The British Amateur Television Club

CQ-TV

No. 271 – Spring 2021

Portsdown 4 – Start here

Reduced bandwidth DVB-T for DATV use

WinterHill - a four-channel DATV receiver

How to make a horn (reference) antenna

A look at the History of BBC Outside Broadcast Vans

Ian Waters, G3KKD - Silent Key

GB3FT Digital Repeater upgrade

Why is my repeater stream delayed?

Modifications to Nokia PA PCB

My Portsdown4/Langstone combo

ATV frequencies and recommended modes

… and much more inside!

WinterHill

The latest BATC receiver project

Full details inside!

Cover photo by Paypwip

CQ-TV 271

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

President: David Mann, G8ADM

Chairman: Dave Crump G8GKQ
Club affairs and Technical queries. .
Email: chair@batc.tv

General Secretary: Noel Matthews, G8GTZ
General club correspondence and business.
ETCC Liason
Email: secretary@batc.tv

Shop/Members Services: Noel Matthews, G8GTZ
Email: shop@batc.tv

Hon. Treasurer: Brian Summers, G8GQS
Enquiries about club finances, donations, Club Constitution.
Email: treasurer@batc.tv

Contests: Clive Reynolds G3GJA
Email: contests@batc.tv

Digital Architect: Phil Crump M0DNY
Email: phil@philcrump.co.uk

CQ-TV Editor: Frank Heritage, M0AEU
Email: editor@batc.tv

Repeaters: Clive Reynolds, G3GJA

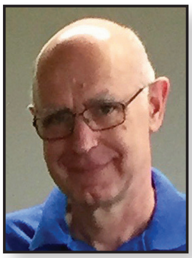
Publicity/Social media: Ian Parker, G8XZD
Email: publicity@batc.tv

Membership: Robert Burn, G8NXG
All membership inquiries including new applications, current membership, non receipt of CQ-TV, subscriptions.
Email: memsec@batc.tv

BATC Online

Website: http://www.batc.org.uk
BATC Wiki: https://wiki.batc.org.uk/
Forum: https://forum.batc.org.uk/
Stream: https://batc.org.uk/live/
Dxspot: https://dxspot.batc.org.uk/
YouTube: https://tinyurl.com/BATCYouTube/

Printed in Great Britain. ISSN 1466-6790



From the Chairman...

Dave Crump G8GKQ

I am pleased to report that BATC Membership has remained at over 1400 members for the past year. One of the benefits of having a strong membership base is that we are able to offer bursaries to support worthy amateur TV projects. Typical candidates include capital expenditure on repeater upgrades, but we are open to other more unusual requests, such as funding DATV receivers for the video downlink of a Swiss student project that is aiming to launch a rocket in the Spaceport America Cup 2021 in New Mexico USA.

We have a reasonable amount of funding available, so please don't be shy. The full guidance and application form for Bursaries can be found under Club Info on the BATC Website. A list of approved applications is maintained on the BATC Forum. We do ask that applicants write up their project for CQ-TV and from time to time you'll see these reports in this publication.

Activity on BATC-sponsored construction projects seems to have accelerated during the last 3 months of lockdown. This issue of CQ-TV includes the launch of the WinterHill, which is a 4-channel DVB-S/S2 receiver for QO-100 or terrestrial use. This is the brainchild of Brian G4EWJ and uses a PIC (not the traditional expensive USB module) to provide the interface between the tuner and the Raspberry Pi. Thanks to Mike G0MJW for designing the BATC Advanced DATV Receiver PCB for this. In due course we also hope to have a software build for the Ryde that uses this PCB.

The other step forward is that Charles G4GUO has written software to enable us to use reduced bandwidth (150 – 500 kHz) DVB-T which will be very useful on 51 MHz. Reception needs a new tuner (the Knucker – similar to a MiniTiouner) that we will be stocking parts for in the BATC Shop but, for many of you, generation of the transmitted signal will only need a software upgrade to your existing Portsdown hardware. Full details in this issue.

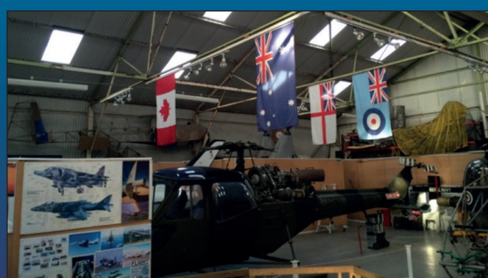
After the success of CAT 20, planning has already started for CAT 21 and our BGM. This will be held over the weekend of 21/22 August. COVID permitting, we hope to return to the Midland Air Museum at Coventry, but we will still go ahead online if we can't meet in person. Please put the dates in your diary.

Lastly, I must thank all the volunteers who have been spending their time designing and sharing their projects with us. Please support them by getting on the air and testing their efforts.

73
Dave, G8GKQ

CAT21 – Aug 21st and 22nd

- 2 day program including talks and demos
- Fix it, test and measurement area
- Members flea market and traders
- Free access to air museum
- BATC GM on Sunday PM
- Midland Air Museum Coventry
  Just off M69 / M6



The Listing

new and renewing members

Rob Burn G8NXG

The publication deadline of a new edition of CQ-TV also dictates the time when an additional version of the member list is to be prepared and published. This time, this particular list straddles the year end so it covers the month of December 2020, plus January and February of 2021. Once again a reminder that this list only contains the details of members who have joined or renewed a membership with the BATC during that period; member details will not appear again until your renewal is paid again.

One of the laws of unintended consequences of e-mail is the possibility of in-coming messages landing in your spam folder instead of into your normal in-box. Unfortunately, that can happen also with e-mails sent from the BATC. As you would not necessarily be alerted to e-mail being diverted to your spam folder I recommend that you check from time to time, particularly if you have requested a new password or perhaps if you are expecting a new edition of CQ-TV to arrive!

We currently have the support of around 1400 members world-wide, of which only 28 are student members. Clearly, with so few we are not reaching much of the student population in any country. If you happen to be aware of students in full time education, who have an interest in amateur radio, please mention ATV and the BATC; maybe point them to the websites where there is plenty of information to whet the appetite.

My thanks to all who continue to support the club; if you spot a mistake in the list just let me know.

Australia		
Mark Fairbairn	VK3XVC	Bendigo
Daniel Granger	VK4KI	Burpengary
Terence Mccarthy	VK5GU	Enfield
Raymond Murphy	VK2ME	Erskine Park
Paul Roper	VK2KZO	Linden
Graham Heenan	VK7GAH	Meander
Brian Riley	VK4ABZ	Narangba
Stephen Rapley	VK2RH	Newtown
Michael Baldock	VK5MCB	Port Pirie
Gary Shipton	VK2CRJ	Ryde
Jules Corben	VK2EXT	Sydney
Austria		
Helmut Fosodeder	OE5FHM	Gaspoltshofen
Shane Lynd	VK4KHZ	Glenden
Richard Posch	OE6OCG	Nestelbach Bei Graz
Josef Waser	OE3JWC	Neuhofen/Ybbs
Kohlross Erwin		Steyr
Christoph Wagner	OE3VIW	Viehdorf
Brazil		
Hipolito Luiz	PY5HC	Curitiba
Belgium		
Alain Hoslet	ON4AH	Antwerpen
Didier Labruyere	ON6YF	Beauraing
Pierard Laurent	ON2VHF	Courcelles
Marien Patrick	ON4APP	Dendermonde
Wim De Smedt	ON8DSW	Dendermonde
Jean-Paul Chevalier	ON7BL	Dour
Frans Van de Velde	ON4VVV	Gent
Wim Ooghe	ON4CFO	Grimbergen
Denis Goffaux	ON4MU	Ixelles
Kenneth Rogge	ONL12658	Lievegem
Frank Huygevelt	ON5AN	Mariakerke-Gent
C Dumortier	ON1RC	Melle
Patrick De Rocker	ON7ARQ	Merelbeke
Willy De Paepe	ON7TW	Montignies-Sur-Sambre
Jean-marie Hermant	ON4HDX	Thieu
Canada		
Stephen J Birkill	G8AKQ	Squamish
Czech Republic		
Leo Hucin	OK2UUJ	Olomouc
Denmark		
Hans Rasmussen	OZ1CMV	Maaloev
Finland		
Jouni Anttila	OH1CO	Littoinen
France		
Daniel Chagnot	F6BUH	Brie et Angonnes
Brenguier Gérard	F1BUY	Brignoles
Frederic Legros	F5ETL	Eslettes
Tourres Michel	F4CRT	L'isle Sur La Sorgue
Bernard Desbiolles	F5DB	La Roche Sur Foron
Patrice Cand	F8BUU	Maisons Alfort
Dominique Didier	F4AQW	Mauprevoir
Christian Martz	F1FAQ	Palaiseau
Jean-louis Truquet	F5DJL	Reignier

Bruno Lequeu	F1MPE	Saint Jean de Boeuf
Dominique Taverne	F5MKM	Saint Jean le Blanc
Guy Lemoine	F4DAI	St Christophe Du Ligneron
Patrice Soutoul	F1GIU	St Orens
Michel Amiard	F6ANO	Tournan-en-Brie
Jean-Pierre Villain	F6BUA	Valenciennes
Germany		
Wolfram Winkler	DB5SL	Aspach
Raimund Jakob	DG9MAQ	Augsburg
Hubertus Rathke	DC1OP	Bremen
Werner Vyhnalek	DG4DUL	Eulowutz
Thorsten Godau	DL9SEC	Gingen/Fils
Ralf Gorholt	DLSEU	Gutweiler
Gerald Kertscher	DB5WY	Halbs
Michael Becker	DD4MB	Hannover
Dieter Meier	DL2VT	Kirchlinteln
Klaus Hirschelmann	DJ7OO	Mainz
Norbert Pingel	DK8DT	Modautal
Heinz Kutschenbauer	DL5ZN	Nordhausen
Oliver Hirsch	DJ6DH	Nottuln
Oliver Goldenstein	DL6KBG	Panschwitz-Kuckau
Josef Schmitt	DK6RS	Pentling
Christian Flierl	DL3RCF	Poppenricht
Heinz Robert Stehr	DK7ZM	Schwalmtal
Juergen Graetsch	DK8AP	Seesen
Joachim Rosenbaum	DG1HVX	Südharz OT-Schwenda
Reinhard Kuehn	DL4FBN	Weisel
Jens Schoon	DH6BB	Wiesmoor
Manfred Bachmann	DK5FA	Wildeck
Rainer Schmitz	DG8KD	Willich
Roland Sobotta	DD0AO	Wolfenbuettel
Ireland		
Des Walsh	EI5CD	Ballinhassig
Liam Maher	EI9KN	Cullen
Paul Kearney	EI7GM	Dublin
Italy		
Claudio Ariotti	IK1SLD	Casale Monferrato
Marcello Giubbilini	IW5ASZ	Castagneto Carducci
David Barneschi	IU5KZL	Cortona
Claudio Marega	I2NDT	Dalmine
Piero Forno	IK1IYU	Montegrosso d'Asti
Maurizio Bazzoni	I3YBD	Verona

Luxembourg		
Dan Jungels	LX1JU	Hautcharage
Netherlands		
Jaap Last	PA0T	Annerveenschekanaal
Pascal Witjes	PA1PAS	Arnhem
Jelle Meintema	PE1AEE	Drachten
René Kint	PA1RKT	Haarlem
Tonnie Luijerink	PA3GLL	Losser
Paul Veldkamp	PA0SON	Nederwetten
Frits Aden	PE1DWQ	Rohel
Pim Polderman	PD2ADX	Rotterdam
Jan Booi	PE1JBS	Surhuisterveen
Rody Korthout	PD2RVK	The Hague
Ezra Vermeulen	PE0V	Tiel
New Zealand		
Robin Ramsey	ZL3TCM	Christchurch
Steve Fogerty	ZL2ASF	Nelson
Portugal		
Jose Assuncao		Carcavelos
Manuel Cardoso	CT1PR	Coimbra
Steve Brown	G1WMD	Lagos
Jose Carlos Antunes Moreira	CT1DHM	Lamego
Antonio Pacheco	CT1ERW	Lisboa
Diogo Sentieiro	CT2HEW	Porto Salvo
Slovakia		
Juraj Buliscak	OM0XA	Poprad
Vladimir Rybar	OM7AVR	Valaska
South Africa		
Gary Immelman	ZS6YI	Three Rivers
Spain		
Joan Pou	EC3DBA	Canyamars
Arnau Perello	EA3FNT	Girona
Michael Naylor	EA7KIR	Málaga
Switzerland		
Michel Burnand	HB9DUG	Vich
UK		
Leslie David Rooks	G3PUO	Accrington
Roy Powers	G8CKN	Alton
Norman Jacobs	2E0RKO	Arundel
David Palmer	G7URP	Attleborough
Chris Holloway	G0GGF	Aylsham
Richard White	GI4DOH	Bangor
Robert Best	GI3VAF	Bangor
Stephen Osborn	G8JZT	Bexleyheath
Christopher Kentch	GOFJY	Bideford

Norman Hunter	G8DQN	Billericay.
Brian Jordan	G4EWJ	Birkenhead
John Churchill	2E0EGP	Birmingham
Keith Prosser	GW8TRO	Blackwood
Nick Passam	M0DSR	Blythe bridge
Bill Edwards	G8GHD	Bognor Regis
Keith Wevill	G4UKW	Bradford
Geoffrey Towler	G4NGS	Brentwood.
Petrie Owen	GW0KAX	Bridgend
Ken Stevens	G4BVK	Bristol
Malcolm Cooper	G8KGH	Bristol
Richard Perzyna	G8ITB	Bromley
Malcolm Bay	M0MBO	Buckingham
David Cope	G8JGO	Buntingford
Brian Smith	G4EQC	Burntwood
Brian Davies	GW4KAZ	Caernarfon
Jason Haywood	G7KPM	Caistor
Darren Warburton	GW7HOC	Cardiff
Robert Lang	GW0FJV	Cardiff
Nick Gilbey		Charmouth
Alexander Slade	G0IJN	Chelmsford
Robin Dakin		Chelmsford
David Brocklehurst	G4VDB	Chesterfield
R Kugler	G8VQS	Chesterfield
Wesley Clinton	G8KZN	Consett
Robert Chipperfield	M0VFC	Cottenham
Alan Ash	G3PZB	Cowes
Bob WIlliams	G8MBU	Cowes
Andy Frank	G0TDY	Cricklade
Leslie Lea		Didcot
Terry Jeacock	G0EZY	Doncaster
Peter Myers	G3UWT	Doncaster
David Williams	G6ONE	Doncaster
Richard Ferryman	G4BBH	Dover
Ian McCrum	MI5AFL	Downpatrick
Robert Harris	G4APV	Dronfield
Alan Rademaker	M0LTN	Dunstable
Paul Phillips	G7KBR	East Grinstead
Dave Williams	G8PUO	Eastbourne
Peter Dick	GM4DTH	Edinburgh
David Taylor	GM8ARV	Edinburgh
Allan Mitchell	G3YJZ	Enfield
Brian Bambury		Evesham
Mark Farnworth	G4WVU	Fakenham
Tim Forrester	G4WIM	Freckleton
Howard Ling	G4CCH	Gainsborough
John Ferrier	G0ATW	Grimsby

Jeffrey Akines	G8XXI	Grimsby
Mark Lee	G6FKN	Guildford
Paul Egan	G1WTX	Guildford
Nicholas McIntyre	M0NMC	Gunnislake
Malcolm Sanders	G8HST	Hainault
David Johnson	G4DPZ	Halesowen
Paul Marshall	G8MJW	Harby Notts
John Van Dyken	G0SPE	Harrow
Neale Davison	G3VFX	Harrow
Neil Douglas	G4SHJ	Hartlepool
Barry Grylls	G4ZCN	Hartlepool
Andrew Dickson	G8DJF	High Wycombe
Roger Howell	G0ROG	Hook
Gregory Fenton	M0ODZ	Houghton Le Spring
Ivan Prince	G6EZG	Hull
Richard Guttridge	G4YTV	Hull
Barrie Procter	G8AWN	Ilkley
Raymond Hurt	G0HDS	Immingham
Mark Riley	M5BOP	Ipswich
Martin Richmond-Hardy	G8BHC	Ipswich
Carolyn Williamson	G6WRW	Kidderminster
Dunstable Downs Radio Club		Kilmingon
Michael Scarlett	G4CAK	Kilmington
Peter Cousins	G4NJJ	King's Lynn
Paul Bolton	G4CXE	Kings Lynn
Steve Fletcher	G4GXL	Kings Lynn
Eric Allison	G4JNQ	Kings Lynn
Alexander Forsyth	G6BJB	Lancaster
Nick Osborne	G4JEI	Lancing
Wirral Amateur Radio Society	G3NWR	Leasowe
David Ross		Leeds
Sarah Elliott	M1SJE	Leicester
David Hocking	G4FSS	Leicester
Bryan Harber	G8DKK	Letchworth
Andrew Glendinning		Leyburn
Ronald Sherrard	GI3VAW	Limavady
Colin Goodwin	G3WTT	Lincoln
Terry Steeper	G7JFI	Lincoln
Francis Breame	G8ISI	Liphook.
Robert James Butcher	G3UDI	Little Wilbraham
Robert Burn	G8NXG	Littlehampton
Peter King	G6BOK	Liverpool
Peter Mc Farland	GW7BZY	Llangefni
Piotr Niewiadomski	M0PGN	London

John Glover	M0JGR	London
Jeffrey Borinsky		London
Jon Carp	G3NHS	London
Frank Dimmock	G0CFD	Long Sutton
Graham Smith	2E0JOG	Loughborough
Daphne Neal	G7ENA	Louth
Robert Saunders	G6OUA	Luton
Dave Perry	G6JIE	Luton
Jenny Easdown	G4HIZ	Maidstone
Ian Webb	G6EFH	Manchester
Chris Gibbs	G8GHH	Margate
Andrew Thomas	G0SFJ	Market Harborough
Robert Copeland	G4PDF	Market Rasen
Ashley Burns	GW0UXJ	Merthyr Tydfil
Tom Mitchell	G3LMX	Milton Keynes
Ken Powell	G0PPM	Nailsworth
David Swash		New Milton
Kevin Francks	M0BFB	Newquay
Brian Alderson	G3KJX	Northallerton
Tony Nicholson	G8FLV	Northallerton
Kevin Robinson	G8ZMH	Northampton
Alisdair Boyle		Northwich
William Hill	M1BKF	Norwich
Phillip Brooks	G4NZQ	Norwich
Dave Sykes	G0JOX	Nottingham
Trevor Baker	G4CLE	Ormskirk
Roger Meakins	G8HKN	Orpington
Peter Anderson		Papa Westray
Clive Peacock	GW6CZE	Pencoed
Alan Farmer		Penicuik
Paul Paterson	GM4JOJ	Peterhead
Michael North		Polegate
Sid Milsom	G8SFA	Prudhoe
Eric March	G8EOJ	Redditch
Geoff Findon	G3TQF	Rugby
Nigel Bourner	G4JYU	Sandwich
Jason Barker	M0SOO	Scarborough
David Swale	G8ETS	Scarborough
Roger Wilson	VK4TV	Scunthorpe
Stewart McCann	G4HFZ	Scunthorpe
David Hay	M0TGC	Seaton
Robert McLintock	G1TGZ	Sevenoaks
Joseph McElvenney	G3LLV	Sheffield
Graham Coyne	G3YJR	Sheffield
David Shemeld	G8YXI	Sheffield
J Oates	G3LZI	Sheffield
Ray Hughes	G8JBQ	South Perrott
Chris Bryant		Southampton
Terry Roxby	G1LPS	Spennymoor
Curtis Arnold	M6TIV	Stoke-on-Trent
Albert Allen	G4DHO	Stoke-on-Trent
Alastair Macarthur		Stone
John Downes	G8SCG	Tamworth
Kevin Brice	M7AWX	Taunton
Brian Roberts	G4VYG	Toft
Norman Green		Twickenham.
Myles Sewter		Uppingham
David Peers	G3REA	Upton Upon Severn
Wayne Sheldon	G8ZBJ	Walsall
Roger Damm	M1CDQ	Waltham
Adrian Hurt	G0OJY	Ware
Warrington ARC	G0WRS	Warrington
Roger Davis	G3IUZ	Wells
Robert Williams	GW6EUS	Welshpool
Dr Jonathan Gudgeon	G4MDU	Wicken
Mark Devereaux	G7GYB	Wigan
Robert Hammond	G4FKR	Winchester
Ian Hart	G8IVC	Winchester
Keith Brooks	G0SPH	Winsford
Robert Whitfield	G8TSE	Wirral
David Brooke	G6GZH	Wisbech
Peter Eggleston	G8KGA	Wolverhampton
Charles Brain	G4GUO	Worthing
Geoff Mather	G8DHE	Worthing
Chris Wherrett	G4IIX	York
United States		
Fred Coe	WB6ASU	Acampo, Ca
Robert Gulley	AK3Q	Bellevue
John O'loughlin		Brooklyn Center
John Ernandez	AA3XN	Chalfont
Lloyd Weekes		Chattanooga
Kerry Banke	N6IZW	La Mesa
Endaf Buckley	N6UTC	Long Beach
William Thompson	N3DC	Maryland
John Kozak	K0ZAK	Reisterstown
Ray Quinn	W6RAY	Visalia
Art Towslee	WA8RMC	Westerville

Why is my repeater delayed by 15 seconds – and what to do about it

A lot of people are finding that when watching on the BATC streamer, their local repeater is now delayed by 15 – 20 seconds. Whilst this doesn't matter for recorded streams or events where there is no interaction, for a real time repeater it makes a 2 way QSO almost impossible.

Why is it delayed now?

As you know if you have simultaneously listened to an FM and DAB broadcast of the same radio station, all digital services do introduce a delay – the reasons are complex but most of it is to do with the fact that the receiver must receive a large amount of data before it can play out a continuous program. This is particularly true for video and most video streaming services suffer from a very long delay.

The exception to this was the Adobe Flash system which had approximately 2 second delay and was used on most repeater streams. Flash was introduced in 2005 and became very common across a number of devices and platforms. However, it did not give very good battery life and was never supported as standard in the Apple iPhone. iPads or MAC computers .

This, plus a number of security vulnerabilities meant that most web browsers, such as Firefox, Edge and Chrome stopped supporting it as a standard feature and eventually Adobe withdrew support on December 31st 2020.

So what happens now?

Just because Adobe withdrew support and it is no longer available in web browsers doesn't mean that Flash has stopped working.

The BATC streamer still supports Flash and repeaters can still send a Flash stream in to the server. However, if you try to view it with a standard web browser you will get a message saying "Please install Flash or click here to watch HTML5 stream". Obviously you can no longer install Flash so you have to click to watch the HTML5 link but with a 15 second delay.

What is HTML5?

