



The British Amateur Television Club

# CQ-TV

No. 259 – Spring 2018

**The HamTV Merger**

**3D Printed horn antennas**

**3404MHz Band Pass Filter**

**Running 28v Latched Relays  
from a 12v Rail**

**Customising the adf4351  
pic code for your frequency**

**My Station - MODTS**

**Minitioune VO.8**

**Producing a PIC for the  
7 - band local oscillator**

**Adding a display  
to the MiniTiouner-V2**

**Portsdown 2018**

**Member's Projects - F6GX1**

**Touchscreen control  
of the DATV-Express**

**... and all the regular features**

# The BATC Shop

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



## BATC DTX1 Digital TV Transmitter

### MPEG-2 encoder and DVB-S modulator

- ▶ Self contained unit - computer not required.
- ▶ Composite and S-video input
- ▶ 2 audio channels
- ▶ Single PCB design
- ▶ Plug in option for 2nd video & audio channels
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- ▶ Tunes the 70cm and 23cm bands. Tuning range from 150Mhz - 2Ghz
- ▶ -5 dBm output
- ▶ Power 500mA at 12 volts
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- ▶ Includes TS Dock PCB free of charge!



### Available from BATC shop

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

*Specification subject to change without notice*

### ▶ The Portsdown Project

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



**... plus: Renew Membership and Badges & Sundries**

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



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ETCC Liason.

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### **BATC Online**

**Website:** <http://www.batc.org.uk>

**BATC Wiki:** <https://wiki.batc.tv>

**Forum:** <http://www.batc.org.uk/forum/>

**Stream:** <http://www.batc.tv>

**Dxspot:** <https://www.dxspot.tv/>

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Printed in Great Britain. ISSN 1466-6790

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## Contributions

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

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

We aim to publish CQ-TV quarterly in  
March, June, September and December.

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

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



## From the Chairman...

Noel Matthews – G8GTZ

It's hard to think that with yet more snow promised this weekend that June and the big ATV contest of the year are only 3 months away! With this in mind, it's great to see so much activity around the country, especially on 5.6GHz, and we have dedicated a few pages in CQ-TV this month to show what people are up to. If you do only manage to get on the air once this year (and hopefully it will be much more than that), please make sure it is during the ATV contest weekend of June 9th and 10th – it would be great to see as many UK entries as possible. And if you do get on the air, don't forget to post your activities on the members forum.

The Portsdown project goes from strength to strength (over 250 builders worldwide) and in this edition the Portsdown Guru, Dave G8GKQ, introduces 2 brand new PCBs to enable the RF output and PTT to be switched to 8 ways, making it ideal for multi-band and transverter working. There's also a feature showing how DATVExpress and Portsdown can be combined to make the ultimate in DATV systems with superb RF performance and touch screen user interface.

And in this issue is news that the BATC convention CAT18 and general meeting will be held on Sept 15th and 16th at the Midland Air Museum next door to Coventry airport – this is a centrally located venue with easy access to the Motorway network and has the added bonus of free admission to the fascinating air museum offering the chance to climb inside a Vulcan V bomber. We will have exclusive use of the conference room and a small hanger for CAT18, so there will be plenty of room for members bring and buy, demos and the talks area. It will be great to see as many members as possible there.

BATC will be out and about again this year, we're already booked to go to HamRadio in Friedrichshafen and also have responsibility for organising the European ATV conference which is held on the Friday afternoon and will be streamed live on batc.tv. This year we will also be at the Martlesham Microwave Round Table, where Dave G8GKQ is giving a presentation, National Hamfest and RSGB convention and a number of local rallies.

If you want to represent BATC at your local rally or help the team at the big events, just contact us and we'll give you all the materials to help put on a good show. Right now ATV is a really exciting hobby to be involved in and you have a great story to tell to your local club - 5.6GHz and Portsdown make really good club projects – and BATC is more than happy to support you with a presentation or demonstration.

**More details of committee elections and agenda will be published in CQ-TV 260.**



Formal notice is hereby given to members of the British Amateur Television Club that the General Meeting of the club will take place at 2pm on Sunday September 16th 2018 in the Argosy Centre at the Midland Air Museum, Coventry Airport, Baginton, Warwickshire, CV3 4FR.



### CAT18 – Sept 15th and 16th

- 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 airport

- Just off M69 / M6
- 5 minutes from Coventry International Airport



# Contest and Activity Weekend News

Dave Crump – G8GKQ

## 13/14 January

Saturday was a cold, breezy and quiet day. Noel G8GTZ/P went to Walbury Hill and I was on Butser Hill with the aim of completing a 24 GHz DATV contact. We failed due to equipment problems. Attempts to work Mike G8LES on 5.6 GHz FM ATV also failed.

Sunday was a complete contrast; the wind dropped and the bands were busy. The following stations were active in the south:

Call	Name	Location	Bands
G8VPG/P	Shaun	Mendips	5.6 GHz FM ATV
G4UVZ	Adrian	Taunton	146 MHz & 10 GHz DATV, 5.6 GHz FM ATV
G4BVK	Ken	Bristol	146 MHz DATV
G8GON/P	Alec	Hey Tor	5.6 GHz FM ATV
G8GTZ/P	Noel	Pen Hill, Mendips	146 MHz & 24 GHz DATV, 5.6 GHz FM ATV
G4KLB	Colin	Bournemouth	
GW8BVI	Phil	Chepstow	146 MHz DATV
GW0KAX	Petrie	Bridgend	146 MHz DATV
G8GKQ/P	Dave	Bulbarrow Hill	146 MHz & 10 & 24 GHz DATV, 5.6 GHz FM ATV

Shaun G8VPG had to try 3 sites before achieving success on 5.6 GHz, but was rewarded with a 2-way contact with Adrian G4UVZ in Taunton. Martin G8LCE in Falmouth was also available for contacts, but there was no activity that far to the south-west.

► G8VPG/P on 5.6 GHz



## 10/11 February

The weather proved too much for most ATVers on this weekend. The only report that I had was of G8VAT/P who made the most of the bright sunshine on Sunday afternoon to go out and look for locations to receive GB3YT, but could only manage to see a noisy signal.

## 10/11 March

There was some activity in the South on the Saturday, with Noel G8GTZ/P out at Butser Hill near Petersfield, Neil G4LDR near Salisbury and myself on Povington Hill near Lulworth in Dorset. Noel and I managed to exchange pictures over 90 km on 5.6 GHz (P5 FM ATV) and on 24 GHz (17 dB MER 2MS 1080p H264). I also heard G3KKD calling CQ on 144.75 MHz very strong on FM from 240 km away in Cambridge.

On Sunday Steve M0SKM/P was active on 146 MHz and worked G8GTZ/P who was on the Ridgeway near Harwell with G0MJW/P. Attempts to work Arthur G4CPE failed on 5.6 GHz and 146 MHz.



► M0SKM/P in his Luxury Mobile Shack

## IARU International ATV Contest June 9/10

The International ATV Contest will run from 1300 BST on Saturday 9 June through till 1900 BST on Sunday 10 June. Please plan ahead and make an effort to participate. Think of the April and May Activity Weekends as practice sessions to get your station working smoothly.

Remember that Portsdown users can generate Contest Numbers directly from the video source menu, but you'll need to set them up from the "Set Band Details" menu on menu 3. By default, they're all set to the same number – which would be illegal in the contest rules.

I'll be posting reminders and updates about the contest on the BATC Forum here:

<https://forum.batc.org.uk/viewtopic.php?f=75&t=5427>

**Contest and Activity Day Manager  
Position**

A reminder that I'm still looking for someone to take over as the Contest and Activity Day Manager so that I can

spend more time on the Portsdown project. Please let me know if you are interested in helping out. 

## ATV activity weekends

7/8<sup>th</sup> April

5/6<sup>th</sup> May

9/10<sup>th</sup> June (IARU ATV contest)



- All bands from 50 MHz to 24 GHz
- Digital and analogue modes
- Repeater and simplex contacts
- See the BATC forum for more information
- Put it in your diary NOW!



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

### Contest and Activity Weekend Calendar

1200 UTC 7 April 2018 - 1800 UTC 8 April 2018 -	ATV Activity Weekend
1200 UTC 5 May 2018 - 1800 UTC 6 May 2018 -	ATV Activity Weekend
1200 UTC 9 June 2018 - 1800 UTC 10 June 2018 -	IARU ATV Contest
1200 UTC 14 July 2018 – 1800 UTC 15 July 2018:	ATV Activity Weekend
1200 UTC 11 August 2018 - 1800 UTC 12 August 2018 -	ATV Activity Weekend
1200 UTC 8 September 2018 – 1200 UTC 9 September 2018:	ATV Activity Weekend
1200 UTC 20 October 2018 – 1800 UTC 21 October 2018:	ATV Activity Weekend
1200 UTC 17 November 2018 – 1800 UTC 18 November 2018:	ATV Activity Weekend
1200 UTC 8 December 2018 – 1800 UTC 9 December 2018:	ATV Activity Weekend
1200 UTC 12 January 2019 – 1800 UTC 13 January 2019:	ATV Activity Weekend
1200 UTC 9 February 2019 – 1800 UTC 10 February 2019:	ATV Activity Weekend
1200 UTC 9 March 2019 – 1800 UTC 10 March 2019:	ATV Activity Weekend



## Members News

Dave Mann – G8ADM

### Streaming Only Repeaters

I have mentioned these before in CQTV 255, repeaters with a TV modulated RF input and an internet output only. You may recall that they are shown in our Repeater Streaming site, [www.batc.tv](http://www.batc.tv), by their QRA locator instead of a callsign. Because no transmitting license is required I expect that we will see many more of these in the future. If you are considering setting one up then please let us know. Currently one repeater is in operation although not 100% completed yet. This is IO9 ILC run by Mike, G8LES in Hampshire and is mainly aimed at stations to the south of the repeater. See the entry on the streaming site for full details. Then in Highgate, North London, we have IO9 IWN run by Duncan, G7VWF. This repeater is on the highest point in London at 420ft (128m) asl. Compare this to other high points in London: Alexandra Palace at 300ft and Crystal Palace at 370ft. See the picture of its 100ft mast that its sharing on the right. The repeater and all the hardware are now complete and is expected to be installed before the summer. The repeater input is on 437MHz, horizontally polarised, digital, with a symbol rate of 2MS/sec and an FEC of  $\frac{3}{4}$ . The repeater has 6 possible inputs so other input frequencies may be added in the future. Eventually it is hoped to also be able to link the output to the GB3EN repeater.

### Es'hail-2 Satellite

This geostationary satellite containing two channels for digital ATV has passed all its tests and is now expected to be launched later this year. It will be launched aboard the Falcon-9 launch vehicle from Cape Canaveral Air Force Station, Florida, US. The satellite will be positioned at 26° east orbital position and will provide TV broadcasting and direct-to-home (DTH) services across the Middle East and North Africa as well as being the first Amateur Radio communication satellite by Qatar.



▶ IO9 IWN 100ft mast with Roger, G8IUC, and the site manager.

### BATC Streaming Service

I often hear it said that the BATC streaming service only supports low resolution 4/3 pictures. I would just like to say that this is not so, it depends entirely on what encoding method is being used. Check out Peter, GW4BZY, on the members stream. He often sends pictures in full resolution 16/9 aspect ratio that can be seen perfectly.

### Repeaters

GB3GQ, 14 miles west of Leicester, is now licenced for 3.4GHz output. This interesting design will be powered from solar panels and batteries only. It will be very interesting to see how this performs. It's also on the BATC streaming service.

You will also see on the stream that several repeaters went faulty over the winter. I am pleased to say that now the weather has improved most have now been repaired and the remainder will soon be back in operation.

### Microwaves

Interest in the higher microwave bands, 6cm+, continues. A useful point of reference is the GB3KM repeater site where most of the operators report their microwave activities and provide useful links.

## Monitoring DX

We run a website for plotting contacts in good conditions:  
[www.dxspot.tv](http://www.dxspot.tv)

This currently contains locations for several members and repeaters in the UK, France, Belgium and The Netherlands. We will soon be adding stations in Germany. In Portugal CT1XV says 'we are playing with DATV. (DVBS) and analogue' so we will put him on the map soon. Meanwhile if you have details of overseas ATV stations or repeaters then please email the station callsign and location to us so that we can add them to the map.

## Rally

Phil Seaford, G8XTW writes: "The Dunstable Downs Radio Club are holding their Annual National Amateur Radio Car Boot Sale at the usual venue, Stockwood Park in Luton on Sunday 20th May 2018. This is the 35th year without a break that this event has been run and we expect the BATC will be represented..."

