under Lyme
Brian Alderson	G3KJX	Northallerton
Tony Nicholson	G8FLV	Northallerton
A S M Boyle		Northwich
William Hill	M1BKF	Norwich
Phillip Brooks	G4NZQ	Norwich
Bill Boyd	G4BID	Norwich
Dave Sykes	G0JOX	Nottingham
Jeremy Jago		Nottingham
Roger Meakins	G8HKN	Orpington
Malcolm Johnson	G0UHY	Paignton
Graham Niblett		Penarth
Justin Cockett	G8YTZ	Petts Wood
Michael North		Polegate
Donald Mobbs	G4MEE	Preston
Sid Milsom	G8SFA	Prudhoe
Rod Smallwood	G8DGR	Reading
Guntis Aspers		Reading
Eric March	G8EOJ	Redditch
Geoff Findon	G3TQF	Rugby
Neil Underwood	G4LDR	Salisbury
David Crump	G8GKQ	Salisbury
David Swale	G8ETS	Scarborough
Jason Barker	M0SOO	Scarborough
Roger Wilson	G1IPE	Scunthorpe
Graham Coyne	G3YJR	Sheffield
Joseph McElvenney	G3LLV	Sheffield
J Oates	G3LZI	Sheffield
Colin Addison-Lees	G4OHV	Somercotes
Ray Hughes	G8JBQ	South Perrott
T Maton	G4GHU	Southend-on-Sea.
Terry Roxby	G1LPS	Spennymoor
Paul Andrews	G6MNJ	St Austell
Patrick Kemmis	G4MGI	Stafford
Alastair Macarthur		Stone
Robert Maxwell	G8MKT	Tamworth
Geoff Harland		Thornhill
Dave Woodhall	G3ZGZ	Thornton Cleveleys
Richard Burrows	G8BYI	Trowbridge
Rob Gill	G8DSU	Twickenham
Myles Sewter		Uppingham
Roger Damm	M1CDQ	Waltham
Darren Storer	G7LWT	Warrington
Peter Smith	G1LTI	Wellington
Roger Davis	G3IUZ	Wells
Robert Williams	GW6EUS	Welshpool
David Young	G8TVW	Welwyn Garden City
Alex Forbes-Perry	M0NZX	Westerham
Mark Kinsey		Weston-Super-Mare
Jonathan Gudgeon	G4MDU	Wicken
Paul Reeves	G8GJA	Wincanton
R Sheppard		Winchester
Keith Brooks	G0SPH	Winsford
Robert Whitfield	G8TSE	Wirral
David Brooke	G6GZH	Wisbech
Laurence James	G2DD	Wokingham
Peter Eggleston	G8KGA	Wolverhampton
Graham Jones	2E0GIJ	Wolverhampton
David Holman	M0YDH	Wolverhampton
John Ashmore	G8GXF	Wolverhampton
Robert Swinbank	M0DTS	Yarm
Chris Wherrett	G4IIX	York
USA		
William Frovik	N0MNB	Blaine
Albert Hale	N7AL	Boise
Donald Nelson	N0YE	Boulder
Henry Cantrell	W4HTB	Bowling Green
Dale Hagert	W0IR	Eagan
Robert Campbell	KB3PMR	Fredericksburg
Michael Lodico	K1EG	Glasgow
Burt Guillot	N7CS	Marysville
Matt Thomas	KE8HWN	Mason
Bruce Kobie	K8FIX	Tipp City
Michael Siwula	K6LDK	Valencia
David Pelaez	AH2AR	Vandalia
Jim Welch	W1XR	Wake Forest
Art Towslee	WA8RMC	Westerville
Nigel Gunn	W8IFF	Xenia

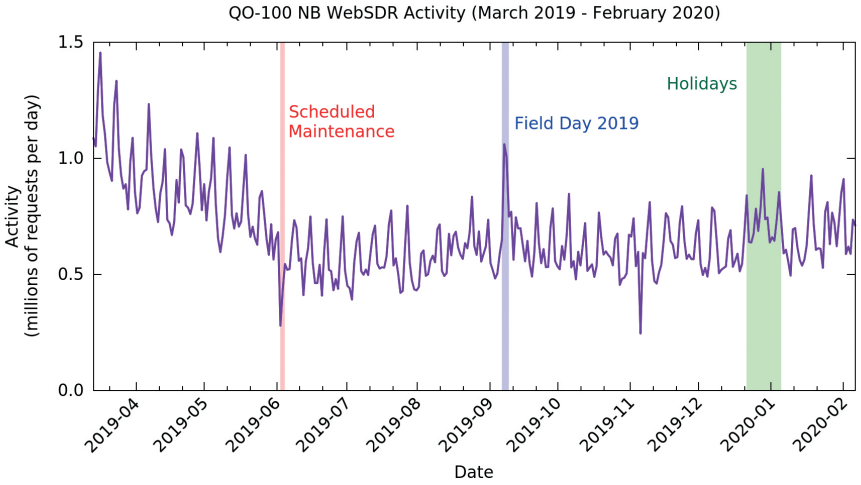


One Year of Operation for the Goonhilly WebSDRs for QO-100

Phil M0DNY

On the 10 February 2019, the British Amateur Television Club and Amsat-UK opened access to their QO-100 WebSDR facility. This facility provides a narrowband WebSDR and wideband spectrum monitor to assist worldwide use of the QO-100 amateur radio satellite transponders.

The facility is generously hosted by Goonhilly Earth Station Ltd. at their world-famous ground station in Cornwall, UK. Goonhilly Earth Station also hosts a VHF WebSDR which assists with reception of the Ariss HamTV S-band downlink.



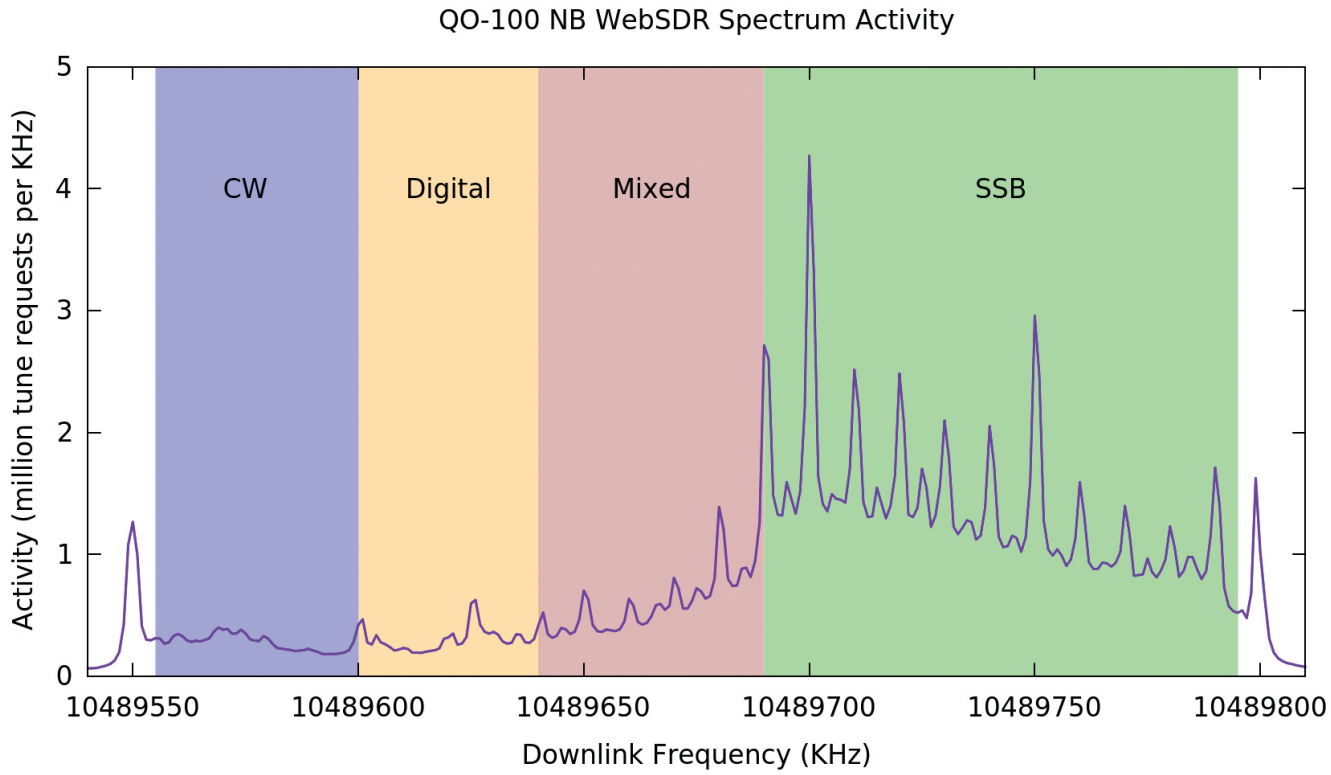
The QO-100 Transponders were inaugurated on 14 February 2019 and in the following days we saw more than 600 concurrent users across the two webpages. Since then traffic has remained high.

The narrowband WebSDR receives an average of 1,500 unique users daily, while the wideband spectrum monitor receives approximately 500 unique users.

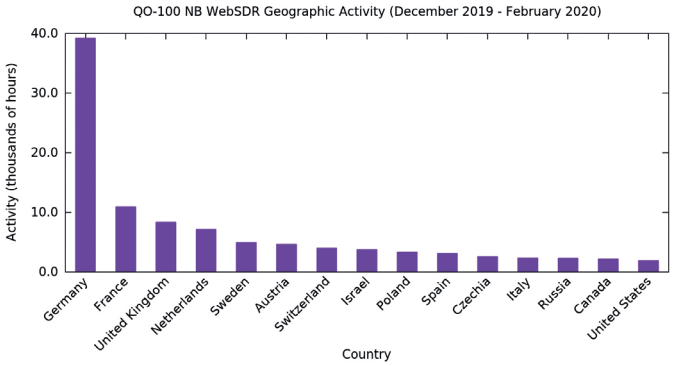
Although we can't claim that these statistics are measurements of usage of the transponder itself, we believe they are closely related and so by processing the server access logs we have produced the following information:

The frequency distribution has notable peaks due to users aligning themselves to the nearest 10KHz. There is likely some bias against digital usage here as the WebSDR has no integrated digital mode decoder, so WebSDR users are unlikely to listen.

Following the falling-off of the initial novelty factor, we've seen a slow general upwards trend in usage for the past nine months, which is likely as more operators assemble their stations and begin testing with the WebSDR.



Narrowband WebSDR

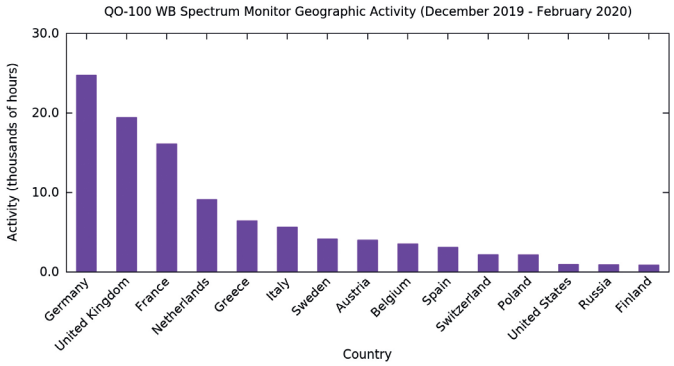


The usage of the narrowband WebSDR is dominated by German users, who account for more than 30% of total time spent listening. It is interesting to note that Canada and the USA feature within the top 15 countries worldwide, despite being outside the footprint.

We hope that the WebSDR and spectrum monitor will attract and encourage more people into the hobby of amateur radio and amateur radio satellites.

Narrowband Websdr: *https://eshail.batc.org.uk/nb/*
Wideband Spectrum Monitor: *https://eshail.batc.org.uk/wb/*

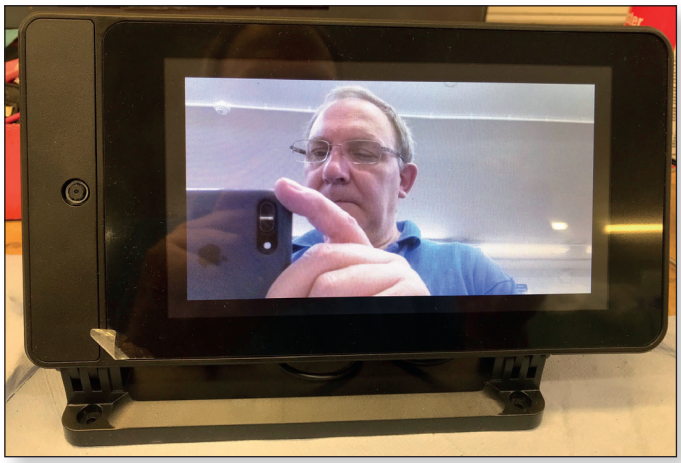
Wideband spectrum monitor



Users of the wideband spectrum monitor are more internationally spread, with the active British and French DATV communities coming in close second and third. The United States again makes an appearance at number 13 despite being unable to view the TV images.

The WebSDR and wideband spectrum monitor have provided the first view of transponder activity to the majority of users and have hopefully encouraged many novice users to set up their own stations. On the wideband side, the text chat window has provided a channel for encouragement, advice and technical suggestions, resulting in some really innovative solutions for transmitting and receiving digital ATV.

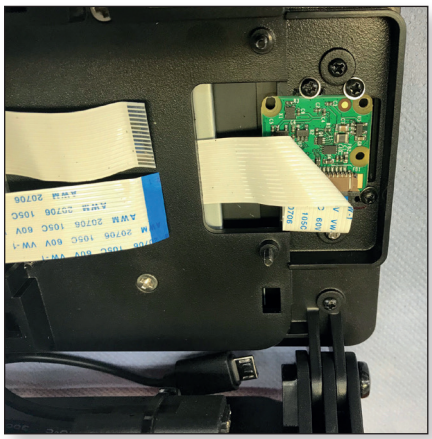
Neat Housing for the Portsdown Seven-Inch Screen with Pi Camera



Colin G4KLB has used the "SmartiPi Touch 2" case for his latest Portsdown Unit.

The case has room for the Raspberry Pi 3B, the Pi Camera and the seven-inch touchscreen and provides a neat and robust solution. However, the camera is normally oriented for use with the screen in portrait mode, whereas the Portsdown software needs the camera to be mounted for use with the screen in landscape mode.

After attempts to fix the problem in software had failed, Colin found that it was possible to modify the case to mount the camera with the correct orientation. First, some plastic had to be cut away to extend the lower end of the mounting recess to make room for the camera ribbon cable socket. Then the mounting screws were moved to fix the camera at the edges of its PCB as shown in the photo.



A standard length ribbon cable was folded to connect the camera in the new orientation.

The SmartiPi Touch 2 case is currently available from the The PiHut, Pimoroni or Cool Components for about £24.

ATV repeater PI6ATS

Chris van den Berg PA3CRX

Since 1987 we have run a cross band ATV repeater in the Netherlands and since then several developments and designs have taken place. In the latest update we decided to transmit four pictures with a quad unit without switching capabilities.

The output of a standard quad split unit is connected to the 23 cm transmitter while three 13 cm receivers and one 6 cm receiver make up the four inputs. This configuration makes it possible to be in contact with four users at the same time.

The audio of the receivers goes via individual squelch circuits and a mixer to the audio input of the transmitter.

PI6ATS information.

Input frequencies:	2330 MHz (FM) 2350 MHz (FM) 2370 MHz (FM) 5780 MHz (FM) 144.7625 (only sound and input for remote control)
Output frequency:	1280 MHz (FM) Sound all 6,5 MHz
Locator:	JO22PE52SQ
More information: (Dutch language)	www.pi6ats.nl

To have the possibility to add an extra person to join - for example one that could receive but not transmit ATV - the audio of the two-metre remote control receiver is also added to the audio.

To avoid constant occupancy of the 23 cm band - and to reduce power consumption - the repeater is normally in stand-by mode. After receiving a 1750Hz tone or (#1 DTMF) on 144.7625 MHz, the 23 cm ATV transmitter switches on for half an hour.

With the two-metre band channel it is also possible to switch the repeater completely off - for example in case of ATV activity weekends - or switch the 13 cm receivers off (regulatory requirement) and some DTMF and basic logic circuit takes care of that.