HTML5 is the alternative streaming technology to Flash which we use on the BATC streamer – every stream is sent out in HTML-5 and Flash to ensure all devices can watch even Flash if that is selected. The benefit is that HTML5 can be viewed on any device including mobiles and tablets. However it does have the 15 – 20 second delay.

So what can I do about the delay?

To avoid the long you must watch the short delay Flash stream. There are number of ways you can do this.

Firstly the Portsdown system has a stream viewer installed as standard (Menu 2 > Stream viewer). This will show the repeater Flash stream with short delay albeit on the small 7" screen.

The Ryde receiver, which can drive a full size HDMI screen, has been upgraded to include a Flash stream viewer. It will be available from the console menu initially, but will be available on the on-screen menu at some point.

The best way to watch the Flash stream on your PC is to use the VLC software. This is free software that has been around for many years and used by Geeks the world over!

If you don't fancy messing around trying to configure VLC, John G7JTT has a written a simple viewer with a drop down box which enables you choose the channel you want to watch.

Full details on how to download and install VLC and John's software are available on the BATC wiki here: *https://wiki.batc.org.uk/Watching_the_streamer_with_VLC*

One problem with all the above solutions is that you do not get the chat box alongside the video window and so you still need your normal web browser open on your PC – you will need to mute the sound on the browser or you will get a 15 second echo!!

There is one further solution which enables you to watch the short delay Flash streams on the BATC streamer.

Earlier versions of the Chrome browser with built in Flash are still available for download and display the standard streamer page with the Flash stream and the chat window. Note there maybe security issues running a non-current version of a web browser and you do so at your own risk – we advise you to only use it to view the BATC streamer. The version of Chrome which several BATC members are running is available for download at : *https://sourceforge.net/projects/portableapps/files/Google%20Chrome%20Portable/GoogleChromePortableDev_49.0.2623.0_online.paf.exe/download*

Should I select Flash or HTML5 for my stream?

Every stream user can choose if his channel is sent out in Flash – as mentioned above, all channels are also streamed in HTML5. The only time you should select Flash is for a repeater channel or when delay time is critical. All other channels should select just HTML5.

The future

As Phil M0DNY presented at CAT20, he is looking to implement another low delay video codec in to the streamer – unfortunately the one he outlined during his presentation turned out to be unsuitable. He is currently researching other alternatives but is very time limited due to work commitments. If you can help Phil in researching and implementing another codec, please let us know.

2020 Christmas Repeater Contest Report

Clive Reynolds G3GJA

The competition ran from the 24th December 2020 through to Sunday 3rd January 2021 and was not such a one-sided affair as in previous years. This time the Severnside Group had some serious competition from the East Yorkshire Repeater Group's GB3EY that came on air in November 2020.

There were 691 separate QSOs during the Contest period and the best DX was on 23cm from Terry G1LPS to GB3EY at 124km. Terry was running 333kS/s with about 45kW EIRP across an obstructed path that included the 1300 feet high North York Moors. On 70cm, the best DX was Adrian G4UVZ into GB3ZZ at 73km.

On 23cm GB3EY led with 17518 points, followed by GB3ZZ with 13504. On 70cm GB3ZZ amassed 19959 points giving the Severnside Group a winning total of 33463 points. Congratulations to the Group who will receive the £100 prize which is sure to help keep their repeater running.

For the 2021 event, I'm considering changing the rules because the advent of the Ryde receiver for repeater use has made it much easier to get a 70cm input. A contact on this band is now not worthy of a significant premium. Please contact me via email to *contests@batc.tv* if you wish to comment.

2020 Christmas Ladder

The first running of this event in parallel with the Repeater Contest attracted 10 entries with Shaun G8VPG placed first, followed by Ian G8XZD in second and myself in third place.

This competition was relaxed, enjoyable and fitted around various inevitable commitments for the time of year. It will run again this year, hopefully attracting more entrants.

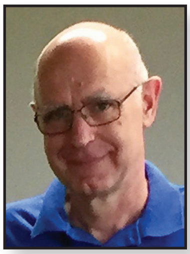
Here are the dates for the remainder of 2021:

- **March 20th and 21st** is 2m and 70cm Activity Weekend.
- **April 17th and 18th** is 23cm and up Activity Weekend.
- **May 15th and 16th** is All Bands Activity Weekend. Get the kit ready for the IARU
- **June 12th and 13th** is the IARU International Contest
- **July 10th and 11th** is Low Bands Activity, hopefully we will catch some Sporadic E.
- There are **no Activity weekends in August** due to the CAT.
- **September 4th and 5th** is 23cm and 6cm Activity Weekend.October 2nd and 3rd is 2m & 70cm Activity Weekend
- **November 6th and 7th** is All Bands Activity Weekend
- **December 24th to January 3rd 2022** is the Christmas Activity Ladder and the Repeater Activity Contest, both with online entries as last year.

Position	Callsign	Points
1	G8VPG	146
2	G8XZD	138
3	G3GJA	82
4	G8VDP	77
5	M1ASR	38
6	G0MJW	25
7	G5TV	22
8	G8GKQ	21
9	G4FKK	9
10	M1EGI	9

2020 Christmas Ladder Results

Portsdown 4 – Start here



Dave Crump G8GKQ

This article is aimed at beginners and does not assume any previous knowledge of the Portsdown project or the Raspberry Pi. It discusses each of the four key components in turn but the fifth component required to complete the transmitter, the power amplifier or transverter, is not discussed here.

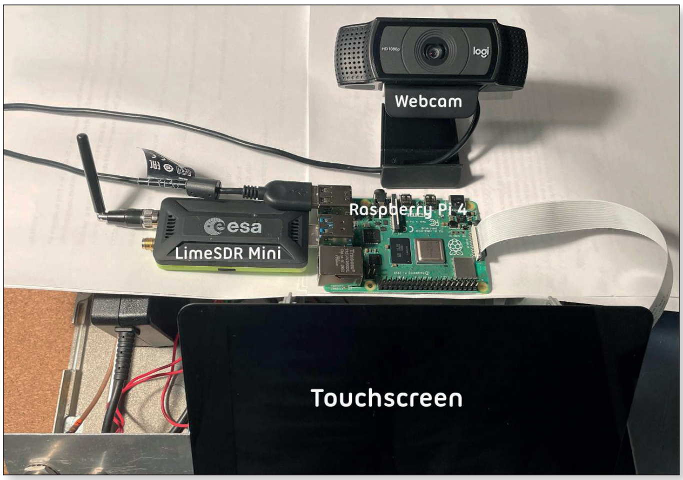
The Portsdown 4 provides a really easy way to get started with digital ATV, either for use on 70 cms and the other terrestrial bands, or for use on QO-100. Unlike many of the more complex solutions (using Windows PCs), it has a standard set of parts and configuration-controlled software, so should "just work" when built and configured according to the instructions.

The key components are the video/audio source, the Raspberry Pi with touchscreen, the software defined radio (SDR) and the optional output switching as shown below. A parts list is provided at the end of the article.

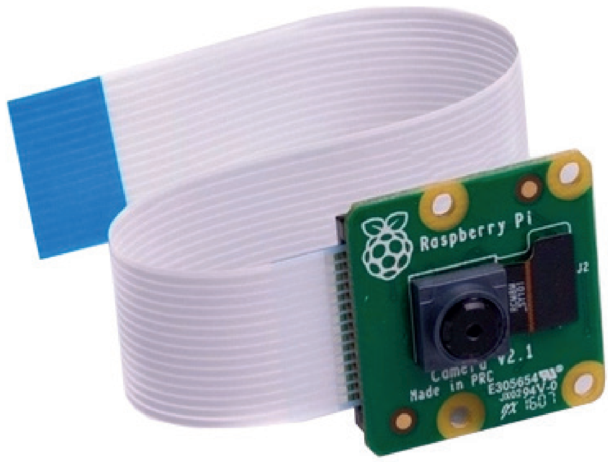
Video and Audio Source

Starting at the beginning, we need a way to get audio and video into the system. You can use a Raspberry Pi camera and a USB audio dongle, a Logitech C920 webcam, or an EasyCap video capture device with a PAL camera. For testing, an internally generated test card is available which does not need any extra hardware.

The Raspberry Pi camera can be an old version one (no longer available), a current version two, or the more expensive HQ camera which takes a (separately-purchased) C-mount lens. All come with short (15 cm) ribbon cables to connect them to the Raspberry Pi. You may want to buy a longer ribbon cable or use adapter sockets to use an HDMI cable extension. As described on the Wiki *https://wiki.batc.org.uk/CSI-2_to_HDMI*, these use HDMI hardware, but not the HDMI electrical standard.



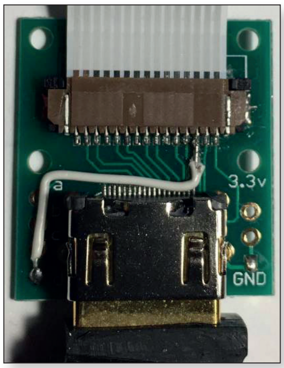
▶ *The simplest "full system". Webcam, RPi4, touchscreen, LimeSDR and PSU (underneath)*



▶ *Raspberry Pi camera version two with ribbon cable*

Video and Audio source	Raspberry Pi and Touchscreen	SDR	Optional output and PTT switching	Power Amplifier(s) and/or Transverters
Pi camera and USB audio dongle	Raspberry Pi 4 with 2GB (or more) of RAM	LimeSDR Mini	Four-way switch	Not discussed here
or	and	or	or	
Logitech C920 Webcam	Programmed SD Card	LimeSDR USB	Eight-way switch	
or	and	or	or	
PAL camera and EasyCap	Official seven-inch touchscreen	Pluto	No switching	
or	and	or		
Internal Testcard	5.2 V 3 Amp PSU	DATV Express PCB (DVB-S only)		

▶ *Adapter to use HDMI cable for camera extension*



▶ *The correct USB audio dongle*

For audio with the Raspberry Pi camera, you should use a cheap (less than £5 from eBay) USB audio dongle of the type shown here. Do not buy any other colour or shape, as they will probably be different internally and not work.

The Logitech C920 webcam is also supported as a video and audio source. There are two versions available – the older version has an internal H264 encoder and is preferable, the newer one works, but not quite as well. **Note that other models of webcams are unlikely to work.**

▶ *The Logitech C920 webcam*

The third option for a video source is to use an old composite video camera and a specific type of EasyCap USB adaptor. Note that there are four types of EasyCap adaptor which are all look identical from the outside. The only one that works is the Fushicai USBTV007. These used to be stocked by the BATC shop (550 were sold) but they are now unobtainable in quantities of under 1000. Work is under way to modify the software to accommodate a suitable replacement.

The final video option, which is useful for testing, is the internal test card. This is selected from the touchscreen and can have your callsign overlaid.

Raspberry Pi and Touchscreen

The Portsdown 4 uses a Raspberry Pi 4. All testing is done on the cheapest 2 GB model, but the more expensive versions with more RAM will work. The Raspberry Pi 4 can run hot, and the best solution is to buy a heatsink case to protect it thermally and mechanically.

You will also need a suitable power supply. The current consumption is up to 3A, and major Raspberry Pi suppliers sell suitable mains power supplies with the USB-C connector. For portable operation a switching power supply (from eBay) can be used to supply 5.2V directly to the GPIO header pins.

The Raspberry Pi needs an SD card with the Portsdown software on it. The recommended type is the SanDisk Ultra 16 GB. These are sold pre-programmed by the BATC shop, or you can program it yourself – full instructions are on GitHub *https://github.com/BritishAmateurTelevisionClub/portsdown4*.

Other brands and types of SD Card do not work well with the Raspberry Pi, and it is not worth the trouble of using them.

The Portsdown is controlled by a touchscreen, which must be the official Raspberry Pi Foundation seven-inch touchscreen.

▶ *The Raspberry Pi touchscreen*

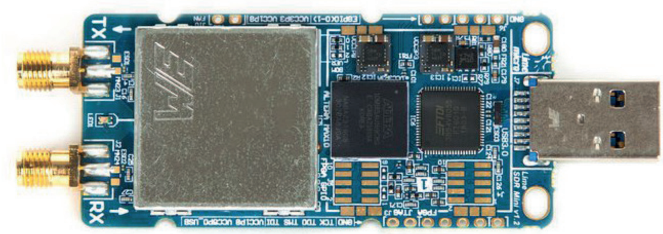
This touchscreen comes with a short ribbon cable to connect to the Raspberry Pi. You may want to buy a longer ribbon cable depending on your mechanical design. The ribbon cable is identical to the one used for the Pi Camera. The touchscreen is powered from the Raspberry Pi.

Software Defined Radio

The choice of SDR comes down to personal preference. The LimeSDR Mini and LimeSDR USB both work well out of the box, but there are not many other systems that use them. The Pluto needs bespoke configuration to be used with the Portsdown and some users have reported difficulty with this process. However, there are other applications (such as the Langstone microwave transceiver and the SatSaGen test equipment software) that also use the Pluto.

Finally, some of you may have a DATV Express PCB (which is no longer in production). This will work with the Portsdown 4 for DVB-S, but not DVB-S2. All produce an output in the region of one to 10 mW.

The LimeSDR Mini is supplied without a USB Cable, so a short USB3 extension cable is required if you are not going to plug it directly into the Raspberry Pi (which can be mechanically awkward).



▶ *The LimeSDR Mini*

For mechanical protection, it is highly recommended the LimeSDR Mini is mounted in a box and provided with adequate cooling as it runs quite hot.

The LimeSDR USB is a more expensive version of the LimeSDR with more options and requires an external power supply.

The Analog Devices Pluto needs three modifications before it can be used with the Portsdown.

Firstly, you need to extend its frequency range by telling it that it has a different IC in it. Details here: *https://wiki.analog.com/university/tools/pluto/users/customizing* and scroll down to "Updating to the AD9364".

Second, you need to enable the second processor. Details here: *https://www.ph4x.com/pluto-sdr-hack-2nd-cpu-core/*.

The final modification is to load a specific version of F5OEO's custom firmware. Note that it must be this version, not more recent versions.

The firmware can be found here together with a link to the upgrade instructions *https://wiki.batc.org.uk/Portsdown_4_Pluto#Suitable_Pluto_Firmware* . If you are not comfortable with these steps, either use a LimeSDR Mini instead or arrange for someone else to make the modifications.

▶ *The Analog Devices Pluto*

The Pluto comes with a suitable USB lead for connection to the Raspberry Pi and is housed in a plastic protective case.

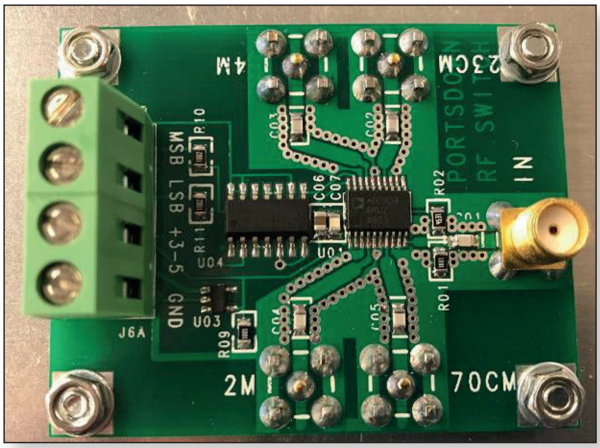
The final SDR option, which is only capable of DVB-S (not DVB-S2) with the Portsdown, is the DATV Express board, which simply connects by USB.

Optional output and PTT switching

If you are manually switching a power amplifier (PA) for a single band, then you can simply connect the output of your chosen SDR to the amplifier and switch the PA on once the SDR has started.

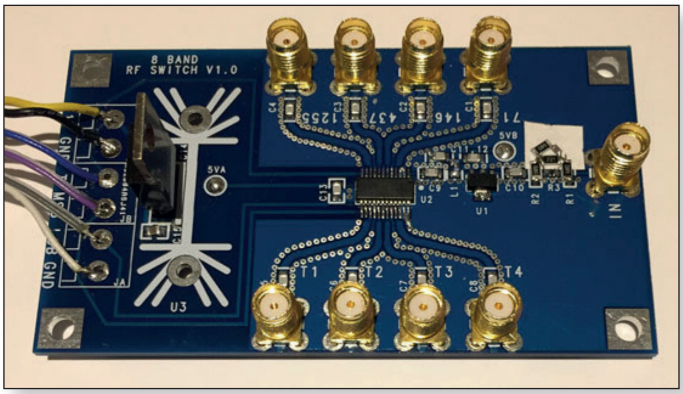
However, some automated switching is strongly recommended as both the LimeSDR and Pluto produce a calibration signal (often much more powerful than the normal transmission) before the transmission starts and this has led to the destruction of several PAs. A delayed PTT signal is available from pin 40 of the Raspberry Pi GPIO connector and this only goes high once the calibration pulse is finished.

If you want to drive up to four PAs for different bands from your Portsdown, then the BATC's four-way RF switch and four-way switch control board are recommended. Full details are on the BATC Wiki here: *https://wiki.batc.org.uk/Portsdown_hardware#4-Band_RF_Output_Switch*



▶ *The four-way RF switch*

You can drive up to eight PAs or transverters with the BATC's eight-way RF switch, control board and PIC. Again, the details are on the BATC Wiki here: *https://wiki.batc.org.uk/8-Band_RF_Output_Switch*



▶ *The eight-way RF switch*

Both the four-way and the eight-way RF switches allow the PTTs for individual PAs to be controlled safely.

Portsdown 4 parts list and suggested suppliers

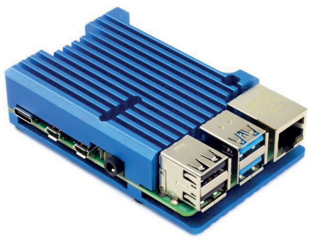
Here is a list of parts required for the Portsdown 4 and some possible suppliers:

Audio and video Source:

- RPi Camera V2 – RPi Suppliers
- Optional longer ribbon cable – RPi Suppliers
- Optional Arducam CSI to HDMI cable kit – *thepihut.com*
- Optional HDMI cable for extension – Multiple suppliers
- USB audio adapter – eBay ***or:***
- Logitech C920 webcam – multiple suppliers ***or:***
- Fushicai USBTV007 EasyCap video capture device – Ex BATC shop, now out of stock.

Raspberry Pi and touchscreen

- Raspberry Pi 4 2GB model – RPi Suppliers
- Raspberry Pi 4 heatsink Case – RPi Suppliers



- Raspberry Pi 4 3A Power Supply – RPi Suppliers
- Official seven-inch touchscreen – RPi Suppliers
- Optional longer ribbon cable – RPi Suppliers
- Portsdown 4 SD card – BATC Shop

SDR

- LimeSDR Mini – Mouser-UK part number cs-lime-05
- USB 3 extension cable– multiple suppliers ***or:***
- Analog Devices Pluto – Mouser-UK part number 584-ADALM-PLUTO ***or:***
- DATV Express Board – no longer manufactured.

Optional Output and PTT Switching

- Homebuilt PTT Driver controlled from GPIO Pin 40 ***or:***
- BATC four-way switch as described on BATC Wiki ***or:***
- BATC eight-way switch as described on BATC Wiki

Major Raspberry Pi Suppliers:

- Pimoroni *https://shop.pimoroni.com/*
- The Pi Hut *https://thepihut.com/*

Further information

Further reference information can be found on the BATC Wiki *https://wiki.batc.org.uk/*. More information, and answers to specific questions can be found on the BATC Forum *https://forum.batc.org.uk/* .

ATV frequencies and recommended modes

Dave, G8GKQ

I'm often asked what frequencies and modes are used for simplex amateur TV.

There is no mandated list, but here is a guide to the most-used frequencies and modes on each band. There may be extra licence restrictions in some regions and regional variations to prevent interference to and from the band's primary users.

The frequencies stated for the higher bands are those where there is likely to be activity during ATV contests.

ATV repeater input and output channels are not listed.

Voice talkback in the UK is generally on 144.75 MHz FM, but other frequencies may be used in some areas.

Before transmitting, please check your licence and the RSGB band plan.

Frequency	Mode	Parameters	Notes
29.25 MHz	DVB-T	333 kHz QPSK	Max 500 kHz bandwidth
51.7 MHz	DVB-T	333 kHz QPSK	Max 500 kHz bandwidth
71.0 MHz	DVB-T	333 kHz QPSK	NoV required. 70.5 - 71.5 MHz
	DVB-S2	333 kS QPSK	
146.5 MHz	DVB-S2	333 kS QPSK	NoV required. 146.0 – 147.0 MHz
437.0 MHz	DVB-S2	333 kS QPSK 1 MS QPSK	Band plan 436.0 – 438.0 MHz
1255.0 MHz	DVB-S2 FM ATV	Various SRs	FM ATV being replaced by DATV Caution not to interfere with Primary User
2395.0 MHz	DVB-S2	Various SRs	
3405.0 MHz	DVB-S2	333 kS	
5665.0 MHz	FM ATV	Wideband FM	Using FPV drone equipment
5762.5 MHz	DVB-S2	333 kS	Using NB Transverters (from 146.5)
10370.5 MHz	DVB-S2	333 kS	Using NB Transverters (from 146.5)
24047.5 MHz	DVB-S2	333 kS	Using NB Transverters (from 143.5)
47090.5 MHz	DVB-S2	333 kS	Using NB Transverters (from 146.5)
75978.5 MHz	DVB-S2	333 kS	Using NB Transverters (from 146.5)

Reduced bandwidth DVB-T for DATV use

Noel Matthews G8GTZ

As a result of tests carried out during 2001 at GB3AT in Winchester, the UK and subsequently the European ATV community adopted DVB-S as its standard for amateur digital TV transmissions (see CQ-TV250 page 40).

At the time, the major benefits of DVB-S (single carrier QPSK designed for satellite) were identified as the variable bandwidth capability which allows operation today down to 50 kHz and requiring less linear PAs than wideband DVB-T, which was only then available in six, seven or eight-MHz bandwidths.

However, it was known at the time that the major advantage of the terrestrial DVB-T standard was, due to the use of COFDM (Coded Orthogonal Frequency Division Multiplexing) technology, the resilience to multipath and phase distortions which appear as ghosting on an analogue TV.

This is particularly true for mobile transmission and reception, particularly in built-up areas (see results from the maritime mobile tests conducted on the Solent in CQ-TV 245 page 15) and is the reason why today all wireless broadcast cameras use OFDM-based technologies.

Multipath and phase distortion also become a problem for ATV operators when trying to take advantage of enhanced propagation particularly on the lower VHF and HF bands where modes such as sporadic E are not phase coherent due to ionospheric turbulence.

DVB-T vs DVB-S

Unlike DVB-S which uses one data carrier on a single radio frequency (RF) channel, DVB-T makes use of COFDM. This works by splitting the digital data stream into many slower digital streams, each of which digitally modulates a set of closely-spaced adjacent sub-carrier frequencies.