All the usual facilities will be there, further details on [www.ddrcbootsale.org](http://www.ddrcbootsale.org) " 🗨️

# CAT18 and the BATC General Meeting

*CAT18 and the BATC General Meeting will be held at the Midland Air Museum on the weekend of September 15th and 16th 2018.*

The Midland Air Museum <http://www.midlandairmuseum.co.uk/about.php> is a small aircraft museum run by enthusiasts on the perimeter of Coventry Airport, where BATC will have exclusive use of the lecture room seating 60+ people and a small hanger where the demo area, test and fix it area, members bring and buy and a few trade stands will be held. There is plenty of car parking and access in to the site will be available for any special interest vehicles.

The full program will be published in due course but provisional timings are as follows:

### Saturday 15th doors open 9.30am

- ▶ Show and tell and demo area
- ▶ Members bring and buy
- ▶ Lunch available to purchase in the museum tea shop
- ▶ Talks program starts at 1:30pm

There will be an informal dinner in the evening at a venue nearby.

### Sunday 16th doors open 9.30am

- ▶ Talks program starts at 10:00am
- ▶ Lunch available to purchase in the museum tea shop
- ▶ The BATC general meeting will be held at 2pm.

The CAT18 ticket price will include full access to the museum and free passes will be available for those only attending the General meeting on Sunday afternoon.



The venue is centrally located with good transport links and close to the M1, M6, M42, M40 and M69 giving easy access from most areas of the country and there are a number of competitively priced hotels nearby.

The museum houses the Sir Frank Whittle Jet Heritage Centre and displays include an English Electric Lightning and a Tornado GR4. Visitors also have the unique opportunity to visit the crew compartment of Avro Vulcan B2 XL360.

**More details to follow, but put the date in your diary and we look forward to seeing as members as possible during the weekend.** 🗨️



## New and renewing members

Rob Burn – G8NXG

The turn of the year traditionally increases member renewals, a reflection of earlier times when your membership subscription would run from the start of the year. You will understand that I am pleased that this is no longer the situation – you can join and renew at any time of the year! Anyway, this results in another bumper listing for this issue of CQ-TV and I hope that you will continue to find it useful. Meanwhile, it is great to note that total membership continues to exceed 1000.

As is usual the list follows CQ-TV deadline dates, so this one covers the period December 2017 to February 2018 inclusive. Please let me know if a mistake has been made and in particular, for those members who receive the printed version of CQ-TV, please ensure that the e-mail address that you have registered with us is correct! 📧

<b>Australia</b>		
Roger Wilson	VK4TV	Booral
Robert Loftus	VK2ADG	Catalina
Keith Rainbow	VK6JT	Dianella
Paul Roper	VK2KZO	Linden
Gary Shipton	VK2CRJ	Ryde
Peter Gibson	VK3AZL	Vermont
Alex Glinski	VK5ALX	Whyalla Playford
<b>New Zealand</b>		
John Nettleingham	ZL1TTK	Kati Kati
<b>Thailand</b>		
Sontaya Kumsan	HS2KSP	Amphoe Muang
<b>Japan</b>		
Masahiro Arai	JN1GKZ	Higashimurayama
Mitsuhiro Matsumoto	JA6MQT	Oita
Abe Hideo	JA7LGC	Sendai City
<b>Belgium</b>		
Alain Hoslet	ON4AH	Antwerpen
Robert Robyn	ON5AF	Bruxelles
Luc Halbach	ON6JY	Esneux
Patrick De Troy	ON2AC	Geel
Rtec Ssprl Pierre Decamps	ON8GE	Heppignies
Guy Roelant	ON4BHM	Lokeren
Jean-Marie Hermant	ON4HDX	Thieu
Albert Van den Abbeel	ON4AAH	Wetteren
<b>Czech Republic</b>		
Leo Hucin	OK2UUJ	Olomouc
<b>France</b>		
Cayez Jean Robert	F1DFY	Brignoles
Brenguier Gérard	F1BUY	Brignoles
Christophe Courtachon		Corquilleroy

Patrick Jacquemin	F6EXX	Dijon
Claude Berthebaud	F8BOJ	Les Nöes
Dominique Didier	F4AQW	Mauprevoir
Lepron Romain	F4HTU	Nimes
Fovet Jean-Pierre	F6HJC	Rurange les Thionville
Patrick Samson	F6GWE	Sainte-Maxime
Guy Lemoine	F4DAI	St Christophe du Lignerou
Michel Amiard	F6ANO	Tourman-en-Brie
Boulogne Gerard	F5DMY	Villeneuve Saint Germain
<b>Germany</b>		
Juergen Teichmann	DL7QX	Aspach
Frank Lohse	DL2JFL	Limbach-Oberfrohna
Thomas Stiefl	DL6RCG	Marktredwitz
Wolfgang Beckett	DL1BJV	Verden
Rainer Schmitz	DG8KD	Willich
<b>Ireland</b>		
Aengus Cullinan	EI4ABB	County Galway
Ian McMullan	EI4DP	Greystones
<b>Italy</b>		
Ottorino Odoardi	IZ6BMP	Alanno Stazione
<b>Netherlands</b>		
Frits Aden	PE1DWQ	Rohel
Rody Korthout	PD2RVK	The Hague
Koert Wilmink	PA1KW	Uithoorn
<b>Portugal</b>		
Pedro Meneses	CU2FH	Azores Isl.
Jose Assuncao		Carcavelos
<b>Spain</b>		
Magin Casamitjana	EA3UM	Castelldefels
<b>Sweden</b>		
Bo Darnald	SA0BTT	Huddinge
Rudolf Gaspar	SA0BDC	Södertälje

Jan Andersson	SM00FV	Solna
<b>Switzerland</b>		
Ernie Streit	HB9AQN	Avenches
<b>United Kingdom</b>		
C Davies	GW7HAE	Aberystwyth
John Morris	G6PEP	Abingdon
David Pluright	M0KHO	Abingdon
Pat Spelman	G4EKD	Alfreton
Roy Powers	G8CKN	Alton
Nicholas Borrett	G8NXB	Ashtead
Nigel Pritchard	G8AYM	Aylesbury
Chris Holloway	G0GGF	Aylsham
Richard White	GI4DOH	Bangor
Robert Best		Bangor
Paul Read		Banstead
Alan Griffiths	G8LJY	Bath
Mark Roper	M0MRX	Beverley
Jim Anderson	G0MPP	Bingley
Andrew Jackson	M1AAS	Birkenhead
Brian Jordan	G4EWJ	Birkenhead
Graham Hankins	G8EMX	Birmingham
Richard Hanes	G0RPH	Bishop Norton
William Horn	G4GPD	Bodmin
Andrew Boardman	G7ROM	Bolton
Ross Wilkinson	G6GVI	Bolton
Jim Aldebert		Bothwell
Derek Blake		Braintree
Alan Turner	G0FMU	Brentwood
Geoffrey Towler	G4NGS	Brentwood.
Stephen Michie		Bristol
Kenneth Stevens	G4BVK	Bristol
Steve Walsh	G8KUW	Bristol
Art Smyth	G3XNE	Bude
Trevor Lumb	G0ARU	Bury Edmunds
Phil Longhurst	GW8BVI	Caldicot
Brian Summers	G8GQS	Camberley
Ian Waters	G3KKD	Cambridge
Colin Elliott		Chatham
Robin Dakin		Chelmsford
David Brocklehurst	G4VDB	Chesterfield
Richard John Cariss	G7ACD	Church Stretton
Mike Cox	G8HUA	Cleckheaton
David Long	G3PTU	Cleckheaton
Richard Gower	M5RHG	Colchester
Phil O'Ryan	G8WWF	Congleton
Peter Smith	G1LTI	Crawley
John Raybould		Derby

David Pickford	G8TNE	Derby
Mike Willis	G0MJW	Didcot
David Williams	G6ONE	Doncaster
Peter Myers	G3UWT	Doncaster
Stuart Grant	G6ENR	Driffield
Barrie Spink	GM0KZX	Dumbarton
Vince Bobin		Eastbourne
Andrew Britton	MM0MGB	Edinburgh
Duncan Rossiter	G7VVF	Enfield
Brian Bambury		Evesham
Tim Forrester	G4WIM	Freckleton
Howard Ling	G4CCH	Gainsborough
Peter Wilson	G0FVG	Gresham
David Johnson	G4DPZ	Halesowen
Paul Marshall	G8MJW	Harby Notts
John Van Dyken	G0SPE	Harrow
Neale Davison	G3VFX	Harrow
Ian Daniels	G4VTD	Hassocks
Jonathan Rome	G8BPH	Hatfield heath
Sally Dixon	G7UCL	Havant
Andrew Rudd	G6MRI	Herne Bay
Kenneth Griffiths	G3WIC	Heswall
Lalith Panditharatne		High Wycombe
Alastair Nussey	G7MIV	Highbridge
Geoff Rhodes	G3XDE	Hitchin
John Brown	G0PIA	Hornchurch
R Percival	G1EQU	Hull
Clive Reynolds	G3GJA	Hull
David Longstaff	G4WCD	Hull
Barrie Procter	G8AWN	Ilkley
Mark Riley	M5BOP	Ipswich
Sam Jewell	G4DDK	Ipswich
Jim Smith	G7NTG	Kettering
Paul Bolton	G4CXE	Kings Lynn
Andrew Sturt	G8SIK	Kingston-upon-Thames
Gordon Bowhay	G3ZYL	Launceston
Wlrral Amateur Radio Society	G3NWR	Leasow
Ian Bailey	G8PQY	Leeds
David Dawson	G1NEV	Leeds
D Ross		Leeds
Alan Gilman	G4GFD	Leigh
Phil Seaford	G8XTW	Leighton Buzzard
Dunstable Downs Radio Club	GB3TV	Leighton Buzzard
Colin Goodwin	G3WTT	Lincoln
Paul Bicknell	G8KFW	Littlehampton

David Ellis		Liverpool
Umar Munir	2E0UMR	London
John Glover	M0JGR	London
M McDermott	G6NAD	London
David Jefferys	G6IWZ	London
Vic Brown	G3SDQ	London
Ray Groom	G4RKP	Lowestoft
Howard Parker	G8GUN	Ludlow
Ronald Claridge	G7DBT	Luton
R Ellis		Macclesfield
Gordon Shorley		Market Harborough
David Barford	G8KBC	Market Rasen
Tom Mitchell	G3LMX	Milton Keynes
Heather Lomond	M0HMO	Much Wenlock
Ken Powell	G0PPM	Nailsworth
Graeme Griffiths	G0KQS	Neston
Jim Coad	G6IZQ	New Milton
John Wiggins	G8KUZ	Newcastle under Lyme
P Hallinan		Newport
C Stanners		Newton Abbot
Brian Alderson	G3KJX	Northallerton
Keith Brooks	G0SPH	Northwich
A S M Boyle		Northwich
Robert Scarfe	G4TUK	Norwich
William Hill	M1BKF	Norwich
Phillip Brooks	G4NZQ	Norwich
Jeremy Jago		Nottingham
Dave Sykes	G0JOX	Nottingham
Steve Liptrott	G4EGY	Nottingham
Roger Meakins	G8HKN	Orpington
Graham Niblett		Penarth
Alan Farmer		Penicuik
Donald Mobbs	G4MEE	Preston
Guntis Aspers		Reading
Rod Smallwood	G8DGR	Reading
Peter Smith	G4JNU	Reading
Eric March	G8EOJ	Redditch
Kevin Taylor	G6YTC	Rochester
Neil Underwood	G4LDR	Salisbury
John Benton	G8UXW	Salisbury
David Swale	G8ETS	Scarborough
Nigel Smith	G4EQD	Scunthorpe
Joseph McElvenney	G3LLV	Sheffield
J Oates	G3LZI	Sheffield
Colin Addison-Lees	G4OHV	Somercotes