Stations identification is the last issue: a quad unit shows four pictures and we would like to use four receivers. One solution was overlaying the station identification over the quad split but we did not like that.

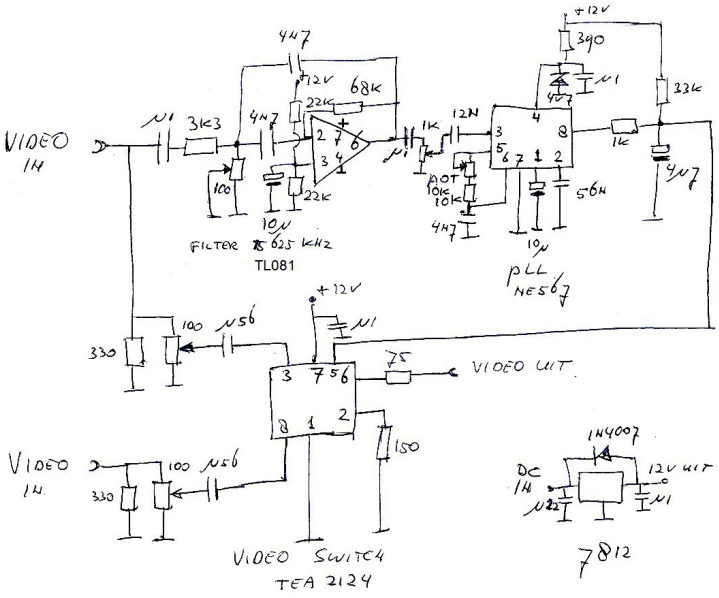
Instead we decided to make a video using a video player which plays back pictures and movies from a USB stick. One of the four inputs shows this identification but if its receiver is active, it overrules the internally-generated video.

Sync detector/video switch.

The circuit that switches the internally generated promotional video and stations identification to the receiver is a combination of some rather basic circuits.

Circuit description.

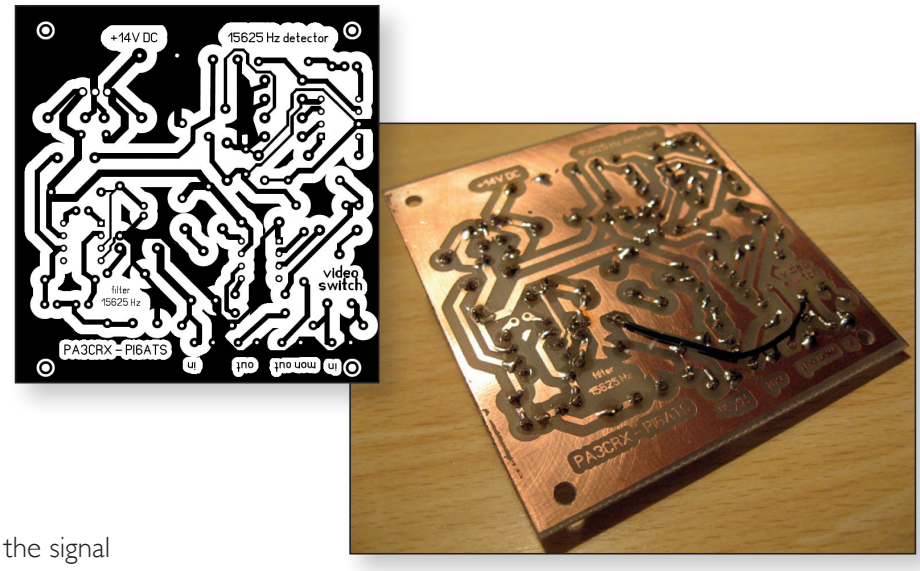
As soon as video is received from the 13 cm receiver it needs to be detected and we use a sync detector for this. We had bad experience with false detections, so first the line sync of 15.625 kHz is filtered with an operational amplifier (TL081) and then passed to the PLL (NE567). When the PLL is triggered, the DC output changes status and operates the video switch. In the past, we used CD4066 switches but this wasn't satisfactory. After some searching I found an IC that is intended for this usage the TEA2124. One of the benefits of this device is that the capacitors do not need to be very large to pass the frame sync undistorted.



The adjustment is straightforward.

Adjustment filter:

- Connect video (1Vpp) to the input.
- Check with an oscilloscope the signal at the output of the TL081.
- Adjust the 100 Ohm pot until a signal appears on the oscilloscope.
- Verify that the signal disappears if the incoming video is cut.



PLL Adjustment:

- Connect video.
- Set the 1K pot to three-quarters so the signal is passed to the NE567.
- Adjust the 10K pot until the DC level on pin five of the TEA2124 changes to low.
- If this does not happen, change the setting of the 1K pot.
- Check if the voltage change back to high if the incoming video is switched off.
- If this functions, the PLL is set to 15.625 kHz.
- Try to reduce the signal with the 1K pot until the point that the circuit does no longer function reliable. Finally do a last tweak with the 10 K pot.
- With the 100 Ohm pots connected via capacitors to the TEA2124, the individual output levels of the switched video can be adjusted.

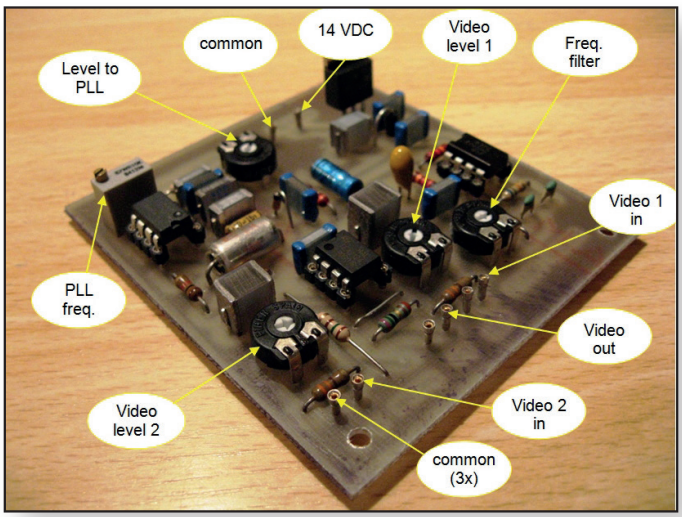
To make it a nice layout I used (for the first time) 'Sprint Layout' resulting in a PCB, including power supply. After placing and soldering the components and testing it, I found out I had made a mistake.

If video was incoming, the wrong video was passed through the video switch. This was not a problem. By cutting a track and adding a wire (I did not change the PCB layout because we needed only one PCB). The sprint-layout files and (components) layout could be downloaded at *http://www.pi6ats.nl/sync-detector-switch.zip* (if you are handy, you could correct the mistake on the PCB).

Power consumption is about 50 mA.

Its sensitivity is set on a level that the received picture is switched at about the same moment as the quad unit switch from 'blue screen' to video. With the used quad unit even very noisy pictures could be retransmitted.

This functional circuit could be implemented rather easily in a repeater or could find its use for home purposes.



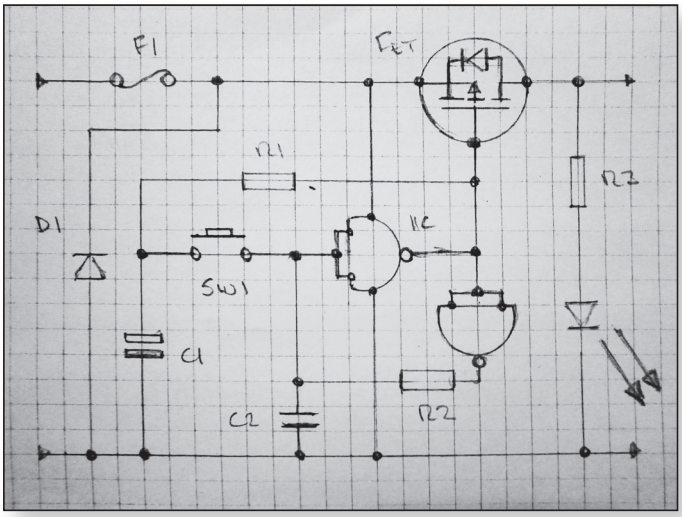
▶ *Received screen of PI6ATS*

Electronic push button on-off switch for the Portsdown

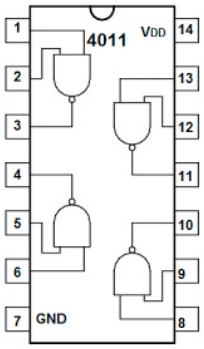
James G0DQH

My Portsdown was originally built with the shutdown push button on the front panel but in the more recent software, this function was changed to a button on the touch screen. Rather than leaving the switch doing nothing, I set about finding a use for it.

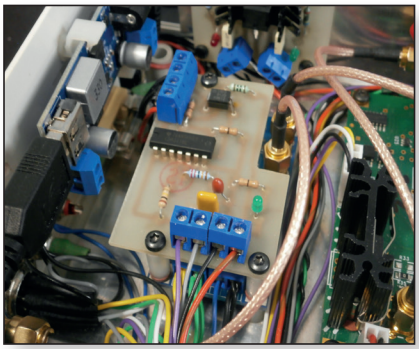
The touch screen shutdown changes to a white screen, but does not remove the power, so I decided to make the push button power the unit on and off. The Internet came up with the basic circuit, and I had a large number of P-channel FETS in my parts box which were ideal for the job.

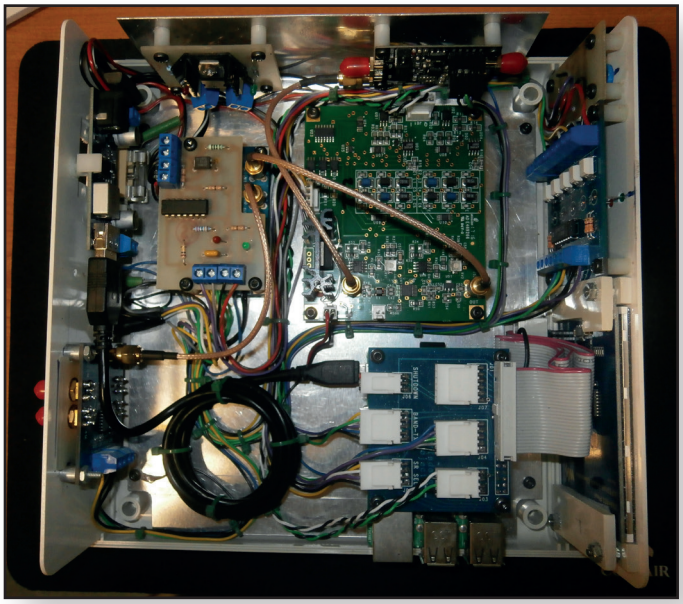


Bread-boarding the circuit first with some minor component changes it worked first time – press once for power on and press again for power off. The circuit is a basic bistable or flip-flop which changes the output state each time the push button is pressed, and has built in anti-bounce. But be aware, the 4000 CMOS devices are static sensitive so tie all unused gates to 0V.



A small PCB was etched which fitted neatly on top of the filter board, which in my unit was also conveniently near the DC input. I only had to buy in the 4011 as I had all the other parts. I needed to remove the wiring from the three-pin connector on the Pi, to the push switch, and fit the four new wires which were routed to the new PCB, two for the switch and two for the LED.





My Portsdown was built with all the boards fitted for all the ATV bands, and has a five-amp buck converter (available from Amazon), and fitted with a USB power socket to feed the Pi, and a separate five-Volt connector to supply the remaining boards. It has a 5mm DC power input socket, plus a connector used to supply the eight-Volt regulator feeding the modulator board - it was almost purpose-built for the job.

With the transmitter set to satellite with two USBs in use (Ethernet to USB converter in mine) on +12V it draws 900mA, and 800mA with +13.8V. A word of caution, transformer type power supplies may say +12v, but off load are much higher, so use a switch mode, its output voltage is stable, and do not give more than +13.8 volts. A safety diode and fuse was included, just in case the polarity is accidentally reversed.

If you are using the Pi for satellite only, you only need supply the PI, with a reduction in current, 600ma with +12V, 500ma with +13.8V. The present design is good up to one-Amp, If you need more than that, then you will need to fit a larger FET. Using two FETS in parallel to increase the current is not generally a good idea, since they do not easily current share. The design also lends itself for use in other similar projects, and will happily work down to five volts, without any component changes.

If you are considering using to switch just the Pi, please take into account the small voltage drop across the FET, which may trigger the under voltage lightning symbol in the top right corner of the screen. The Pi needs a minimum of +5.1v.

The addition of the switch in the end, has enhanced the appearance of the Portsdown, and has operated faultlessly since it was built.

Even after many hours of work, the FET just gets mildly warm, which is surprising for its size. A small heatsink was added to help with cooling.

Parts list for the Portsdown electronic switch

F1	1 amp fuse & holder
D1	1N4001
D2	LED
R1	220k 0.25w
R2	100k 0.25w
R3	2k 0.25w
C1	4.7uf 25v tant
C2	0.47uf
IC	CMOS CD4011
FET	IRFD9120
SW1	Push to make

If anyone would like the IRFD9120 FET, please get in touch, and I will send two free of charge but I will need the cost of postage please. I have approximately 300 in stock. *james.colwill@hotmail.co.uk*

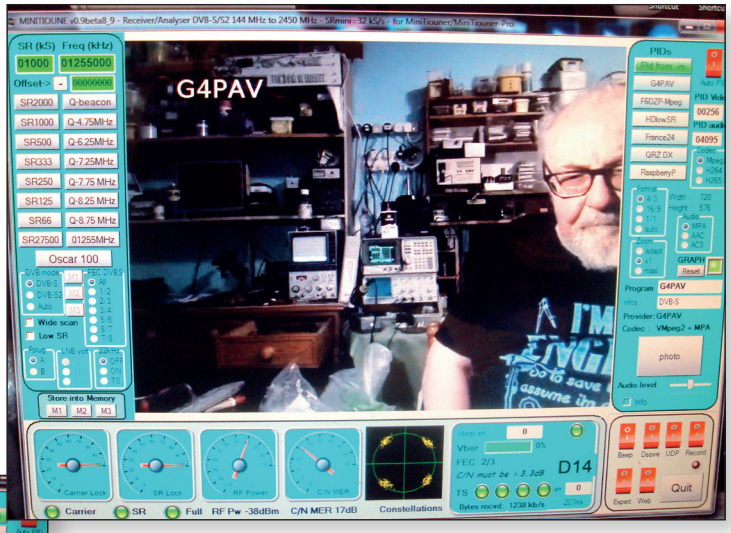
DATV Activity in North Northamptonshire

Jim G7NTG

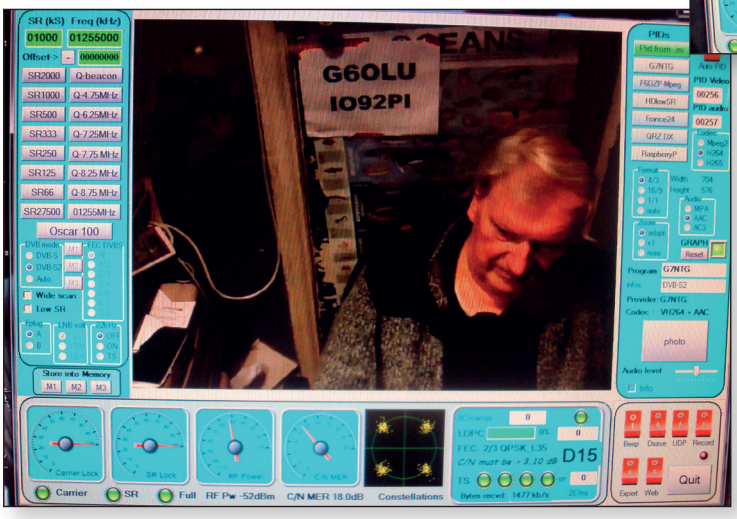
There is regular activity on DATV in the area near Kettering and Wellingborough.

The transmitters are Malcolm G7HPE and Jim G7NTG in Kettering; Peter G6OLU in Burton Latimer; George G4PAV in Irchester near Wellingborough; and Steve M0SKM & Arthur G4CPE in the Luton area. We have a regular Monday evening net on 1255 MHz 1000 SR DVB-S2 and DVB-S with talkback on 70.45 and 144.75. The net is active from about 19:30.