In DVB-T there are two choices for the number of carriers known as 2K-mode or 8K-mode. Note there are actually 1,705 or 6,817 sub-carriers. These close-spaced signals would normally be expected to interfere with each other, but by making the signals orthogonal (at right angles) to each other, there is no mutual interference.

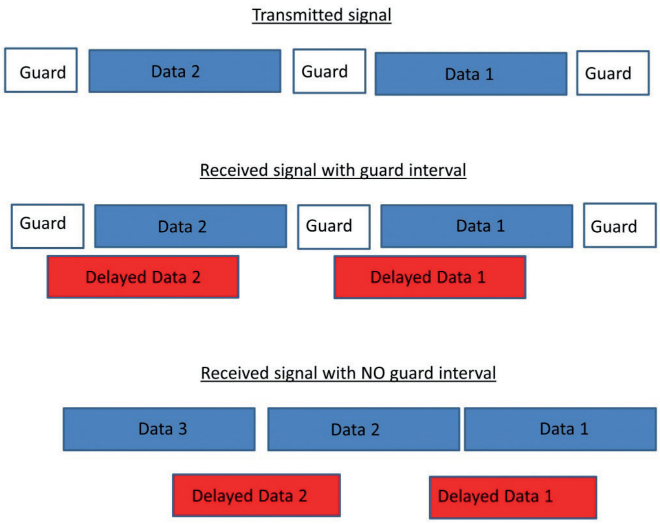
The data to be transmitted is shared across all the carriers and this provides resilience against frequency selective fading from multi-path effects. Nulls caused by multi-path effects or interference on a given frequency only affect a small number of the carriers, those remaining being received correctly.

These individual carriers can be modulated using QPSK, 16 or 64 QAM with the benefit of increasing the amount of data carried but at a cost of increasing the SNR and the amount of signal required to achieve successful decodes. Forward Error Correction (FEC) is also applied to each carrier which also affects the robustness of the signal and amount of data carried.

Some of the carriers don't carry traffic but provide phase and amplitude references to help the receiver decode the signal and others provide information on the format of the signal again to help the receiver do the decoding.

Guard interval

One significant difference between DVB-S and DVB-T Is that OFDM also uses a technique called guard interval to improve multipath performance. When trying to understand guard interval, it is important to think in the time domain rather than frequency domain. The damage done by multipath is when reflected signals (or digital symbols) arrive after the direct signal or symbol and at the same time as the next symbol of information and thereby corrupting it.



A guard interval (or time delay) is added to the beginning of each symbol of data, thereby ensuring any reflections from the previous symbol have been received before the data in the second symbol starts. Any corruption to the first data block by its own delayed reflection can be dealt with by error correction. Note that a longer guard interval results in a reduction of the payload bits available and therefore reduces picture quality.

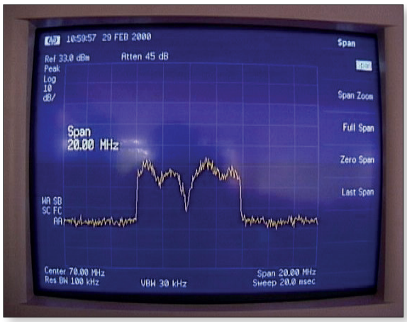
Guard interval duration

As mentioned previously, DVB-T was designed as a PAL replacement system and the guard interval was set to compensate for typical reflection delays seen on a domestic TV using "rabbit's ear" antennae. With the PAL line scan duration of 64 microseconds, typical ghosting of up to 10 microseconds could be seen before the sync waveforms were too distorted for the set to lock.

With an eight-MHz bandwidth, the maximum guard interval can be set to 1/4 or 56 microseconds and the Freeview SD multiplex currently operates at 1/32 or seven microseconds.

With reduced bandwidth DVB-T, the length of the guard interval directly scales with the reduction in bandwidth and the 1/32 setting gives a guard interval time of 112 microseconds at 500 kHz and 168 microseconds at 333kHz.

The effectiveness of the combination of multicarrier modulation and the guard interval can be seen in this spectrum analyser plot showing an eight-MHz OFDM signal with 20dB notch caused by mobile multipath and frequency selective fading but signal decoding was not affected.



PA linearity

One requirement of the OFDM transmitting and receiving systems is that they must be very linear.

Any non-linearity will cause interference between the carriers because of inter-modulation distortion. This will introduce unwanted signals that would cause interference and impair the orthogonality of the transmission.

In terms of the equipment to be used, the high peak to average ratio of multi-carrier systems such as OFDM requires the RF final amplifier on the output of the transmitter to be able to handle the peaks although the average power is much lower and this leads to inefficiency. Typically power amplifiers should be run at only 10% of their rated power output when DVB-T is used.

Why DVB-T for DATV now?

As mentioned previously, as DVB-T was originally only available in fixed six, seven and eight-MHz bandwidths with a 1.7 MHz variant being developed more recently. These wide bandwidths meant PA linearity was a real issue and for typical amateur applications DVB-S was more efficient although the ATV community in the USA has adopted DVB-T using HiDES equipment.

However, a recent development in silicon technology has meant there is now variable bandwidth DVB-T tuner silicon available that will go to bandwidths below 1 MHz and Charles, G4GUO, has developed core software core to enable its use in amateur applications.

Charles has also developed transmit code to enable DATVExpress and Portsdown systems to transmit narrow band DVB-T down to 250 kHz.

These core developments by Charles have now been used for the basis of the Knucker narrowband DVB-T project which includes a new USB receiver card and DATVExpress and Portsdown transmit capabilities.

Where should we use DVB-T?

DVB-T is NOT a replacement for DVB-S and there is no need to upgrade or replace anything if you do not want to take advantage of the two very specific applications for DVB-T.

Low band VHF and HF DATV

Up until now it has been impossible to use DVB-S based DATV on the lower VHF or HF bands to take advantage of enhanced propagation because certain modes such as sporadic E are not phase coherent. However, it is believed that reduced bandwidth DVB-T will be more resilient and enable ATV operators to take advantage of the recent introduction by IARU Region One of segments for digital experiment in the 29 and 50 MHz bands.

VHF and UHF mobile DATV

It is also envisaged that narrow band DVB-T will enable the use of reliable mobile transmissions on VHF and above and opens up the opportunity for amateurs to develop new repeater and wireless camera applications.

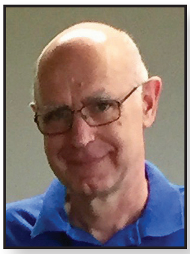
Summary

Reduced bandwidth DVB-T will not replace DVB-S as the preferred technology for most of our applications such as simplex and home station to repeater transmissions or when operating on QO-100.

The development of the reduced bandwidth DVB-T capability does give DATV operators the opportunity to explore new applications and could enable fast scan digital Television QSOs around the world.

Reduced-Bandwidth DVB-T Receive Systems

Dave Crump G8GKQ



DVB-T has been available for more than 20 years, but only in fixed bandwidths for broadcast use (8, 7, 6 and 1.7 MHz) making it unsuitable for DATV use. However, receiver chips with programmable bandwidths have recently been released and software enabling it to be used for amateur applications has been developed.

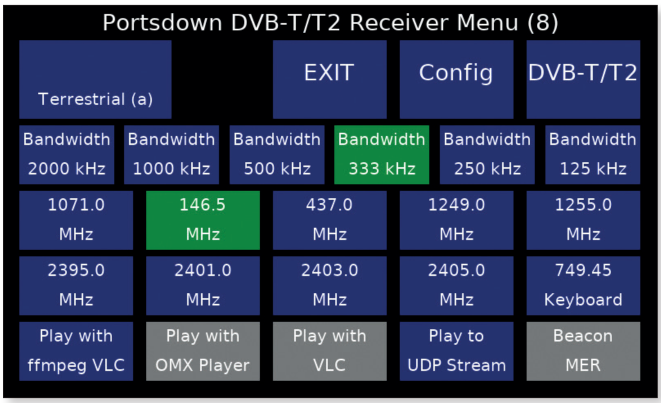
A small team supported by the BATC has developed a new USB receiver PCB known as the Knucker which hosts the Serit FTM-4762 DVB-T NIM (Network Interface Module – the tin can). This tuner enables us, with the right software, to receive DVB-T and DVB-T2 signals with bandwidths of 8 MHz down to 150 kHz. It also covers the wide frequency range of 48 MHz to 1000 MHz.

The BATC wiki has more details of the PCB build and the BATC shop stocks the Serit FTM-4762 NIM, PCB and USB module which, although the same hardware, is programmed differently to the MiniTiouner module.
https://wiki.batc.org.uk/Knucker

There are currently two receive systems that can be used with the Knucker tuner - the Portsdown 4 and the Ryde receiver. There is no Windows software available to use with the Knucker tuner (we're looking for volunteers to write it).

DVB-T Receive With Portsdown 4

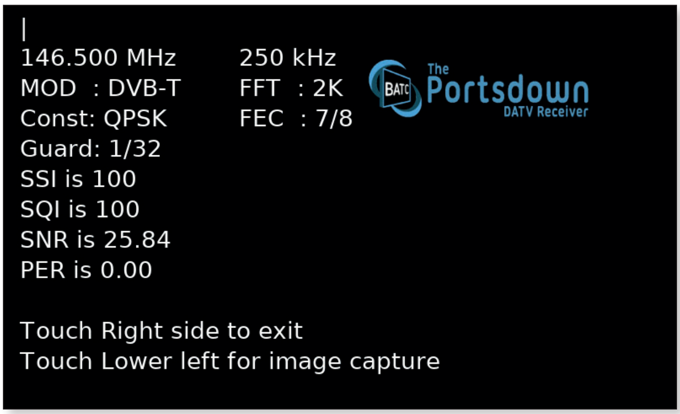
Connect the Knucker to the Portsdown 4 (not a Portsdown 2020, as the feature is not available on that version) and disconnect any MiniTiouner. The receiver will not work with both connected. Select "RX". You can then select DVBT/T2 on the top right button (which toggles between that and DVB-S/S2).



The top left button enables you to switch between QO-100 downlink frequencies (which can be used for very brief DVB-T tests) and normal terrestrial frequencies. The next three rows enable you to select the desired receive frequency and bandwidth.

Only two options are available to start the receiver: "Play with ffmpeg VLC" which displays the video on the touchscreen and outputs audio to your selected audio device; and "Play to UDP Stream" which outputs the received transport stream to the UDP address and port set on the receiver configuration menu.

The first time that you select Receive, the tuner takes about 40 seconds to initialise; it is downloading the firmware from the Portsdown to the tuner. Subsequent receive initialisations take about eight seconds. It then starts searching for the signal, and when it achieves lock it displays the signal parameters.



Most amateur signals will be DVB-T, 2K, QPSK. The FEC and Guard Interval are displayed in addition to the:

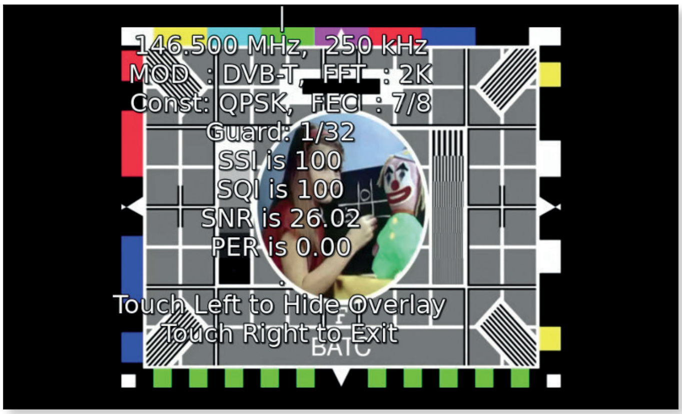
SSI	Signal strength indication	0 – 100 scale
SQI	Signal quality indication	0 – 100 scale
SNR	Signal to noise ratio	dB
PER	Packet error rate	0.00 to 1.00 scale

The signal strength indication is just that. Good results are achieved when this is between 90 and 99. Anymore and you don't know if the receiver is being overloaded. Valid decodes seem to be achieved down to an SSI of 20.

The signal quality indication gives a measure of the accuracy of the received OFDM signal. Transmissions with poor carrier balance, or interfering signals, will cause this number to fall from 100. It has been noticed that transmissions with poor SQI take longer to achieve signal lock at the receiver.

The signal to noise ratio gives an indication of the received signal strength compared with the noise level. Note that a signal with good SNR (> 6dB) might fail to decode if it has a poor SQI. Higher SNRs are required for higher FECs and 16-QAM or 64-QAM.

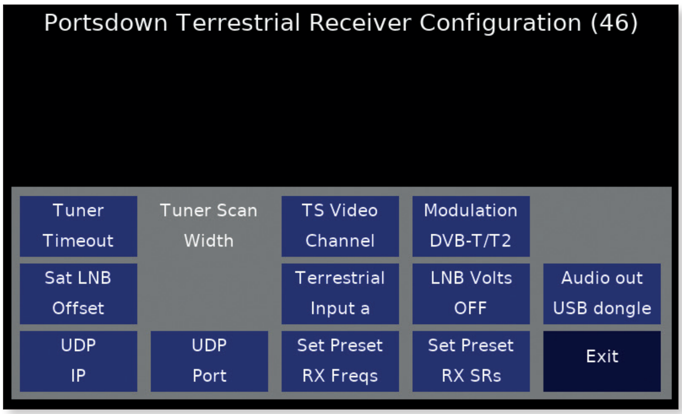
The packet error rate is a measure of the residual errors after digital error correction. Most video players will cease to play video as soon as this error rate begins to rise above zero.



If "Play with ffmpeg VLC" is selected, and a valid transport stream is decoded, then VLC will display the video with the parameter overlay for about five seconds before the overlay disappears.

The overlay can be reselected by touching the top left of the screen. Touching the bottom left of the screen takes a screenshot (saved in the /home/pi/snaps folder), and touching the right side of the screen exits back to the receive menu.

Configuration



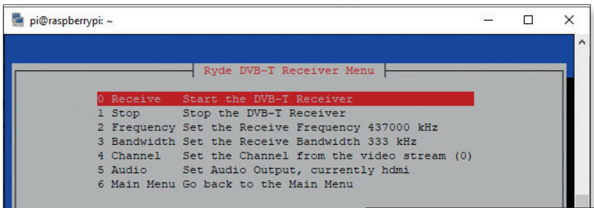
On the receiver configuration menu, the transport Stream video channel (programme) can be selected; this enables broadcast programmes to be selected from broadcast "bouquets". The tuner timeout button has no effect on DVB-T; the tuner resets after about 15 seconds of searching and then resets itself for another search.

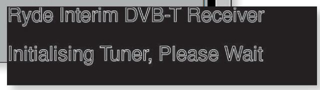
The Sat LNB offset can be set from this menu if required, but the input cannot be switched; the lower input socket is always used for DVB-T. Neither is there any facility to switch the LNB voltage. The audio out, UDP and preset selection buttons are all active.

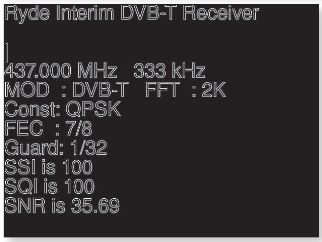
DVB-T Receive With the Ryde Receiver

An interim DVB-T capability has been added to the Ryde receiver. As with the Portsdown receiver, this receiver will work on any bandwidth from 150 kHz to 500 kHz, and on the spot bandwidths of 1, 1.7, 2, 4, 5, 6, 7 and 8 MHz.

The receiver control is accessed through the console menu at present, but it is hoped to add it to the remote control menu in the future. So log in by ssh, type 'menu' and then press enter. Select the DVB-T RX option to get to the DVB-T receiver menu.







This is a more basic receiver than the Portsdown and has no facility to use an LNB offset. You can set the frequency, bandwidth and channel/program within the stream, and audio channel from this menu. Then select receive and the displays are very similar to the Portsdown described above.

Once the video is decoded, it is displayed with a permanent parameter overlay as seen here.

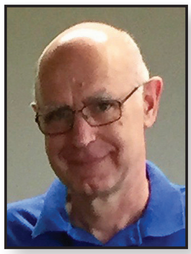
Summary

Apart from the Knucker tuner module, no extra hardware is required for either receiver; just make sure that you have updated to the latest software.

Both DVB-T receivers have the same performance in terms of sensitivity. The Portsdown receiver is optimised for portable operation, while the Ryde DVB-T facility is a temporary shack-based receiver pending full implementation of DVB-T in the Ryde remote control menus. Either will enable you to start experimenting with 50 MHz and 71 MHz DVB-T.

Reduced-Bandwidth DVB-T Transmit Systems

Dave Crump G8GKQ



DVB-T Transmit Systems

There are currently three ways to generate reduced bandwidth DVB-T signals for amateur use. If you currently have equipment capable of transmitting DVB-S2, it is very likely that a simple software upgrade can add DVB-T capability.

DATV Express PC Software

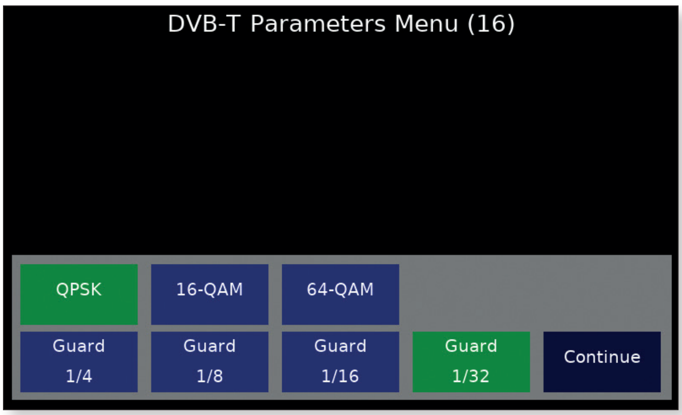
The DATV Express experimental software 1.25pl17 running on a Windows PC will drive a DATV Express Board, a LimeSDR Mini, or a Pluto to generate DVB-T. You can download this software from *https://www.dropbox.com/s/ghwlhqugg8yrdxu/setup_datvexpress1.25lp17.zip?dl=0*

Note that the DATV Express software is not optimised for the low bitrates used with reduced bandwidth DVB-T so it needs careful adjustment to transmit a valid reduced bandwidth DVB-T signal.

Portsdown 4 with Pluto

The latest version of the Portsdown 4 will drive a Pluto to generate DVB-T at between 150 kHz and 1 MHz bandwidth. Only the 2K (1705 carriers) mode is supported, but all the standard modulations (QPSK, 16-QAM and 64-QAM) and Guard Intervals (1/4, 1/8, 1/16 and 1/32) are available.

To set up for DVB-T transmit, make sure that you have the Pluto selected as the output device. Then select Modulation, and then DVB-T. The next menu shown will be the DVB-T parameters menu.



For normal operation, make sure that QPSK and 1/32 are selected and then press Continue. If you need to access this menu again, you will need to reselect DVB-T as the modulation, and then it will be displayed.

Select the desired frequency and bandwidth. Note that some of the menus still refer to SR, rather than bandwidth; this is incorrect and will be corrected in due course.

Pi camera, composite video, C920 webcam, test card, and contest numbers are available as video sources, but only with H264 encoding (MPEG-2 is not implemented).

HDMI from an LKV373A cannot be used (unlike for Pluto DVB-S and DVB-S2 transmissions). You can use IPTS In (selected from the Encoder menu). The exact TS bitrate required for IPTS In can be looked up on the Info menu accessed from Menu two.

Note the output power for DVB-T is significantly lower than that for DVB-S and S2. Typical values measured at Pluto Pwr = 0 (the maximum) are listed below:

51.7 MHz	- 10 dBm	0.1 mW
71 MHz	- 8 dBm	0.15 mW
146.5 MHz	-5.5 dBm	0.28 mW
437 MHz	-3 dBm	0.5 mW
1255 MHz	-4 dBm	0.4 mW
2400 MHz	-5.5 dBm	0.28 mW
3400 MHz	-7 dBm	0.2 mW
5760 MHz	-13 dBm	0.05 mW

The output power can be controlled in approximately 1 dB steps. For example, the output power with Pluto Pwr set to -5 is approximately 5 dB lower. The lower frequency limit is 48 MHz and the upper limit 6 GHz.

It is hoped to add LimeSDR Mini DVB-T capability to the Portsdown 4 soon. Evariste F5OEO has very recently added direct DVB-T transmit capabilities to his latest Pluto firmware.

Portsdown 2020 With LimeSDR Mini

Operation of the Portsdown 2020 with the LimeSDR Mini is very similar to the Portsdown 4/Pluto combination. The major difference is that the waveform is fixed using QPSK at a guard interval of 1/32, so the DVB-T Parameters Menu is not shown. The LimeSDR Mini works over a higher bandwidth range than the Pluto: from 150 kHz to 2 MHz.

The LimeSDR does emit a very significant calibration power spike after transmit selection and before the PTT is enabled, so it is important that proper PTT-driven PA switching is used. The output power is generally higher than the Pluto:

51.7 MHz	-1 dBm	0.8 mW	Lime Gain 90
71 MHz	-1 dBm	0.8 mW	Lime Gain 90
146.5 MHz	-1 dBm	0.8 mW	Lime Gain 90
437 MHz	-2 dBm	0.6 mW	Lime Gain 90
1255 MHz	-2 dBm	0.6 mW	Lime Gain 90
2400 MHz	-13 dbm	0.05 mW	Lime Gain 90

The Lime Mini output power can be increased by adjusting the Lime Gain up towards 100, however the spectral purity of the signal is reduced. The practical lower frequency limit for the LimeSDR Mini is 32 MHz. The upper limit is theoretically 3500 MHz, but the output power reduces rapidly above 1500 MHz.

The LimeSDR USB is not yet supported, but this is planned for a future software upgrade. It is not planned to add Pluto support to the Portsdown 2020

Power Amplification

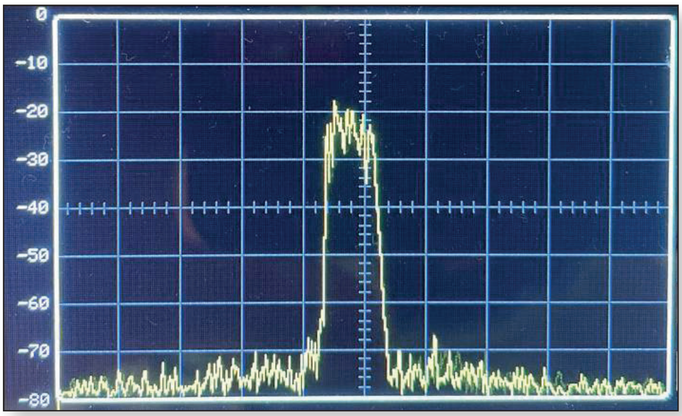
Even though the modulation software used in the Portsdown takes steps to reduce the waveform peak-to-average ratio, great care must be taken when amplifying the low levels from an SDR to reach transmit power levels.