Ray Hughes	G8JBQ	South Perrott
T Maton	G4GHU	Southend-on-Sea
Graham Sunderland	G8UTH	Sowerby Bridge
Terry Roxby	G1LPS	Spennymoor
Darren Storer	G7LWT	Stockport
Alastair MacArthur	NONE	Stone
Harvey Wilkins	G3TBF	Stonehouse
Darren Coe	G7SDC	Suffolk
Geoff Harland		Thornhill
Dave Woodhall	G3ZGZ	Thornton Cleveleys
Brian Roberts	G4VYG	Toft
David Ellis Jones	GW8PBX	Tregarth
Rob Gill	G8DSU	Twickenham
Myles Sewter		Uppingham
David Young	G8TVW	Welwyn Garden City
D Wroe	G0MXD	Whitchurch
Jonathan Gudgeon	G4MDU	Wlcken
Paul Reeves	G8GJA	Wlncanton
R Sheppard		Winchester
Robert Whitfield	G8TSE	Wlrral
John Ashmore	G8GXF	Wolverhampton
David Holman	M0YDH	Wolverhampton
Peter Eggleston	G8KGA	Wolverhampton
Kris Nicklin	2E0DWQ	Worcester
Robert Swinbank	M0DTS	Yarm
Chris Wherrett	G4IIX	York
<b>Canada</b>		
Arthur Critchley		Markham
Lucien Pigeon		Montreal
Luc Pernot	VE3JGL	Ottawa
<b>United States</b>		
Fred Coe	WB6ASU	Acampo
William Frovik	N0MNB	Blaine
Albert Hale	N7AL	Boise
Andrew Spencer	KA5BBC	Broken Arrow
Gary Grivna	K0GX	Brooklyn Park
John Hernandez	AA3XN	Chalfont
Roger Berchtold	WB6HMW	La Habra
Bryan Herbert	KE6ZGP	Las Vegas
Steve Sampson	K5OKC	Oklahoma
James Tittle	K6SOE	Pittsburg
James Kevin Raymer	AJ4KR	Smiths Grove
Dan Higgins	N6ZDH	Tracy
David Pelaez	AH2AR	Vandalia
Mario Badua Jr	KD6ILO	Vista

# GDPR and the BATC



Rob Burn – G8NXG

**GDPR – yet another new digital TV format? No! Read on for a glimpse of the impending General Data Protection Regulation as it applies to members of the BATC.**

In April 2016, regulations for how companies and organisations in the EU manage Personally Identifiable Information (PII) were agreed upon under a new General Data Protection Regulation (GDPR). That regulation will go into effect on 25th May 2018. Built on core principles established by the Data Protection Directive in 1998, GDPR establishes new rights for consumers and new legal obligations for organisations that gather and utilize that data. It updates the laws covering the capture and control of personal information and our consent to use it.

As a hobby organisation, the BATC is not required to register with the Information Commissioner's Office although we are legally bound to adhere to the Regulation. The purpose of this article then is to advise you of the new regulation and its impact on the data that we hold about members.

BATC currently holds your name, callsign, home address, telephone numbers and e-mail address. In addition to this we record membership details such as date of joining, renewal date, membership type, permissions such as streamer access.

Our privacy statement on the BATC website remains valid: the BATC will continue to treat the personal data it keeps in strict confidence and the records kept are only used for membership records, mailing of CQ-TV magazine (electronic and/or printed) and processing shop purchases. Your data will not be given to third parties and is only available to the Club's Committee.

## **The GDPR provides the following rights for individuals:**

**The right to be informed:** we shall continue to advise you about the data we hold via our privacy notice on our web site. In accordance with the Regulation, you will be obliged to formally accept the notice. Any shop purchase, including membership purchase and renewals, in the new BATC website will require you to accept our terms and conditions which will include our privacy statement

**The right of access:** your personal information is always available for you to access via the website. Members who do not have internet access, or prefer written details can apply for a copy of your information from the Membership Secretary.

**The right to rectification:** if you wish to amend or correct your information yourself you can do so by logging in to the website or by asking an officer of the club to do so on your behalf. Only your member number and user name cannot be amended. Members who do not have internet access, or prefer written details can apply for a printed copy of your information from the Membership Secretary.

**The right to erasure:** the right to erasure is also known as 'the right to be forgotten'. The BATC retains membership data for up to 12 months from expiry of your subscription; you can of course request that your data is deleted from records at any time. Note that if you are a current member, erasing your data means you have resigned with immediate effect and no further communication from us is possible!

**The right to restrict processing:** as the BATC only uses your data to communicate with you and to supply parts if you were to order them; in practice this 'right' is limited.

**The right to data portability:** the right to data portability allows individuals to obtain and reuse their personal data for their own purposes across different services. The BATC does not offer data portability.

**The right to object:** members have the right to object to processing, for example processing based on legitimate interests or the performance of a task in the public interest/exercise of official authority (including profiling); direct marketing (including profiling); and similar. The BATC is not and will not be involved in such activities; the information that you provide us with stays with the BATC and is not provided to any third party.

**Rights in relation to automated decision making and profiling:** the GDPR applies to all automated individual decision-making and profiling. In line with 7 above the BATC is not and will not be involved in such activities.

We do occasionally receive requests from one member requiring the address of another. It has always been Club policy to not to provide this information and this will not change. We are however quite happy to pass on any letter sent to the club secretary for forwarding onto another member so contact can be made.

If you have any questions about BATC and the GDPR, please do not hesitate to contact the Membership Secretary. 📧

# The HamTV Merger

*Phil Heron MIOVIM & Phil Crump MODNY*

*Combining the outputs of multiple radio receivers is a key technique in the reliability of many modern wireless technologies including WiFi and 4G. Faced with the challenges of reliably receiving wideband TV from a spacecraft in low earth orbit, for events lasting less than 10 minutes with live audiences of many hundreds - we have developed a system that combines received HamTV data from contributing Amateur TV Stations around the world to support the local amateur teams and maximise the impact on the audience & participants of the Amateur Radio on the International Space Station (ARISS) astronaut contact events.*

## Background

A VHF voice Amateur Radio station has been used for ARISS contacts on the International Space Station since the Russian Service Module was launched in July 2000, in the same year a proposal for an accompanying ATV system was submitted by Graham G3VZV. After much work by ARISS teams globally, the ESA Columbus module was launched with L- & S-band patch antennas in 2008, and the HamTV S-Band Video Transmitter was launched, or 'upmassed,' to the module in 2013. It was commissioned into use by Koichi Wakata on Expedition 39 of the ISS in early 2014.



The HamTV Transmitter is NTSC Composite Video & Analog Audio in, DVB-S out, on 2395MHz at ~10W RF EIRP. The transmitter is connected to a RH-polarisation S-Band patch mounted on the outside of the Columbus module.

The video transmitter complements the VHF voice ARISS contacts by providing a live video feed of the astronaut while he answers the questions, and allows live visual demonstrations. Use of HamTV has produced a great reaction from the audience in contacts worldwide involving Tim Peake, Thomas Pesquet, Jack Fischer & Paolo Nespoli.

Attempts have also been made to use HamTV as a Voice Downlink, such as when the VHF Voice Transceiver in Columbus failed at the UKYOTA Contact in summer 2017. The significant (~6s) encoding delay in the HamTV transmitter however demands strict patience and nerves of steel from both the astronaut in space, and the ARISS operator on the ground. At the UKYOTA contact, reception of the VHF uplink was also found to be inoperative, and so the contact was successfully completed from the Service Module on the following orbit, without HamTV.

## HamTV Data Format

The output of the HamTV transmitter is DVB-S at either 1.3 or 2.0M/s, currently operational at 2.0M/s. QPSK modulation is used with 1/2 FEC, giving ~1.8Mb/s digital throughput after overheads. Contained in this Transport Stream (TS) are the Program Elementary Streams (PES) listed below:

Packet Identifier (PID)	Description	Bitrate
256	Video (MPEG-2) + PCR	~980kb/s
257	Audio (MP2)	~265kb/s
8191	NULL Padding	~580kb/s

In DVB-S there should also be a Program Map Table (PMT) that tells the receiver which Program Streams to map to video & audio. However this was removed during development in order to de-brand the transmission, unfortunately preventing reception of the signal with an off-the-shelf set-top box. Therefore the Minitioune software written by F6DZP is most often used for direct reception as it can manually select and decode the Program Streams.

## Operational Challenges

The ISS orbits the Earth at a relatively low altitude for a spacecraft, an average of about 408 km. The resulting orbital velocity of 7.66 km/s makes reliably receiving the HamTV signal somewhat of a challenge. From an individual ground station's point of view the station spends more than half of a pass at elevations below 45°, where up to 2000km of slant range means that received signal strength is the key and accurately-pointed dishes of > 1m diameter are required. At high elevations the link budget becomes significantly more favourable however the required tracking speed increases to more than 1°/s, which can be challenging for larger dish motion systems, especially in AZ/EL motor configurations when the pass is directly overhead.

In addition to this the S-Band signal is attenuated by any vegetation, preventing reliable reception at lower elevation for many ground stations. Occasionally even parts of the space stations own structure and visiting supply craft will get in the way for periods of the pass, blocking the signal path completely.

In general, these effects will be local to each ground station, so therefore multiple stations tracking the ISS will tend to see the signal come and go at different times. This implies that we can use the data from several widely-spaced ground stations to reconstruct a more complete version of the signal, supplementing the (often temporary) ground station at the contact venue and providing a longer duration of live Amateur TV to the audience during the voice contact.

A web page with a Live Video stream from several ground stations was set up by the BATC, however this required manual monitoring & changeover between the stations, limiting the quality achievable with intermittent ground station feeds. Therefore we started working on a lower-level automatic changeover system.

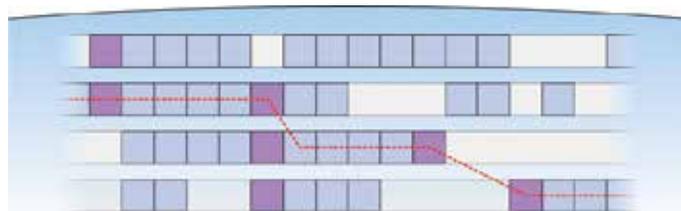
## The Process

Although it was not designed to be used in this way, DVB-S does provide some clues that the HamTV merger can use to reassemble transport streams from several stations back into one stream. Embedded within the header of one in every ~50 packets is a timestamp known as the Program Clock Reference (PCR) which is derived from a 27 MHz clock in the DVB-S encoder. An incrementing value known as the Continuity Counter is present in the header of every packet, however this resets every 16 packets and so is not suitable for aligning between input streams.

The output process runs with the task of navigating between sequential PCR timestamps in as optimal a way as possible. It does this by dividing up the streams from each station into segments, where a segment begins and ends with a timestamped packet. After each segment has been sent to the viewer, the server will look at all the potential branches to the next timestamped packet that can be taken on the streams from the input stations. For each potential branch that points to another complete segment, a score is calculated based on some simple criteria:

- ▶ How many packets does the segment contain?
- ▶ Are there any breaks in the Continuity Counter?

The branch with the highest score, therefore containing the most complete segment, is then taken. If no valid branch is found the server will instead look at all the stations for the next highest timestamp and jump to that. If no newer timestamps are available then the server waits until more data is uploaded. This process simply repeats and is constantly running on the HamTV merger server.



## Merger System

The MPEG Transport Stream (TS) data is sourced from the UDP output on the Minitioune software on HAMTV Ground Stations. The video & audio are not required to be decoded on the client. A small client application validates the TS packets, filters the PIDs required (removing the padding) and uploads the TS packets in UDP batches to the Merger System. A sequential ID is assigned to the uploaded packets, allowing detection of internet packet loss.

The UDP packets are received by the Merger server application and are stored in statically allocated buffers according to their station ID (callsign), allowing operation of the core Merger process as described above.

The merger has a TCP output socket through which clients can then directly receive the resultant merged Transport Stream. Raspberry Pi -based software has been developed that can connect to this socket directly and use the RPi's hardware MPEG2 decoder to provide a video feed of less than 200ms latency into the venue.



**Live ISS HAMTV Video**  
Received by Amateur Radio

**HAMTV Receiver Stations**  
Goonhilly Dashboard & ISS Tracker

GOONHILLY - Cornwall, UK	Prime Receiver	Receiving Data	EL: 19.0°
MOONY - Southampton, UK	Receiving Data	Receiving Data	EL: 15.1°
FEDZP - Migné-Auxances, FR	Receiving Data	Receiving Data	EL: 13.6°
PAJWEG - Delft, NL	Prime Receiver	Receiving Data	EL: 27.1°
IK1SLD - Casale Monferrato, IT	Receiving Data	Receiving Data	EL: 21.1°

Streaming provided by BATC

Until then the HamTV transmitter is fully operational with the exception of short mandatory outages due to EVAs & crew arrivals/ departures. Without a video input it transmits only a black screen with a blue line down the left, and a soft hiss on the audio channel. Note that as the compression used is Constant Bit-Rate (CBR) for both video and audio, the transmission and Transport Stream contained within are

In constant connection to the TCP output socket is a server process that transcodes the MPEG2 & MP2 to the H.264 & AAC codecs required for live web viewing. This feeds both the low-latency Flash RTMP stream for specific venues (URL not distributed), and the high-capacity HTML5 HLS stream for public viewers (<https://ariss.batc.tv/hamtv/>).