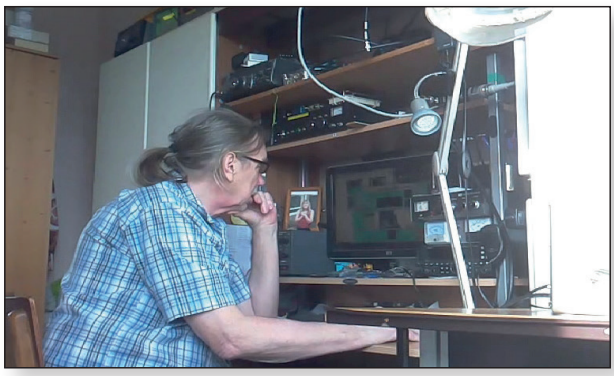
Anyone is welcome to join in and Jim G7NTG can be contacted on *thebigclunk@virginmedia.com*



▶ *George G4PAV*



▶ *Peter G6OLU*



▶ *Jim G7NTG*

CQ-TV, the BATC and you, our members

Brian Summers, Hon. Treasurer G8GQS

Every year in March the UK post office, the Royal Mail, increases the cost of posting CQ-TV. Each year your committee looks at the costings and once again we have decided not increase the cost of being a member.

In the past year or so we have been able to welcome many new members from all over the world! This has brought us economies of scale, so although the cost of postage has gone up the unit cost of printing has gone down and we are able to keep subscriptions at the current level again. We hope that you will support the paper CQ-TV by opting to have yours.

Membership: Paper plus Cyber

UK	One year £20	Two years £39
Europe	One year £30	Two years £59
World	One year £35	Two years £69

Membership: Cyber only

All locations	One year £8	Two years £15
	Three years £21	

There is also a special membership available for **students** in full time education.

Membership notes

As mentioned above we encourage members to have the paper plus option, they get our prize winning journal posted to them four times a year. Your committee feel that the paper CQ-TV is an important and impressive way of promoting our hobby. There is a long line of CQ-TVs going back 70 years recording the development of ATV and our history.

All members receive, via email, a link to download a cyber copy of CQ-TV.

The BATC operates a rolling membership which runs for 12, 24, or 36 months from the date of joining. Our software will send out automatic renewal notices before your subscription renewal is due.

The normal method of payment is via our website and PayPal. Other ways are possible, more details are here – *https://batc.org.uk/how-to-pay/*

The BATC

For our new members, a bit about how the BATC works, first perhaps our name. Years ago it was the obvious choice, we were smaller and operated in the UK. Things have changed since then and we now welcome members from all over the world and our outlook is international.

CQ-TV: This is your journal. Please write to us about what you are doing – we can accept text and images in most formats and these will be laid out to the house style of the magazine. Please send content to *editor@batc.org.uk*

Our websites: Our clubs main large website is *www.batc.org.uk* but there is a lot more to explore:-

https://forum.batc.org.uk/

https://wiki.batc.org.uk/BATC_Wiki

https://www.youtube.com/channel/UCUWLnUZIlytlcCFd93tnBzw

https://www.dxspot.tv/

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

https://github.com/BritishAmateurTelevisionClub

Most of these sites are freely available to all, as part of our efforts to promote Amateur Television.

Our Shop: This is now a major part of the clubs activities, parts are offered at a low price, again to support our hobby. It is run by volunteers in their spare time and while we try hard, sometimes we run out of stock or there are software hiccups. We do make a small surplus from the shop and the funds raised are used to help run the club. We only supply items within the club to our current members.

Your Committee: The BATC operates under a written constitution with nine committee members who are elected at our biennial 'CAT' Conference on Amateur Television. Any member may stand for election to the committee according to the rules in our constitution.

It is hoped that the above synopsis will help new, and possibly some old, members to get the most out of being a BATC member.

Brian Summers, Hon. Treasurer, BATC 2020.

A new controller for VK2RTS

Gary Shipton VK2CRJ

Background

The VK2RTS ATV repeater is located at Lawson at 730m asl in the Blue Mountains to the west of Sydney, Australia, and has been operating for more than 30 years.

The original controller has given excellent service and consists of a three-way analogue PAL video/audio switch controllable by DTMF, from two metres, and a sync detector.

One of two 23cm receivers could be selected which turned on the 70cm transmitter and relayed the pictures when syncs were detected. Without syncs, colour bars and VK2RTS callsign were sent along with a test tone.

The repeater was upgraded to digital by first replacing the AM transmitter with a DVB-T modulator, and PA in 2013. Later, a DVB-S receiver on 1283MHz in addition to the existing FM receiver on 1250MHz was fitted.

This simple arrangement worked well for a few years but when John, VK2ATU, wanted to add low cost drone receivers for 5.6GHz (see CQ-TV 262) and 1280MHz, additional DTMF and sync-operated switches had to be added to work round the lack of inputs on the controller.

It was time to design a new controller which would give us a lot more room for expansion and functionality on VK2RTS. The project also gave me a good excuse to go out and buy a Raspberry Pi and do something with it which I'd been meaning to do for some time.

Requirements

- Simple to use
- Menus with two metre DTMF control
- Automatic mode to select active receiver
- Manual mode to select receiver and other video sources
- Up to 12 video inputs each with stereo sound
- Quad video display
- Show status information
- Run slide shows and videos
- Show usage
- Provide an upgrade path to full HD
- Secure internet access for monitoring and remote software updates

SD configuration

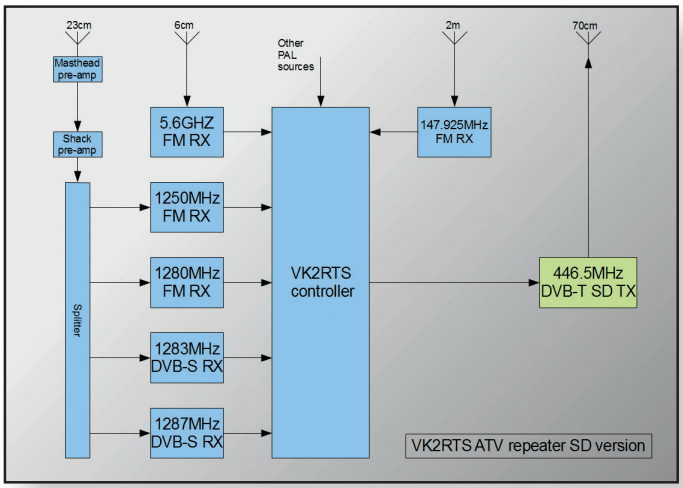


Figure one shows the connection of receivers and transmitter at VK2RTS and how the controller fits in. The receiver of the co-sited two metre repeater provides the DTMF control tones.

The 5.6GHz RX is at masthead and feeds down video and audio to the controller. The controller was first installed to make use of the existing transmitter which only supports SD PAL.

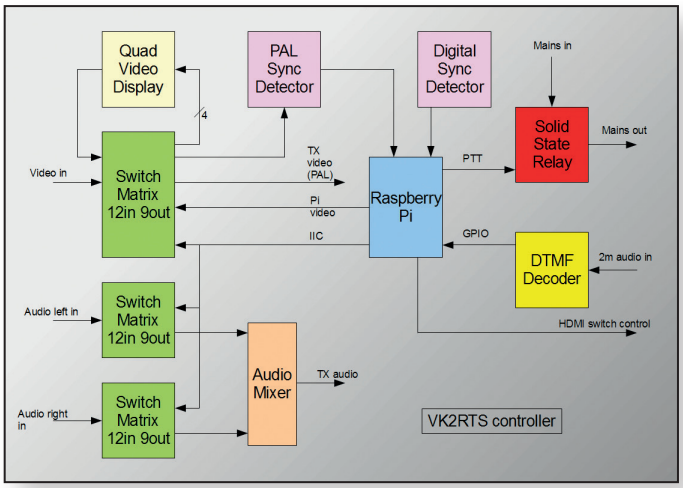


Figure two shows the how the Raspberry Pi is connected up to its peripherals.

DTMF tones from the two metre repeater are decoded by a small add-on board for an Arduino which provides a parallel interface connected to the Pi GPIO.

The PAL sync detector is based on a BATC design using an NE567 tone detector and is good down to about 'P half'.

Fortunately, the DVB-S RX has a LED to indicate reception so a photo transistor was added to act as the digital sync detector.

The video and audio switching is handled by three FMS6501: 12 in, nine out ,cross-points which are controlled by I2C.

This device presented a challenge because the pin spacing is only 0.65mm so the project would only be feasible for me to build if they could be soldered onto breakout boards taking them to 0.1 inches. Fortunately, Len VK2CBL was able to help and got six boards working so construction of the switches could proceed on Veroboard.

I decided to use separate cross-points for video, audio left and audio right respectively allowing great flexibility.

However, the FMS6501 only supports two addresses with a single select pin. So I used one address for video and the other for audio and split the SDA data bus with FETs which could be used to enable commands to one or both devices at the same time.

The software was written in Python with the first step to read the GPIO and decode the four-bit data from the DTMF decoder board and display it to the screen.

Early on, I made use of VNC so I could remote desktop onto the Pi and work on a laptop during the development.

Some months later I ended up with about 1,500 lines of object-oriented and multi-threaded code that implemented the full controller functionality. Secure internet access is in place using SSH with key authentication and tunneling for VNC.

Figure three is the rear view of the controller. To make life easier, I first worked out the positions of all the holes in some drawing software and printed it out scale. Then by taping the printout to the metal plate, I could easily drill the holes. This is the most RCA connectors I've ever mounted and wired up. The left group of RCAs are the 12 video and stereo audio inputs with various outputs on the right.

Figure four was taken at final testing using a resistor wheel to simulate the photo-transistor of the digital RX. The FMS6501s are mounted on the small green breakout boards. To the right are 24 preset pots to match the audio levels from the various sources.

Operation

The simplest and most common way to use the repeater is to start it up in automatic mode by sending a pair of DTMF digits.

This switches the TX on and pages of information generated by the Raspberry Pi are displayed.

At the same time, the controller scans three analogue receivers and one digital for syncs and switches the TX video and audio over to the first RX it finds syncs on so the user no longer has to manually select the receiver as they did with the old controller.

Another pair of DTMF digits switches the repeater off but there's also an inactivity timer which will turn it off after 30 minutes if no further syncs are detected.

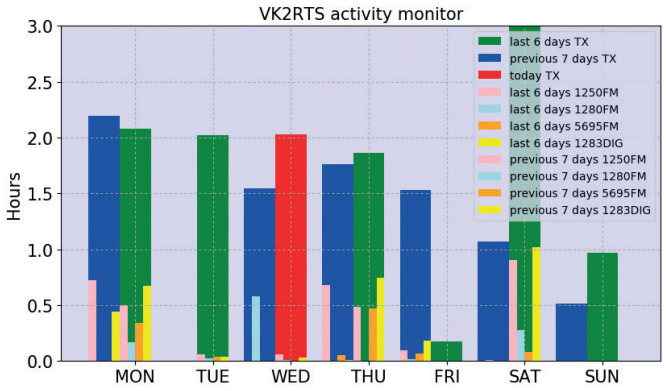


Figure five shows the way repeater usage is logged and displayed over a two-week period. The wide bars indicate TX on time and the smaller bars RX usage. This picture appears as part of a slide show when the repeater is started up in automatic mode.

In manual mode, the user can select any of the 12 inputs to be transmitted. By default, the sync detector still operates so will only switch over from showing Pi video when valid syncs are detected. The sync detector can be overridden to see if there is any signal in the noise.

One of the manual selections is the output of the quad video display which is an external piece of hardware.

It only provides video so audio switching is performed by the controller's switch matrices and a stereo audio mixer which can sum up to eight sources on each left and right channel.

Sources are selected as stereo pairs, e.g. L1 and R1 with half direct and half cross connected and can be separately enabled.

$$L_{out} = \underbrace{(L1 + L2 + L3 + L4)}_{\text{direct}} + \underbrace{(R1 + R2 + R3 + R4)}_{\text{crossed}}$$
$$R_{out} = (R1 + R2 + R3 + R4) + (L1 + L2 + L3 + L4)$$

Examples:-

single stereo source $L_{out} = L1, R_{out} = R1$

single mono source $L_{out} = L1 + R1, R_{out} = R1 + L1$ so the input can be connected to either L1 or R1

quad display $L_{out} = L1 + L2 + L3 + L4, R_{out} = R1 + R2 + R3 + R4$

By default, the three analogue receivers, and the 1283MHz DVB-S, go to the quadrants. The PAL sync detector is then used to only pass audio through when syncs are detected, the digital RX audio being self-muted.

If one or more of the analogue signals is weak with noisy sound, it would be better to mute that source and this can be done by users with DTMF control.

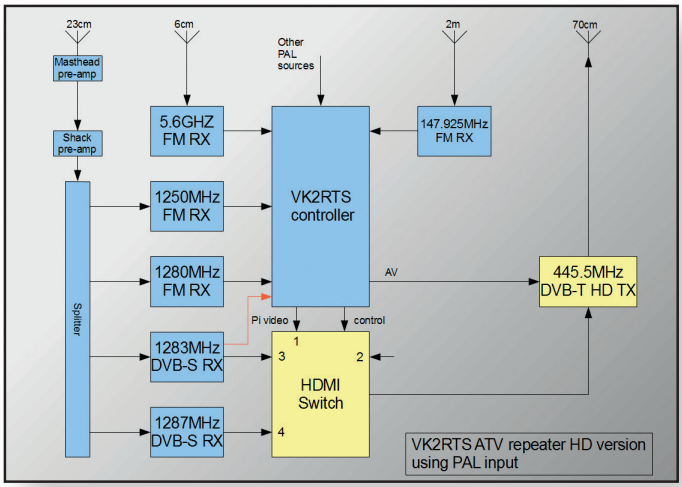
The default inputs can be changed by the user allowing any of the 12 inputs to go to any quadrant.

This involves sending two pairs of DTMF codes, one pair to select the quadrant and the other the input. The output of the quad can be selected as one or more of its inputs which results in some interesting recursive patterns.

Figure six is an off-air snapshot with VK2ME on 1250MHz FM, a picture from the Raspberry Pi, VK2ATU on 5.7GHz FM and VK2CRJ on 1283MHz DVB-S.

As no-one was on 1280MHz FM, I used the manual quad control to substitute a picture for the default blue quadrant. Other manual selections include a weather station showing live conditions at the repeater site, a Minitiouner display, test cards, slide shows and videos.

HD upgrade



The next step in the development of VK2RTS has been to upgrade to HD with a Hides modulator and HDMI switch shown in yellow.

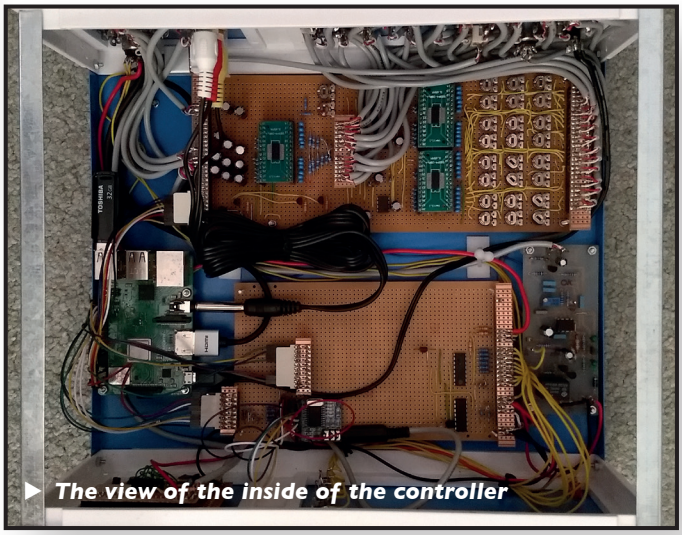
A low cost Simplecom CM324 HDMI switch was chosen and is controlled with an IR LED driven by C code running on the Raspberry Pi which mimics the data normally sent by the remote control.

The 1283MHz DVB-S RX can output PAL and HDMI at the same time so that its video can still be displayed in quad mode.