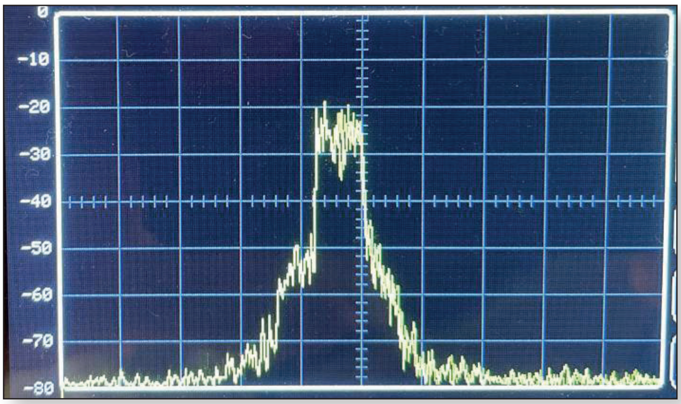
As a rule of thumb, any power amplifier should be operated at between 16 and 10 dB (1/40 to 1/10) below its rated maximum power to prevent re-growth of "shoulders" either side of the signal. The two spectrums on the right show acceptable spectrum and not-so-good spectrum.

If you have access to a spectrum analyser you can adjust the input power to the amplifier (and possibly the amplifier bias) for best results.

Conclusion

The current generation of software defined radios used for DATV are finally showing their full potential, as additional modes can be added with a simple software upgrade. The use of DVB-T is well worth considering for 51.7 MHz and 71 MHz DX, and possibly for mobile experiments on the higher bands.





WinterHill - a four-channel DATV receiver

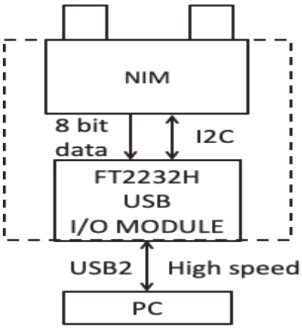
Brian Jordan G4EWJ

MiniTiouner

For many years, the mainstay of DATV reception has been the MiniTiouner, designed by F6DZP. This uses a NIM (network interface module – the 'tin can') and an FT2232H USB interface module (the small green PCB) to connect to a PC. F6DZP's MiniTioune software runs on the PC. Among other players, VLC, which can process and display many media formats, is used to display the video.

MiniTiouner BATC Mk2

▶ *PCB, construction Photo by G0MJW*



▶ *MiniTiouner hardware configuration*

LongMynd and Ryde

In 2019, M0HMO developed the LongMynd software which runs on Linux computers, such as the Raspberry Pi (RPi). The same MiniTiouner hardware could now be used on both a PC and the RPi and LongMynd was incorporated into the BATC Portsdown system.

In April 2020, an outline specification for the RPi-based Ryde single channel receiver with infra-red remote control was published on the BATC forum for discussion. The design specification was to be able to receive a UK terrestrial repeater which could have a transport stream data rate up to 7M bit/s, or around 1M bytes/s on the 8 bit parallel bus. The Ryde stand-alone receiver is now well established.

One component of the MiniTiouner, the FT2232H USB module, is about £25, so it adds significantly to the hardware cost. The possibility was raised of interfacing the NIM directly to the RPi, without the expensive FT2232H USB module.

Replacing the FT2232H

The standard MiniTiouner interfaces to the FT2232H using a high speed eight-bit parallel bus for the received data (the transport stream) and a low speed I2C bus for control and status. The RPi has an I2C port, so that is easily taken care of, but the high speed eight-bit parallel port proved to be more of a problem to interface to, without the FT2232H.

You would think that an RPi4 with 4 x 1.5GHz processors would have no trouble inputting one byte per microsecond, but that proved not to be the case. While the RPi has many specialised serial peripheral modules, it does not have any easily usable ones for parallel data. You can read parallel data from the input ports, but you have to handle it yourself without much help from the system.

The program could have a loop running which looks at an input port that indicates that the NIM has presented a byte on its parallel port that needs to be read, but this can happen once every microsecond. With an operating system like Linux, there's no guarantee that all the processors are not all handling other tasks on the system as they share out the processing time. You only have to take your eye off the NIM for a microsecond for a byte to be lost.

The 'byte-ready' signal could be tied to an interrupt pin on the RPi. Rather than having to look at the ready signal all the time, Linux runs part of your program whenever a byte is ready. Unfortunately, it can take 100us or more between the interrupt occurring and it reaching your program.

With Linux, it is possible to add a device driver of your own (a kernel module) to the Linux operating system. This gives faster access to input / output functions and tests showed that the time to respond to an interrupt was 1 - 12us. This is still too slow to interface directly with the NIM, but it could be possible to put a buffering chip in the path.

A FIFO (first in, first out) chip can store say 512 bytes and generate an interrupt on the RPi when it is half full. The program now has much more leeway about reading the bytes from the FIFO and can read multiple bytes for every interrupt. However, older FIFO chips tend to run on 5v, whereas the RPi runs on 3.3v and newer FIFOs can be expensive and be so small as to discourage home construction.

Serial interface to the NIM

In addition to its eight-bit parallel data output, the NIM can be configured to output one bit at a time. The NIM also outputs clock and control signals in both modes.

When outputting one bit at a time, this is very similar to the widespread SPI protocol. The RPi4 has several enhanced SPI ports, whereas earlier models have only one. The SPI ports have built-in FIFO buffers, interrupt capability and even better, DMA (direct memory access). I decided that this was the most promising method to investigate.

After configuring a few more registers in the NIM, the output was looking exactly like SPI master mode. SPI is a serial master-slave protocol where the master provides the clocks and the enable signals. It was at this point that I realised that the RPi does not support slave SPI modes. Two masters cannot communicate with each other, so it would not be possible to connect the RPi directly to the NIMs. There would still need to be a hardware interface between them.

If a suitable microcontroller with multiple SPI ports could be found, this could act as a back-to-back coupler for two SPI master ports.

WinterHill design goals

In the current MiniTioune and LongMynd software, the second receiver in the NIM is not used to produce a transport stream output, so it was decided to investigate the possibility of doing this, to receive two signals simultaneously from a single NIM.

The RPi4, with its multiple-enhanced SPI ports and hardware H.265 decoder is the best choice of RPi.

With so many signals on the QO-100 satellite, a four-channel receiver with two NIMs would be useful. After reserving several pins on the RPi for compatibility with the Ryde infra-red remote control receiver (for future development), there were two free SPI ports on the RPi. An interface chip with three SPI ports could connect to the two receiver outputs on each NIM, combine the data streams and send them to one SPI port on the RPi. The interface chip would run all three SPI ports in slave mode.

A search with the Microchip advanced parts selector produced the PIC24FJ128GA702 microcontroller. This costs £2 and replaces two £25 FT2232H modules. It is available in a DIP through-hole package.

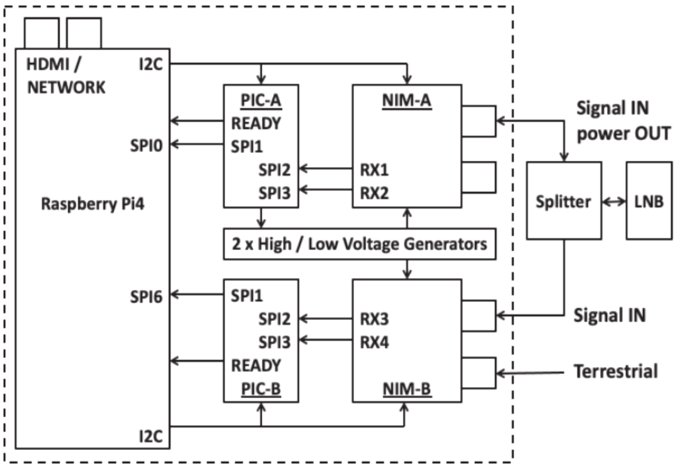
For the SPI ports on the RPi, the best compromise between speed and complexity would be an interrupt-driven kernel module, which is added to the Linux operating system core at power up.

Making WinterHill communications based solely on UDP network protocol would enable command inputs, status outputs and transport stream outputs to come and go from any network device: the RPi itself, the local network, or anywhere on the internet.

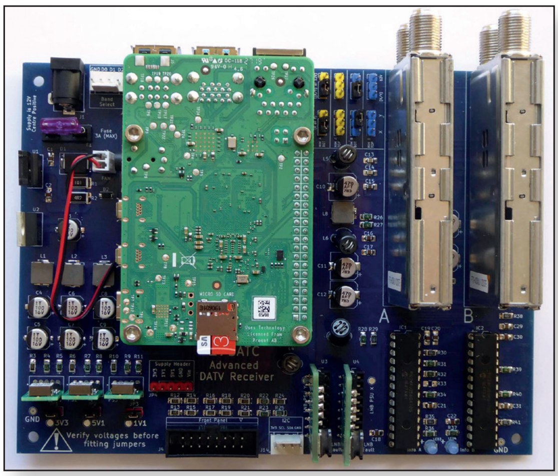
On the RPi, WinterHill is designed to use a 1920x1080 HDMI monitor, but can be customised for other screen sizes.

The DATV transponder on QO-100 is horizontally polarised, so the LNB needs to be fed with 18v (vertical needs 13v). It would be useful to have on-board current limited voltage generators.

WinterHill block diagram (QO-100, four RX)



BATC Advanced Receiver PCB



WinterHill uses the BATC Advanced Receiver PCB, designed by G0MJW.

The RPi is mounted on a 40-pin socket.

The components are a mixture of through-hole and surface mount. The SMD resistors and capacitors are 1206 types – the largest size.

The PICs can be programmed in-circuit by the WinterHill software installation routine.

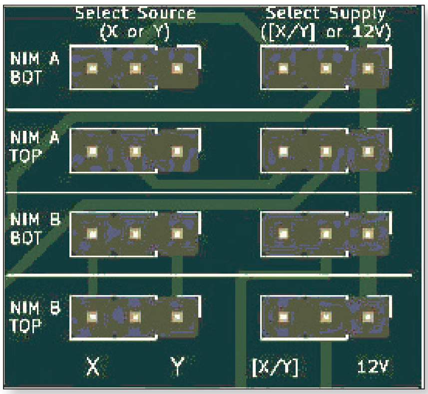
The 5.1v, 3.3v and 1.1v power supplies are provided by modules at the bottom left of the PCB.

The two small PCBs to the bottom right of the RPi are optional LNB voltage supply modules, based on the RT5047. These are controlled by software commands and provide short-circuit protected 13v or 18v. They can also generate the 22kHz tone signal that can switch an LNB to its secondary local oscillator – usually 10600MHz for a 9750MHz LNB. Two boards may be fitted – referred to as voltage generators X and Y.

LNB power supply configuration

A voltage can be sent out of the NIM antenna sockets to power LNBs and preamps. In the simplest system, the LNB can be turned on its side and fed from the on-board current limited 12v supply.

Any of the LNB supplies can be routed to any antenna socket on the NIMs, by using the jumper matrix at the top of the board in between the RPi and the NIMs.



Receiver antenna selection

The NIM has a multi-output switch at each antenna input, which can connect either antenna input to either receiver. For a four-channel QO-100 receiver, the LNB signal needs to be connected to only one antenna input on each NIM. The two unused antenna inputs can be connected to other systems. Antennas can be selected by remote commands.

Data transfer

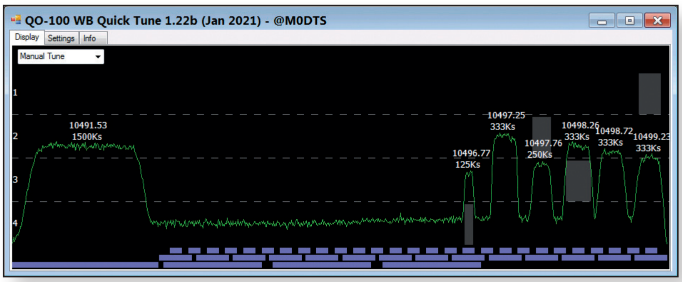
All data transfer in the system is done via UDP network protocol – even when displaying video on the RPi itself. The received transport streams can be sent to any IP address – the RPi itself, another PC on the network, or a remote PC somewhere on the internet. The program is given a base IP port number at start up and all ports are relative to this. E.g. if the base IP port is 9900:

9901	sends receiver parameters
9902	sends a status display for all receivers
9921	listens for MiniTioune type commands for RX1
9924	listens for MiniTioune type commands for RX4
9941	sends transport stream from RX1
9944	sends transport stream from RX4

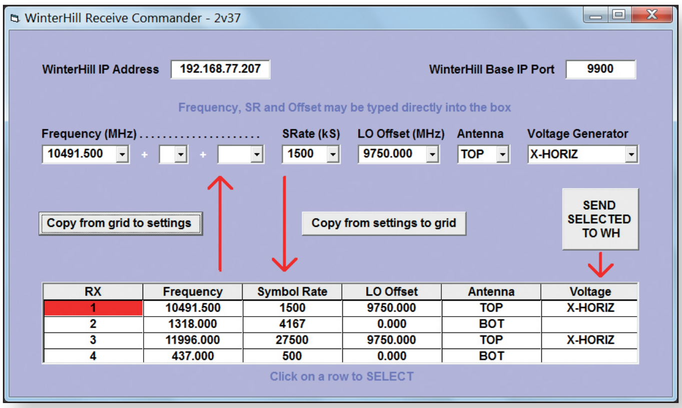
Controlling the receivers

Receive commands can be sent from QO-100 QuickTune (aka LiveTune), or other utilities such as the PC-based Receive Commander. The latest version of QuickTune can automatically select new stations as they appear and send commands to all four WinterHill receivers at intervals, to give a picture of what is happening on QO-100.

QuickTune (PC based)



Receive commander (PC based)



Maximum receivable data rates

The throughput of each PIC-RPi SPI link is limited to about 10M bits/s, so it is nowhere near fast enough for broadcast signals like the BBC Arabic transponder on 11996MHz, which has a data rate of around 42M bits/s.

It is still possible to use that transponder as a tuning aid, as the MER and other data are transferred over the I2C port. The QO-100 beacon and a terrestrial repeater running SR4000 FEC 7/8 should be receivable on the same NIM, at a combined 9.4M bits/s.

As with LongMynd and Ryde, the minimum receivable symbol rate is 66kS.

Raspberry Pi display limitations

There are limitations on using VLC on the RPi. This varies depending on which Linux operating system SD card image version is being used:

The hardware H.264 and H.265 decoders on the RPi4 are very efficient, but will not display some signals, most noticeably the QO-100 beacon. The FFMPEG software decoder will display the beacon, but it consumes a lot of CPU power.

The hardware H.265 decoder exhibits a colour plane slip on some signals.

VLC locks up when trying to display more than one H.265 signal using the hardware decoder.

VLC windows shut down sporadically.

Terminal windows can slowly consume memory.

As it is not possible to display more than two H.265 signals on the RPi, the preferred way to run WinterHill is in 'Anyhub' mode where no VLC windows are displayed on the RPi and transport streams are viewed on a PC.

Modes of operation

There are several modes in which WinterHill can be started. In all cases, commands can come from any network location.

In the 'Any' modes, each receiver can independently send its transport stream to a different IP address - wherever the receive command for that receiver came from.

Local:	the transport streams are sent to four VLC windows on the RPi. Only two VLC windows on the RPi can display H.265 video.
Anywhere:	each transport stream is sent to wherever the receive command came from. Four VLC windows are displayed on the RPi. Only two VLC windows on the RPi can display H.265 video.
Anyhub:	each transport stream is sent to wherever the receive command came from. No VLC windows are displayed on the RPi.
Fixed:	All transport streams are sent to a fixed IP address. No VLC windows are displayed on the RPi.

Start-up commands

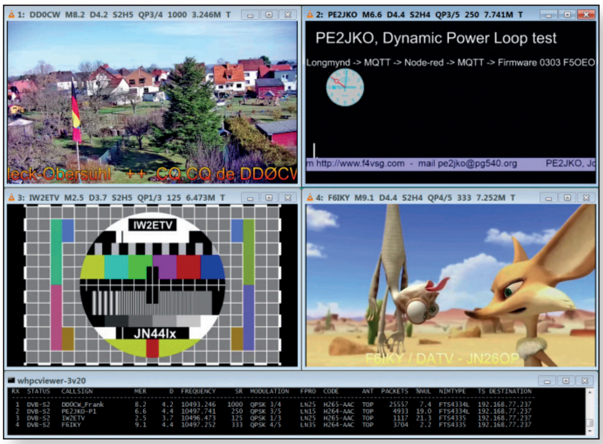
Receive commands can be placed in an initialisation file, to be actioned at start-up. For QO-100, this would normally be used to select the beacon on RX1 and RX3, to auto-calibrate the receive frequency for each NIM.

Displaying the received video

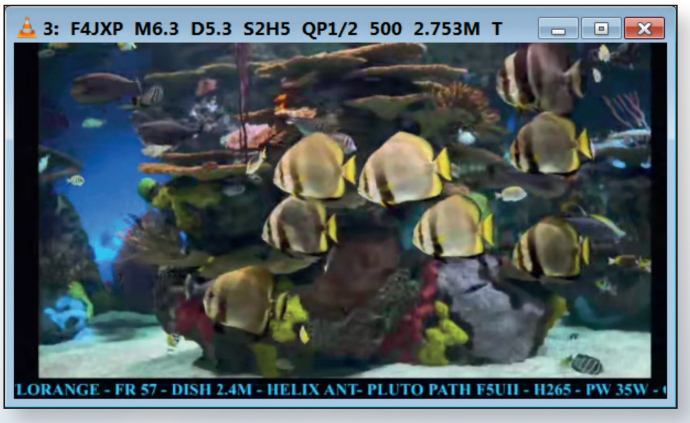
Depending on the start up mode selected, the received video can be displayed with VLC on the RPi, a PC or both.

On the PC, the 'whpcviewer' utility shows the four VLC windows, with an info window displaying the parameters for all receivers underneath. The display on the RPi is very similar. The size and position of the windows may be customised.

VLC is reset automatically when a new station or codec change is seen, so no user intervention is required.



An abbreviated subset of the receive parameters is displayed in the title bar of each VLC window.



VLC can be used on its own, outside a viewer program. All that is required is to know the UDP port that the transport stream is arriving on. In this case, some WinterHill parameters may need to be changed to enable the VLC title bar display. Manual intervention may be needed to reset VLC when the received station changes.

The WinterHill name

WinterHill is named in memory of Brian G3SMU, who was a huge presence in ATV and narrowband operation on VHF to microwave, from his Winter Hill QTH in Lancashire, north-west England.

Credits:

F6DZP: MiniTiouner hardware and MiniTioune PC software

M0HMO: LongMynd software for MiniTiouner control on Linux

M0DTS: QuickTune QO-100 spectrum display and MiniTioune commander

G0MJW: MiniTiouner BATC Mk2 PCB, BATC Advanced Receiver PCB and power supplies

G8GKQ: Software for installation and configuration

G4EWJ: SPI interface for NIM-PIC-RPi, PIC software and Linux kernel module, LongMynd software mods for quad receive

Download locations

- WinterHill manuals, PC viewing and control software
  https://wiki.batc.org.uk/WinterHill_Receiver_Project
  See the WinterHill manual for Raspberry Pi software download details.
- BATC Advanced Receiver PCB
  https://wiki.batc.org.uk/Advanced_receiver_hardware
- BATC WinterHill Forum
  https://forum.batc.org.uk/viewforum.php?f=136
- QO-100 QuickTune
  https://github.com/m0dts/QO-100-WB-Live-Tune/releases/tag/1.22b
- WinterHill CAT20 Presentation
  https://www.youtube.com/watch?v=ZmUHBH7J8Ss

The BATC forum

Overview

The BATC forum is an on-line bulletin board run by the club to promote discussion and information exchange about amateur television. You don't have to sign-up to view it, just go to *https://forum.batc.org.uk/* .

If you have a question about an aspect of ATV, try looking on the forum – that's what it's there for.

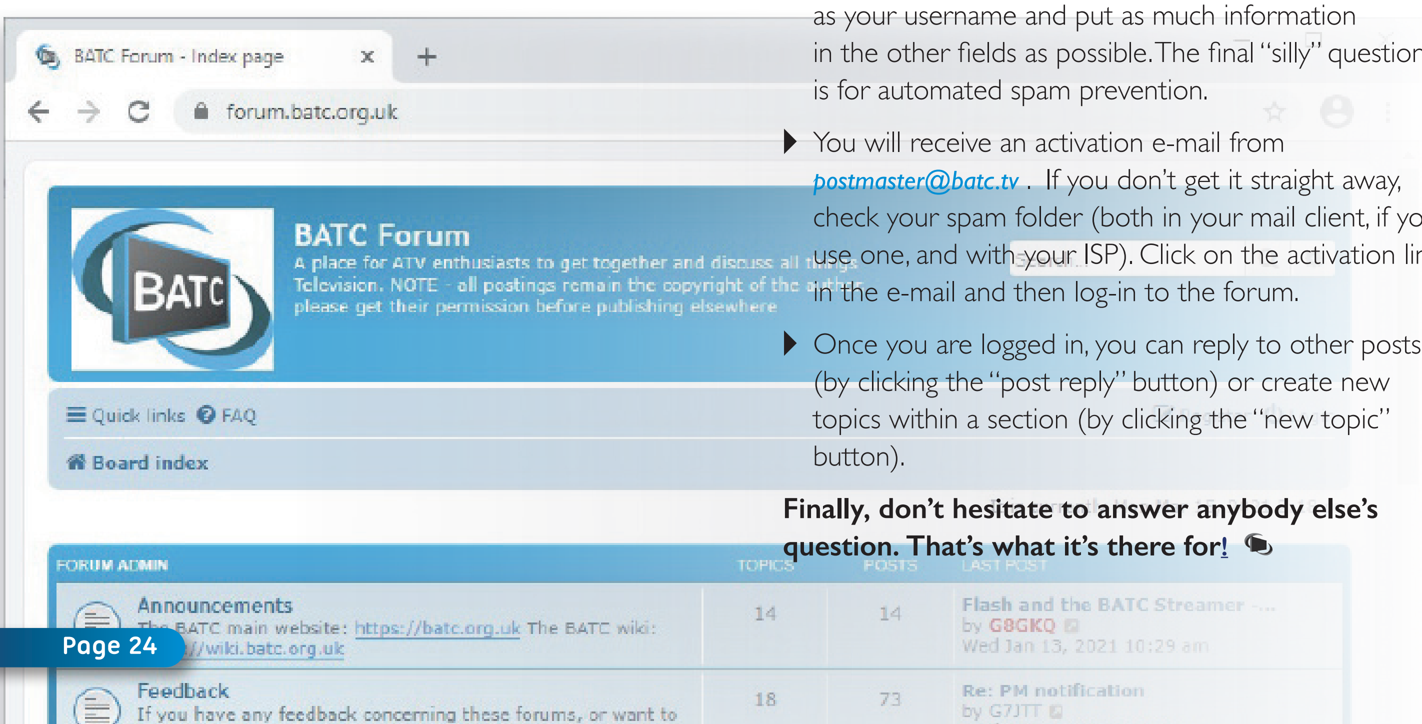
Sections of the forum are devoted to broad areas of our hobby, such as digital ATV, Portsdown, Ryde, contests, repeaters, and broadcast equipment. There is also a general ATV discussion section for all those questions that don't neatly fit anywhere else. Once you have looked at the forum you may want to post a question or an answer. To do this you will need to sign up for an account.