Continuous statistics on packet count and merger performance are measured for diagnostics & debugging, and also fed to the viewer's web browser via a websocket to enable the real-time status display on the right of the public page, note that therefore this can be 5-15s ahead of the buffered HTML5 video stream.

The HAMTV merger is currently in 24/7 operation, and even receives regular short bursts of video once a day as the ISS flies perfectly over Goonhilly Antenna #99's zenith! For those interested in the detail of the software implementation, the source code can be found at <https://github.com/ARISS-UK/tsmerge>

### Current State of HamTV

Unfortunately ARISS has experienced repeated issues with the Ericsson VHF Voice Radio in the Columbus Module since summer 2017, preventing the use of the Columbus module and hence HamTV for ARISS Contacts. ARISS continues to use what crew time it has available to investigate the issues and has meanwhile stepped up the volunteer time and effort being put into the flight certification of the replacement Kenwood D710 system, in preparation for upmass and commissioning expected before the end of 2018. Flight safety certification of hardware is an extremely expensive & time consuming process, so ARISS is always grateful for whatever support can be offered by the amateur radio and wider community, financial or in other ways.

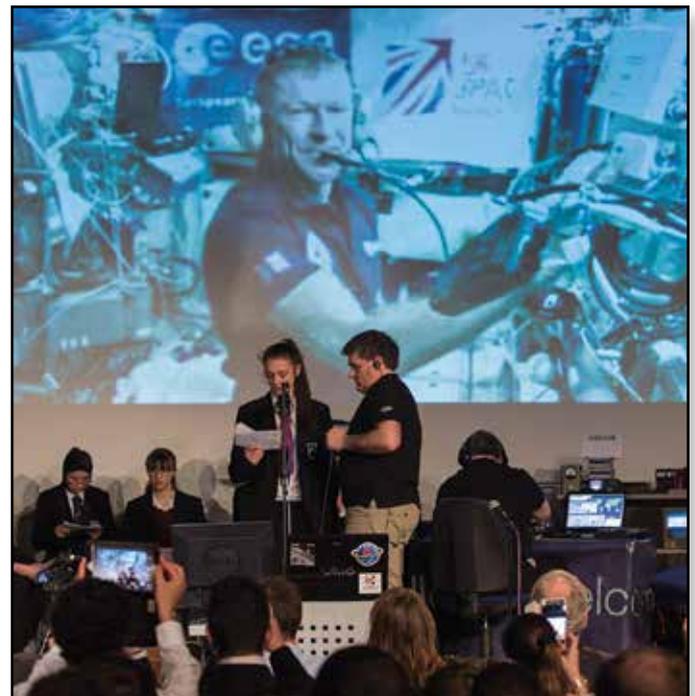
still of identical bandwidth and data-rate to when it contains images of a floating astronaut. This permits complete testing of ground systems despite the (nearly) null input. 🗣️

### Relevant Links

To stay up to date with the ongoing status of HamTV, join the 'ARISS HamTV' Forum at <https://forum.batc.org.uk/> The BATC requests that you use your callsign as username if possible.

The current location of the ISS and status of the ARISS-UK Goonhilly Ground Station can be monitored at <https://ariss.batc.tv/goonhilly/>

To chat to the authors about the HAMTV Merger, join us on #ariss on Freenode IRC. This can be accessed through the web interface at <https://webchat.freenode.net/?channels=#ariss>



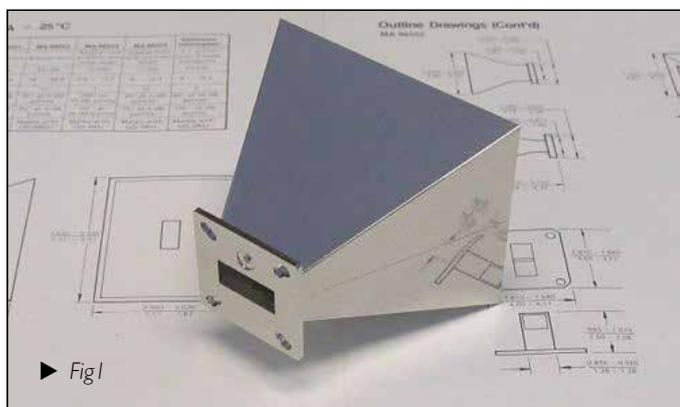


## 3D Printed horn antennas

Gary – MIEGI

*At the beginning of 2017 I started at a new place of work, and within a very short space of time I had soon made friends with a colleague (Dave Fox) who had an interest in 3D printing and was also looking into injection moulding and CNC, this turned out to be a great two-way relationship as I don't have those facilities, and he required help with the electronics side of things... perfect!*

Initially my thoughts were to getting some slotted waveguides machined, as I didn't really have a use for 3D printing at the time.



But then, one day it struck me that I had bought several X-band horns which are moulded ABS plastic! These have a base plating of copper and finished in bright nickel plating with a quoted gain of 17dbi.

This got me thinking, wouldn't it be great if we could use 3D printing as a method to produce horns for 10GHz and 24GHz or even higher! Anything which could help the bands become more accessible the better.

So the next question has 3D printing antennas been done before? A quick internet search resulted in an article about the European Space Agency 3D printing a cassegrain dish with integrated corrugated feed horn as a "single piece of polymer" and then copper plated [http://www.esa.int/spaceinimages/Images/2016/03/3D-printed\\_antenna](http://www.esa.int/spaceinimages/Images/2016/03/3D-printed_antenna).



Well if it's a good enough process for space, then it should be adequate enough for amateur radio use!

So now my thoughts turned to having to

create a design/file suitable for the 3D printing process. After a quick look around at free CAD software, I decided to use the cloud based "TinkerCAD" which seemed ideal as I found it very easy to use with a short learning curve.

Initially I started to design a conical horn for 10GHz as this was easiest to design with my lack of experience of the CAD software, then I realised that having to create a waveguide transition might be getting a little ahead of my new found skills...

It was at this stage I had remembered about online repository for other peoples 3D creations/designs and had a look around. Within a very short space of time I had not only found a suitable design with a file to download, but it also had a neat "customizer" function whereby the designer (rdklein) had entered formulas from [http://www.ece.mcmaster.ca/faculty/nikolova/antenna\\_download/current\\_lectures/L18\\_Horns.pdf](http://www.ece.mcmaster.ca/faculty/nikolova/antenna_download/current_lectures/L18_Horns.pdf) and you can simply select waveguide for the band of interest along with waveguide & horn length.

After creating a small selection of horns for 10 & 24GHz with even a unit that might be of use on 47GHz with WG20 flange, the files were downloaded and handed to Dave for printing. Over the following week I was handed several horns in various materials all with impressive results!

Now it was time to think about the next step, which is effectively going from a plastic model to a metallised part that could be pushed into service. After a short chat to Dave explaining the theory of operation and how it needed to be conductive, we discussed what filaments were available which are conductive. These all seemed to be relatively high resistance when compared to copper for example, this is when Dave pointed out that filament is available with up to 80% copper loaded – worth a go...

At the time when Dave ordered a sample length of the copper loaded filament to test with, only 40% loaded were available unfortunately. Better than nothing for the experiment...

The result was a horn which certainly weighed more; it felt more robust in the hand, after a quick test with a ohm meter showed open circuit. So time to read up to see if the 80% variant would be conductive, the results indicated that this too reads open circuit to an ohm meter.



Over this short period of time I had been taking these samples to the radio club (Finningley) and discussing the progress with Kevin G3AAF, who kindly offered to conduct some basic tests on the 24GHz horns to see if they showed any sign of being functional, none of them did.

By the time the microwave roundtable had come around, Kevin had fitted some self adhesive copper strips to see if that would make it perform and the results were poor.

After getting the horns on the antenna test range at the roundtable, it confirmed that these indeed were not performing very well as antennas. Kevin, Martin G7CKX and I had a discussion about this and Martin made a suggestion of trying conductive nickel paint to see if this would be the key to get them working.

Later on at the same event, I happened to get chatting to Barry G8AGN about the project and he filled me with confidence that not only was it worth pursuing, but he felt that this approach could yield results on 47GHz and maybe even 76GHz bands if a suitable low resistance coating could be applied.

#### Results from FRT-17 test range:

- ▶ 17dbi metallised ABS 10GHz horn (Fig1) – 17.4dbi
- ▶ 3D printed 10GHz horn (RHS of Fig3) – 8.7dbi
- ▶ 3D printed 24GHz small horn (Fig3) – 7.8dbi
- ▶ 3D printed 24GHz large horn (Fig3) – 9.3dbi

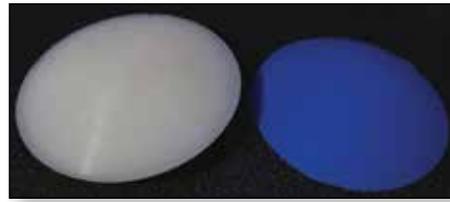


▶ Fig 3 -

Spurred on by the conversations I had at FRT17, I set about investigating 3D printing in 100% metal using a process is called "direct laser metal sintering" and after narrowing down a short-list of companies I submitted the relevant files to receive a quote for 3 prototypes. The cost was over £2000! Not amateur friendly, Needless to say I didn't pursue this further.

Shortly after the roundtable, Rob M0DTS Tweeted (18/7/18) a picture of a 3D printed lens inspired by what he had seen at Finningley!

The 3D print had around the same gain (~36db) as a Flann lens at 134GHz!!! Very exciting times...



▶ Fig4 taken from Rob's tweet, Flann lens on the left, 3D print to the right.

The next step was spraying a small selection of the prints with nickel conductive paint (TBA ECP 552) the results can be seen in Fig5, these would have to wait till CAT17 to see if any improvements would be seen.



▶ Fig 5 -

Around this time I became aware via my Twitter feed of a fellow amateur in America (N4IP @ibelings) was also experimenting with 3D printing horns, "Tested it to be within 0.2 dB of the \$1000 Narda die cast aluminium version" Pieter has used both nickel conductive paint along with silver coated copper conductive paint.

One of Pieters tweets stated "nickel vs silver didn't show any difference at 10GHz for me, but did at 24GHz. but, not a lot. Would use again."

This all sounds very promising!

So after presenting the same three samples to the test range at CAT-17, which had now been sprayed with the nickel paint, all three now showed signs of gain!

- ▶ 3D printed 10GHz horn (RHS of Fig3) – 16.5dbi (very close results to Fig1)
- ▶ 3D printed 24GHz small horn (Fig3) – 13.3dbi
- ▶ 3D printed 24GHz large horn (Fig3) – 14.8dbi

As you can see from the results, this is now showing to have some real potential!

Whilst at CAT17, I was talking with Malcolm GOUHY, who mentioned he had a copy of QEX (Sep/Oct 2016) which had an article about 3D printed horn antennas. Malcolm kindly offered to lend me the magazine which made for an interesting read, again the evidence points towards this having real potential for low volume production of antennas.



► Discussions at the antenna test range - CAT17

**Conclusion:**

Whilst my results weren't quite as expected, the evidence is that 3D printing could have some real potential!

After some discussion recently with Dave about this project, the next step should be to copy the dimensions of both a 10 and 24GHz horn antenna I have in my collection, get a copy printed, and then set about doing a side-by-side comparison.

The reason for this is that I have not checked the dimensions for the horns generated by Thingiverse! By creating identical copies of existing horns it should be easier to compare performance between metal and 3D printed metallised horns.

It would be great to have readily available horns off the shelf for 10-47GHz 🗨️



# International ATV contest

## June 10<sup>th</sup> and 11th



- The only 2018 ATV contest
- Saturday 1pm – Sunday 7pm
- Home or Portable stations
- Single or Multi operator entry
- Simple to enter
  - Exchange 4 digit number
  - Submit entry to BATC

- Any IARU band including 437Mhz, 23cms, 5.6 and 10GHz
  - But not 71 or 146MHz
- 27 UK entries in 2017
  - No GM, GW or GI entries!
- Goal to have more UK entries than any other country!
- Great excuse to get on the air!






1964

# 3404MHz Band Pass Filter

Design and Build by Steve G0AIN; article by Tim Forrester, G4WIM

The design criteria for the filter was simply to attenuate the mixer image and local oscillator leakage with minimum attenuation of the 3.4GHz transmitter drive signal. This was achieved by the use of a 3 pole bandpass filter, using Butterworth design characteristics and implemented as a classic Interdigital filter.