Conclusion

The controller has been operating for about six months and proven to be very reliable. The remote link has been used to upload new videos and make small improvements to program operation after user feedback and on air experience.

One little feature I couldn't resist was when the repeater shuts down, first the picture shrinks to a dot and then disappears after half a second when the TX goes off.



The view of the inside of the controller

Don Saunders, G0WFT - silent key

Sadly Don Saunders, G0WFT passed away on 31 December 2019 following a two-year battle with cancer.

When the disease was diagnosed the doctors said he had between six months to two years left.

Due to other health issues he was unable to have chemotherapy but still fought for two full years. Don's birthday was 14 December, he had just reached his 70th.

At the age of seven Don had polio, and if that wasn't enough, polio struck again at the age of 30.

Both bouts caused physical damage and he was registered disabled. Don was often seen at radio rallies with his walker or mobility scooter.

His wife Rose was his rock and full time carer.

During his illness not once did I see any sign of weakness, a braver man I have not met, right up until he was no longer physically able he was on the local net nightly. As the illness progressed he could no longer venture out. We visited him regularly and during those visits he could still crack a joke even when it hurt.

When I first met Don I was puzzled how a guy with a radio licence could be microphone shy but that was Don.

He preferred operating data modes which helped with his shyness. As time went by he took an interest in what others were doing with ATV eventually gaining the confidence to sit and chat in front of a camera.

Don grew to love the TV modes and in the end we couldn't shut him up - not that we really wanted to, bless him.

Unable to operate portable, he participated in the BATC activity weekends from his QTH in Bedfordshire. During the evening nets he delighted in telling us of the contacts he'd had.

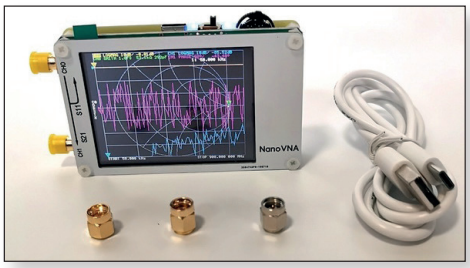
Don will be missed by all who knew him, including members of local clubs he attended in Bedford, Dunstable and Milton Keynes.

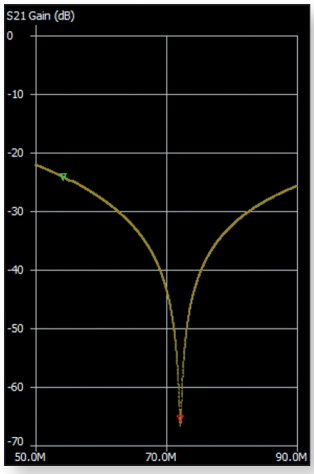
RIP old friend.

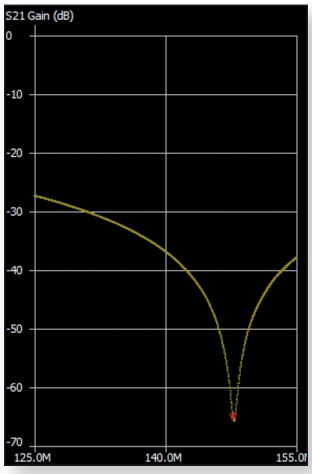
Test gear snippet...

Gareth G4XAT

Don't you just love having the right gear?
Screenshots from the PC via my NanoVNA (eBay, £29 with leads and calibration kit) which I was using to cut coaxial traps for 146MHz and 71MHz. Checked with a spectrum analyser and a noise source, they agree…







DATV repeater receiver with active video switch

Duncan Rossiter G7VVF

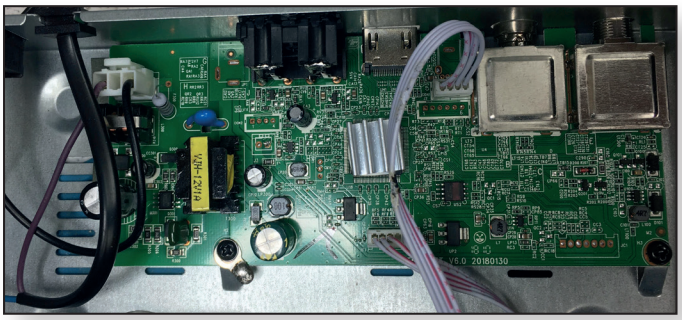
I was at CAT 19 South last year and was talking to Noel, G8GTZ, about his demo for 23cm repeater conversion to DATV. I noticed he was using a common cheap eBay satellite receiver.

I pointed out to Noel that the RX has a lock light that illuminates when a valid transmission is received, and that I had utilised this LED to switch a video relay so that the output from the receiver can be used with a standard sync detector as used in repeater switchers.

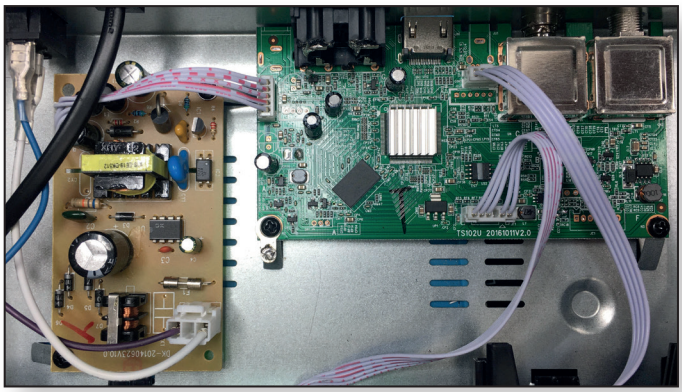
Noel asked me to write it up for CQTV, so here it is.

The satellite RX typically costs about £20 and it is commonly described as DVB-T2+S2 Combo HD 1080p Tuner Decoder Satellite TV Receiver HDTV Set top Box. It looks like this and will decode down to 1MS/s signals with auto FEC

I have converted two of them so far. The first one had a 12v board with an on-board PSU.



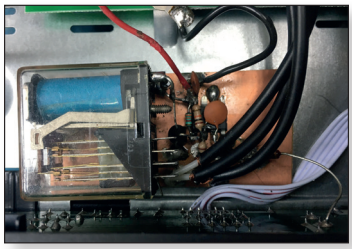
The later model has a 5v board with separate PSU.



Noel G8GTZ had previously published a circuit for use in the Comag SL30 so I took this circuit and modified it to work in this receiver.

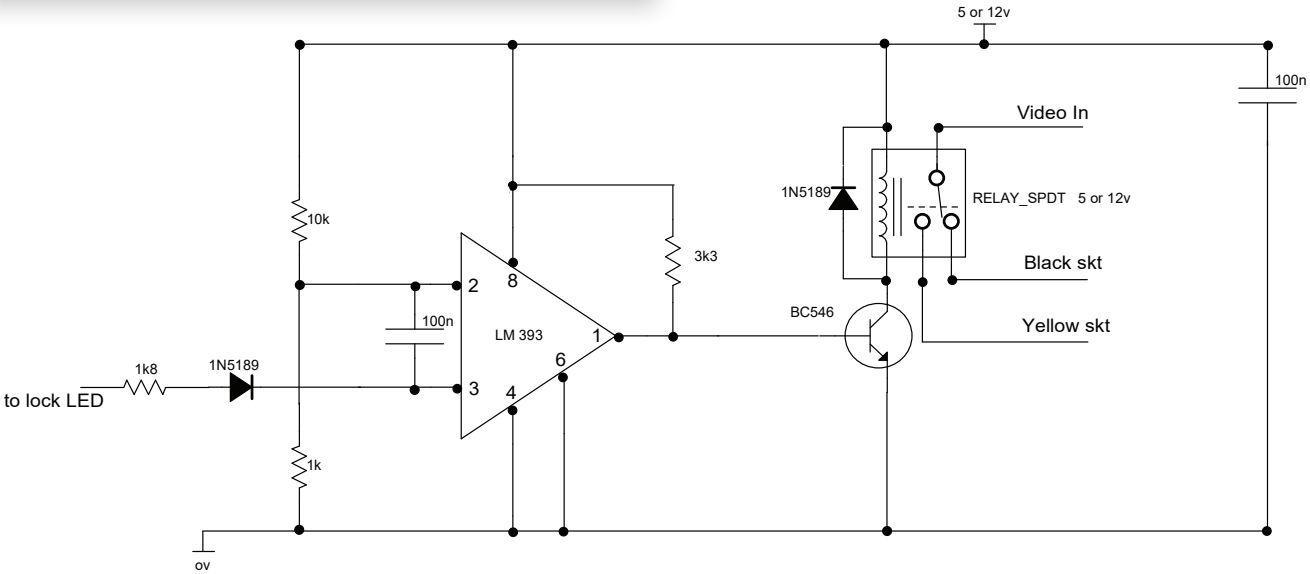
The lock LED in this RX only uses 0.5v to turn on so I had to make sure the circuit attached to it didn't pull down the voltage.

After a bit of trial and error I came up the circuit shown below.

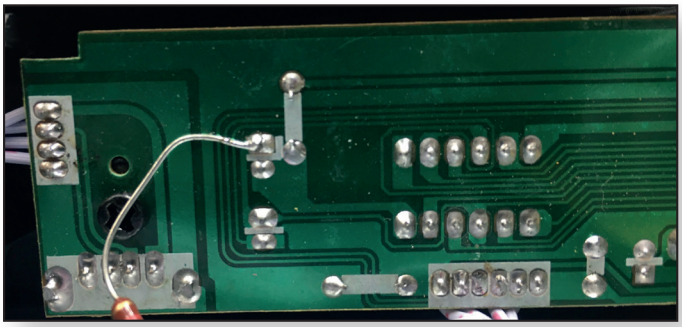


The same circuit will work with the 12v and 5v boards without changing any component values - apart from the relay.

I built the circuit on a bit of scrap copper clad board (it could also easily be built on Veroboard) with components I already had.

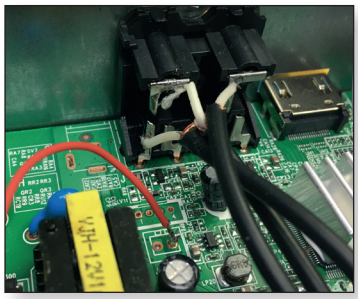


The 1k8 resistor is soldered on to the LED + pin on the back of the display board.



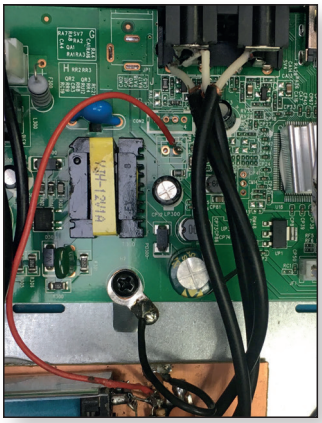
To get the video signal, I just separated the video out socket and SPDIF socket from the main board and spliced in some screened cables to connect to the relay.

I used the yellow video socket for the switched video out and the black SPFIF socket for non-switched video, so you can connect a monitor to the SPDIF socket and still see the menus for setup.

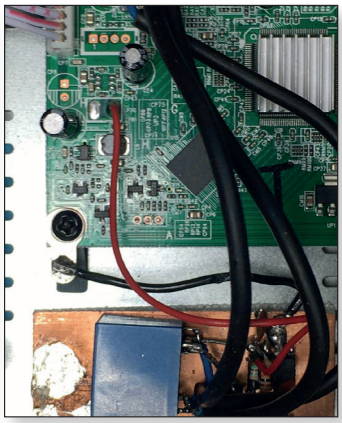


For the earth connection I just used a solder tag and attached it to one of the board mounting screws. The next pictures show the location of the 5v and 12 v sources.

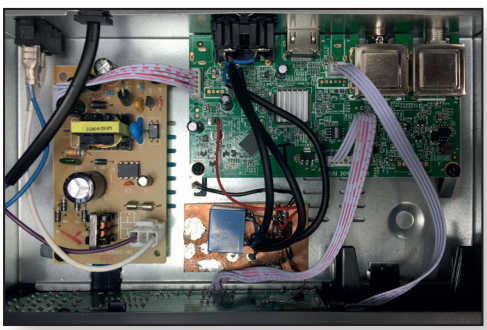
12v



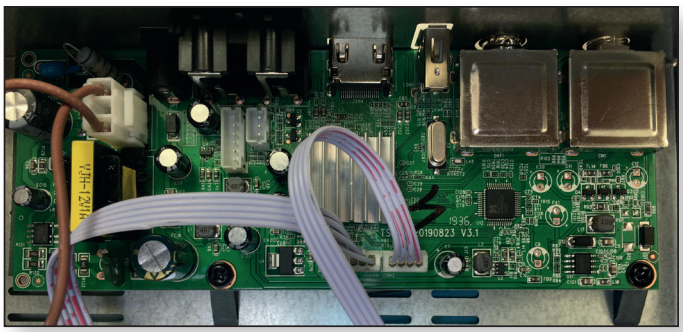
5v



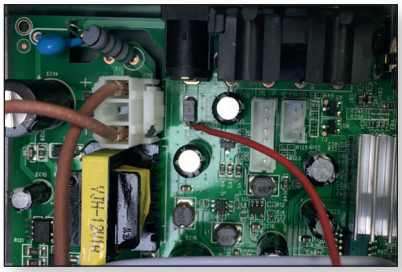
Here is the completed modified Sat RX (5v model).



Since writing this article I purchased another receiver to see if I would get a 12v or a 5v model – much to my surprise, I received a third variant with yet another different main board. This one is 12v working and also has a 12v power plug on the back panel so that it could be used portable. My circuit works without modification in this receiver as well.



The 12v supply for the circuit can be picked up from here



However, after more testing, I discovered this receiver has different software and doesn't perform as well – the picture freezes and maintains a video output even after it has stopped receiving a signal.

This RX is not suitable as a repeater receiver.

It may now be a bit of a lottery as to which design you will get. The first two I bought both had UK moulded plugs but this third one had a European plug.

I have ordered another from China that appears, from the eBay pictures, to have the same software that my first two RXs had, so I'm hopeful that this one will work OK but I'm still waiting for it to arrive at time of writing.

One of the converted receivers is now in use at GB3EN on 1249MHz.

At GB3EN the aerial feed after the preamp and filter was split with a cheap satellite splitter and now feeds the DATV RX and the analogue RX, the video and audio from the DATV RX go to a second input on the sync detector video switcher.

At two-and-a-half miles from GB3EN I can access the repeater with 4mW.

It is auto FEC and will accept DVB-S, DVB-S2, MPEG 2 and H264 at 1MS/s.

BBC MCR21's Sound Mixer Desk and audio systems

Brian Summers G8GQS

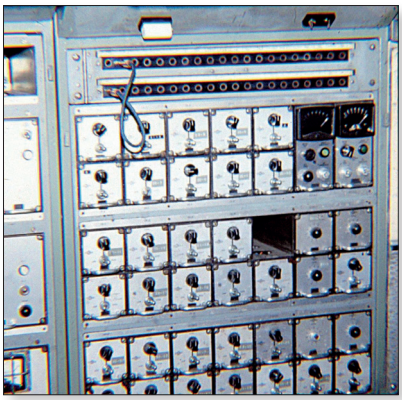
The sound desk installed in MCR21 was made by Pye Ltd. from modules in their new 'Broadcast Audio Equipment' range. The idea behind this was that simple or complex installations could be made up by combining a number of standard units selected from the module range.

A full sound system, programme and talkback, to the BBC's requirements was made up for MCR21 complete with amplifiers, PPMs, faders, power supplies, reserve battery supply, tone generators, and a telephone system with ring generators.

This compact installation was built into two desk units that form part of the overall production desk fitted transversely across the vehicle. These were notionally 'portable' in the sense that they could be removed and operated away from the vehicle if the programme required that.

▶ *The 20 channel Pye sound mixer assembled to BBC requirements.*

Part of the BBC's specification was that there were various levels of equipment 'de-rig' to increase the flexibility and accommodate different circumstances. Notable was the programme made of the ascent of the Old Man of Hoy where it was not possible the get the MCR near enough to the site so the complete contents were moved there and operated under canvas! Another situation was at Wimbledon were at least two MCRs were de-rigged into the void under the court seating.