Creating an account

The forum is a stand-alone part of the website, so unfortunately your BATC membership or streaming account will not work on the forum and you will need to sign up for an account. This process is simple, but you have to jump a few hurdles that we have put in place to prevent the spammers using our forum to advertise kitchens (and worse).

- Click on "Register" and then agree to the terms on the next page.
- In the registration form, please use your callsign as your username and put as much information in the other fields as possible. The final "silly" question is for automated spam prevention.
- You will receive an activation e-mail from *postmaster@batc.tv* . If you don't get it straight away, check your spam folder (both in your mail client, if you use one, and with your ISP). Click on the activation link in the e-mail and then log-in to the forum.
- Once you are logged in, you can reply to other posts (by clicking the "post reply" button) or create new topics within a section (by clicking the "new topic" button).

Finally, don't hesitate to answer anybody else's question. That's what it's there for!



How to make a horn (reference) antenna, the easy way

Chris van den Berg PA3CRX

A horn antenna is nothing more than an adaptation of the waveguide to the ether, just like a horn held in front of the mouth does to the surrounding air.

Horn antennas can be used to send or receive signals, to illuminate parabolic reflectors or as a reference antenna of known gain. The size of the opening of the horn mainly determine the gain. To get twice as much gain (3 dB), twice as large area of opening is needed. That is quite a difference, which is why dimensions during construction are not very critical and provide a predictable gain: a reference antenna.

Due to its simple construction and predictable gain, this antenna is also very suitable as illuminator of parabolic antennas. In that case it is important that the phases of the E and H fields are as similar as possible. In other words that they come as much as possible from the virtual point in the horn (the so called 'phase center').

Depending on the size of the horn, the position of the phase center of these fields may be in other places, deeper into the horn or more towards the opening.

The shape of the opening has an influence on this, as well as on the efficiency. Logically, if only the size of the opening would determine the gain, we would go for a very short cone and a large opening. It doesn't work that way. To look at the influences of this I made an overview of a number of simulations.

The influence of different dimensions (height/width of opening, length of horn) whereby the area of the opening remains the same. The 'phase centers' vary considerably (given values in Lambda from the horn opening). Longer horns give a higher efficiency (and a cleaner radiation pattern).

▶ *Different dimensions of the horn for the 6 cm band*

153,8 x 153,8 mm	H-plane 178,7 mm E-plane 132,4 mm	H-plane 210 mm E-plane 112,7 mm	
Corrected gain: 18,1 dBi H-plane phase centre 1,09 E-plane phase centre: 2,38	Corrected gain: 18,2 dBi H-plane phase centre 1,87 E-plane phase centre: 1,3	Corrected gain: 17,8 dBi H-plane phase centre 3,22 E-plane phase centre: 0,68	L=180 mm
Corrected gain: 16,9 dBi H-plane phase centre 1,39 E-plane phase centre: 3,21	Corrected gain: 17,2 dBi H-plane phase centre 2,3 E-plane phase centre: 1,77	Corrected gain: 16,8 dBi H-plane phase centre 3,59 E-plane phase centre: 0,94	L=129,7 mm
Corrected gain: 14,3 dBi H-plane phase centre 1,81 E-plane phase centre: 4,65	Corrected gain: 15 dBi H-plane phase centre 2,6 E-plane phase centre: 2,65	Corrected gain: 14,7 dBi H-plane phase centre 3,12 E-plane phase centre: 1,43	L=80 mm

Building of a Horn antenna without big machinery.

The next construction method is used for a 17 dBi reference horn antenna for 5780 MHz. (6 cm band). The method can of course also be used for other frequencies and other antenna gains. The reference antenna described here was based on the following principles:

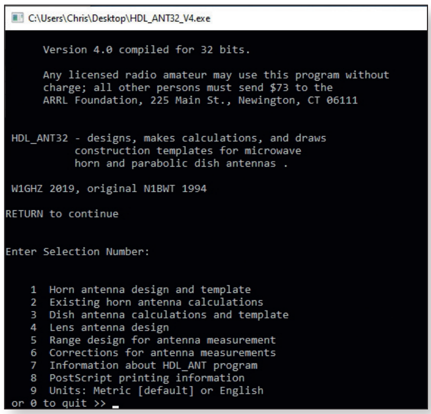
- good compromise between gain and size,
- can be made with one piece already present, 1mm thick tinned steel plate.

Software does the easy part of the job.

I used an old DOS software program written by Paul Wade N1BWT (now W1GHZ).

The program could be found as HDL_ANT, I get it running with DosBox in W7. Rather recently, an update is made by Paul that runs directly without DosBox, even under W10. Still free to use by radio amateurs, it can be downloaded here: *http://w1ghz.org/software/HDL_ANT32_V4.exe*

(Just unpack it and double-click on it, no further installation or so. I had to accept a notification by Windows Defender when running it the first time).



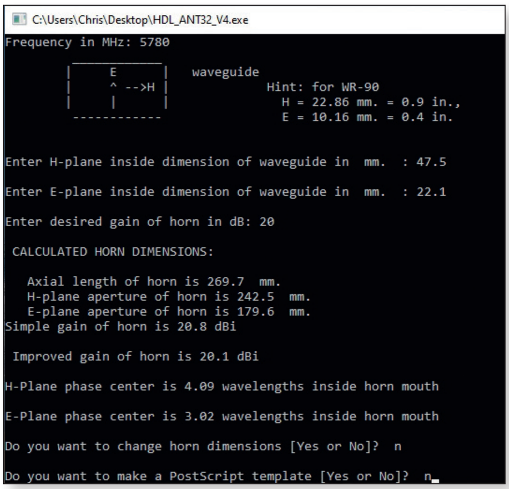
▶ *The program running under W10 with vintage appearance*

When using this program, the mouse is not applicable and the keyboard is used to enter data. So, for the 'horn antenna calculation' key in '1' (and <enter>).

With the help of this program, you can easily play with gain and dimensions. Numbers should not to be entered with commas but with points, it is after all an American program.

Because an existing piece of waveguide is usually assumed, it can be easily measured and entered. (If you do not have a waveguide, you can see which dimensions are suitable by searching in Google for 'waveguide dimensions'). If you do not have a piece of waveguide, you could make a similar box of metal sheet the same way as described below.

After entering the answers to the other questions, the desired data will come out and, if necessary, some dimension changes can be made. An existing horn can also be evaluated this way.



▶ *Example calculation of the 20 dBi horn for 6 cm band*

After that you can choose to create a .PS file with the data for the template. Yes, the program also provides the templates for the metal sheet. The .PS file is also readable as .txt, all data of the horn antenna in question is there as text. That .PS stands for postscript, nowadays it can be converted to a .pdf file with simple tools on the internet (such as *http://www.ps2pdf.com/convert.htm*) or simply try to open it with PDF creator.

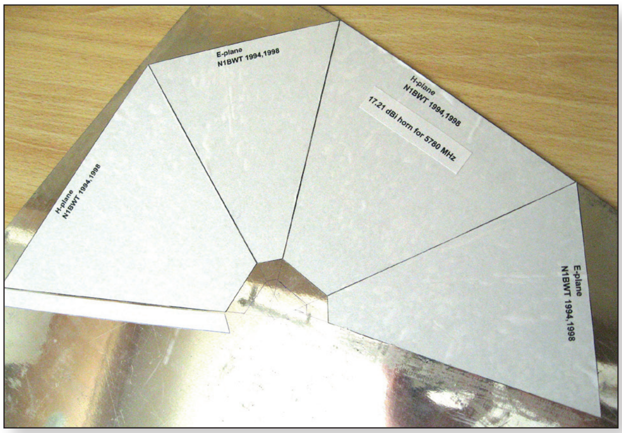
As can be seen in the picture, the program contains many more things than horn antennas, including optimal setups for antenna measurements, noise measurements or determining the focal point of offset dishes.

Defining what horn to make.

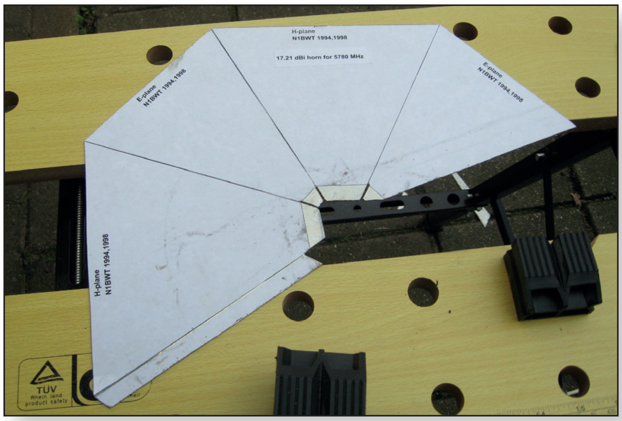
20 dBi is a nice round number but produces a fairly large horn. 3 dB less is easier to achieve. The template is printed on self-adhesive printer paper that is stuck to the metal plate.

A small additional flange (that forms an overlap to make soldering easier after folding) has been added by me (taking into account the one-mm plate thickness). Where the horn would be soldered to the waveguide, extra flaps were added (which unfortunately turned out not to fit, so they were afterwards removed).

The lack of a metal scissor and folding equipment resulted in a different method than usual: instead of cutting, sawing was done with a hacksaw and with a jigsaw.



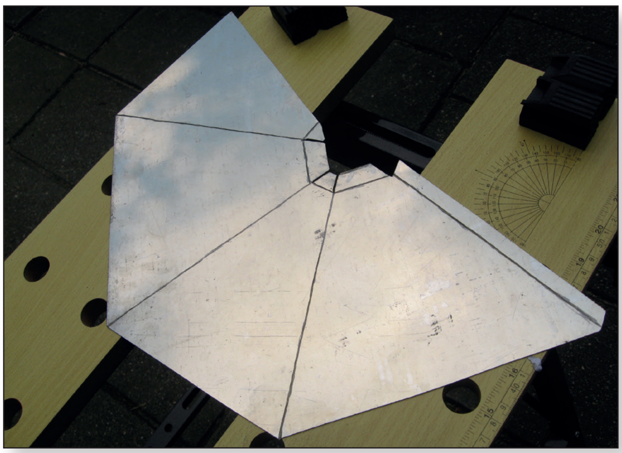
▶ *The printed .PS printed on self-adhesive paper and stuck to the metal plate.*



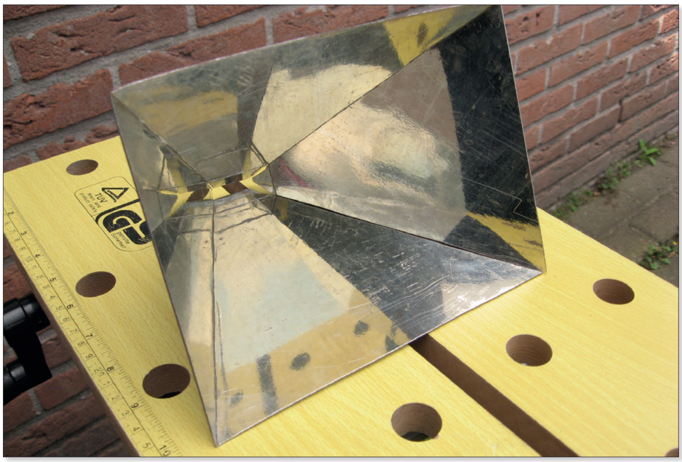
▶ *Following the outer lines, cut with a (hand) hacksaw and a jigsaw*

At the places where the plate should be folded, gutters were drawn in the plate by using a thin disk in a Dremel. So not completely through the plate, it is just to make folding easy.

The narrow edge (that forms the overlap) is clamped between two slats to have some grip to make the folding straight, the rest is folded by hand.



▶ *With the Dremel and a small disc through the lines the material partly milled away*

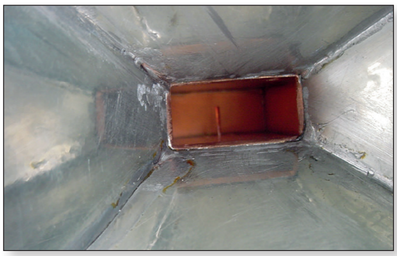


▶ *Because the material is thinner at the position of the folding lines, folding (by hand) is easy*

Now the overlap can be soldered, resulting in a solid construction.

The copper of the waveguide (on the inside) would be processed with a file to make the horn transition gradual. The intention was to fit the horn on the waveguide with the flaps on the outside and then be soldered together.

After folding the flaps, it turned out that the waveguide didn't fit. To remove the flaps, I just bended them back and forward a few times until they broke off. The horn could now be soldered directly to the edge of the waveguide, no flaps needed. A large (350 Watt) soldering iron was used for this. A gas flame could also be used instead. After that, some filing work was done on the inside, a Dremel proved also to be handy this time.



▶ *The transition of the waveguide to the horn after filing work*

A SMA connector was chosen to be used, one with four screw holes for mechanical stability. It would be handy to use M2.5, but M3 works too, if at least the holes in the connector are drilled a bit larger and the screw heads are somewhat reduced in diameter. This is done by clamping the screws in an electric cordless drill and then slowly moving the screw head back and forth on a file while the screw rotates.

The thread of the screws must not penetrate the waveguide, the length of the available screws has therefore also been adjusted. This is done by using an M3 nut and some washers covering the wanted length of thread. Then the screw in question is held with a pipe wrench, sawed off with a hacksaw and then filed flat to the nut.

▶ *Screw length corrected, and head diameter reduced*

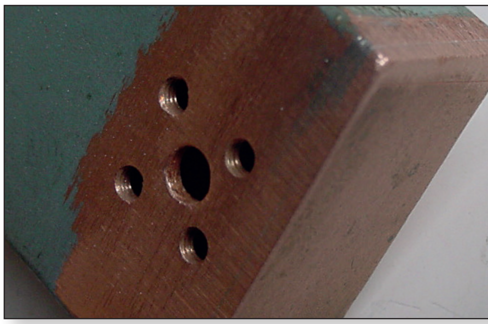
When securing the connector, the screws will be even with the inside of the waveguide. After the holes had been taken over and drilled in the waveguide, it was unfortunately also necessary to file the holes of the connector a bit.

The position of the probe (connector) is not unambiguous in the various designs, sometimes even with big differences. A matter of searching the internet or literature.

For example, Paul W1GHZ wrote an interesting article about this in QEX Nov/Dec 2006, in which he also performed various measurements that resulted in recommendations per waveguide.

The position of the probe is more critical than the length. The article with the table can be downloaded at *http://www.w1ghz.org/*

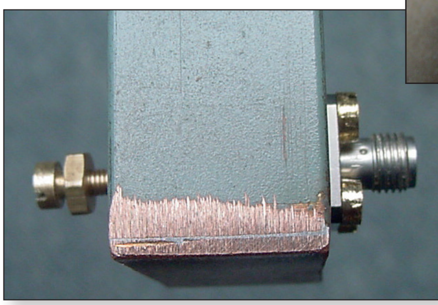
Since I used a piece of WR-137 waveguide, I made the distance from the probe to the back wall 8.5 mm.



▶ *Holes drilled and tapped, deburred and then closed the open end of the waveguide*

The probe itself is made from a strip of copper foil (coax shielding) wrapped around a drill bit and soldered, resulting in a very small tube. The diameter is 1.27 mm and the length is 10.5 mm. It is easy to solder to the connector pin. Because it does not have a large mass, it will not become skewed after a mechanical shock.

▶ *Copper foil rolled on a drill and soldered to close it. Then soldered to the SMA connector*



▶ *An M3 screw is placed in opposite of the probe to have some match adjustment possibility*

To have some adjustment, a screw could be added in opposite of the probe. In retrospect, the match without the screw turned out to be good. The horn antenna is broadband, the adjustment screw barely penetrated the waveguide.

▶ *Practical use of the 17 dBi horn, with a small transmitter and a camera as video source to a local repeater*

How realistic does software program HDL_ANT predict?

In order to test the predictive capacity of the program HDL_ANT against practice (and thus to get an impression of the reliability of a horn build according to that program), the gain of horn antennas actually measured (at Thales) was obtained.

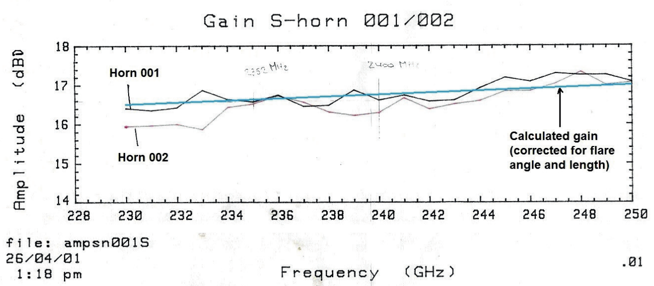
These are the reference horns that are used during the antenna measurement days that the VERON Meppel department sometimes organizes.

It should be noted here that two (in terms of dimensions) identical horns are made per band. Obviously, the gain is not the same over the entire frequency range: indeed, expressed in wavelength, the opening is larger as the frequency increases so gain increases.

The two horns for the 23 cm band deviates less than 0.2 dB from each other. With the 13 cm version there is (spread over a range of 2300 to 2500 MHz) a difference of up to 0.4 dB with a peak of 1 dB.

At higher frequencies it is demonstrated the reproducibility is difficult anyway.

Based on the dimensions of those horn antennas, I did a simulation with HDL_ANT and added the straight line in the picture.



▶ *Reference horns for 13 cm band*

The following data can be derived from the graphs:

	2353 MHz	1296 MHz
Predicted gain with HDL_ANT	16,5 dBi	14,7 dBi
Predicted gain with HDL_ANT (corrected for flare angle and length)	16,7 dBi	15,4 dBi
Real measured gain	16,5 dBi	15,7 dBi

In general, the gain predicted by the W1GHZ program is very realistic.

So when you make one and compare the received signal strength with an other antenna you have, it could be defined if that antenna has really functioning and gives the gain it claims. Some attenuators could be handy by performing such test.

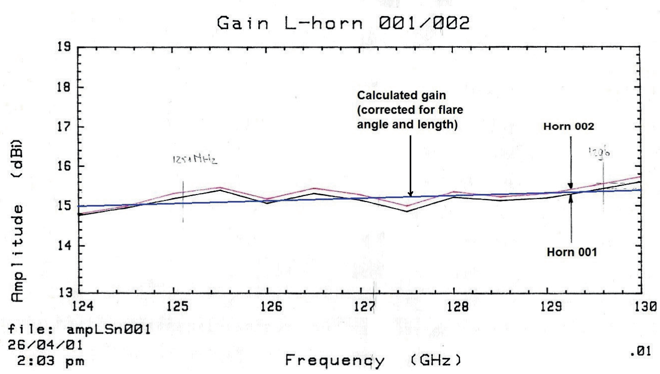
Other versions

Of course, constructions are possible with completely different materials. What about mesh? Sides of a cardboard box covered with aluminum foil. A small horn antenna from leftovers of PCB? Or made with a 3D printer? It is all not critical, but the larger versions are of course wind catchers.

In professional use sometimes the smallest sides (E-plane) are left open, or just with some supports. (For examples see *https://www.everythingrf.com/products/waveguide-horn-antennas/q-par/617-211-qwh-sl-0-17-4-a-sg*)

So likely these sides are only present for mechanical stability, leaving them away could reduce the windload a lot in case of larger horns.

Let's experiment!



▶ *Reference horns for 23 cm band*

A look at the History of BBC Outside Broadcast Vans

Brian Summers G8GQS

At the recent CAT20, a meeting by Zoom - what strange times we live in, I gave a short presentation about BBC Outside Broadcast vans and the place of our project MCR21 in that history. This is an expansion of that short presentation.

MCR21 was made in 1963 by Pye. This was the third of a fleet of ten state of the art vans, MCR19 to MCR28. Pye knew them as "main fleet scanners". These became the mainstay of the BBC's OB operations in London, Bristol, Cardiff, Manchester, Belfast and Glasgow.

The allocation of a particular vehicle was not absolutely fixed, and often started its career in one base and then would be moved to another BBC area. However MCR21 stayed in the London base at Kendal Avenue with the local title of Unit 1 - then later LO21, when it was converted to colour in 1969.

It is useful to look back at the history of the BBC's OB units, and to place those units in a timeline. A good reference point is the start of the BBC 405 line "High Definition Service" on November 2nd 1936.

This recent picture of Alexandria Palace shows the BBC transmitter mast now repurposed as a communications and cell-phone tower. Apart from the transmitter mast, virtually nothing remains of the original station - a ghost in the æther.

But even before this there was a significant event in 1931 when John Logie Baird took his 30 line scanner (camera) and installed it in a caravan to televise the Derby. This is arguably the worlds very first outside broadcast.

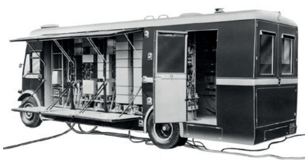
A word or two on the origin of the term Scanner as applied to OB vans. When the BBC high definition service started in 1936, the BBC employed a number of Baird staff who had used the term Scanner for the Derby event and they continued to use "the Scanner" to describe the BBC OB van and the term stuck. Mainly, I think, because it is easier to say than "outside broadcast van".

▶ *Baird's caravan by the winning post, note the mirror on the door, used to "pan" the scanner?*

A second lesser reason may have been that the Line & Field scan generators for the Emitron cameras were inside the MCR and not in the camera. Tony Bridgewater, who worked for Baird from 1928 and was with Baird at the Derby race, confirmed this as the origin of the term "the Scanner". He later joined the BBC Television Service as a Senior Maintenance Engineer under Douglas Birkenshaw, the first EIC (Engineer in Charge) at Alexandra Palace.