There are two easily accessible design tools on the web and both generate reliable outputs for the Butterworth (maximally flat) type of filter:

[http://www.changpuak.ch/electronics/interdigital\\_bandpass\\_filter\\_designer.php](http://www.changpuak.ch/electronics/interdigital_bandpass_filter_designer.php)

<http://www.vk3um.com/interdigital%20filter.html>

Please do note that these design tools are based on a limited range of fractional bandwidths, that range being 0.01 to 0.1. As an example, the design tool output is reliable for a filter centre frequency of 3.4 GHz and bandwidths of 34MHz to 340MHz.

So to meet the requirements set by G4WIM for GB3FB, then the primary design criteria are:

- ▶ Center Frequency 3402 MHz
- ▶ Passband Ripple 0 dB
- ▶ System Impedance 50 Ohm
- ▶ Cutoff Frequency 3267 MHz and 3537 MHz
- ▶ Bandwidth (3dB) 270 MHz
- ▶ Fractional Bandwidth 0.08

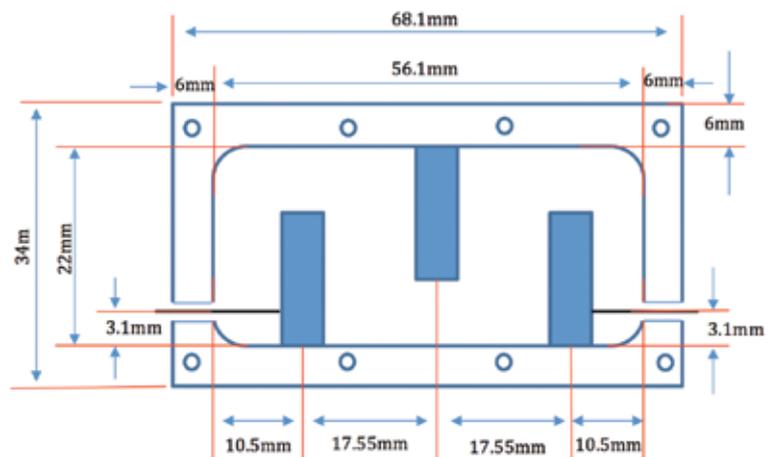
The design tool suggests an ideal world passband attenuation of 0.1 dB, but this ignores connectors, build quality and so forth.

The filter should also yield >30dB attenuation at frequencies below 3GHz.

[G4WIM comment - Measurements show it is -34dB at 2089MHz which combined with the mixer LO balance and PA gain drop off at 2089MHz means that the LO leakage at the output of the PA is -70dBc or -30dBm absolute. Given that the antenna efficiency at 2089MHz will be very low, this figure is probably acceptable, none the less an extra 3404MHz band pass filter on the PA output might be in order – hint]

One question might be – “Why 270MHz bandwidth, why not 34 MHz?” The wider bandwidth does not compromise the design goals but has a number of benefits:

1. The filter is physically narrower – saves 20mm of metal
2. The tapping point at 34MHz is just 1.1mm above the base of the outer rods rod rather than 3.1mm for the 270MHz bandwidth design
3. The theoretical stopband attenuation rises from 0.1dB at 270MHz Bandwidth to 0.8dB at 34MHz Bandwidth UNLESS the depth of the box is increased substantially, which makes the machining more problematic.



- ▶ Length interior Element 17.58 mm
- ▶ Length of end Element 17.83 mm
- ▶ Internal Depth of box 15 mm
- ▶ Diameter of resonators 6 mm

To this design, 4mm brass tuning screws were added with lock nuts, aligned to the centre of each element (rod). The screws were just long enough to short out the rods with a locking nut in place.

## Materials

- ▶ Aluminium plate 70mm x 25mm cross section
- ▶ Aluminium sheet 3mm thick to form a cover
- ▶ 2.5mm caphead stainless steel screws to retain the cover
- ▶ 4mm stainless steel button head screws to retain the rods
- ▶ Gold leaf to act as a gasket between the copper rod and the aluminium case.
- ▶ 1.6mm silver plated copper wire to tap the exterior elements



## Construction

There are a couple of points which are not obvious from the sketch and photographs. The first is that the rods are drilled at the tapping points to ensure accurate location during soldering. The second is courtesy of Ian White, GM3SEK. The rods need to be cut concave (use a countersink or lathe) such that the edges of the rod are sharp and will cut into the case ensuring good conductivity bearing in mind skin effect and to use gold leaf as a gasket to ensure a good bond. Finally, the use of a small propane torch to warm up the whole assembly before using a 100Watt iron to ensure good soldered joints. 🗨️

## Narrow-bandwidth Television Association

Not to be confused with Reduced-Bandwidth TV, the NBTVA Association was formed to shed fresh light on the Television systems used by John Logie Baird, and others, following on Baird's original demonstration in January 1926.

According to the official web site of the Association it is devoted to all aspects of early television. Members' interests include:

- ▶ Historical interest in the origins of early television.
- ▶ Restoration of original equipment.
- ▶ Construction of replica mechanical television apparatus
- ▶ Conventional electronic circuit design and construction
- ▶ Personal Computers and software associated with the display and production of low definition television.

The NBTVA 2018 UK Convention takes place on Saturday April 7th from 10.00 am at Plumtree Hall, Church Street, Eastwood, Nottingham NG16 3BP. Full details from [jeremy@nbtv.org](mailto:jeremy@nbtv.org) or 0115 9621 453

*More details about the Association including their latest newsletter can be found at: [www.nbtv.org](http://www.nbtv.org)*



▶ Photograph shows the latest project of Roger Dupouy: a 30 line mechanical televisor working with a vintage tube amplifier



## Video Fundamentals 13

### Using & interpreting test signals

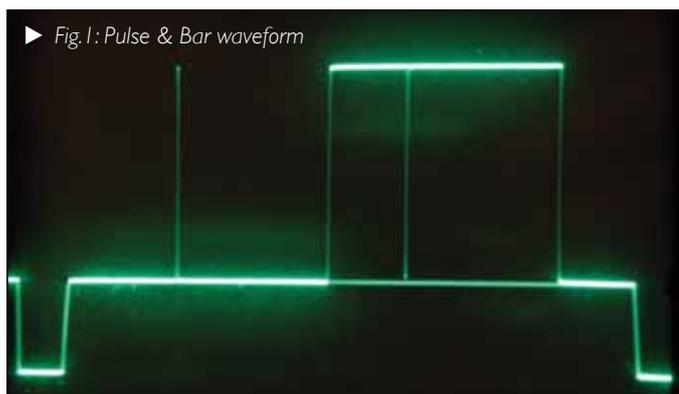
Brian Summers G8GQS

#### What they are for

There are a very large number of different test signals of all sorts of measurements to reveal different aspects of performance. We are going to look at the pulse and bar test signal. It is one of the oldest dating back to the earliest days of television. It has stood the test of time and with the addition of the 5, 10 & 20T pulses, much can be learned about the colour performance of cables and equipment.

#### Testing Cables

Following on from number 12 last time I would like to explore the use of the sine squared pulse & bar signal to test cables and networks. This test signal comes in many different permutations from the simple monochrome one shown in fig. 1 to its inclusion in the ITS<sup>1</sup> and even incorporated into test cards.



► Fig 1: Pulse & Bar waveform

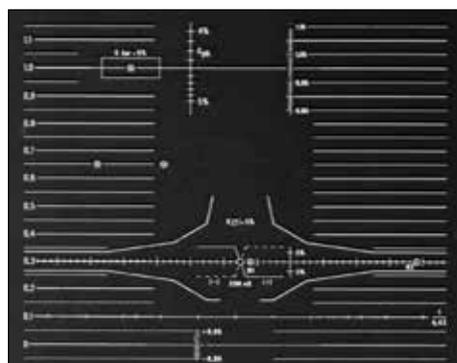
The  $\sin^2$  pulse is for the higher frequencies and the bar tests the low frequencies. The output of the cable or network to be measured is observed on an oscilloscope with a special graticule, called a "K" rating graticule see fig. 2. If the oscilloscope was adjusted to display the P&B in the graticule boxes the K factor could be read off in percentage terms according to the "fit" within the graticule.

The  $\sin^2$  pulse had 5 different "T" ratings used according to what parameter you wish to measure.

1T pulse with significant frequency components to 10 MHz.

2T pulse with significant frequency components to 5 MHz.

5, 10 or 20T pulse with subcarrier for chrominance gain & delay measurements.

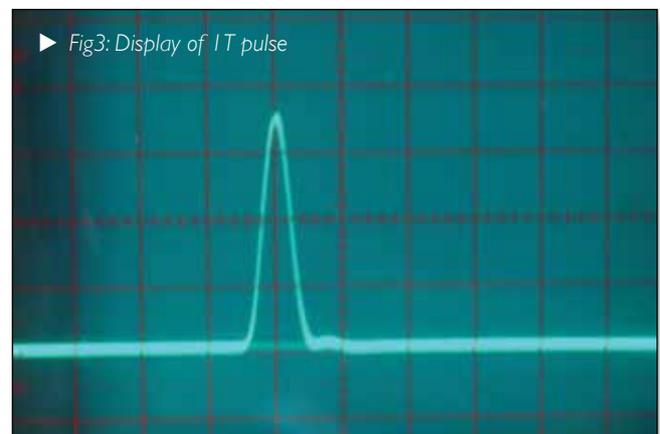


► Fig 2: K measurement Graticule

The BBC monograph number 58 has much information as to using P&B signal for testing and is available free from the BBC<sup>2</sup>.

#### Use as a Time Domain Reflectometer, TDR

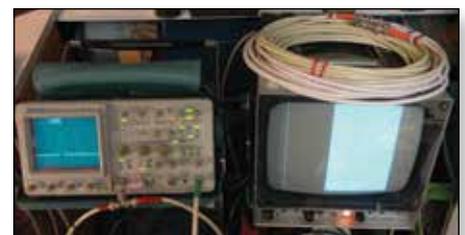
One of the interesting and useful things you can do is to put a "pulse" down a cable and observe the result. I set up the equipment, using equipment that was to hand, to display the 1T  $\sin^2$  pulse on the oscilloscope as in fig 3. I used a BNC "tee" connector and a further length of cable with a  $75\Omega$  termination was connected<sup>3</sup>.



► Fig 3: Display of 1T pulse

In fig. 3 the term is connected and there is no reflection, and from the 'scopes point of view the cable is infinitely long.

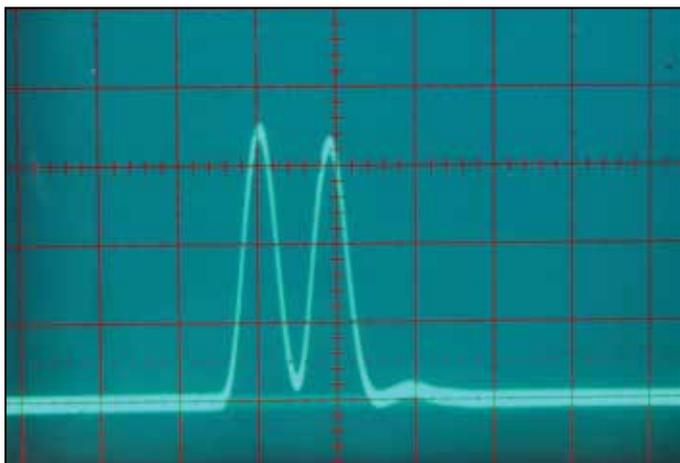
This is the set-up in Fig.4, the scope with the tee piece, the cable, the line drive as external trigger to the scope



► Fig 4: 'Scope, cable and monitor

input and a monitor to show what P&B looks like. In this picture the termination, with a green cap, can just be seen on the end of the cable coil.

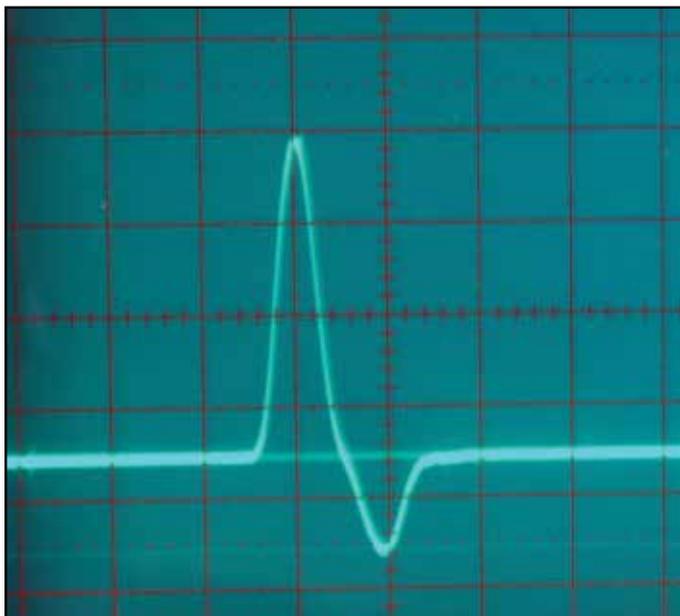
In Fig. 5 the termination has been removed from the end of the long cable, open circuit, and the pulse has been reflected back up the cable (think poor SWR). From this the length of the cable can be calculated



► Fig. 5: Cable unterminated with reflection

by measuring the delay. About 200ns. in this case, so a bit of maths gives:-  $C \times \text{velocity factor} \times \text{delay} \& \text{ divide } 2$  (there and back!).