▶ *The amplifiers are neatly fitted under the desk*

The sound mixer had 20 input channels, each having its own plug in amplifier module with gain control and input level switching. These channels were divided into three groups, green, blue and red which could operate independently, perhaps feeding a PA system or foldback, or they could be mixed again at the master faders for a combined output. Two independent PPMs could monitor different signals and there was a BBC-designed 'Optical PPM' installed above the transmission video monitor. This was so the sound supervisor could see the PPM in the same eye line as the master monitor.

The mixer modules were easily accessible under the desks, on the left are the power supplies and the loudspeaker amplifiers and on the right, the channel and mixer amplifiers. Top right are the two PPM driver modules. The standard PO316 jackfield allowed limited patching and the mixer inputs connectors are on the rear of these units. Of note is the lack of equalisation, the mixer has a flat frequency response.

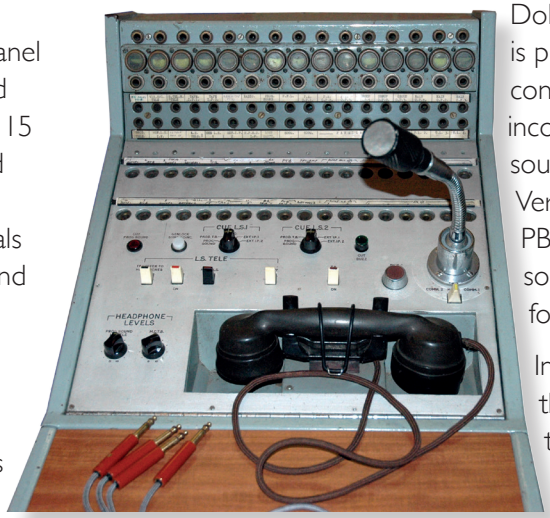
Communications to the cameras outside the MCR was built into the cameras as 'talkback' so the cameras could hear production talkback, programme sound and engineering talkback. There were spare jacks on the cameras so that others could plug in and listen. This was well before radio was used for talkback! Telephones were used, but if these were near the 'action' the bells would be turned off.

At the commentary position was a commentator's telephone unit, known in the BBC as a Baron box. These have been restored as part of the project. It has two pairs of headphone sockets at the front, each headphone pair has its own volume control which is normally supplied with production talkback, the other choices are programme sound or 'off air', sound & vision from a TV receiver unit.

The telephone handset operates as a loudspeaking telephone in the OB Van for the producer, or production secretary. Switches are provided to call the producer or to cue the sound mixer. There is no bell with the telephone, a bell is the last thing you want ringing… There would have been one or two picture monitors displaying mixer out and off air. One or both of these would have the picture displayed selected in the MCR by the production secretary.

▶ *A fully restored 'Baron Box' commentator's communication unit.*

To the left of the sound desk is the engineering manager's position. His panel has talkback controls, a telephone and the telephone exchange. MCR21 has 15 principle audio circuits to the forward termination panel. At the panel they connect to an XLR and three terminals for wire connections and the other end connects to a jack and a 'Dolls Eye' at the EM's desk. On an 'OB' the sound and talkback to the studio could be complex. You might have one or two main programme outputs with spares in reserve.



▶ *Engineering Managers Desk*

On the talkback side a four-wire speech circuit provided two way communication with the studio, or you might have 'control lines'. These were military-style, copper all the way, magneto-calling telephone lines. An incoming ring, 75 volts at 25Hz, would drop the dolls eye indicating which line was calling so it could be answered. The desk had a ringing generator module to call in the other direction. This rather primitive system, essentially the same as field telephones, had high reliability and would work even in a power fail situation. Control lines were still in use well into the late 1980s or even into the 1990s. It could be a challenge to get a long control line through several GPO exchanges. I rather think that in later years the 'copper all the way' disappeared and cunning GPO devices simulated the direct current circuit.

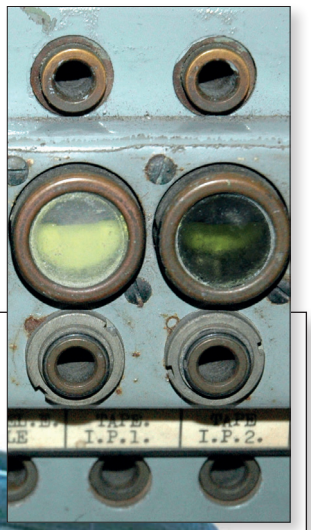
Dolls Eyes! The origin of the name is plain, but these have a solenoid connected across the line and a incoming ring will drop the yellow flag, sounding a buzzer and opening the eye. Very similar to the 'indicator flags' on a PBX. When a jack is inserted into the socket below it resets the eye ready for the next call.

In the picture of the desk above the two rows of holes in front of the more upright jacks and dolls eye are meant to have the unused jacks parked in them. A bit like the conventional larger GPO exchange desks. However, the GPO desks have room underneath to accommodate a weighted retraction pulley device.

In MCR21 there is no room for such a device and we are puzzled as to how the cord retraction might have been achieved?? Some sort of spring wind-up gizmo? Has anyone seen such a device? The Jacks can be seen in this original picture; *http://mcr21.org.uk/gallery/none/*

Useful links:

www.mcr21.org.uk
www.bttt.org.uk
www.tvobhistory.co.uk
www.tvcameramuseum.org



▶ *Close up of the Dolls Eyes*

▶ *A BBC "Main Fleet" MCR in original colours early in it's career.*

Remote Repeater and Station Monitoring with ModBus (Part 1)

Justin Cockett G8YTZ

Introduction:

When we apply to the ETCC for our repeater NoVs we are required by Ofcom to put in arrangements to close down the station within a set period of time, usually 30 minutes. On top of that it is usually desirable to have some monitoring of the station's vital functions. This three-part article is designed to describe how anyone with a basic familiarity of computing technology can build a standards-based SCADA (Supervisory Control and Data Acquisition) system using readily available components and free software for monitoring a remote repeater or transmitting station.

Modbus® Protocol

Modbus is a protocol that was developed in the late 1970s by Modicon (now part of Schneider Electric) to provide communications services between its range of PLCs (Programmable Logic Controllers) and other systems. Nowadays Modbus is more or less the de-facto standard for the SCADA systems used in industrial process automation; from factory and process automation to system heath monitoring. You'll find Modbus used in industries as diverse as control of nuclear power plants, baggage handling systems in airports, railway signaling systems, traffic lights, the water industry, HVAC control, to the machines that make Mars Bars and cars, perhaps even cars for Mars one day!

One of the reasons that Modbus is so popular, and remember this technology pre-dated twisted pair Ethernet, was due to the long transmission ranges possible over simple CW1308 telephone type cabling using the RS-485 protocol. Later developments included Modbus over TCP/IP.

Believe it or not, I'm actually not a great fan of Modbus for building control applications, more modern protocols like KNX have significant advantages, particularly in the number of data point types that are supported and KNX has many security features that were just not on the Modbus designers' radar in the later 1970s. Modbus, however does have two massive advantages over KNX; that is cost and market penetration. Apart from the well-established manufacturers like Schneider, Siemens, Allen-Bradley etc., there is now a wide range of Chinese manufacturers producing Modbus compatible RTU's (Remote Terminal units) as very reasonable costs and it is this that led me to using the USR-IO424T-EWR device that's available through a number of sources, including direct via Ali Express for around £50 plus duty. If you are designing a control system for an industrial application such as a nuclear power station or another safety critical system or one where reliability and component traceability is important, I'd definitely stick with a locally-produced product and the all-important local support network, but for an amateur radio hobbyist application there really is no significant downside of using these Chinese solutions for the amateur radio purpose of self-education and learning. There is nothing new about SCADA systems, but fashion dictates that they are often referred to as "The Internet of Things". It just shows how flexible the Modbus protocol has been in adapting to new requirements and technologies.

The USR-IO424T-EWR unit supports wired Ethernet, Wi-Fi, RS-485 and runs from a 12-28V power supply. If you really want, the company also provides a customisable cloud dashboard, but in principle I don't like cloud solutions and even less so Chinese cloud solutions. In the GB3JV implementation I've used the open source "Home Assistant" software to provide a dashboard, and mobile app integration. The USR-IOT product handbook is fairly well written and not too hard to understand, I found USR-IOT's online support to be to a good standard, the device has a web configuration interface as well as MS Windows configuration tool that's available as a free download from the manufacturer's website. For GB3JV I opted for a Cisco router using an LT2P site-to-site VPN over a cellular connection back to my house. The firm has other products versions that support a GSM connection or the option of the standards compliant LoRa (long range) wireless protocol on 868MHz, so there are several networking options.

An Overview of the USR-IO424T-EWR

This unit provides all the functionality required for monitoring of a simple repeater site:

- 4 x binary (TTL) inputs (dry contacts)
- 4 x binary (TTL) outputs (coils, AC/DC up to 5A)
- 2 x analogue 0-10V or 0-20mA inputs
- 1 x PT100 temperature sensor input
- 1 x Ethernet
- 1 x Wi-Fi (client or server mode)
- 1 x RS-485
- EMC protection to IEC 61000

The RS-485 interface can be used to daisy-chain more Modbus RTU's (remote terminal units) to expand the input and output capabilities for a larger site.

Application in an Amateur Radio Repeater

The GB3JV repeater consists of a series of SR-Systems modules to generate modulated RF at 900MHz, followed by a 3.4GHz up-converter. The up-converter provides filtering and with the 900MHz modulator generates a pure DVB-S2 signal at 3.404GHz. The multiplexer and H264 encoder are also from SR-Systems modules and a low-power Atom-Based micro PC running an OEM version of Windows 10 provides media player and testcard graphics. The cost of this PC, which looks just like an Apple TV box, was £110 from Amazon. It has 4GB RAM and a 64GB eMMC HDD, but also has a Micro-SD card slot, Intel 4k graphics, USB, Gigabit Ethernet, Wi-Fi and Bluetooth. I access the PC using Microsoft's Remote Desktop Client from my Mac over the VPN and the PC also serves to manage other local devices, such as the Modbus controller's app-based configuration interface.

The SR-Systems modules are managed using a USR-IOT single port terminal server (Ethernet to RS-232) for remote access to the SR-Systems system configuration items via Telnet. These devices cost about £20 on Ali Express and are similarly well made and have proved 100% reliable in this application.

The Power Amplifier is a Stealth Microwave SM3437-43L, the version that I have has a reflected power indication 0V = zero return loss and 5.0V = infinite return loss and a TTL level on/off function, so I've used the DO-4 on the USR-IOT Modbus device to switch the PA on and off and one of the analogue inputs to monitor the return loss. For amplifiers that have a forward power indication you can use the other analogue input to measure the forward power as well. I've not yet wired up any of the inputs, but I'm going to use a couple of them to confirm status of the Mean Well PA power supply and another one for the rack door tamper alarm. The PT-100 input has a PT-100 sensor connected to it to monitor the PA heatsink temperature, three-wire PT-100 sensors are available from most plumbing outlets, or Amazon. (Note: this is not the more common PT1000 sensor type). Of course, you can use the inputs and outputs for whatever you like; could be rotator control or antenna or pre-amp switching for instance. The output relay contacts (called "coils" in Modbus terms) are rated at five-Amps, but I'd not go anywhere near this limit, instead use the outputs to drive an external contactor or relay coil.

Modbus Registers (or memory locations)

Each Modbus line requires a "Master" unit, a master can control up to a further 252 slave units via a RS-485 bus. Individual slave units have registers which store data related to the various input and output functions. These are written to, or read from, by specifying the slave unit number and the individual register (memory) address.

The data rate of the bus can be configured from as low as 300b/s, up to 230kb/s, but the choice is really according to the data acquisition requirements for the application; a device that might only generate low traffic rates, for example a door being occasionally opened, but is a long distance away might be best suited to a low data rate, but if there is a pulse counting requirement, for example fluid flow measurement in a pump then a higher data rate may be required. In our case the USR-IO424T-EWR will be the master unit as it provides the Modbus TCP interface for our soon-to-be dashboard GUI, for the small application described here, there are no slave units.

The USR-IO424T-EWR user guide details all the supported registers, but for our purposes we can summarise the capabilities of this unit thus:

Type	Register Address			
#	1	2	3	4
DI Inputs	48	49	50	51
DO Outputs	00	01	02	03
Analogue Inputs	88	89		
PT 100 Input	80			

Modbus specifies different register types, the registers that hold the last reading, count pulses or you can read the instantaneous register. You have to consider which register type you need to read, for your application. In the example above the DI registers quoted detect electrical level or "button press" detection, the function code within the Modbus protocol determines the type of register that is read or in the case of outputs is written to and what happens after a register is read (is the register reset for example). A pulse counting register, for example might count pulses from a water pump to determine the flow rate, whenever the register is read the total count is received by the application until it reaches its maximum count cycle and resets to zero.

If you would like greater depth into how Modbus works, there is the excellent Modicon Modbus Protocol Reference Guide on the *www.Modbus.org* web site, but don't forget the USR-IOT user manual which also provides a gold mine of information.

System Dashboard GUI HMI (Human Machine Interface):

There are several options here, my top two favourites were to use IBM's Open Source "Node Red" building block or the Open Source. "Home Assistant" Application. Both are equally suitable, and both can run on basic hardware like a Raspberry Pi and are equally easy to program. I say this as I am absolutely not a coder and even I can understand it! If you've not coded before you'll realise, quite soon that most coding is

done through borrowing and plagiarising other people's work, which I guess would be a very good definition of "Open Source" I opted to use Home Assistant as I already use Home Assistant to control everything from my KNX Smart home, lights, heating door locks, security and even vehicles. I also use Node Red for a few dashboard applications I created, but Home Assistant has a very neat companion app (iOS and Android) and offers a secure remote access solution for $5/month while with Node Red I'd have to rely on using a dial-up VPN from my iPhone. Home-Assistant is Python-based and uses "yaml" for configuration, whilst Node Red is Java-based, so if you're handy with Java and prefer that approach. There exists a number of highly suitable Modbus Nodes in the pallet. For this article I'll describe the Home Assistant approach that I used.

Familiarising yourself with the USR-IO424T-EWR Modbus Controller

Firstly, download the user manual from the web site or just google: "USR-IO424T-EWR User Manual" This manual is about as comprehensive as you can get and is a very handy reference guide. In summary:

- Binary (contact) inputs are labeled DI 1-4
- Binary (coil) outputs are labeled DO 1-4
- Analogue inputs are labeled AI 1 & AI 2
- The PT100 temperature sensor input is labeled PT100 and needs to be a three-wire type
- The LED's show the status of the relay coil outputs
- The "Power" LED confirms that power is applied
- The "Work" LED shows the CPU is running
- The "Net" LED confirms that device is connected to the manufacturer's cloud (if this option is required)
- The WAN/LAN LED shows the status of the network port.

Configuring the USR-IO424T-EWR Modbus Controller

1. For this set-up we won't use the built-in Wi-Fi AP, so we can place a small 50Ω SMA termination on the antenna port and keep the supplied mag-mount for another application.
2. The device requires a DC power of between 12 and 28 Volts, if you can keep the supply voltage at the lower end of the range as it will reduce overall power consumption.
3. The default IP address is set to 192.168.10.1 and from this you can reach the in-built web interface.

Figure 1: The USR-IO424T-EWR Modbus Controller

I'll describe a basic set-up that will work, but you might like to change various aspects when you deploy the unit. Log on to device's web interface and configure the unit as follows:

Mode Selection => AP Mode

AP Interface Selection =>

- Wireless Network => Check the "Hidden" Box
- USR-IO424T-138C => Leave as default, but choose a very secure password
- LAN Setup => Choose a Gateway address that is on a different subnet. e.g. 192.168.50.1 and a subnet mask of 255.255.255.0. Just avoid using existing subnet on your network, or you'll have a conflict.
- DHCP Type => Set to server.

The above setup will provide a local Wi-Fi access network if your site does not have Wi-Fi, in this case connect the supplied antenna. This could be useful in some cases and for diagnostics.

STA Interface setting =>

- This section is only used if you are using the Wi-Fi as a station (client) and not as an Access Point (server), you could use this if you are not using a wired Ethernet connection, but otherwise this section is not used in this example, where we are using the wired Ethernet port.