Once the BBC Television service was established at Alexandria Palace, the advantages of being able to take cameras to a remote event were clear and the BBC commissioned their first Mobile Control Room, MCR1. This was just in time to cover the Coronation of King George VI and Queen Elizabeth on the 12th of May 1937. It had three Emitron cameras the same as the studio ones. These were installed in a coach built body on an AEC Regal Greenline bus chassis. MCR1 travelled as one of a circus with support vehicles - the generator van, and a transmitter van. In 1938 a second OB van was added to the fleet, MCR2 along with a Merryweather fire escape ladder unit that was used to extend the outgoing circuit aerial to 80ft. There were now four vehicles in the circus! The RF link back to AP was usually on a band 1 frequency above the broadcast AP transmitter output.

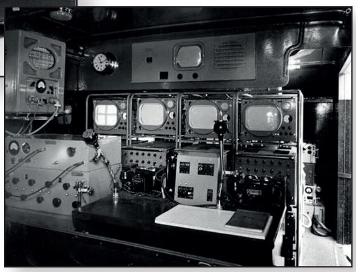
▶ *1936 "short neck" Emitron camera as used on MCR1*



▶ *MCR1 with the maintenance doors open*

This is MCR1. It had up/down doors on both sides to access the rear of the equipment racks. The idea of these doors was rediscovered in the 2000s for the Super Outside Broadcast Artics. A story for another day.

The BBC re-established the television service after the war and ordered two more OB units MCR3 and MCR4. MCR 4 arrived first just in time to cover the 1948 Olympic Games. MCR4 was built by EMI and had three of the new CPS Emitron cameras installed. These cameras had a 3-lens turret. They were built into a semi-trailer with a Transverse Layout which made good use of the space by using the same picture monitors for engineering, sound and production.



▶ Picture of EMI MCR4 (above)

▶ The inside of MCR4 looking towards the rear.

MCR3 was made by Pye and had the same transverse layout as MCR4. The transverse layout became the standard BBC OB van plan for the next 20 years. MCR3 had three Pye cameras with a 4-lens turret and they used the Photicon tube made by Cathodion, a Pye subsidiary.

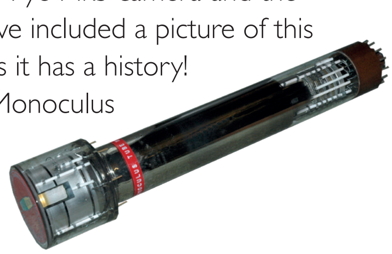
During this early period the camera tube technology, and the patents relating to them, determined what and how particular manufacturers made their cameras and what were installed in the OB vans they made.

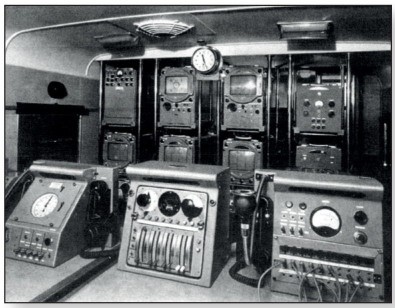
- Early classes of tubes in the UK:-
- EMI Emitron was a front scanned tube.
- EMI Super Emitron, front scanned tube plus Image section.
- EMI CPS Emitron, a rear scanned tube.
- Pye Photicon & PES Photicon, a front scanned midget image Iconoscope.

A brief list, a whole book could be written about tubes.

Vidicon tubes were available but the performance was not considered good enough for full broadcast work.

RCA invented the 3 inch Image Orthicon, and it was also made by EMI, EEV and Cathodion in the UK. The 3 inch tube was used in the Pye Mk3 camera and the early Marconi cameras. I have included a picture of this particular 3 inch I.O. tube as it has a history! The red Dymo label says "Monoculus tube" and it a tube from one of the cameras in Joe Rose's Pye Outside Broadcast van Monoculus. (see CQTV 75). This van has a lot to answer for, it appeared at many BATC events in the early 1970s and it is directly responsible for my long involvement in amateur television. This ultimately led me to join the BBC and get paid for what was my hobby. Readers may be interested to know the BATC has a long involvement with amateur OB vans going back to the first "Matilda" (see CQTV 31)





▶ Interior or MCR12 by Pye (right) with 3 cameras, a 4 channel vision mixer and an 8 channel sound mixer, in 1952.

▶ MCR12 (below) in 1965 at the BBC Training school at Wood Norton, near the end of its service life.

The BBC continued to expand the OB fleet. It was important then, as it is now, to encompass the events all over the UK. During the early 1950s, MCRs 5 to 12 arrived - these were of the same semi-trailer constriction. They were made by Pye & Marconi. MCR7 was the first one to be equipped with the Marconi MkIb camera which was built under a patent exchange with RCA. This camera used the 3" I.O. tube as developed by RCA and it was made in the UK by EEV. (the English Electric Valve company)

The next milestone in OB development was the new design for MCR13 to 16. They were the first BBC mobile control rooms of post-war design to mounted on a self-propelled Bedford 7 ton chassis. The standard camera compliment was three Marconi MkIII cameras which were designed to use the newly developed 4.5inch I.O. tube. However the cameras were initially fitted with 3 inch tubes, as the 4.5 inch ones were not fully developed in time. MCR13 was delivered to the BBC North Region

base in Manchester for its exclusive use**. This group of four OB vans were the inspiration for the Dinky toy model, now quite sought, after and the cutaway drawing published in the Eagle comic.

This brings us to MCR21 and its nine siblings. This design represented a major step forward in the technology and facilities that could be accommodated in a mobile control room. The basic design was still a transverse layout with the production team sitting behind and above the vision control engineers, looking forwards over them to the common monitor displays. There was extra seating available behind production and a drop down seat for the lighting director. The front section was an engineering equipment area, all of this fitted in just a 24½ ft length. These final ten black & white OB vans, known by Pye as "Main Fleet Scanners", represented the pinnacle of BBC monochrome OB van design.

The restoration of MCR21 is proceeding well

The principle technical equipment installed:-

- 4 Pye Mk6 Image Orthicon cameras using the improved 4.5 inch tube and they were hybrid construction using transistors and valves. There was provision for a 5th camera.
- A ten channel solid-state vision mixer with wipes and caption keying type MX1/501
- A twenty channel solid state sound mixer with three groups and main faders.
- As well as the 4-camera preview monitors there were two switchable preview monitors.
- A seventeen inch transmission monitor.
- Seating for four vision control engineers - one for each camera with individual camera control panels which have set up controls and an Iris & Lift joystick. The Pye Mk6 was not the first camera to use an Iris & Lift control, but this could be the first time it was used in a BBC OB installation.
- A Musa jackfield was installed - possibly for the first time in a BBC OB van.

** A report for this was in Practical Television, July 1955.

- A sophisticated talkback system with production TB, Programme Sound, Engineering talkback to cameras, Commentators talkback, a telephone exchange, a loudspeaking telephone to a "studio" set, producers secretary talkback and control lines back to a BBC studio.
- Main and reserve triple standard SPGs with genlock, crystal, or mains lock for 405, 525 or 625 lines. It was also possible to lock to a remote incoming 50Hz reference from a remote studio.
- Remote controlled ¼ inch twin channel tape recorder type EL3503 in a custom housing.
- BBC designed audio line identification unit type RP4/1
- Six BBC waveform monitors type - MN6/510 and two Tektronix 515 oscilloscopes.

The BBC started colour transmissions just 4 years later in 1967 and this was the end for most of the monochrome fleet, some lived on for a while in the regions, and some were converted to colour. MCR21 was one of the lucky ones. It had two PC60 cameras installed in July of 1969 in time for its first colour programme on the 1st July - the Investiture of HRH the Prince of Wales. Nothing like being thrown in at the deep end! But to be fair it was a minor role. Next time I will talk about the early colour scanners and on to recent times.

Restoration of MCR21

We are taking MCR21 back to it's original 1963 state, or as close as is feasible. It has been resprayed in the correct green with a grey stripe and the final work on the body and engine is being completed. As I write the engine has been started and MCR21 has moved under it's own power for the first time in 23 years. We will be able to start rebuilding the interior and re-fitting the equipment.

Further information can be found on our websites:-

- *www.mcr21.org.uk* — About MCR21
- *www.bttt.org.uk/our-trust/* — About the Trust
- *www.tvcameramuseum.org* — For camera details.
- Our YouTube channel. — Search "mcr21"
- *www.bbc.com/historyofthebbc/research/mcr21*
- *www.tvobhistory.co.uk*

MCR21 is owned by our Trust, the BTTT which is a Registered Charity. We are partly funded by the Heritage Lottery Fund and donations from Friends of MCR21.

HERITAGE FUND

I would like to thank my fellow trustees, our supporters and volunteers for their help in preparation of this article.

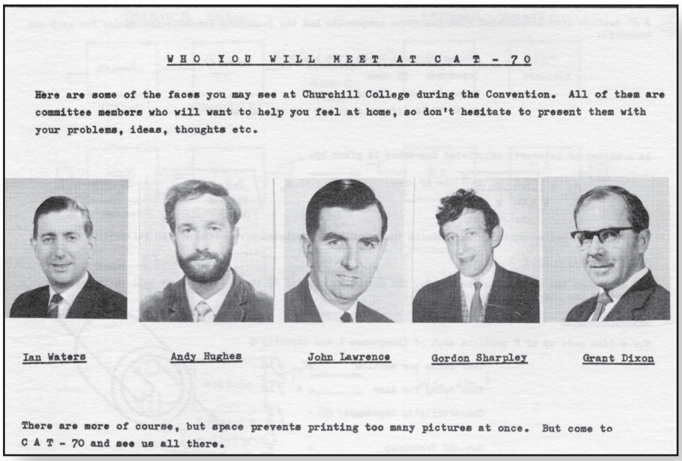
Ian Waters, G3KKD - Silent Key

Ian Waters, G3KKD sadly passed away in January 2021.

Ian lived in Ely, Cambridgeshire, England, and was involved with ATV for most of his life, in 1945 at the age of 15 he joined Pye Ltd. as an apprentice.

Pye was one of the major designers and producers of television studio products in those days. He remained with the company for most of his life in the position of Professional T.V. transmission engineer.

During 1945, he built a five-inch television set out of parts from a scrap dump this was followed by building a monoscope picture generator and then a Photicon Image Iconoscope camera, vision mixer etc. and so it went on. He joined the BATC in 1952 and was elected chairman in 1967.



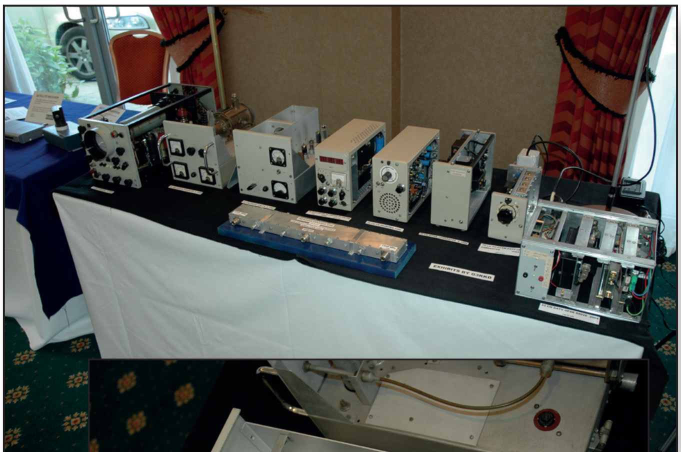
W H O Y O U W I L L M E E T A T C A T - 7 0

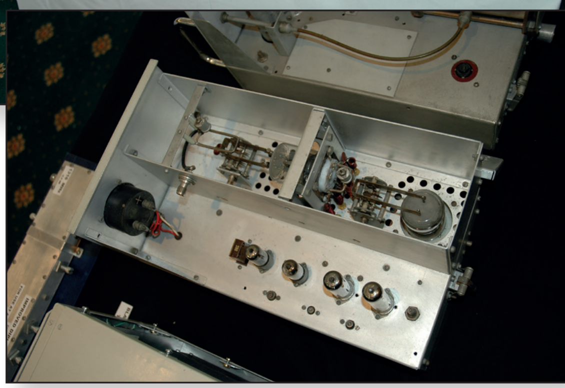
Here are some of the faces you may see at Churchill College during the Convention. All of them are committee members who will want to help you feel at home, so don't hesitate to present them with your problems, ideas, thoughts etc.

Ian Waters   Andy Hughes   John Lawrence   Gordon Sharpley   Grant Dixon

There are more of course, but space prevents printing too many pictures at once. But come to C A T - 70 and see us all there.

Ian's callsign was G6KKD/T, and later G6ADE, transmitting with high power mainly on the 70cm band and involved with the East Anglian TV Net. They also used to have stands in many amateur radio rallies demonstrating ATV.





Ian was a prolific author for CQ-TV and always offered helpful advice to beginners. One would have excused Ian from avoiding the post analogue era, but he didn't, and fully embraced all of the BATCs digital projects, was currently monitoring the QO-100 wide-band downlink and was well on the way to getting his uplink system put together, working on this over Christmas. His illness was short and having been persuaded to go to Addenbrooke's Hospital in the New Year, suffered his fatal heart attack there on the 10th January.

ATV in the Cambridge area will be much quieter now and Ian will be sadly missed.

GB3FT Digital Repeater upgrade

Tim Forrester G4WIM

Background

GB3FT was originally built in 2016 from readily available components and supported reception on 1249MHz using either analogue FM or digital DVBS at 2M symbols.

It is still located in the Blackpool area at the QTH of Steve, G3WGU, who is the keeper.

The block diagram below shows the original GB3FT and how the video had to become analogue before being re-encoded resulting in some loss of picture quality.

Initially, an Alford slot was used but this was quickly replaced by a slotted wave guide antenna resulting in about a 7dB improvement in path loss capability.

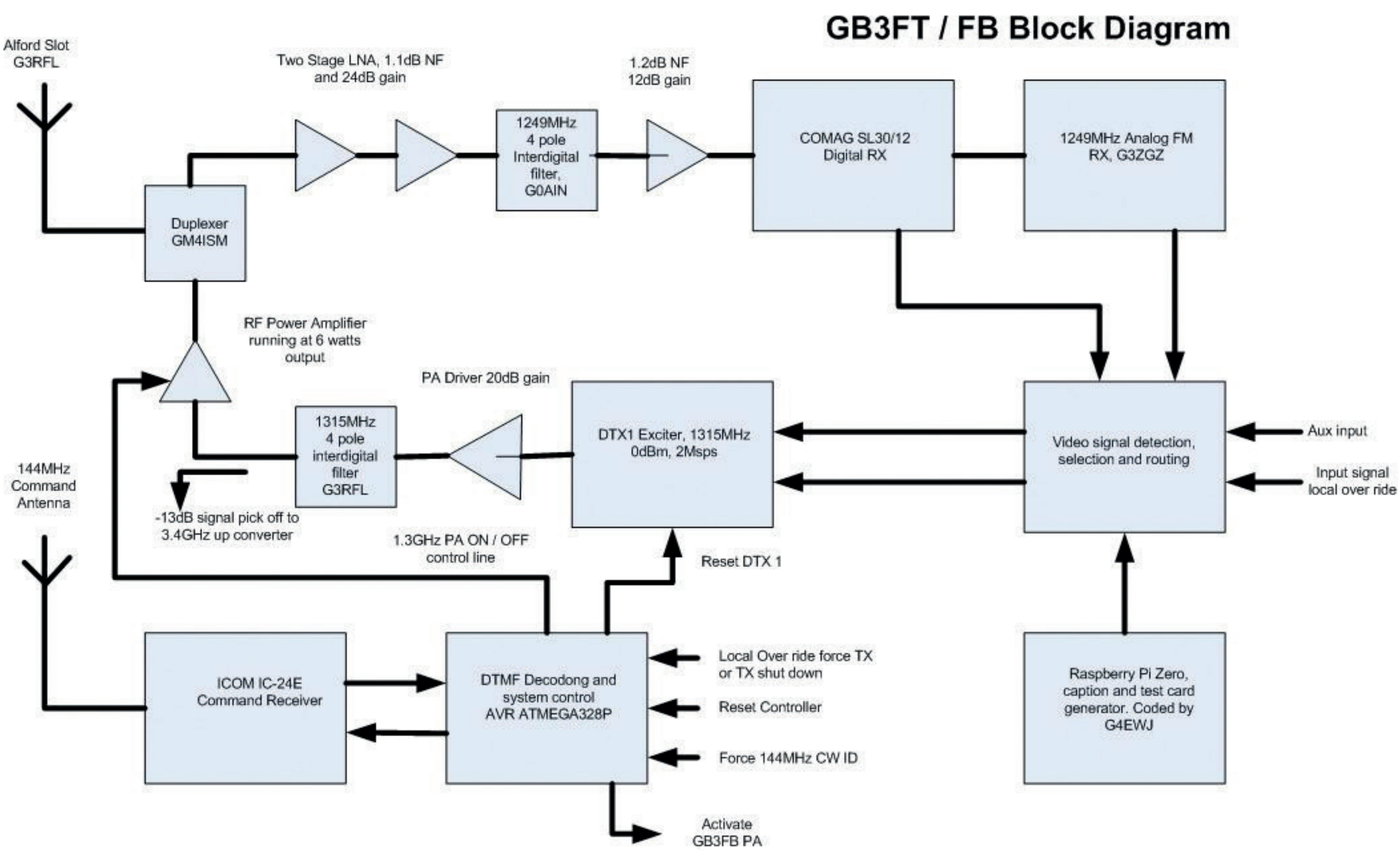
The transmit hardware comprised of a DTX1 exciter driving a 10 watt 'brick' amplifier and a duplexer kindly supplied by GM4ISM.

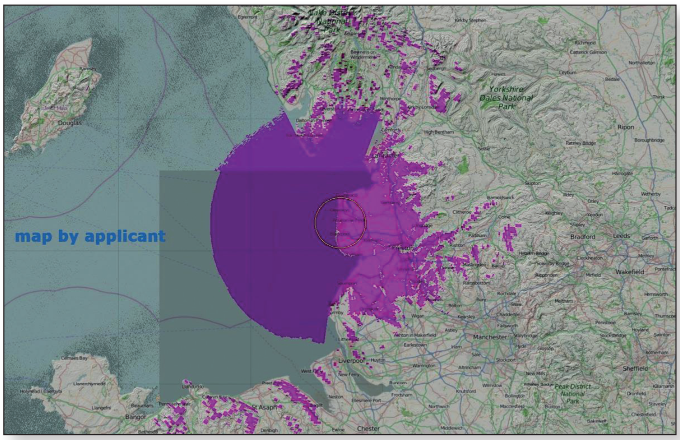
The receiver comprised a Comag SL30 modified with external preamp and signal detection to feed the control logic.

Remote control was, and still is, provided by an Icom IC24 handheld connected to a DTMF decoder running on an Atmel Amega 328.

A BATC stream was provided by another Comag receiver and a Raspberry Pi. While this worked, it did tend to crash frequently.

Given the symbol rate, bandwidth required, necessary C/N and receiver performance the threshold for signal detection was -103dBm with FEC 1/2.





The coverage was found to match the original predictions, but there were some coverage holes around the Fylde coast due to local obstructions and multi path – especially to the north of the repeater.

Time moves on

About 18 months ago some tests were performed to see how well an upgraded repeater might perform using more modern technology.

Specifically, a Pluto exciter running at a symbol rate of 500ks, DVB S2 and H265,– essentially what is used by many amateurs through Es'hailSat.

The results were in line with calculations ie a 9dB improvement in path loss capability but surprisingly no significant problems caused by intersymbol interference over marginal paths.

The decision was taken to perform a major upgrade to GB3FT to improve both the TX, RX and video quality by going entirely digital with no analogue signals involved.

As a result of this decision the DTX1 was replaced by a Pluto running F5OEO firmware which would accept a RTMP stream.

The Comag was replaced with a Ryde receiver whose HDMI output was split two ways using an HDMI splitter.

One path going to a Chinese H265 encoder, set to H264 and RTMP streaming to the BATC streamer, the other to a second encoder, set to H265 and a RTMP stream pointing at the Pluto.

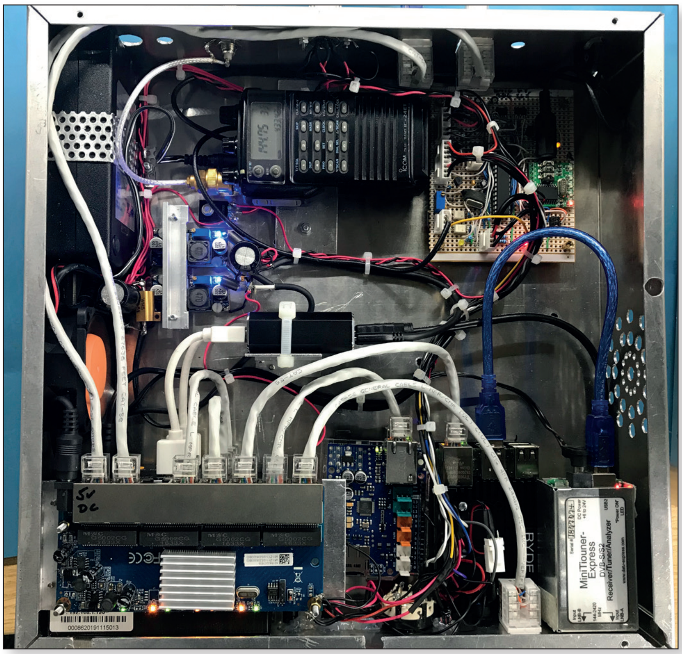
The Icom TX/RX on 144.75MHz and controller controlled the TX PA on/off etc but is now used to send serial commands to change the resolution settings on GB3FT H265 encoder between 1920x1080, 1280x720 or 576x432, the default being 1280x720.

An Arduino Uno was used with an Ethernet shield to convert these serial commands over to IP for use by the H265 encoder.

IP connections to the outside world, Pluto, Ryde, serial to Ethernet and the two H265 encoders are handled by a 1G bit eight-port Ethernet switch.

The diagram over the page shows the interconnections between the major components.

The picture below shows the internal assembly of all the above components along with a 12V 2A power which runs everything except the PA.