$300 \times 0.65 \times 200 \text{ns} / 2 = 19.5 \text{m}$  which is about the length I had.



► Fig. 6: Double termination ( $2 \times 75\Omega$ )

In Fig 6, I have double terminated the end of the cable, effectively  $37.5\Omega$ . You can see that the reflection is now inverted because the termination is less than the characteristic impedance of the cable.

Fig. 7 shows the extreme case of a short circuit on the cable end. If the X deflection speed was reduced to show the more of the P&B signal you would not be surprised to see that the signal is really wrecked!

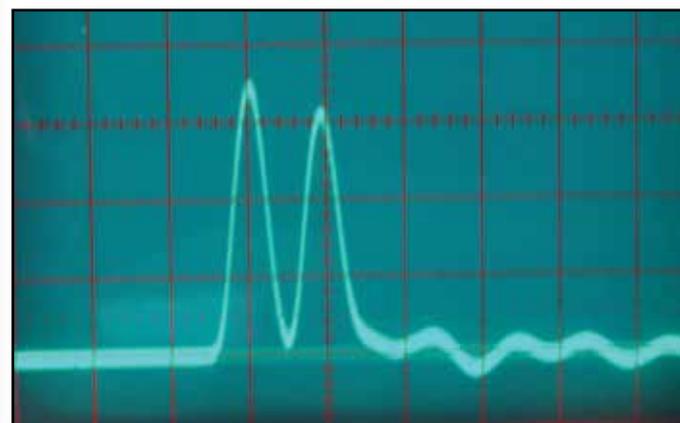
This technique is really useful for determining, for instance which end of a cable might be faulty or were it is severed.

When I was at work for BBC outside broadcasts we had a really useful unit, made by the boffins in base. It made a suitable pulse and had a readout so you could identify



► Fig. 7: Short circuit at cable end

the distance to a fault. When setting up there was lots of occasions for using it, my very favourite phrase was "it's open circuit at your end!"



► Fig. 8: With length of 50 cable added.

In Fig. 8, I have added a length of  $50\Omega$  cable to the end of the  $75\Omega$  length to show the effect of the impedance discontinuity.

Although I have used analogue test signals here to examine cables, the cables don't care whether the signals are analog or digital, as far as the cable goes a digital signal is just a collection of waves of different frequencies. 🗣️

1. ITS = Inserted Test Signal in the field blanking of TV signals
2. [http://www.bbc.co.uk/rd/publications/bbc\\_monograph\\_58](http://www.bbc.co.uk/rd/publications/bbc_monograph_58)
3. To clarify, the output of the P&B generator was connected to the tee piece, on the scope input and further length of  $75\Omega$  cable. For convenience the scope was triggered from Line Drive to give a nice stable trace.



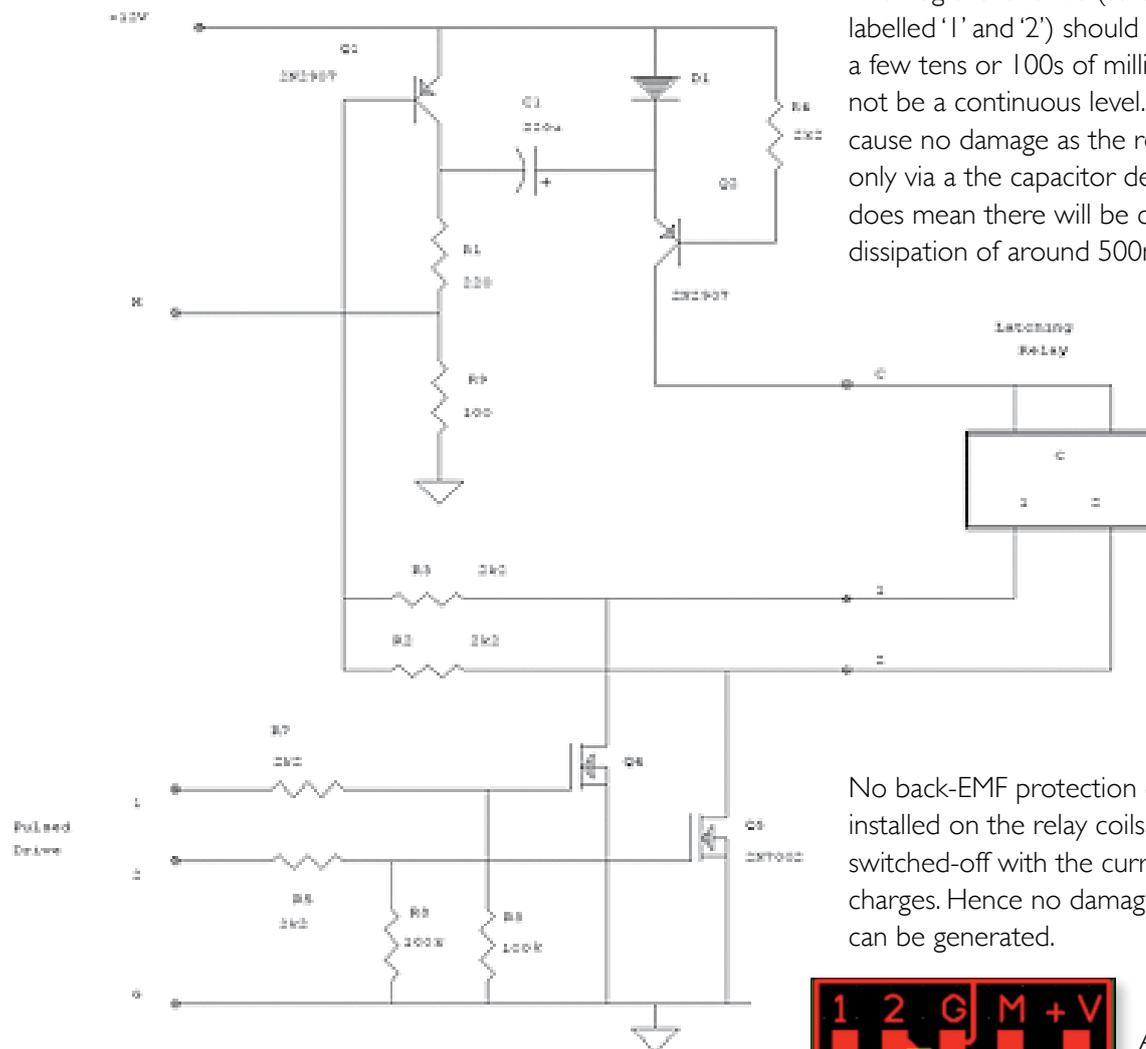
# Running 28v Latched Relays from a 12v Rail

Andy Talbot - G4JNT

A previous design <http://www.g4jnt.com/Download/minipulsedrelaydriver.pdf> (CQ-TV 258) showed how a 28v standard (non-latching) relay can be driven from a 12v supply by providing an initial 'voltage doubling' pulse from a capacitor. Here we carry the concept a stage further to drive dual-coil latching relays using circuitry derived from that design.

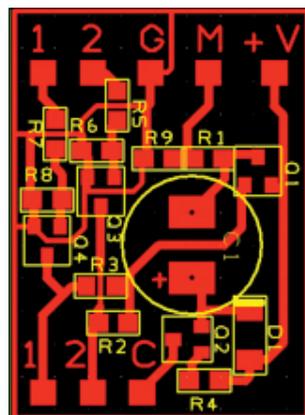
Q3 and Q4 form the interface from the controller and select which coil is to be activated. A resistive OR function from these via R2 and R3 activates Q1. R6 and R8 are present just to stop the gates floating if left unconnected; R5 and R7 are there more as jumpers on the PCB than for any real function.

The Logic level drive (to the input terminals labelled '1' and '2') should consist of a pulse of a few tens or 100s of milliseconds, and should not be a continuous level. Whilst a DC level will cause no damage as the relay itself is powered only via a the capacitor defined pulse drive, it does mean there will be continuous excessive dissipation of around 500mW in R1/R9.



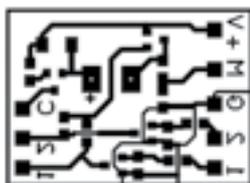
No back-EMF protection diodes should be installed on the relay coils; they are not hard switched-off with the current reducing as C1 charges. Hence no damaging high voltage spikes can be generated.

The circuit is shown in Figure 1 below. Q1 and Q2 function in a similar manner to that on the non-latching circuit, although the polarity has been swapped so they run on the high side. The DC holding path has been removed as only the initial pulse is needed – Q2 switches off when C1 has discharged. With no DC path through the relay, an alternative route has to be provided to recharge C1 during the waiting period. This is provided through R1 (and R9, see later).



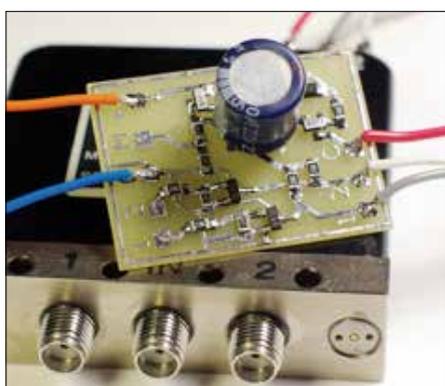
All the components fit easily onto a PCB of 32 x 23mm with the layout shown. This is small enough to attach onto the side of a typical SMA relay, or can be squeezed in somewhere.

Mirror imaged 1:1 PCB layout for home constructors. A higher resolution version in .PDF format can be found at:



[http://www.g4jnt.com/Download/LatchedRelayDriver\\_PCBMirrored.pdf](http://www.g4jnt.com/Download/LatchedRelayDriver_PCBMirrored.pdf)

The board made up and connected to a relatively large relay with a coil resistance of 180Ω. The majority of latched SMA relays are smaller than this with a higher coil resistance, typically in the region of 500Ω. Although rated at 28V, it pulls-in at 15V. In the doubling circuit here it works from a supply as low as 8.5V



### CI Recharge Monitor.

An option that can add increased reliability to a system is to monitor the voltage on CI during its recharge cycle, after the driving pulse has completed. If switching is done too rapidly, CI may not recharge sufficiently to pull-in some relays when operating from a lowered supply. Just after transition, the voltage on the CI negative terminal falls from VDD towards zero as CI charges. The time is determined by the value of CI and the value of the charging resistor, and typically should be complete in 200 - 300ms.

The charging resistor is split into two, R1 and R9, to give a potential divider so the voltage on the [M]onitor pad will not exceed 5V. If a microcontroller such as a PIC or Arduino or similar, with A/D inputs, is used for sequence control and pulse generation – for example it may be used to also monitor RF levels or supply current – it is little effort to include an additional A/D channel from this point. Then the control software reads the capacitor voltage, and safely inhibits the sequence until the A/D reading indicates sufficient charge has built up. Belt-and-braces, but worth adding if a spare A/D channel exists.



## Railways on the air – Sept 22<sup>nd</sup> / 23<sup>rd</sup>



*“This celebration is not a contest - organised so that radio amateurs have a good time and promote Amateur Radio while helping to celebrate the unique position railways hold in our national heritage.” <https://rota.barac.org.uk>*

**What could be better - a weekend of radios and railways offering some great technical challenges and video opportunities.**

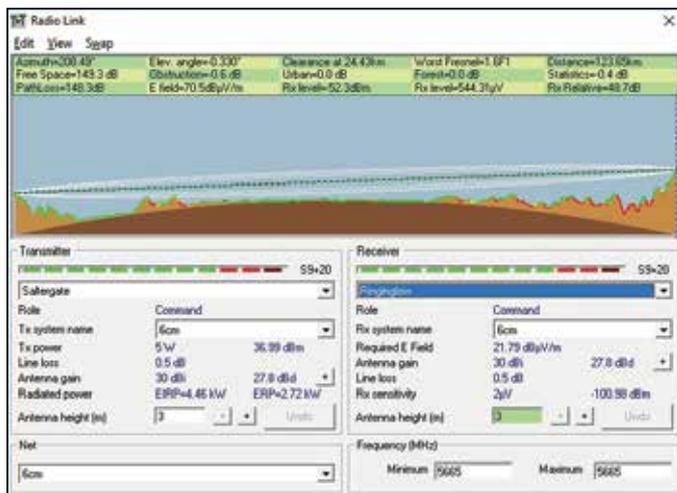
**Why not team up with your local radio club and show them what ATV is all about?**



# ATV activity update

The BATC activity days continue to encourage people to get out and get on air and there continues to be interest in the higher frequency bands particularly on 5.6GHz and 24 GHz.