Application Setting =>

- Modbus address setting => This is an important setting - remember that I said you can add more Modbus slave "nodes" via the RS-485 interface to expand the capabilities? Basically, each Modbus "node" has to have a unique identity between one and 253, so set each node to a unique number, you can use your own logic. Just document which node address you use for each device. As we only have one node and this node will be the master, you can select "1" for this parameter.
- Registered package setting => Leave as default, but select "First and every"

- Remote Network Parameter Setting =>
  - Mode => Client
  - Protocol => TCP
  - Port => 502 (This is the standard Modbus TCP Port)
  - Server Address => This is the address of the "Home Assistant" client that will connect to this device for "Push" notifications
  - TCP Time Out, I left as 0
- Local Network Parameter Setting =>
  - Mode => Server
  - Protocol => TCP
  - Port => 502
- Ethernet Ports Setting => WAN Port
- Device Management =>
  - Set a secure admin username and password
  - The other settings are self-explanatory, you'll need to press the "restart" button when changing configuration items

How to determine the device's Ethernet IP address:

In the event that you cannot determine the device default IP address then USR-IOT publish a tool to help with this and configuration. You can also configure the device using the RS-485 interface, if you prefer to use this technique then you'll need a little USB to RS-485 adaptor. You can buy one of these on Amazon like this one: *https://www.amazon.co.uk/gp/product/B078X5H8H7/ref=ppx_yo_dt_b_asin_title_o06_s00?ie=UTF8&psc=1*

If you need the tool it can be downloaded from the USR-IOT web site, the file you are searching for is: [Setup software] USR-IO (Original version). There is a "new" version, but this is only compatible with the V2.0 hardware, the older version is compatible with all hardware versions. The hardware version is written on the unit.

Operation of the tool is fairly straightforward, but there are a couple of pitfalls that kept me guessing for hours! It was at this point I discovered how helpful the technical support people were. The software runs on Windows 7/10 and it is important that the device and the PC are located on the same subnet. You just run the exe file, there's nothing to install as such.

In part two I'll go into more detail about the setup of the Modbus Controller and example configuration settings and in part three I'll cover the set-up of Home Assistant to provide the web-based dashboard and remote-control interface.

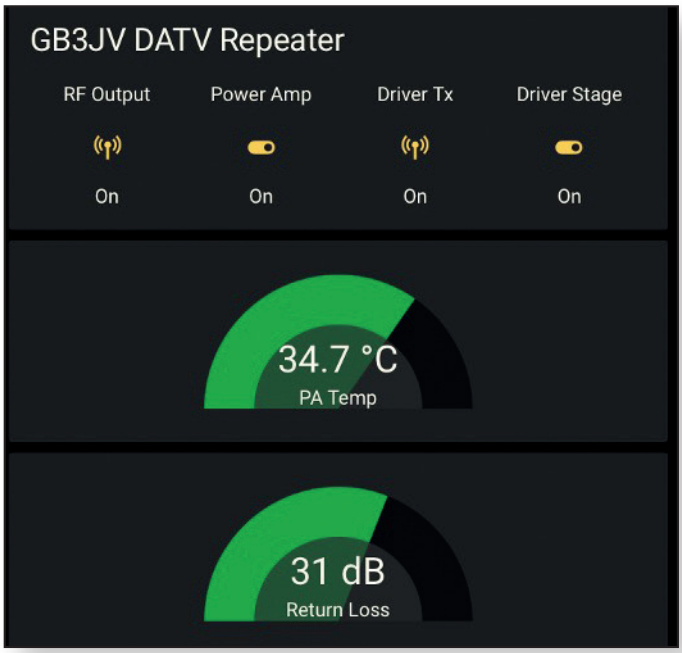


Figure 2 GB3JV "Home Assistant" Web Dashboard

Figure 3 The USR-IOT 1042T-EWR Modbus Device

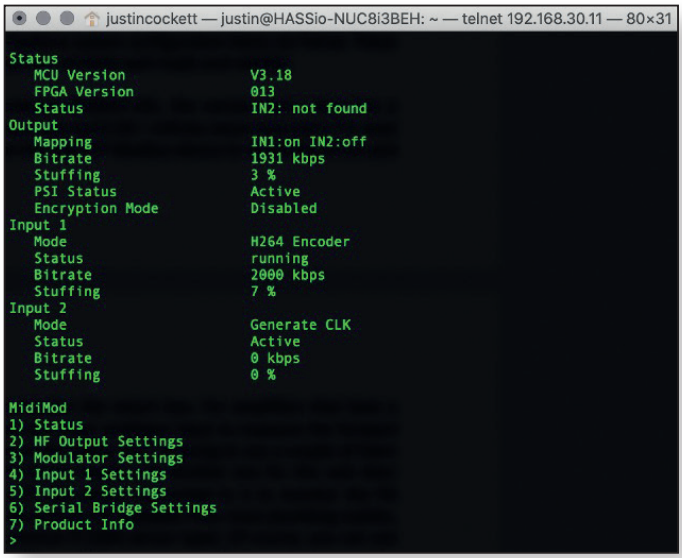


Figure 4: RS-232 Interface to the Driver Transmitter

Video production with a smartphone part two

Ian Parker G8XZD

One of the other little-known aspects of the BATC constitution is the society also exists to encourage members to produce video content as well as experimenting with RF.

When I first started work in broadcasting in the late '70s ago there were amateurs that built their own cameras, and some that even restored video tape machines. As well as transmitting these pictures many also created content.

But the set up was very bulky, expensive to run, rather high maintenance, and quite frankly by today's standards the quality was rather mediocre.

Fast forward forty years, and it is now possible to capture pictures, edit them and upload from your phone or tablet. Many broadcasters are already doing this system of 'mobile journalism' (MoJo) already – and many viewers would find it difficult to see the difference between this and material shot on a full-sized camera.

In CQ-TV 264 I summarised how you could use any modern smartphone to record video and audio, and some timely tips for making it look professional. So let's now go editing. If you understand the concept of cut and paste, and drag and drop, you are almost there.

Once you have gathered all your takes, and probably outtakes as well, you need to edit them together to tell your story. Unlike tape-based systems it is very easy to manipulate your story timeline simply by dragging and dropping your clips. As I mentioned earlier we are trying to tell a story and it is using your skill and judgment to put it together.

On one level editing helps us tidy up the narrative, to remove the 'umms and ahhs', and effectively compress time, but more importantly it also allows us to have a beginning, middle and end to our story.

So what makes a good short film?

You need to make something that is informative and will keep your viewers' interest. As well as identifying the story you want to tell, you need to think of a variety of shots to edit together to achieve this.

Let's think about what we might film? Perhaps a show-and-tell of your shack and aerials?

Before picking up the camera some people find it easier to storyboard the story. Take a sheet of A4 and draw lots of rectangles in a sequence down the page so you can visualise how the story will run, and hence the shots you'll need. You'll need a variety of shots, some wide to set the scene, and plenty of close ups to show the important details. Also think about how you can use sound creatively – to work with the pictures – to add value to them.

In terms of edit software there are many systems to choose from – some are free to use non commercially – and others that are geared towards professional workflow that cost hundreds.

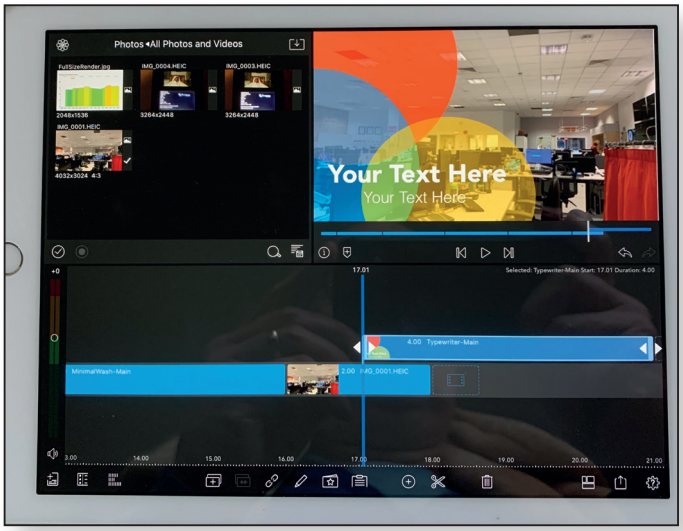
A couple I'd recommend:

iMovie (iOS) *free*
https://apps.apple.com/gb/app/imovie/id377298193

DaVinci Resolve (iOS, Mac, PC, Linux) *free*
https://www.blackmagicdesign.com/uk/products/davinciresolve/edit

Lumafusion (iOS) *£28.99*
https://apps.apple.com/gb/app/lumafusion/id1062022008

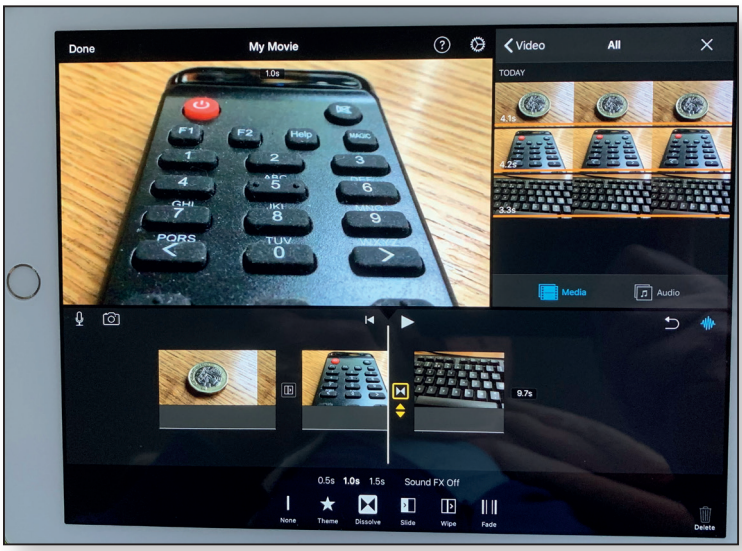
Final Cut Pro X (Mac) *£299.99*
https://apps.apple.com/gb/app/final-cut-pro/id424389933?mt=12



▶ *Lumafusion in action - don't overdo the graphics*

In the simplest explanation each video take becomes a clip – and appears in the clips bin of the editor package once uploaded. Voiceovers, music, stills or graphics also appear as clips.

The ins and outs of each clip can be trimmed, and then dropped into the project and moved up and down the primary timeline as required. And if you need to drop in cutaways (close ups etc), these go above the primary timeline, along with any captions or graphics. Voiceovers, sound effects or music generally go below the timeline.



I won't go further into the specific mechanics of editing but there are some very good tutorials on the internet (YouTube etc).

So keep it basic, think about the story and how you are going to tell it in a compelling manner. Don't go overboard with special effects or gaudy captions.

Most importantly have fun.

▶ *iMovie is a free download and can do the basics of editing*

Revived Terrestrial Activity

Steve M0SKM

Over the past couple of years interest in ATV activity has diminished in the Luton/Dunstable area. At times there had been as many as 10 during an evening natter. As one of two regulars who stuck with the TV I can't think why the others lost interest.

It was hoped QO-100 might bring about a revival; and for a short while a couple of locals did install receive facilities, sadly nothing more came of it. Locally the only stations with QO-100 wideband RX and TX are G4CPE and M0SKM.

It may be just a personal thing but I haven't found QO-100 anywhere near as much fun as terrestrial operation. Building the kit was good experience but now I can just switch it on and guarantee there will be someone on the other end. G4CPE and I still have satellite installations ready to fire up but they are in the main being rested.

Christmas 2019 and into the new year we played locally with kit and software acquired for QO-100; the satellite has certainly given us new ideas and to some extent changed systems in the shack.

It was in February Jim G7NTG posted on the BATC forum and told of the activity in Northamptonshire. There were several stations participating in a Monday evening net; some of them appeared to have a reasonable path to Bedfordshire. This was looking very interesting so we decided to contact Jim and arranged to call into the net the following week.

So it was on 17 February that we first joined the Northamptonshire group and it's been great to meet several very friendly new contacts. We've done some tests on 23 and 70cms DATV which have proved very useful to me. Up till now I have only used 23cms for the local repeater, it is clear now I need to make some antenna improvements. Jim also found a problem with his 70cm preamp, something which wasn't apparent with local contacts.

There are plans ahead but progress has already been made, Arthur G4CPE has had good results on both 23 and 70cms. These include a two-way contact with Malcolm G7HPE on 23cms and one-way contacts sending to Jim G7NTG and George G4PAV. Arthur and Steve M0SKM have both had two-way contact with Jim on 70cms.

Those joining the net so far have been G7NTG (controller), G3ZSE, G4CPE, G4HND, G4PAV, G6OLU, G7HPE and M0SKM. Locations are Burton Latimer, Irchester, Kettering, Upper Sundon and Dunstable. It would be great to expand the group and you can call in to G7NTG Monday evenings from 19:30 on 144.750MHz FM or 70.450MHz FM.

There is still good terrestrial ATV out there; and my satellite kit may rest up a bit longer.

▶ *Malcolm G7HPE*

Portsdown Newsletter

Dave Crump, G8GKQ

Portsdown Buster 2020

The development focus for the project has now moved on to Portsdown Buster 2020. So, what does this mean?

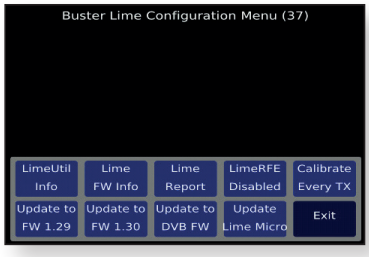
- Throughout 2019 the Portsdown software was based on a version of the Linux operating system known as Stretch. This operating system is no longer supported by the Linux maintainers and has been replaced (by Buster). However, your Portsdown Stretch version will continue to operate, but will not get any new security or functionality updates. If you are happy with the way that your Portsdown Stretch system works, simply bolt the lid down on it, don't try any software updates and keep using it on the air.
- Most of the old Portsdown functionality was ported straight across to Portsdown Buster; the only thing that doesn't work in the new build is "FreqShow", the spectrum viewer. You can't do a software update from one system to the other, you have to wipe the SD Card and start again. This is worth doing if you are using a LimeSDR Mini, but less so if you are using an old filter-modulator board (but this will still work).

For a limited period, you can order SD Cards for either version from the BATC Shop.

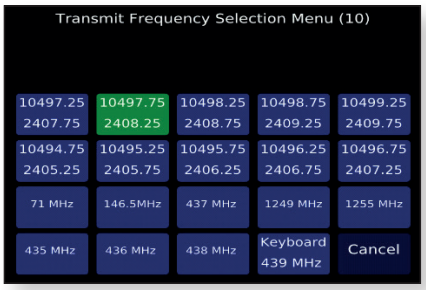
New Features and Bug Fixes

The best new feature is the LimeDVB mode. This enables you to load custom DVB firmware on to your LimeSDR Mini, specifically designed for DATV by Nats F4IHX with assistance from Evariste F5OEO. Thanks to their efforts, the Raspberry Pi simply sends the data to the LimeSDR, rather than having to control the QPSK waveform. This means that the Raspberry Pi and USB link have much more capacity, enabling higher symbol rates to be transmitted. You can load this firmware (or revert to the stock firmware) from the Lime Config menu.

You can also select whether the LimeSDR Mini calibrates on every transmission, or only on frequency change (or never) from this menu. The LimeRFE button is not yet functional.



The other notable new feature is the ability to select one of 10 preset (not changeable) QO-100 uplink frequencies directly from the frequency selection menu. As yet, there is no facility to change these frequencies, or to cater for transverted uplinks; possible future capability.



The performance with the C920 Webcam and the LimeSDR has been significantly improved.

One bug that had been annoying me for ages was that if you tried to select a new symbol rate immediately after deselecting transmit, the Portsdown would instead reselect transmit. I have now cured this, and touch selections after deselecting transmit are simply ignored until the Portsdown is ready to handle them properly.

What Next?

I think that we are approaching the limits of what a Raspberry Pi 3 can do, so while I will continue to make incremental updates, I am also investigating both the Jetson Nano and the Raspberry Pi 4.