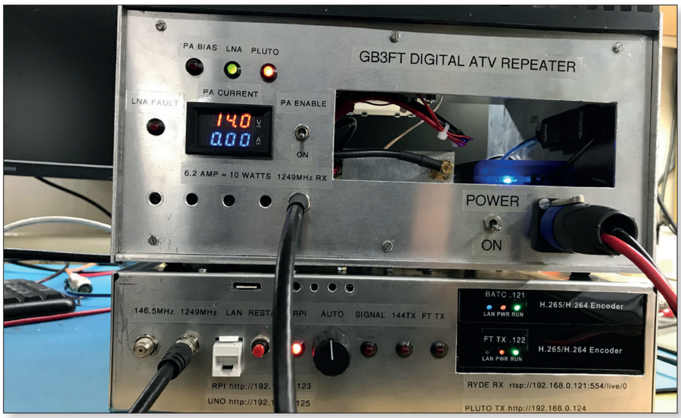


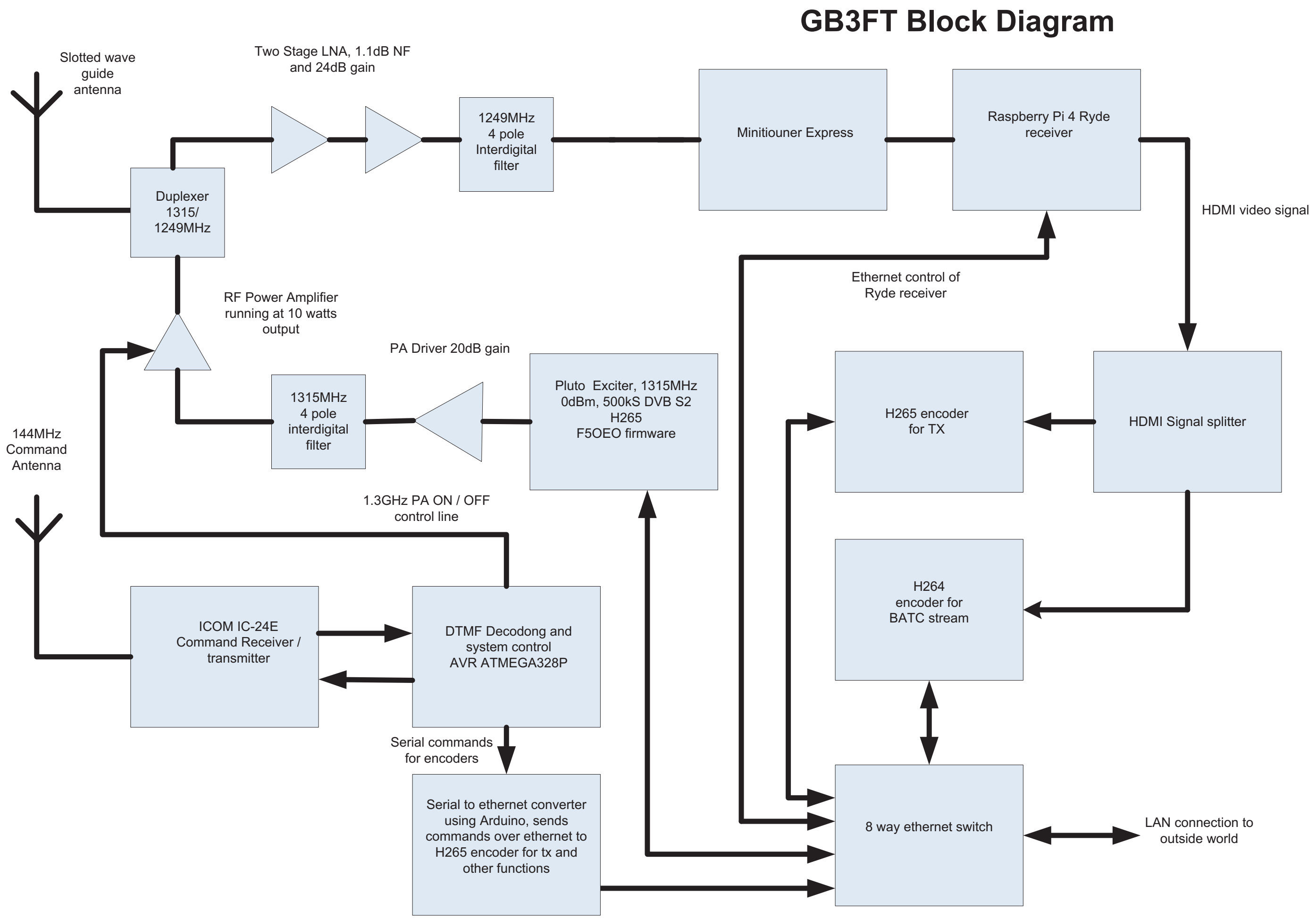
Top left is the PSU, top middle Icom control transceiver, top right control logic and DTMF decoder. Middle left, a small cooling fan, then 5V PSUs for Ryde RX, HDMI splitter and Ethernet switch.

Lower left eight-way Ethernet switch with two H265 encoders beneath it (obscured from view by the switch).

Middle bottom serial to Ethernet conversion, right bottom Raspberry Pi4 and DATV Express RX for Ryde.

The picture below shows how the original GB3FT was adapted to accept the new hardware. The large hole where the DTX1 was located has now been filled in with mesh.





The little slot above the LAN / Restart is for the Raspberry Pi 4 memory card. All the IP addresses or the internal components are also shown for maintenance – but to date, nearly six months on - everything just keeps on working.

Here is a list of frequently used DTMF commands and how to use them.

DTMF commands are sent on 144.75MHz and must be completed within 10 seconds.

The 144.750MHz TX will normally reply with a K or SK depending on the command.

If no response from the 144.75MHz TX, wait at least 10 seconds before trying again.

It can take up to 20 seconds before changes are seen on the BATC streamer.

- 12390 = GB3FT transmitter shut down, sends SK to confirm
- 12391 = GB3FT transmitter on air for 1/2 hour, sends K to confirm
- 12397 = Toggles Ryde RX status banner showing received station, MER and D number. Sends K or SK to confirm
- 12304 = Sets definition to HD 1920x1080, sends K to confirm, VLC (if used) will automatically re-size
- 12305 = Sets definition to 1280x720, sends K to confirm, VLC (if used) will automatically re-size
- 12306 = Sets definition to SD 576x432, sends K to confirm, VLC (if used) will automatically re-size

Other DTMF commands.

DTMF commands starting with 1239

- 12393 = Power cycles H264 BATC streamer encoder, sends K to confirm
- 12394 = Power cycles Pluto, sends K to confirm
- 12395 = Power cycles Ryde RPi rx sends SK then K to confirm
- 12396 = Power cycles H265 GB3FT encoder, sends K to confirm
- 12398 = GB3FT on indefinitely, sends K to confirm, command 12390 or 12391 resets

DTMF commands starting with 1230

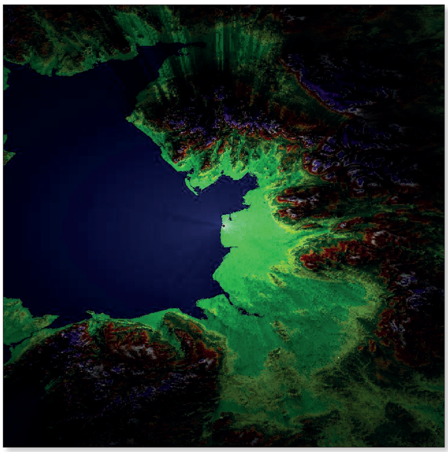
- 12309 = H264 BATC encoder soft reboot, sends K to confirm
- 12301 = Ryde rx app restart, sends K to confirm. Useful if Ryde not loaded.
- 12302 = H265 GB3FT encoder soft reboot, sends K to confirm

Results in practice

Since the upgrade picture quality and coverage has been greatly improved in line with expectations.

Measurements on the bench show no signs of RX desense when the TX is on and the RX sensitivity threshold is now -113dBm for 500k symbols FEC1/2 or about a 10dB improvement.

As a bonus the local 'black holes' have been filled in with several dBs in hand and coverage now extends down to the Wirral much to the delight of G4EWJ.



G0MJW provided the coverage prediction shown here for 500k symbols and has proved to be fairly accurate as far as we can tell.

Future enhancements

Currently when the repeater is not in use it shows the following caption which is generated by the Ryde RX. While this caption is functional it is a little boring and would benefit from being animated.

Therefore it is hoped to replace the simple HDMI splitter with some sort of HDMI switch to enable other media to be displayed when the repeater is not actively in use.

Conclusion

I'd like to say a big thank you to the BATC committee for their generous bursary donation which helped fund this upgrade and the generosity of G3YTI, G8WZW, G4YLB, G4MXR among others.

G0AIN for helping machining some of the filters and other mechanical items.

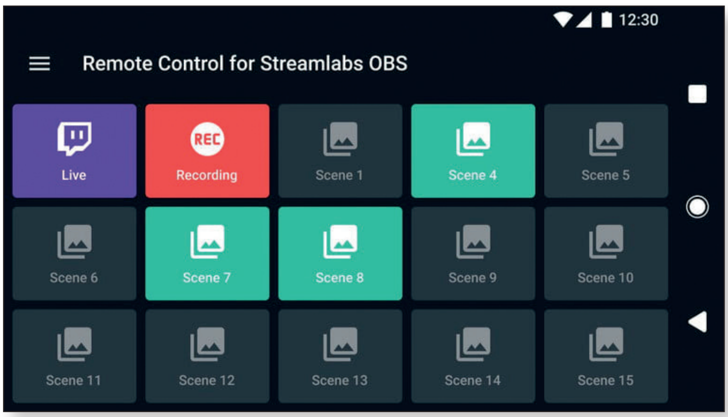
Finally, a big thank you to Steve G3WGU for hosting the repeater and the electricity to keep it running.

Alternatives to the Elgato Streamdeck

In the last edition of CQ-TV we featured the Elgato Streamdeck - a useful hardware add on for controlling all your production tools, including OBS and vMix. However the Streamdeck is not cheap!

There is a new version of the Streamdeck out - the Mini, - but with only six buttons accessible at any one time, it's a little limited.

Fortunately there are other options, including Streamlabs Remote Control, available for iOS and Android.

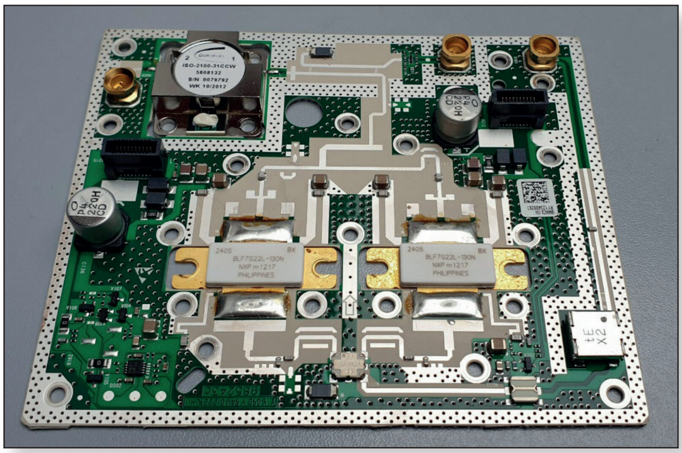


For a full list of alternatives, along with all the pros and cons for each, please visit:
https://www.digitaltrends.com/gaming/best-elgato-stream-deck-alternatives/

Modifications to Nokia PA PCB

with 2 x BLF7G22L-130N for 2.4GHz

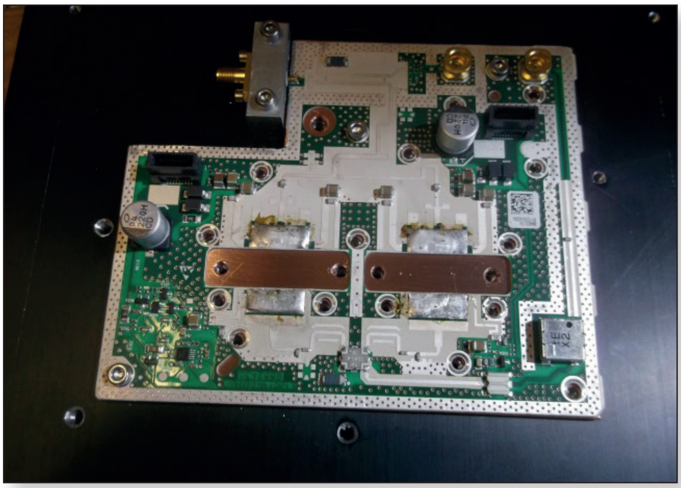
Jim Smith G7NTG



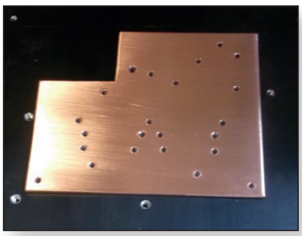
First thing remove the two transistors and output circulator from the PCB. Remove the transistors on an earthed metal sheet with an earthed soldering iron by melting the solder on the transistor tab and carefully lifting it with a jeweller's screwdriver.

The transistors should be tested with a meter such as a Fluke 75 on the continuity range with the black wire on the source and the red wire on the gate and drain. Both should read open circuit look for solder shorts between source and tabs and clear them if necessary.

Cut off the corner of the PCB where the circulator was to allow the fitting of a connector block.

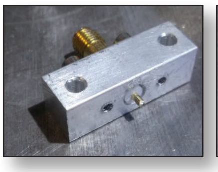


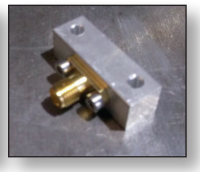
Cut a piece of copper 3mm thick the same size as the PCB to act as the heat spreader.



Drill the heat spreader and heatsink to take the PCB and mark the positions of the transistor fixing holes and drill them as well.

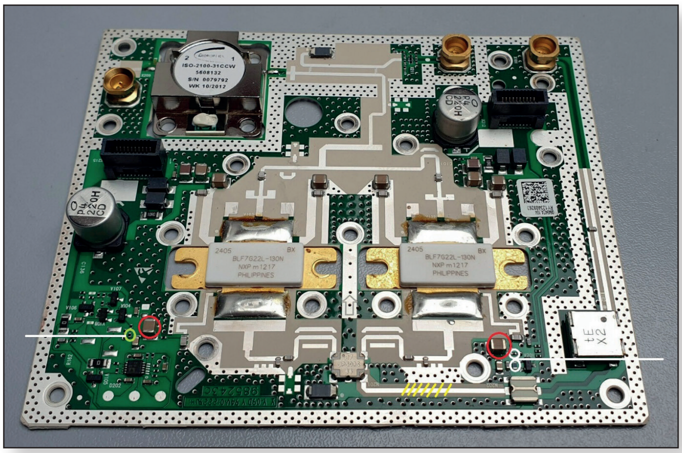
Make an output connector block so that the SMA pin is the correct height above the heatsink.





Remove three resistors from PCB (circled).

Cut the PCB track at the input to the Xinger hybrid coupler marked yellow to allow input connection.



Make bias input connections to high ends of capacitors circled in red to connect to bias PCB.

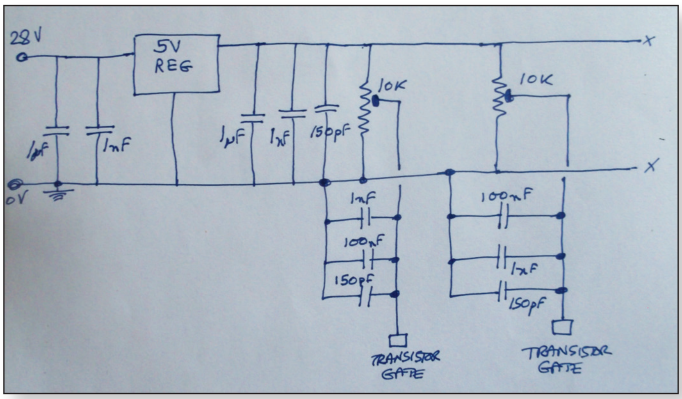
The bias pcb consists of a five-Volt regulator to drive 10k, 10-turn pre-set potentiometers with plenty of decoupling.

Screw everything down to the heatsink.

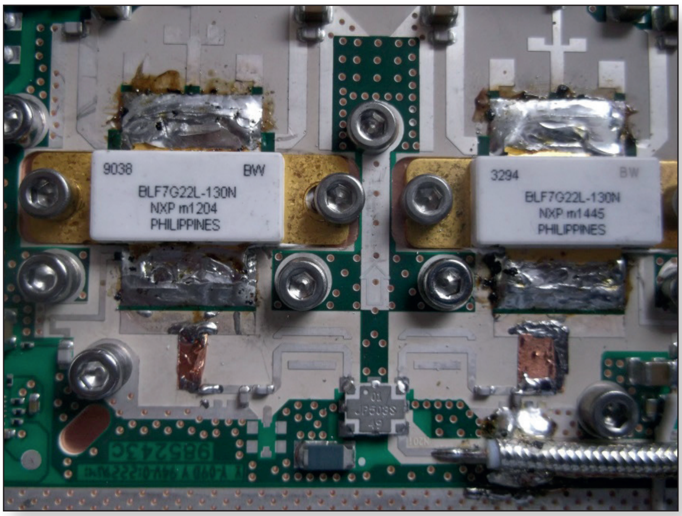
Screw down and solder in the two power transistors.

Set the bias to one Amp per device – two Amps total

The bias PCB I used also provides bias for both stages of the Andrew driver amp I used.



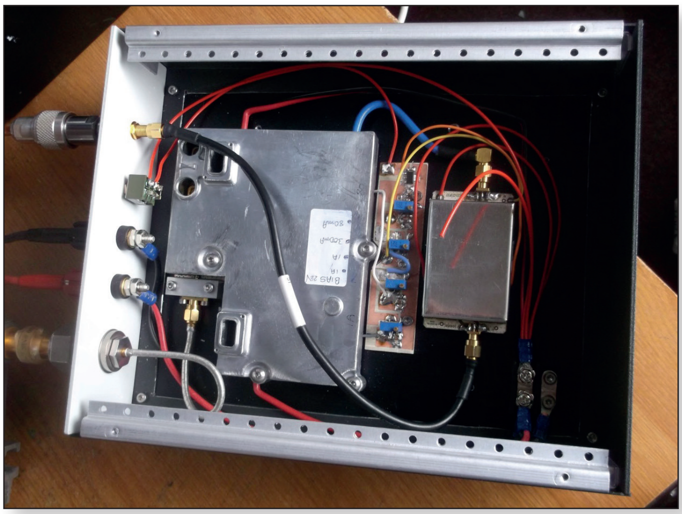
▶ *Circuit of bias PCB*

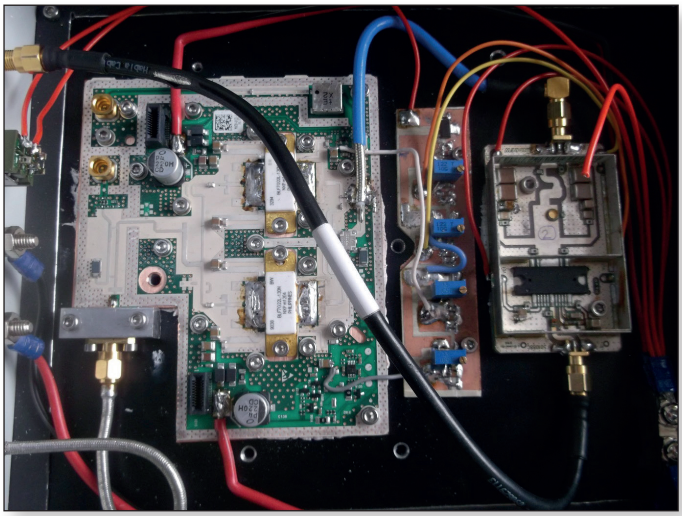


▶ *Snowflake tuning of gate circuit.*

If you have the screening cover then this need cutting and fitting and needs slots cut to allow entry for the cables – bias, power and rf input.

I got 170 watts at 28 volts 12 amps saturated power for 30 watts drive.





P1dB is about 100 watts for about seven watts drive at about eight Amps.

Put in this type of case ignore the 100W!

If you have any questions; would like bigger pictures; or would like me to build you one for £400 + postage (subject to availability - there are still some PCBs available at the time of publication) please contact me at *thebigclunk@virginmedia.com*

PLEASE NOTE THAT TESTING THIS AMPLIFIER WITHOUT THE SCREENING COVER IS VERY DANGEROUS FOR YOUR EYES. FIT THE SCREEN EVERY TIME WHEN TUNING AND TESTING!

My Portsdown4/Langstone combo

Gareth Evans G4XAT

At the 2019 Didcot mini-convention I came away with several ideas for yet more projects. Not least, Colin G4EML, was demonstrating an early version of his Langstone transceiver, based on a Raspberry Pi and an ADALM Pluto. Very interesting indeed and I followed its development in the following months.

Once Dave, G8GKQ, joined forces and the A27Portsdown/Langstone combo started to come together, I ordered a RPi4 and its matching touchscreen. At this stage the project was changing rapidly with better performance, range and functionality regularly appearing.

I needed a case to suit the new project having initially made do with a simple pair of stabilising feet I designed and printed to save the touchscreen from damage. Browsing on eBay for 'sloping front instrument cases' I happened across an ideal candidate sold without its aluminium panels for a very reasonable £5.95. It was clear that at least the RPi and screen would fit, and hopefully a lot more.

I bought three (well why not?).

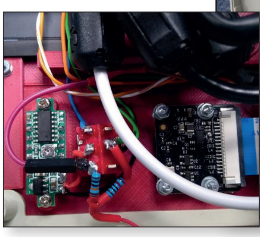
With the box in my hands and the technical drawings for the RPi screen printed, I set to designing a suitable screen panel, while giving a lot of background thought to its end use (home and /P). Decisions were made to include enough to make it a standalone project, requiring just external DC and the external amplifier and switching to suit the chosen band.

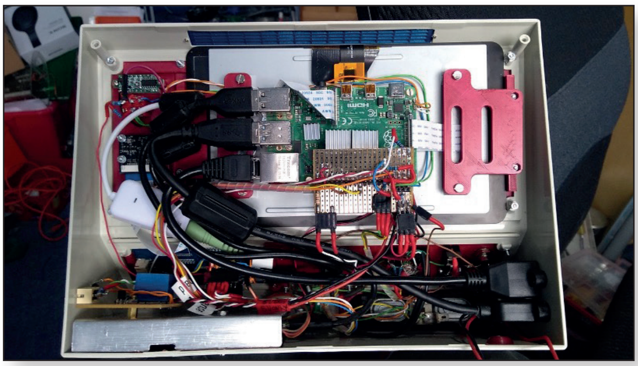
I shared my enjoyment of the project with my friend Martin, G4FKK, and he bought the same case. The design progressed with the panel fitting nicely into four-fifths of the front panel. So, what to fit in the remaining fifth?

A built-in voltmeter can be very handy for /P use.

I fitted one in my Portsdown 2018 and it has, on occasion, reminded me to start the generator or pack up for the day. As on my earlier unit, I used a centre-off switch to select DC in, off and RPi voltage, given how it dislikes low Vin its helpful to know if it's low for some reason.

Now that the project was DATV capable I chose to fit a RPI camera on the front panel, so it's a bit like a laptop camera view. One less thing to leave behind and a great standby video source. I bought a third Pluto and a 0.1ppm TXCO board





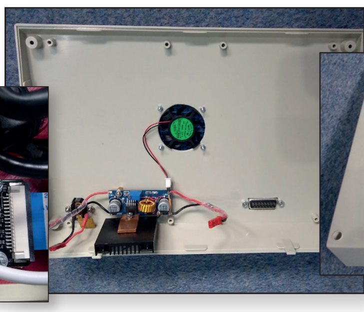
offered by a German amateur and his young son. The Pluto was removed from its blue plastic case and fitted in the bottom of my box, using copper foil tape as a ground plane, brass standoffs and an aluminium clamshell lid. Short, decent quality USB leads were bought (Anker brand) to connect the Pluto to the RPi. Clip-on ferrites of various sizes were applied to all the USB and network leads.