Whilst the equipment needed for each band is very different in terms of price and complexity both bands only really work well over line of sight paths and so portable operation from your local hill or mountain top is needed to achieve any real distances. Having said that, 5.6GHz is also a great band to set up a local link across town between 2 stations using Sky mini dishes.



## 5.6GHz

Despite being a much higher frequency than many ATV operators have used before, many stations are now active on this band using the drone downlink equipment available for under £20 for both transmitter and receiver! See CQ-TV 258 and the BATC wiki

[https://wiki.batc.org.uk/5.6\\_GHz](https://wiki.batc.org.uk/5.6_GHz)



Activity reported includes:

- ▶ G0RPH, G8AGN and M0DTS working over 124Km from Sheffield to North Yorkshire Moors.
- ▶ Shaun G8VPG and Adrian G4UVZ worked over 40Kms during the January activity day
- ▶ GB3TZ has a 5.6GHz input and G4CPE and M0SKM are active on the band
- ▶ G8DKC is planning a 5.6GHz input on the newly licensed GB3GQ
- ▶ G3KKD and G4BAO are planning tests in the Cambridge area



## 24GHz

Further up the spectrum there are at least 6 stations active on 24GHz DATV. This is far more complex than 5.6GHz and requires the use of a narrow band transverter driven by a DATV transmitter such as Portsdown.



Stations known to be active include

- ▶ M0DTS
- ▶ G0MJW
- ▶ G4LPS
- ▶ G4FRE
- ▶ G8GTZ
- ▶ G8GKQ



Dave G4FRE has seen his own DATV beacon from home at 60 Kms and has also been doing tests on 47Ghz where he has received his IMs pictures over a 30Km path.



G8GKQ and G8GTZ have worked over 90Kms with Dave using an HD webcam in to his Portsdown to transmit real HD pictures at 1920 x 1080 resolution.



Full details of all ATV activity can be found on the members forum – and don't forget to post your activities there: <https://forum.batc.org.uk/viewforum.php?f=75&sid=6b8287bc4aaefc8a8d4a9674e8fd477>



# Customising the adf4351 pic code for your frequency

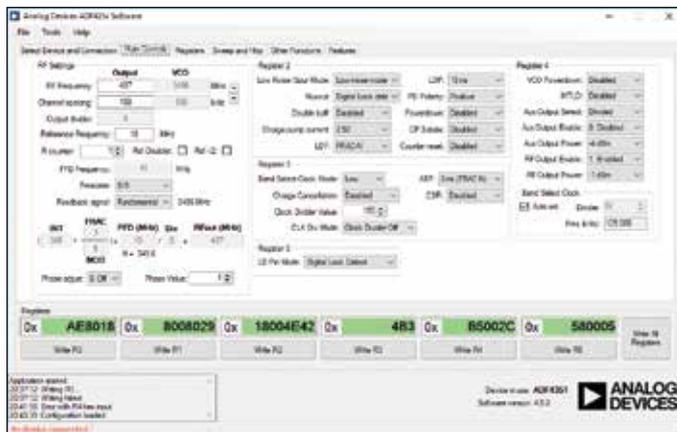
Dave Crump - G8GKQ

Many members are using Ron G7DOE's PIC code and circuit board (available from the BATC Shop) to program the ADF4351 35 MHz to 4.4 GHz synthesizer. This article explains how to modify his code to generate the frequency of your choice.

## Calculate the Programming Commands

Calculating the Programming commands isn't as scary as it sounds. First of all you need to download and install the ADF4350/ADF4351 Evaluation Board Software from Analog Devices: [http://www.analog.com/media/en/evaluation-boards-kits/evaluation-software/ADF435x\\_v4\\_5\\_0.zip](http://www.analog.com/media/en/evaluation-boards-kits/evaluation-software/ADF435x_v4_5_0.zip)

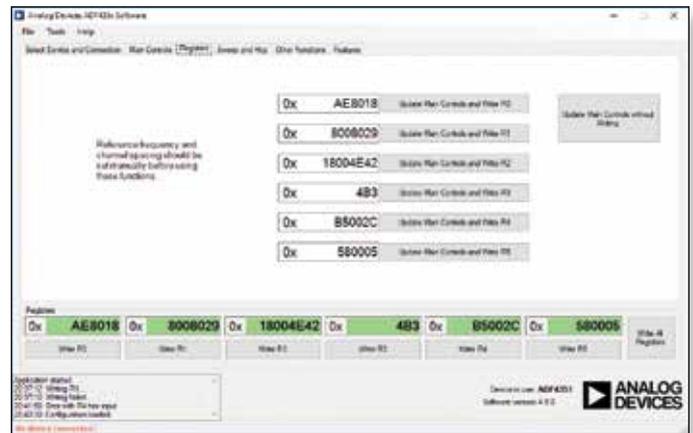
Then, unzip and install the software (Windows only, unfortunately). When you first run the software, it will ask what device you are using (ADF4351). Ignore the "Choose Connection Method" box and then select the "Main Controls" tab. You will see a bewildering number of controls, and 6 Registers, R0 to R5, along the bottom of the page. It is the values in these registers that you need to calculate and put in Ron's program to set the frequency on your ADF4351.



The easiest way to use this page is to enter a set of values that you know will work, and then modify it for your needs. You cannot enter directly into the registers on this page, but you can on the next page, "Registers". Select the "Registers" tab, and in the white boxes, enter the hex values from Ron's example program thincontrol.c which you can download from the BATC Wiki.

[https://wiki.batc.org.uk/ADF435x\\_PIC](https://wiki.batc.org.uk/ADF435x_PIC)

Ignore the leading 0x, this simply indicates that the digits after that are a binary number in hexadecimal (hex) format. You do not need to enter leading zeros either.



In fact all the 6 registers have 8 digits each representing 32 binary bits – 192 in total. Once you have entered the 6 values, press the "Update Main Controls Without Writing" button, and then select the "Main Controls" tab again.

If you have used Ron's example (shown above), you should see that the output frequency is 437 MHz, and the reference frequency is 10 MHz. The first thing to check is that the reference frequency matches your ADF4351 board. Some eBay boards use 25 MHz oscillators. You can also adjust the output frequency and power level; if you have a specific requirement you can adjust the other parameters as well.

## Amending the C Program

When you have finished, you will need to copy the new register values into Ron's code and save them. The easiest way to do this without using additional software is to open the file in Wordpad (right click on the file in Explorer, and select open with), and then set Wordpad to landscape format so that the lines don't wrap round. Alternatively, you can download a proper editor such as the excellent Notepad++.

About half way down the code, you will see a line that starts "**unsigned long registers[6]**" and it is here that you want to put the new values that you have calculated. You will probably not need to change them all. When you have finished, select File, Save as, Plain Text Document and give it a file name that you will understand (such as 437\_MHz\_10\_MHz\_Ref.c). Make sure that you have a .c Extension, and not a .txt extension as this will make it easier for you in the next stage.

All that remains is for you to compile this code, and then to program the PIC. The article by Steve, M0SKM elsewhere in this issue describes that process.



Rob Swinbank - M0DTS

## My Station

### A little bit of history of my portable operation from IO94...

I started out on ATV in 2001 I think with a Pace satellite receiver and a homemade yagi held together with sellotape! I managed to receive a signal at the time from Terry G1LPS, Laurie G3ILD (sk) and a little later on Brian G3KJX after listening to them on 144.750 talking about something more interesting than HF! ;-)

They all helped me a lot along the way to setting up a station; this was without any microwave experience at all, just some knowledge from CB/HF operation. It was a few years before I figured out my home location was not great for working any DX on ATV so started to try some portable operation in 2006.



The portable setup back then was rather more cobbled together; used the main car battery for power, a very small wooden drive-on mast and all the gear on the back seats, I know you have been there, done that...

I did seem to manage better DX back then though with less capable equipment, but there were more tropo events then than there are now. The car setup carried on until 2010 with a different car and a little more effort into masts and more batteries but the time taken to setup on site was just getting too long. During the IARU contests I would leave all the antennas attached to a short mast lying in the heather out of view from the road on the Saturday evening before returning on the Sunday morning!

Since then the dedicated portable van has proved itself - it just makes things so much easier for transporting antennas and the ability to setup most of the equipment beforehand. It does not get around having to lug the equipment in and out of the house though when I do go out, security is something you need to be very aware of!

Here are some more details on the portable setup.



### Power source:

Originally I started off with some used 90Ah gel batteries off eBay, unfortunately these did not last long, and as usual you get what you pay for. I struggled with these for 2 years and finally bit the bullet and bought two 230Ah Lead Calcium (basically lead acid) batteries and these have served reasonably well for the last 5 years.



The two batteries are in series to give 24V for the 23cm and 70cm amplifiers, the 13.8v supply comes from two 30A dc-dc converters connected to the 24v. This arrangement will usually last a full day's operation; if I'm out two days in a row then they are put on two 8A chargers overnight for a top-up. I don't use the van enough during the week to warrant a split charging system.

### Mast/Antennas:

The mast is just an alloy scaffold pole around 17ft long - this is clamped to the roof bars using regular scaffolding clamps when transported - just two nuts to release on site. There is a steady bar attached to the rear roof bar which uses another scaffolding clamp to support the mast



up vertical from the rotator at the base. An old food tin is cut and used for a slip ring around the mast where it is clamped. A chain goes around the mast onto a separate bolt on the steady bar just in case the scaffolding clamp happens

to come apart as it is just loosely clamping the mast to allow for rotation.

The rotator is a Yaesu 400 unit which had faulty ac motor; this was replaced with a dc



motor from a printer and a new digital readout for the beam heading. The readout is just a cheap volt meter; the voltage feedback from the rotator is scaled down from 5v to 3.60v for 360deg, the 'V' is covered up inside the display. Thanks to G0EHV for ideas for the rotator and slip ring.



I have a 3 cable loom which is used on 23cm to save time setting up (I use a masthead LNA on this band) this is connected to the equipment inside the van before heading out. I also have a couple of looms to connect transverters for the higher bands. On 13/9/6/3cm I have interchangeable feeds on an 80cm satellite dish, I just plug in the feed as required. This is handy when it comes to contest activity when operating on all bands, the dish can be left on the same position and you can work the



same station across multiple bands relatively quickly by just swapping over the dish feeds.

On 10 and 24GHz I use a transverter mounted on a boom of its own which just slides into the same 80cm dish. On 13/6 and 9cm bands the

feeds are on one boom, each feed can be rotated into position, not quite as efficient but adequate for the job.



## Equipment:

- 146: Tx: DATV Express, RD06/RD15 PA, 8el LFA Yagi.  
Rx: MiniTioune, various LNA/Filters.
- 70cm: Tx: MM AMTx with 2MHz wide Filter, 25el Yagi.  
Rx: RTLSDR/TVSharp.
- 23cm: Tx: Solent Analogue, Mitsubishi PA, PEIRKI 120W PA, 2x28el Loop Yagi.  
Rx: Analogue Zeta 1000 with 8MHz wide IF 'DX' filter.
- 13cm: Tx: Comtech, Spectrian 25W PA.  
Rx: Kuhne Downconverter to 23cm.
- 9cm: Tx: MK808/Digilite Digital Tx, Homemade Up converter, Stealth 25W PA.  
Rx: C-Band round LNB.
- 6cm: Tx: Tarot 600mW, 8W PA.  
Rx: Tarot.
- 3cm: Tx: Solent Analogue, Homemade Up converter, EyalGal 2W PA.  
Rx: Cambridge LNB (9G LO).
- 1.2cm: Solent Analogue Tx, Modified Broadern Transceiver, Homemade Kuhne design LNA.

I'm also able to operate Digital using DATV Express/ MiniTioune on all bands except 6cm.

All bands above 23cm share the same 80cm dish.

The Camera is fed into a 3-way video splitter to feed the various bands. Audio is an electret into a pre-amp then a 3-way splitter. Getting good video scenes in the van is difficult against the contrast with outside so I don't put that much effort into the video side of things really, my main interest is in microwaves bands rather than video... Can you tell?!