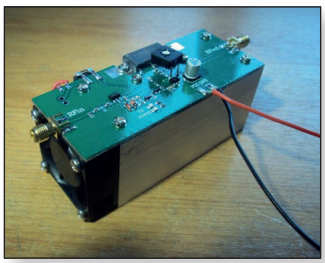
The Jetson Nano is very capable for H265 encoding and decoding, but is not as easy to set up as the Raspberry Pi. It could be used in one of three configurations:

- Controlled from the Portsdown and used as an external video encoder with the LimeSDR connected to the Portsdown.
- Controlled from the Portsdown and used as an external video encoder and driver for the LimeSDR (with the LimeSDR connected to the Jetson Nano).
- As an independent transmitter, controlled from its own keyboard, mouse and screen. Note that the Raspberry Pi touchscreen will not work with the Jetson Nano and a HDMI touchscreen, with new touchscreen software would need to be used for Portsdown-like touch control.

With some specialist software the Raspberry Pi 4 will decode H265, but not using the standard Raspbian Buster as used by the Portsdown. Also, the touchscreen software used by Portsdown is not supported on the Raspberry Pi 4. So migration of Portsdown to the Raspberry Pi 4 is a big job, which I have started – please watch this space!

A 10 Watt Linear Amplifier for 70cms DATV or narrowband modes

Jim Smith G7NTG



Some of you may recognise the amplifier as being advertised on eBay as

"433MHZ 335-480MHz 13W UHF RF Radio Power Amplifier AMP DMR + Heatsink + Fan"

I needed a linear driver amplifier for 70cms and thought that this amplifier ,advertised for about £33 on eBay, might fit the bill so I ordered one. Delivery took a few weeks from Hong Kong and, when it arrived, I set about testing it.

The number on the amplifier module had been scratched off but was just readable as an RA07M4047M which I looked up on the internet and found it to be a seven watts, 7.2 volt module from Mitsubishi and gave the absolute maximum supply voltage as 9.2 volts.

On reading the details from eBay, they claimed 13 watts on a 13.8 Volts supply which is well outside the Mitsubishi ratings! I wonder if this is a very successful copy of the original Mitsubishi device!

I connected the amplifier up to power at 13.8 volts via an ammeter and to my HP432A power meter via a 40dB attenuator and applied input from my signal generator. The amplifier saturated at 18 watts but was not in the slightest linear! The power came on suddenly as the input signal was increased. Only suitable for FM as purchased then.

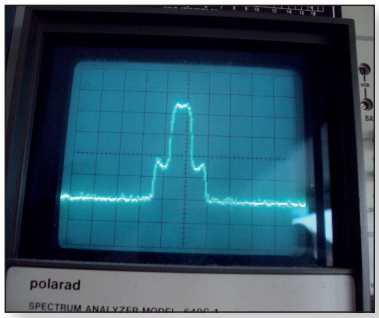
Looking at the circuit used, it became obvious that the first stage amplifier output was used to drive a detector and amplifier to provide a voltage to drive the Vgg pin two on the module so I figured that if I disconnected this amplifier and applied a fixed bias arrangement to drive pin two the device might behave in a linear mode.

(Note that the Ebay picture and the one I received are different so there may be different versions out there!)

I removed the two resistors associated with pin two and soldered on a 10k preset as shown in the pictures. I then adjusted the pin two voltage to 3.2 volts and the amplifier bias current went up to about 1.5 amps.

I again tested the amplifier and found that it was linear up to a P1dB point of about seven Watts and saturated at about 16 Watts for 2.6 amps supply. The linear region gain was about 54dB so that for seven Watts output the input level required was about -15dBm or 32 microwatts.

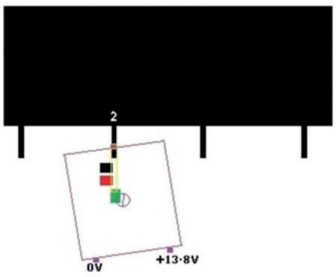
The next stage was to give it a test with DATV so, with an input of 437MHz DVB-S2 at 333ks/s and an average power output of seven Watts the amplifier was left on soak test for several hours with the spectral regrowth shoulders about 28dB down (lower regrowth at lower power). Spectral purity of the Lime Mini I used is not much better than this for spectral regrowth as I am sure many of you are aware.



As the amplifier exhibited no signs of distress and failed to blow up as I thought it might, I figured it was a great success and I will detail the modification for others to try.

There are two SMD resistors close to pin two of the module, marked red and green on the sketch – these are both removed and the red resistor to ground is replaced with a 100nF ceramic capacitor.

A 10k preset is the fitted so that the slider goes to pin two of the module, max cw pin goes to 13.8v supply and max ccw pin goes to ground. These last two connections may need the solder resist to be scraped away so that the copper track underneath can be soldered.



I found the best type of pot to fit is a square Iskra preset 10k ohms as pictured above – they have long enough pins to give clearance for soldering.

In conclusion, the amplifier will be used to drive a 100 Watt power amplifier using an MRF286 (Chinese eBay kit which works very well) for DATV transmissions in my local area (Kettering, Wellingborough) and I expect to be able to run an average power of around 40 Watts.

The amplifier will also be useful for lower power transmissions of up to four Watts DVB-S2 and for the cost is a good start because it will run off the output of a Portsdown or LimeSDR Mini via a suitable attenuator.

A compact 12 volt Beam Antenna rotator...

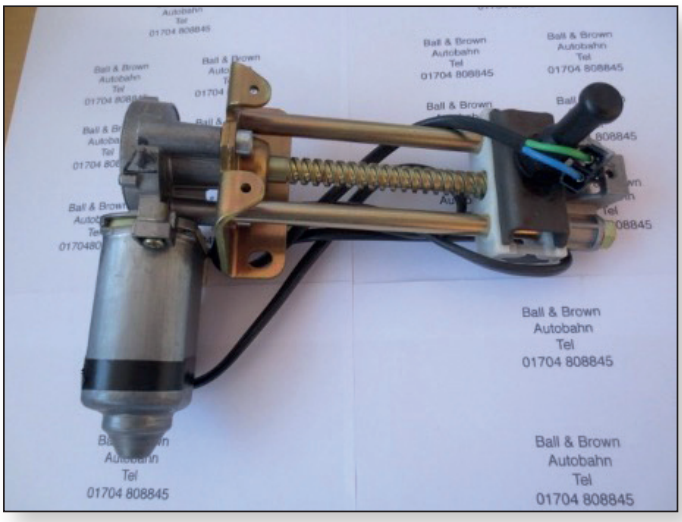
Gareth G4XAT

...and how things come in useful one day

I have a variety of beam antenna for various amateur radio bands and often use them when operating portable. As the name implies, they 'beam' a signal in whatever direction they are pointing in usually the station I'm trying to talk to. There are plenty of mains powered HD units available, but they are heavy and not particularly fast, often taking over a minute for a complete rotation. Something lightweight and faster was needed…

I salvaged a pair of these handy geared motors many years ago when I dismantled an old Ford Scorpio. These motors adjusted the rear seat back angle and clearly would 'come in useful one day'. The first was used to adjust belt tension in a drive system that had a Picador variable ratio pulley. The seat back peg was machined to take a ball-race and that mounted the tensioning/idler pulley. The ratio could be adjusted 'on-the-fly' with a centre-off toggle switch. It lasted well over 6,000 miles in its application.

Fast forward to a couple of weeks ago and with a new beam and further planned portable operations looming the thinking cap was popped on. My collection of geared motors (voltages, various, sizes, many, ratios lots) were assembled and laid out, including a couple of worm-drive mains voltage Parvalux motors acquired at a rummage sale last year. Worm drives are handy for their reduction and not needing any brake mechanism. A Parvalux unit was dismantled and found to have a 8mm drive shaft, the worm conveniently secured with a roll-pin. The seat motor drive shaft speed was tested at 12 volts and in conjunction with the worm found to offer a single 360 rotation in just over 20 second. That should do.



Some thinking and measuring ensued, followed by turning down the drive shaft and shortening it to mount the worm. A 3-D printed (in PETG) adaptor collar was designed and used to mount the worm-wheel gearbox assembly. A sprocket engagement plate was reverse engineered and a mast base clamping unit produced to bolt the assembly together and secure it to the drive sprocket. Gear wheel design software was used to produce suitable gear ratio .DXF files which I imported into Inventor 18 and made the required changes. To drive the motor a eBay H bridge driver board using the L298N dual two-Amp bridge was pressed into service(doubled up) along with a Picaxe 14M2 on one of my own design project boards. Some software development later (with help from the excellent Picaxe forum) I have a working unit.

Problems solved included dealing with a larger than expected 'dead-zone' at each end of the position potentiometer travel and overshoot due to momentum of the gear train. This was solved by introducing PWM motor speed reduction as the beam heading approached commanded position. A degrees readout (to +/- 10 degrees) was added using a digital voltmeter module and driving it from another PWM output, suitably scaled in software (saves using additional components).

Example of the seat adjust motor (left) – I forgot to take a picture of my unit before I took it to pieces. On eBay for £149.99, New Old Stock!! The finished article, (above) nice sloping front box from a junk sale about 20 years ago and yes, lots of CAD and 3-D printing.

****UPDATE**** some really cheap three-wire voltmeter modules arrived from eBay (under a £1 each!) after completion and as they auto-scale I could now have 'degree level accuracy' readout. Not really needed but would look nicer perhaps. Might print a big bezel/mount and swap out the current unit.

Turning Back the Pages

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

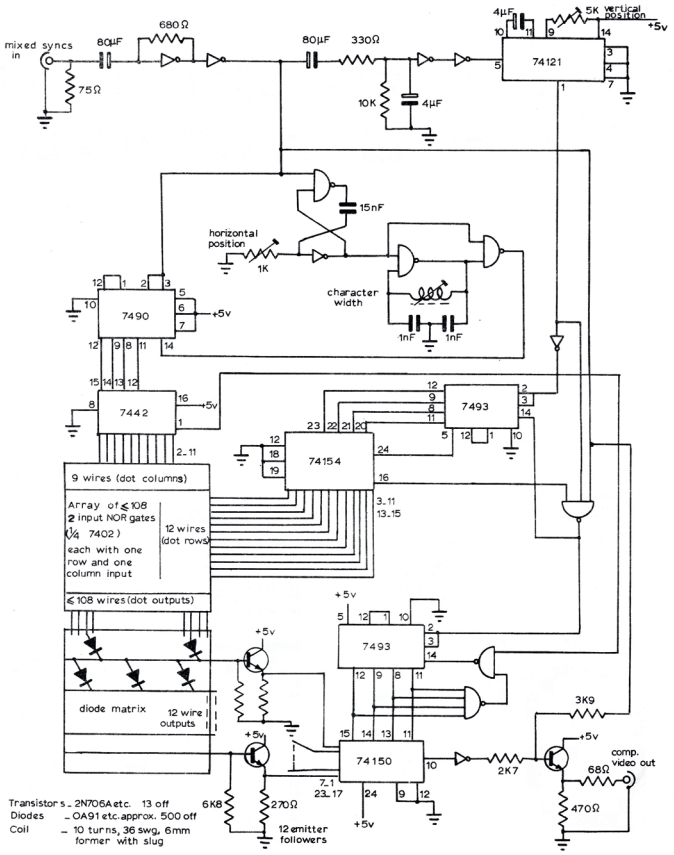
Peter Delaney - G8KZG

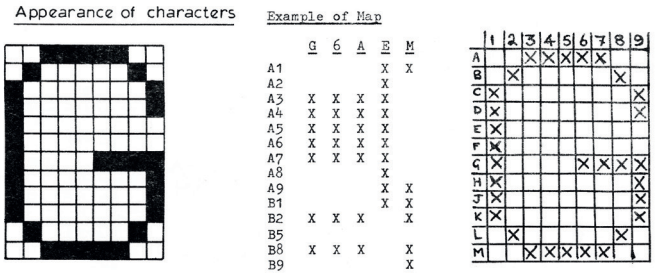
CQ-TV 78

In May 1972, CQTV 78 arrived with members, with news of a new club president, Bob Roberts, who had taken over from Ivan James. In introducing himself, Bob mentioned that he was deputy head of the Department of Electronics and Communication Engineering at the Polytechnic of North London, and that he had been interested in television engineering from the days of 30-line to teaching the first colour television engineering courses, as well as having held a transmitting licence since 1927.

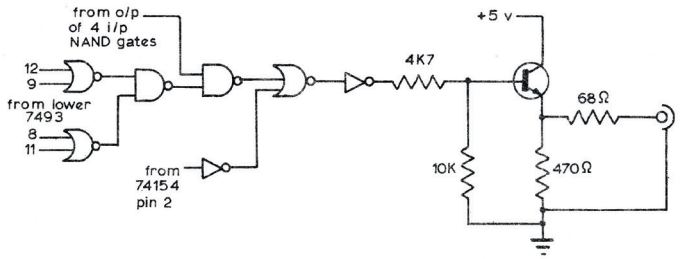
Most amateurs up to this time had shown their callsign, or similar captions, by means of a caption card (such as that for G6NOX-T shown in the last issue). Generating text and numerals electronically is now often done by either a dedicated 'on screen display' device, or in software on a computer, but in the early 1970s innovative ways had to be found to achieve this. Martin Allard explained in his article "An IC Character Generator" that by creating a 9 x 12 pattern of squares, with the columns numbered and the rows lettered, and shading in some of them, the various characters could be formed.

For example, the letter G was made of A3; A4; A5; A6; A7;

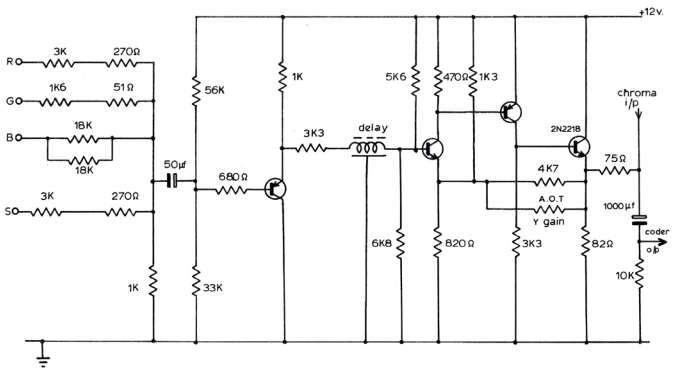


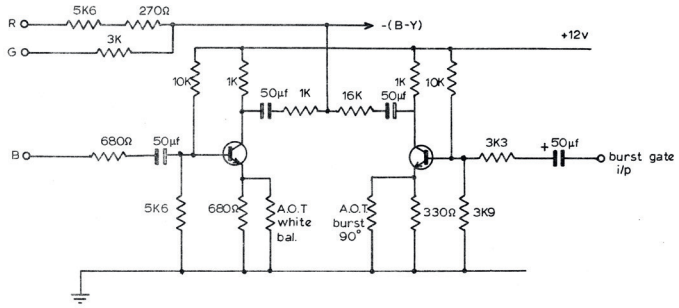


B2; B8; C1; C9; D1; D9; E1; F1; G1 (etc). These positions were represented by a matrix of diodes, a diode for each of the cross-points marked with an X. The circuit was arranged so that the outputs of the 7442 selected each column in sequence, and the 74154 similarly incremented the rows, and these were then gated to produce 108 possible 'positions'. The required ones were combined in the diode matrix, and buffered by emitter followers. The output from the diode matrix for the appropriate letter was then fed by the 74150 data selector in turn to the output stage. Martin also showed that by selecting various of the timing signals, a waveform could be generated to inlay the caption onto another picture.

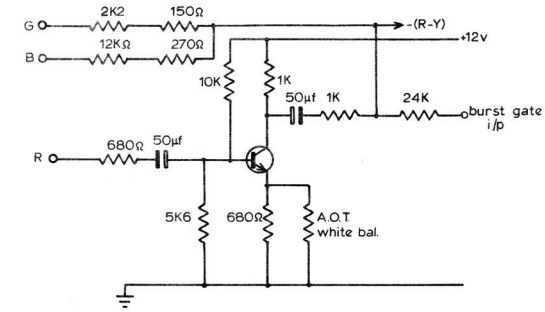


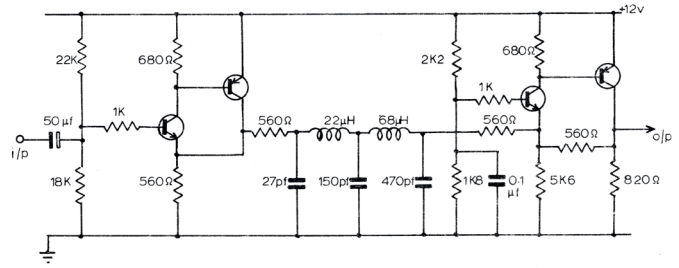
Having shown in the previous issue the basic principles of a PAL encoder, Nigel Walker continued his "Ideas for Amateur Colour" series with a set of practical circuits. The luminance circuits were all shown together, with the red, green blue and sync pulses matrixed together at the input, fed through the delay line, and mixed with the chrominance signal for feeding to the output.