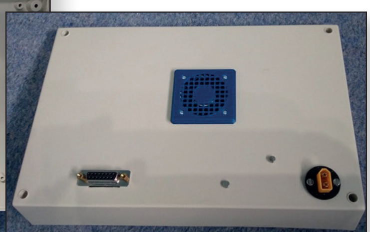
A panel mount short external USB lead was sourced from eBay and Martin shared a short RJ45 panel mount lead to complete the external connections. DC is supplied via a XT60 connector, mounted in a 3D printed housing.
These are a great power solution and are in use all over my shack, including power-hungry things like HF radios and all my amplifiers.

Internally I decided on a speaker and amplifier and found a lovely little three-Watt Class D board that included an on/off volume control. For a speaker I reached into my 'it will come in useful one day pile' and picked out a nice stereo pair of slim-line speakers taken from a dead flat-screen telly.

These sounded great on the amp so a front grill and back mounting plate were designed and fitted. (I learnt how to draw proper grills in my CAD package).

Keeping the RPi cool was clearly a requirement based on running temps seem by other users, so I looked through my fan stock, choosing a small 12v unit originally fitted into its own heatsink. A mount and grill for this were designed and printed.





Running on five volts, it blows just enough air onto the RPi heatsinks to keep it under 55C even when working hard. A vent-out grill was designed and printed for the top of the box, along with stabilising feet for the bottom. Not entirely necessary but wise I felt as the case wasn't designed to stand upright as now used.

The front control panel also evolved, offering a power available LED, master on/off switch, a CW key and socket (micro-switch, an idea borrowed from Hans Summers QRPLabs QCX transceiver). External headphones (from the audio dongle so amp can be turned off if not needed) mic in, plus a standard four-pin mic socket for a handheld unit with PTT.

Martin mentioned he had seen an Arduino used as a mouse simulator, so he wrote some code to replicate a mouse (Colin did a similar thing a few weeks later). A pair of tactile buttons were mounted on a piece of Veroboard, along with a rotary encoder (custom 'BATC' knob) and the panel was beginning to fill up.

Martin had previously told me about his extensive use of Nextion touchscreens. This sounded like another option to include so I reached into the project box for a 2.8" screen originally bought for uBitX conversion (still pending).

To my delight the screen fitted the remaining space very nicely, so a matching style bezel and fixings was designed and printed. Martin wrote the required code to measure various voltages (including one from the outside world for SWR warnings or similar – the screen flashes red) and to double up on the mouse buttons, an eight-bit output port and the new 'lock' function.

Switching back and forth between the two programmes can cause the Pluto to re-boot, so I 'remoted' its two blue LEDs onto the front panel.

Some standard five-mm ones were tried across the existing Pluto ones, both lit up so they exist in parallel with a small series resistor. This was based on my remoting of the RPi red and green LEDs to the front side panel for the same reason – it's good to know what is going on.

The green LED proved very difficult to remove, so I left it there and used a yellow one for the front panel.

Its lower Vf means it lights up fine. The red one was happy in parallel. External control is provided by a single five-volt relay and driver, closed by the PTT signal.

The eight-band expansion is available via a 15 way D on the back panel along with 12V DC for relays etc. Power for the whole unit is from an eBay three-amp step-down SMPSU, fed via a polyfuse.

It plugs in/out of the RPi via the front panel switch using silicon wired JST connectors, which, like the XT60s, are very handy. The fan is also plug-in, allowing for easy maintenance.

I finally buttoned it up (screwed the top on) around the beginning of November and it's been on ever since.

In use, it's great and with ongoing software modifications in just keeps getting better. I've had NB QSOs on it via 4m, 2m and QO-100.

I've received my own DATV and Martin's back from QO-100 and even joined in the Thursday evening DATV, admittedly with the audio a 'bit loud'. Although I didn't write any of the software, I do feel I have crafted a useful piece of amateur gear that in terms of cost and functionality is simply 'second to none'.

One box does it all, from 70MHz up to 6GHz (and above via harmonic mixing). Just HF missing - Lime mini perhaps? But I did buy three cases, and you may have heard of a Red Pitaya. Using another RPi and a touch screen, this SDR will cover from top band to 50MHz. And lots of the parts I have already designed can be re-used, just what to replace the RPi camera with

A huge thanks to Dave, Colin and Heather plus many others who have contributed bits and pieces to enable the project get where it is now.

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 82

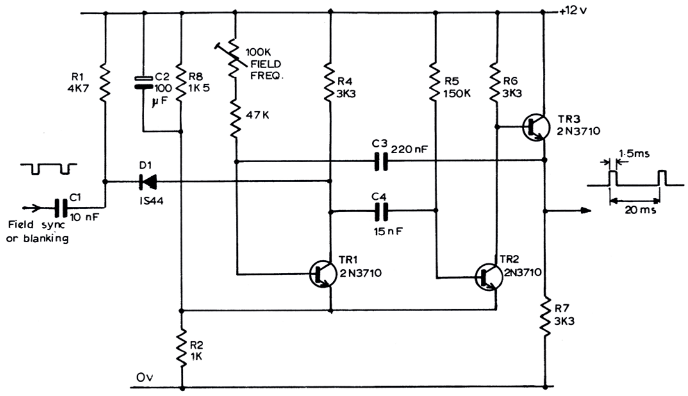
The first technical article in CQTV 82 was John Lawrence's 'Circuit Notebook'.

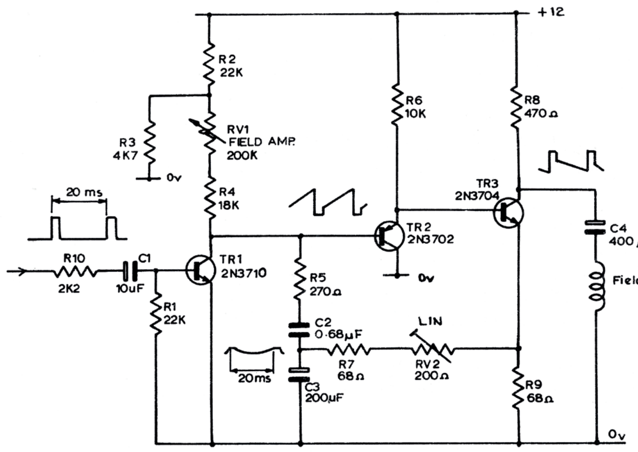
Having described the operation of a vidicon camera line scan circuit in the previous issue, this time he covered the equivalent field scan circuits. The scan coils were basically inductive at line frequency, but at field frequency it was their resistance that was the important factor.

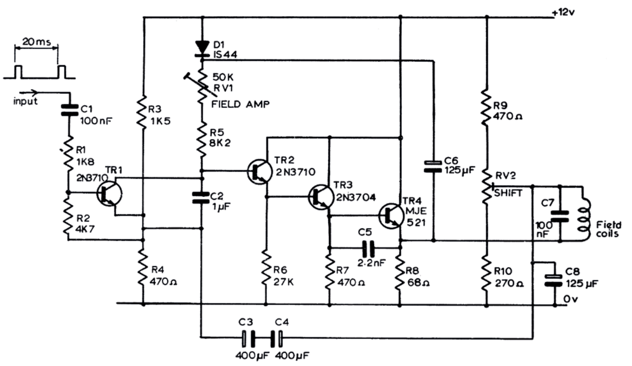
As a result, the circuit required was not a case of changing component values, but it worked on a different principle. A multivibrator oscillator formed by Tr1 and Tr2 generated pulses at field frequency and could be locked to either a sync pulse generator or the local electrical mains supply by introducing negative pulses at C1.

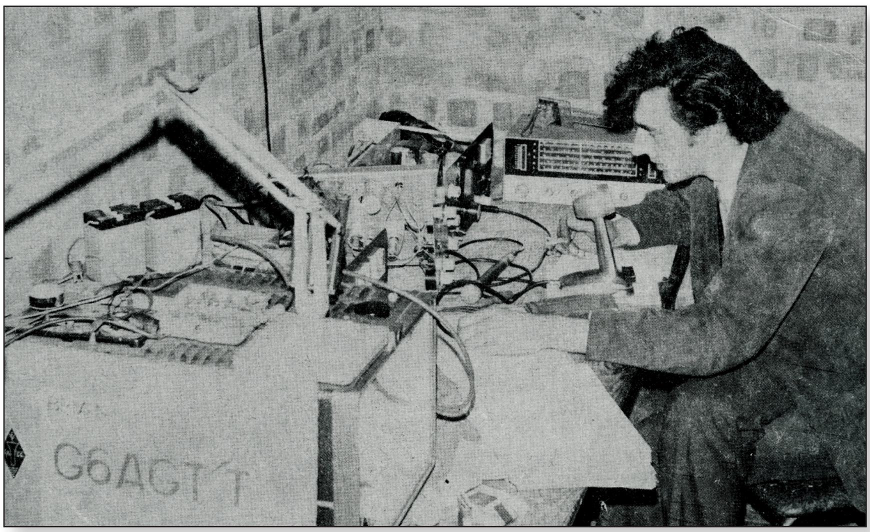
These, though, needed to produce a sawtooth voltage at the field scan coils, (rather than the large pulse which would produce a linear current in the inductive line coils). The output stage did this by charging C2 through R4 and RV1 during the active part of the field, at the end of which Tr1 would be turned on by the field rate pulses at R10, and so discharge C2.

The emitter-follower stage Tr2 minimised the loading of the output stage on the integrator capacitor C2, and the sawtooth voltage at Tr3 base resulted in a sawtooth current through the field coils at its collector. In the alternative output stage design, capacitor C2 was again the one charged during the active part of the field, and the emitter follower formed of Tr2, Tr3 and Tr4 isolated C2 from the effect of the load formed by the field coils. The output voltage was also fed back to RV1, and this 'bootstrap' action resulted in an extremely linear current in the scan coils.







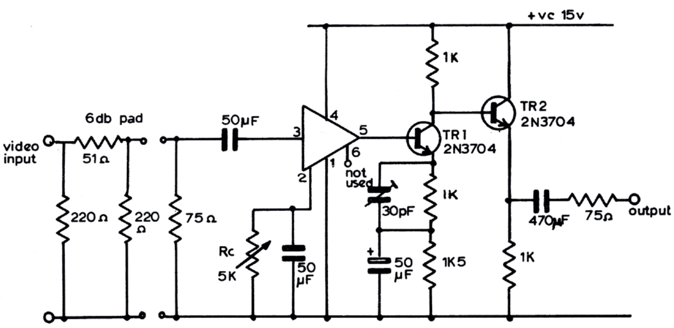


The magazine announced that the committee had a new member, Brian Kennedy. Having been the winner of the international contest the previous year, he had been co-opted to organise ATV contests for BATC. CQTV 82's front cover illustration was of Brian 'at the microphone' of his station - with his television callsign caption card on the left hand side.

Another member who had recently joined the committee was Dave Lawton, G6ABE/T, who went on to serve as the club's membership secretary for many years. In this edition of the magazine he described a video attenuator circuit which was based around the Motorola MFC6040 device. The 6dB pad at the input was needed to reduce the signal at the device input pin three to be within the maximum allowed.

The IC output was an inverted version of the input, with the gain set by either a voltage applied at pin two (3.5V gave 0 dB attenuation, and 6V gave 90 dB attenuation) or a resistor there, as shown in the diagram. Tr1 turned the MFC6040 output back the 'right way up', and the emitter follower stage Tr2 matched that to the usual 75-ohm cable.

One useful feature of the circuit was that as the attenuation was set by a DC voltage, the potentiometer did not carry the actual video signal, and so the physical control point could be remote from the video path.



Malcolm Sparrow, the club's chairman, provided a design for a 405-line sync pulse generator. As he commented, although the use of 405 was declining in the UK, in the provinces a number of amateurs still used it.

His design was as much a way to learn about the then novel TTL logic integrated circuits. The sync pulse generator outputs were formed by gating together signals counted down from a master oscillator. The counters were either divide by two, divide by three or divide by five blocks, and he showed how 7473 type J-K flip-flop devices could be made to count in numbers other than multiples of two by using an output to set one of the J data inputs.

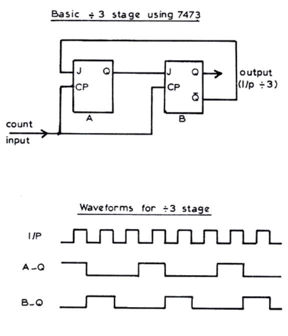


FIG. 1A

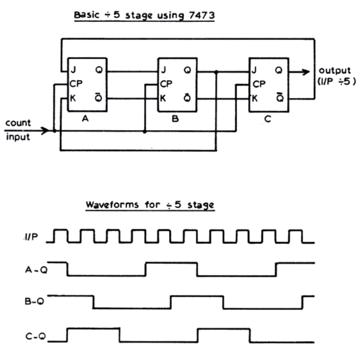
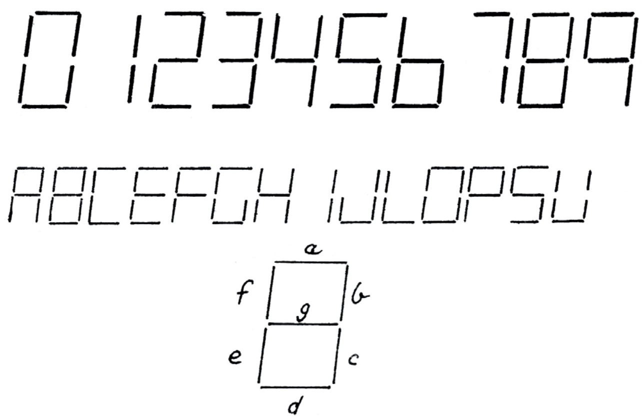


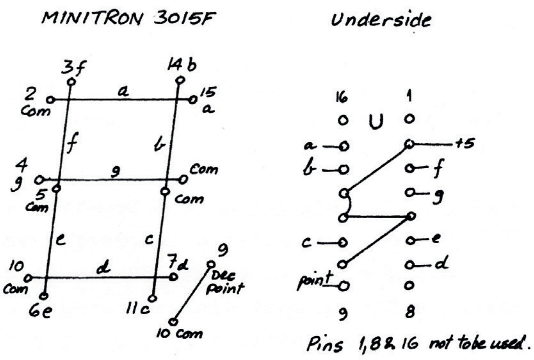
FIG. 1B

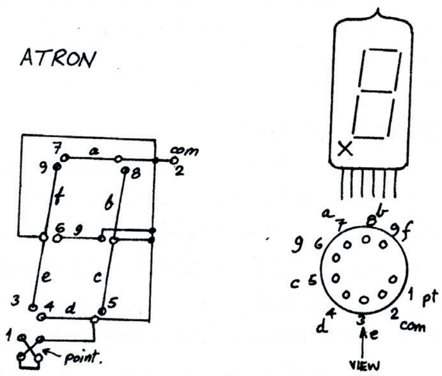


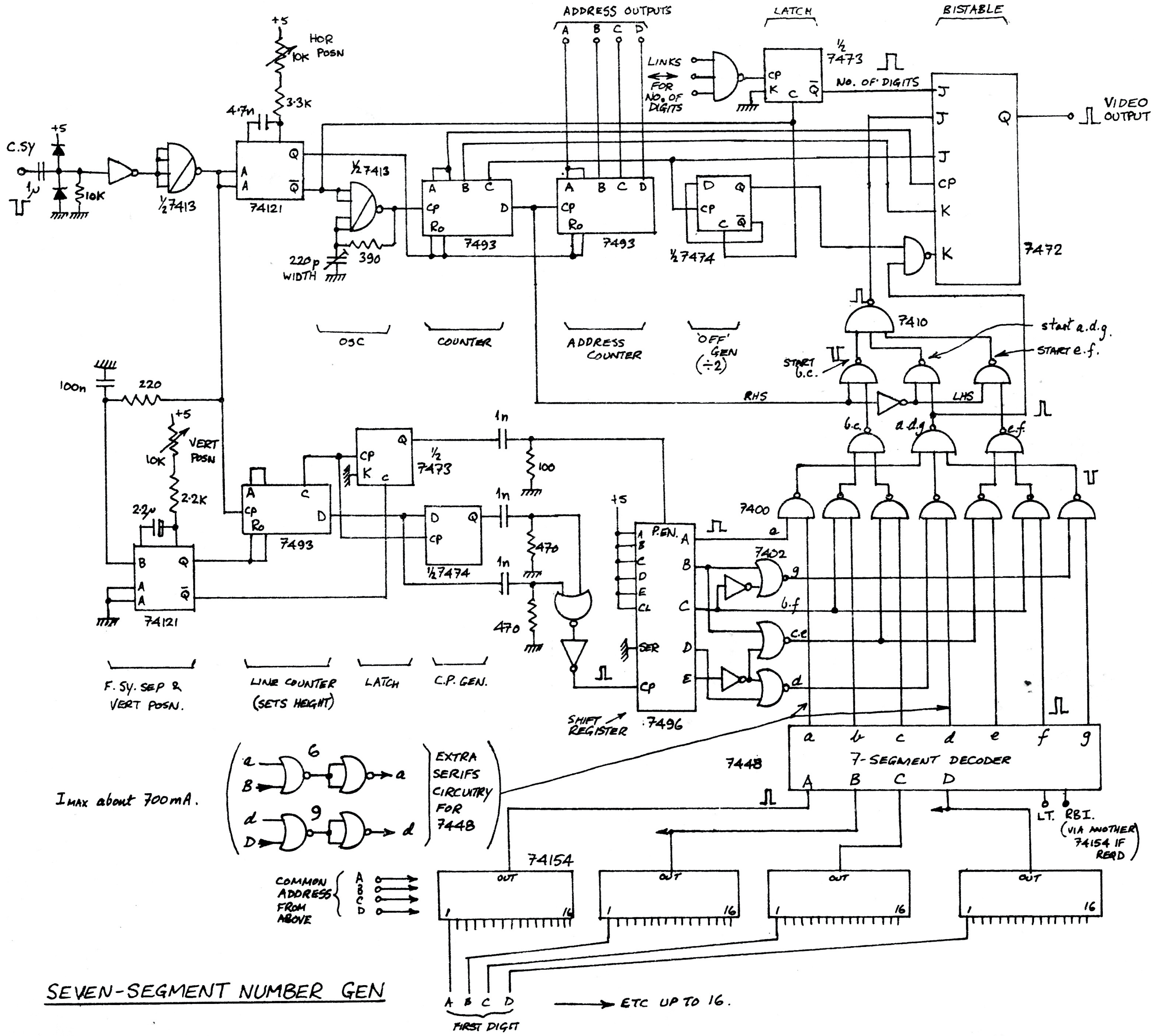
Arthur Critchley had been providing a series of articles on integrated circuits, explaining the principles and giving practical examples of how they might be used in an amateur television application.

This time he considered seven-segment number displays, in which each digit - and several letters - could be represented by lighting some or all of the seven segments. The resultant displays did not have the smooth curves of typed or handwritten characters but were sufficiently distinctive to be unambiguous.

Each segment was usually identified by a lower-case letter, a to g (upper case representing binary logic signals). The displays could be in the form of a set of small incandescent filaments, such as the Minitron 3015F, in a 16-pin dual in line package, or the Atron device which was in a miniature valve-style glass envelope. LED seven segment displays were also then starting to become available at an affordable price.







SEVEN-SEGMENT NUMBER GEN

While these devices were useful on various pieces of equipment, they did not lend themselves to creating figures and letters as part of the television image. Arthur observed that, although not an easy task, using logic circuits seven segment characters could be generated as part of a television display.

The oscillator, counter and shift register in the middle left of the diagram were triggered by frame sync pulses and set where each of the segments was on the screen in a vertical direction, whilst at the top of the diagram the line triggered oscillator and left hand 7493 determined where each segment was in a horizontal direction.

The righthand 7493 would increment the set of 74154 devices at the bottom, to feed the relevant digit information to the 7448 seven segment decoder. The a to g segment drives from that were then used in the array of NAND gates to select the appropriate segment start information from the shift register commands from the shift register, and that is then combined with the segment end information in the 7472 bistable circuit, from where the output is taken. The result was that up to 16 seven segment digits could be displayed across a television screen.

Displaying text and figures on screen nowadays is easily done - probably in software - but in 1973 the alternative method was to write the on a piece of paper put in front of the camera lens.

The British Amateur Television Club

Out and About

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

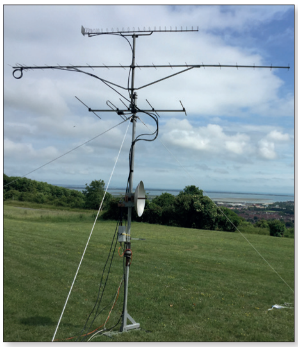
BATC CAT 21	*21/22 August*	*Midland Air Museum Coventry*

Many amateur radio rallies have been postponed or cancelled.
We will show any that will be running in the next issue.

The most up to date status can be found on this RSGB web page:
https://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 contests will go ahead as single operator or stay-at-home events.

2021 Activity Days:

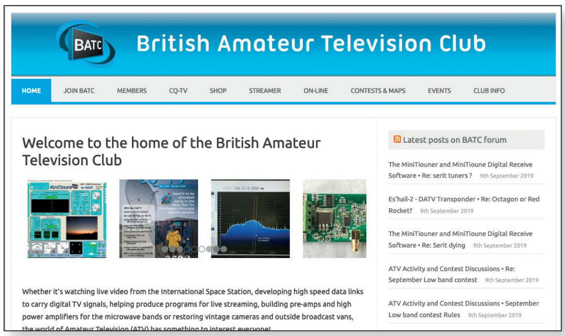
April 17/18	*23cm and up Activity Weekend*
May 15/16	*All Bands Activity Weekend*
June 12/13	*IARU International Contest*
July 10/11	*Low Bands Activity*

There are no Activity Weekends in August due to the CAT

September 4/5	*23cm and 6cm Activity Weekend*
October 2/3	*2m & 70cm Activity Weekend*
November 6/7	*All Bands Activity Weekend*
Dec 24 - Jan3 2022	*Christmas Activity Ladder and the Repeater Activity Contest*

BATC Online

Website: http://www.batc.org.uk
BATC Wiki: https://wiki.batc.org.uk/
Forum: https://forum.batc.org.uk/
Stream: https://batc.org.uk/live/
Dxspot: https://dxspot.batc.org.uk/
YouTube: https://tinyurl.com/BATCYouTube



batc.org.uk