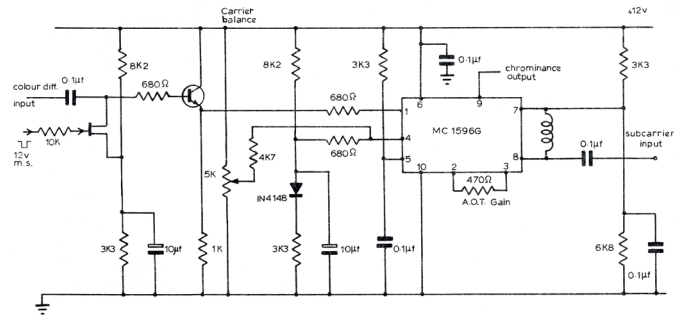


The colour matrices were shown separately for the blue and red channels (strictly speaking, - (B-Y) and -(R-Y), as the signals were inverted), with a burst gate pulse added in each case.

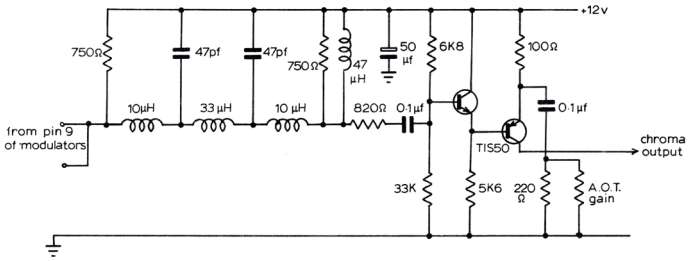




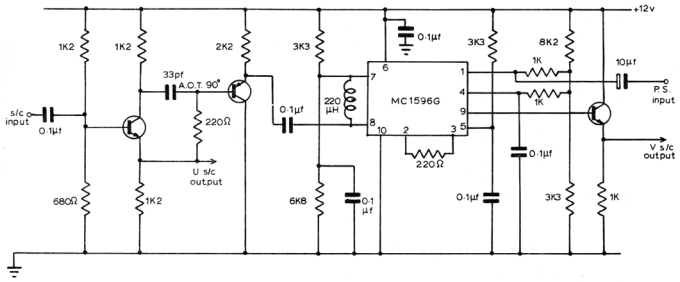
These were then fed to a pair of the chrominance filters, to limit the bandwidth of the chrominance signals, before passing to a pair of identical balanced modulators.



The outputs of these were combined at the input to the chrominance filter, which filtered out the second harmonics of the sub-carrier, before passing it to join the luminance signal at the output.

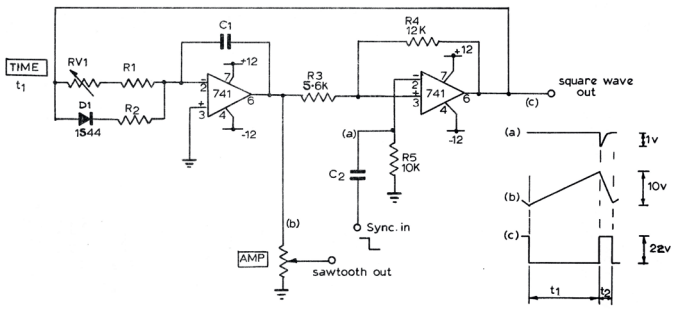


To feed the two modulators, the sub-carrier had to be processed.



The input stage of this circuit produced two signals, 90° apart, and that for the (B-Y) channel was simply buffered to form the U s/c signal, fed direct to its modulator circuit. The sub-carrier for the (R-Y) channel, however, had also switched by 180° on alternate lines. This was done by the Pal Switch (PS) signal being mixed with the sub-carrier in a similar MC1596 modulator device, the output being the V s/c signal fed to the main R-Y channel modulator.

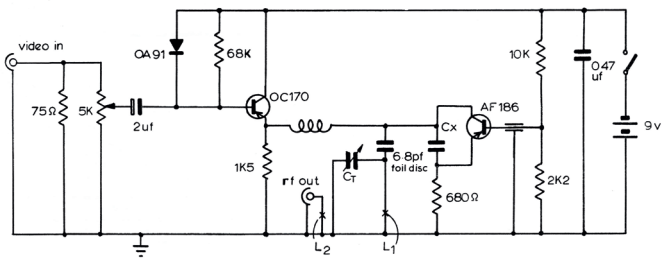
John Lawrence's useful Circuit Notebook series included a timebase generator circuit, based around two of the ubiquitous 741 op-amps.



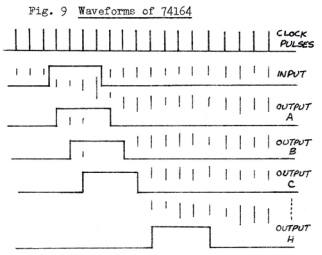
The left hand half with a capacitor in the negative feedback path generated a linear sawtooth, and the right hand half has positive feedback, so that it worked as a schmitt trigger type of level detector. The square wave output from this was also fed back to the input of the left hand circuit, to reset the integrator and start a new cycle of operation. By triggering the right hand 741 at its inverting input, the timebase could be locked to an external source. Suitable component values were listed for a 50Hz tv field, or for line or field scanning in a slow scan system.

	Scan	Flyback	C1	RV1	R1	R2	C2
TV field	19 ms	1 ms	0.1µF	250 k	100 k	10 k	0.01µF
Slow scan line	59 ms	1 ms	0.1µF	500 k	560 k	10 k	0.1µF
Slow scan field	7.1 s	100 ms	10 µF	500 k	560 k	10 k	0.1µF

A popular way to display pictures at the time was to use a small modulator to feed the aerial input of an unmodified domestic tv receiver. David Long's modulator used an AF186 oscillator to produce an rf signal in the UHF band, (a little above the amateur 70 cm allocation), which was modulated by a video signal buffered by the OC170 transistor stage. The complete circuit, including its battery, could be built into a tobacco tin - readily available then, and affording good screening.

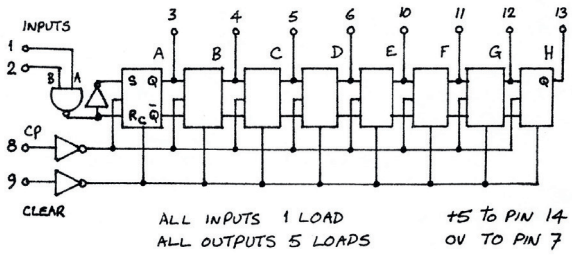


Part 8 of Arthur Critchley's "Integrated Circuits" series explored the workings of shift registers - in essence a series of bistable circuits that had a common clock pulse feed. The various types available were tabulated, showing the different features of each - some with serial inputs, some with parallel, and similarly either serial or parallel output versions were available.



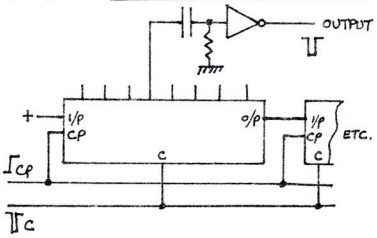
The two main applications were to work as a delay line - the input pulse being passed from one bistable to the next at each clock pulse - or as a temporary memory of digital information applied to it. As usual, Arthur not only explained how these devices worked, but gave some practical applications appropriate to amateur television.

Fig. 8 74164



This time, as well as various counters, he showed how the 74164 could be used as a tapped delay line, which had applications in sync pulse generators. The 74164 was a device with serial input and eight parallel outputs; a common clock pulse; and a common clear as well. The input sequence would be stepped from output A to output B, to output C, and so on, on each clock pulse. If the clock pulse was 10 MHz, then the time increment between each output was 100 ns, so the required

Fig. 14 74164 as a Tapped Delay Line



▶ *Features & Facilities of various TTL shift registers*

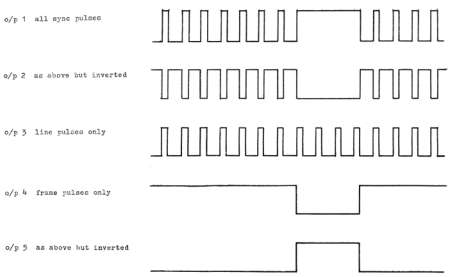
Type	No. Pins	No. Bits	Input	Output	Shift	Clear Input	Preset Enable	Clock	Mode
7491	14	8	Ser. 2 off	Ser.Q & Q	Right	No	No	Pos.	No
7494	14	4	Ser. Par. (2)	Ser.Q Par.	Right	Pos	(2)	Pos.	No
7495	14	4	Ser. & Par	Ser.Q & Par.	Right	No	With Mode	Pos.(2)	Yes
7496	16	5	Ser. & Par	Ser.Q & Par.	Right	Neg	Yes	Pos.	No
74164	14	8	Ser. (2)	Ser.Q & Par.	Right	Neg	No	Pos.	No
74165	16	8	Ser. & Par.	Ser.Q & Q.	Right	Neg?	With Load	Neg (2).	Yes
74166	16	8	Ser. & Par.	Ser.Q	Right	Neg	No	Pos (2).	Yes
74194	16	4	Ser. (2) & Par	Ser.Q & Par.	Left & Right	Yes	No	Pos	Yes
74195	16	4	Ser. & Par.	Ser.Q & Q. Par.	Right	Yes	No	Pos	Yes
74198	24	8	Ser. (2) & Par.	Ser.Q & Par.	Left & Right	Neg	No	Pos	Yes
74199	24	8	Ser. & Par.	Ser.Q & Par.	Right	Neg	No	Pos	Yes

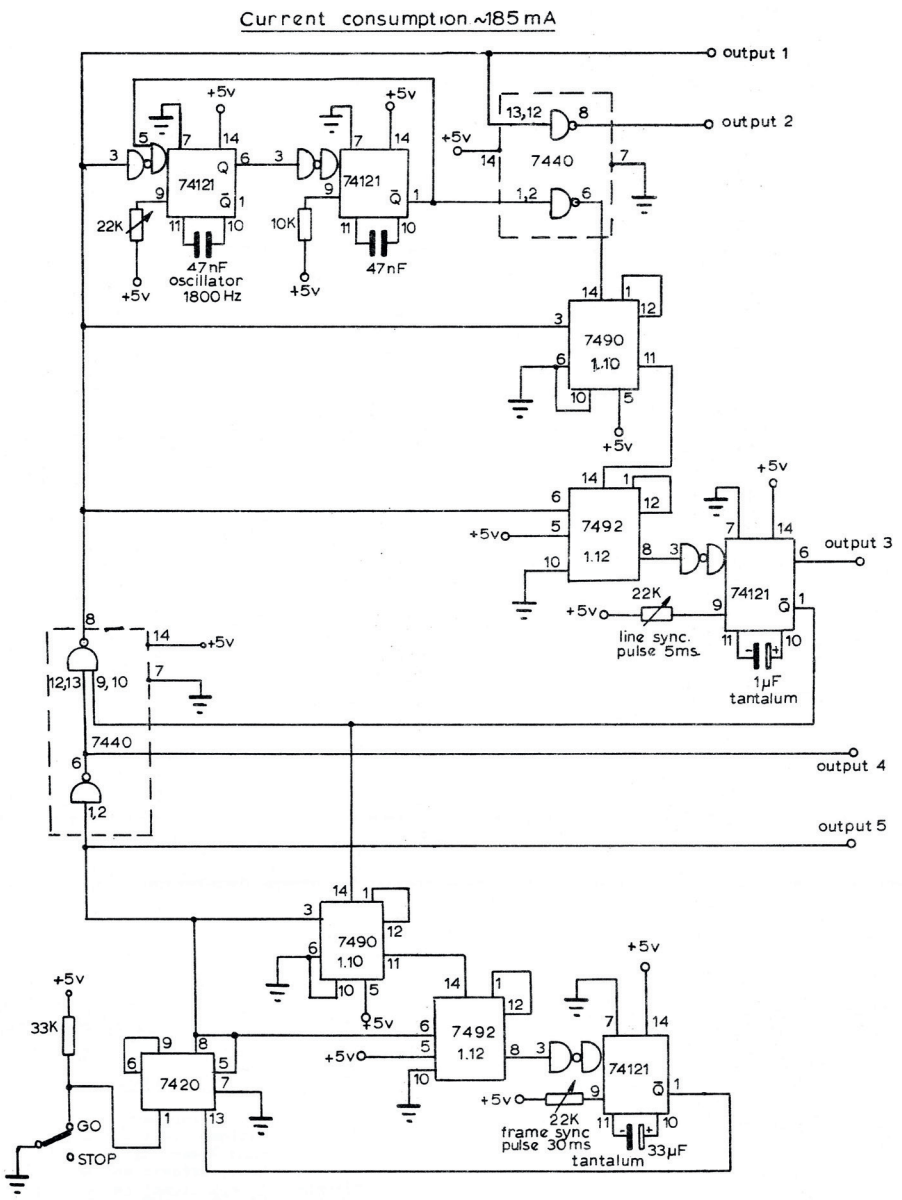
Ser. = Serial; Par. = Parallel; Pos. = Positive; Neg. = Negative

delay was obtained by selecting the appropriate output - longer time delays could be created by cascading the devices together.

Slow scan was then still a popular mode, but difficulties could arise when exchanging pictures between areas with 50 Hz mains, such as Europe, and those with 60 Hz mains (as in North America). Ake Backman presented a sync pulse generator that would produce the slow scan timing pulses for a 15 Hz field frequency, rather than the 16 2/3 Hz derived from 50 Hz mains.

The stop/ go switch was to produce a long sync pulse, allowing the slide in a flying spot scanner to be changed ! The master oscillator, at the top, ran at 1.8 kHz, feeding a divded by 10 counter (7490) and a divide by 12 counter (7492), so creating line sync pulses at output three. The frame sync pulses were generated by the lower third of the circuit, available at output four, or inverted at output five, and also combined in the left hand 7440 with the line pulses to produce composite sync pulses, available as output one, or inverted as output two.





A facility offered to members in the early 1970s was the "BATC Equipment Registry". The Club did not physically handle the equipment, nor enter into negotiations on price, but provided a facility for those with things to dispose of to contact with those looking for such. The equipment surplus might come from members or from manufacturers - prospective purchasers and sellers were asked to indicate the price they were prepared to pay / hoped to get when registering with the club.

Did you know...?

All of the CQ-TV magazines are available for download in the archive on the BATC website.

Seen something in Turning Back the Pages you'd like to read more about?

Visit the archive here and download a copy: *https://batc.org.uk/cq-tv/cq-tv-archive/*

The British Amateur Television Club

Out and About

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

2020

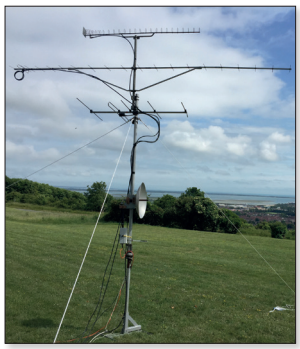
All rallies are currently cancelled. Please see below for a list of rallies later in the year. Please check organiser and RSGB websites before traveling.

12 July	McMichael, Near Reading.	www.mcmichaelrally.org.uk
9 August	Flight Refuelling & Hamfest, Dorset	www.frars.co.uk
25-26 Sept.	National Hamfest, Newark Showground	www.nationalhamfest.org.uk
9-11 October	RSGB Convention	www.rsgb.org
24 - 25 October	BATC Convention. Midland Air Museum	www.batc.org.uk

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

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

Activity Weekends & Contests



Activity Calendar

Activity weekends and the IARU contest will go ahead as single operator stay-at-home events.

11 & 12 April – Activity Weekend

16 & 17 May – Activity Weekend

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

BATC Online

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