Soon I will be adding a Dish Positioner on the roof, hopefully it will be useful for Es'hailsat. Just waiting for some nice weather get it installed..



# Minitioune V0.8



Jean Pierre F6DZP

*Minitioune V0.8 is almost ready for release and has a number of enhancements and new features not available in previous versions. It is compatible with all previous hardware and NIM modules and introduces the following features:*

- ▶ All NIMs (Sharp, Eardatek or Serit) can now receive very low SR down to 65 kS/s
- ▶ SR scan lock search very near the SR value asked (+/-2%)
- ▶ DVB tables are now well decoded and also in case of very high SR
- ▶ Packets are aligned to synchro byte in TS stream
- ▶ Low SR are smoothly sent to the graph
- ▶ Frequency is set to give the lowest noise in the demodulator (we can get 2 dB of MER compared to the V0.7) and a better lock.
- ▶ The noise oscilloscope gives a better view of the noise and is very useful to see how low SR mode add noise but give a quicker lock.
- ▶ You can set the position of the Minitioune software in your PC screen (.ini)
- ▶ You can set a dual screen mode (.ini)
- ▶ You can ask Auto send of picture to your TiouneMonitor (.ini)
- ▶ Digole LCD and OLED can be used with MiniTounerV2 + resistor or MiniTiounerPro (Description for MiniTiounerV2 modifications)
- ▶ LAN gain is displayed (variable if you use a Serit NIM) and if you use a Serit NIM we can see that it operates also as an attenuator
- ▶ Lower % of CPU is used
- ▶ The get\_TS thread works only if TS is present
- ▶ You can drag smoothly the Minitioune Window

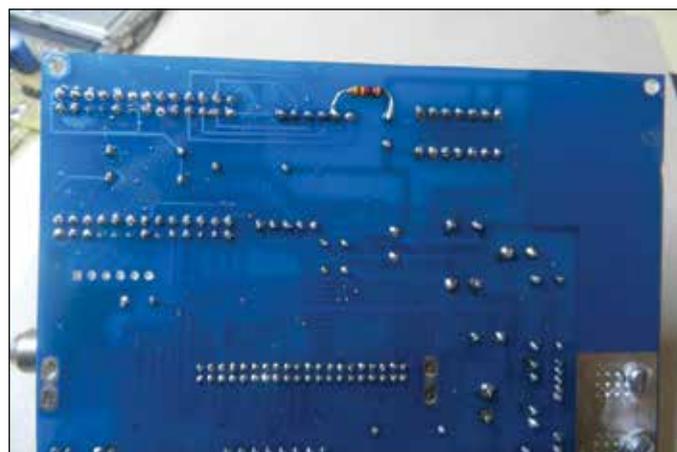
## Automatic hardware detect

Minitioune V0.8 is compatible with all versions of hardware and automatically detects the version of hardware in use – to enable this function to work with the BATC MiniTouner hardware you need to add a 4.7k or 10k resistor between pin CN2-19 of the USB module and Ground before running the software.

You can do this on the Mini module or on the main PCB as shown in the following pictures:



Or you can do it on the pcb

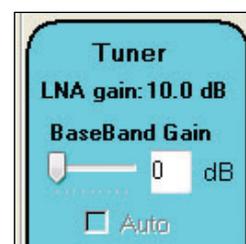


## Control of Serit FTS4334 tuner LNA chip

The Serit FTS4334 tuner has a built in STVWGLNA chip which can be programmed via I2C and also be set in different automatic modes.

Version 0.8 of Minitioune has enabled control of the chip and sets it to give an output signal with a level of -20dBm. The STVWGLNA adapts automatically its gain to obtain this result: -20dBm: It can vary automatically its internal gain from -17dB to +13dB. If the signal is very low, its gain is +13dB (max gain), if the signal is very high its gain is -17 dB (=max attenuation).

That means that it can act as an attenuator which lowers the Noise Factor of the NIM and prevents from overloading the tuner input.

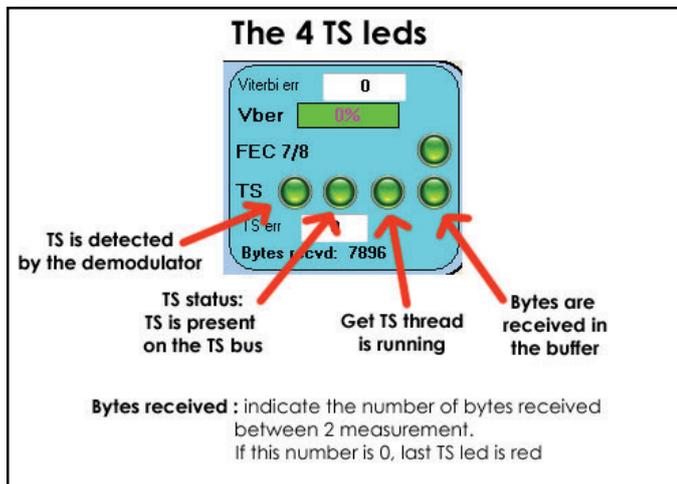


So, if the signal level is below -33dBm it will give a gain of +13 dB, if the signal level is between -33 and -20 dBm it will give a gain between 13dB and 0dB to set the output to -20 dBm, if the signal level is more than -20dBm it will give a negative gain between -0 and -17 dB to keep the gain to -20 dBm.

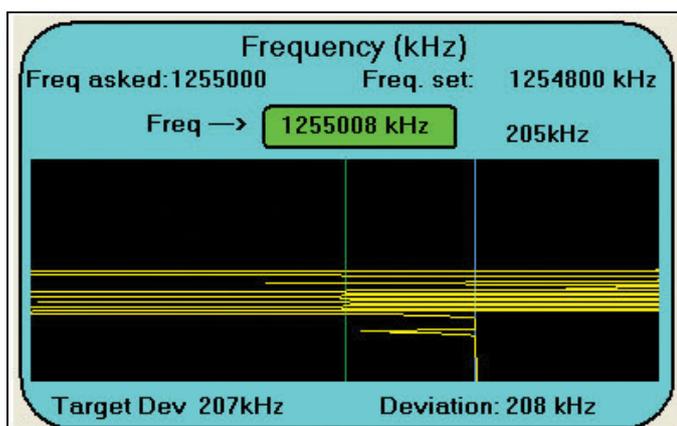
As the gain of this LNA is variable, dependent of the signal level, I have not let the auto set mode for the Base Band Gain, as it seems complicated to find the best value in all circumstances. Most of time, it is better to let it to 0 dB.

**The TS leds:**

The first led indicates that, after lock, the demodulator has detected a conform TS, the second led indicates that the TS is going out = present on the TS bus of the NIM, the third indicates that the software is working to receive the data sent via USB, the last led indicates that data is effectively cached.



**Derotator scan:**



► Minitioune V0.8 improves the operation of the rotator scan function.

As can be seen from the screen shot, the red line indicates the frequency set (1 254 800 kHz), the blue line is the

Frequency asked (1 255 000 kHz) before we are locked and change to the frequency found after lock (1255008 kHz is this example).

As you see on this picture I have asked 1255 MHz (I have a 1255 MHz preset button). When we use a Sharp tuner STV6110, the VCO step is 250 kHz or 500 kHz, when we use an Eardatek Tuner STB6100, the VCO step is 26 kHz or 52 kHz, when we use a Serit tuner STV6120 the VCO step is 57Hz or less. The exact frequency set depends of the quartz precision and the VCO step.

Using the former Minitioune versions (v0.7), I set the tuner nearest to the frequency asked and give the offset of frequency remaining to the derotator to help it to lock quicker.

But with the Serit I have discovered that, at low SR, it is not the best solution to set the tuner VCO too near to the real frequency. So now, with the v0.8 there is automatically an offset, I don't set the frequency asked, but a further off frequency to keep a minimum distance between the frequency received and the VCO frequency.

You can do test with the V0.7 version of Minitioune: you want to receive 1255 MHz at SR 250, ask 1255 000 kHz, wait for lock and note the MER. Now ask 1254 800 kHz, wait for lock and note the MER. I bet than it will be better.

After hours of observation I decided to change the way the frequency is set when we use low SR. To see better the noise I have now more amplified the Noise oscilloscope signal.

Results are evident if we look at the following tests

**Noise display**

The noise oscilloscope is now modified (signal more amplified) and we can see better how the noise can change. For these tests the same amplification is used for the Noise oscilloscope and I want to receive a DVB-S signal sent at 1255MHZ, SR250 kS/s

**Low SR mode**

For Eardatek and Sharp NIMs, you can choose if you want to use low SR mode between 180 kS/s and 6500 kS/s. Under 180kS/s low SR is automatically selected and above 6500 kS/s Low SR is not allowed.

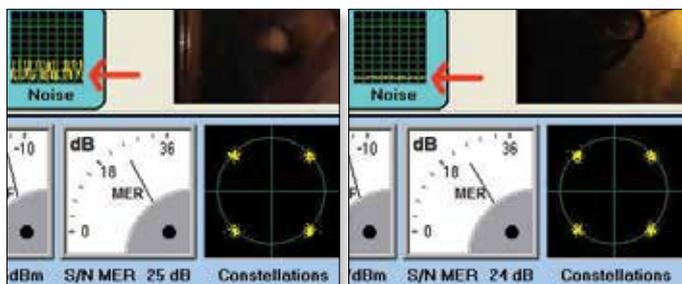
Low SR mode is useful to give a quicker lock for Eardatek or Sharp, but is not useful for a Serit NIM.

In all case, at low SR, it is better to set a tuner frequency different from the real frequency. (Sometimes with the Serit Tuner, depending of its frequency precision, we can be very near the real frequency and the MER value goes down very much).

### MiniTioune V0.8 vs V0.7 in practice:

The following screen shots show the results of many hours of testing – the main result is that at SR250, Serit NIM has the lowest Noise floor and can reach 33dB of MER, but Eardatek seems to be the fastest for locking if it is set in Low SR mode.

### Using Eardatek NIM

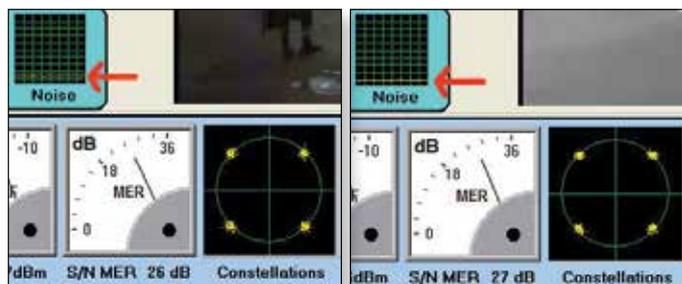


▶ V0.7 mode=1255000 kHz low SR    ▶ V0.7 mode=1255000 kHz high SR

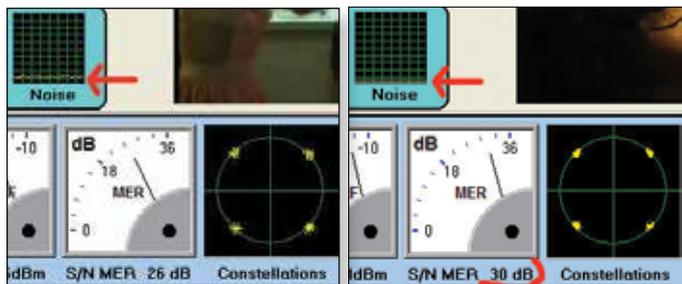
### Summary

MiniTioune V0.8 offer some significant performance improvements over previous versions however much more testing and on air evaluation is needed to optimizing the system for all symbol rates and gain setting.

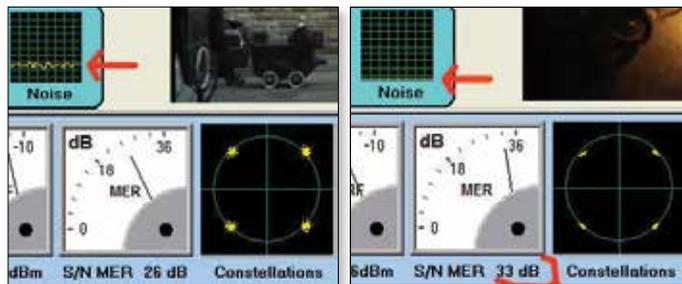
### Using Serit FTS4334



▶ V0.7 mode=1255000 kHz low SR    ▶ V0.7 mode=1255000 kHz high SR



▶ V0.8 mode=1254800 kHz low SR    ▶ V0.8 mode=1254800 kHz high SR



▶ V0.8 mode=1254800 kHz low SR    ▶ V0.8 mode=1254800 kHz high SR



# Producing a PIC for the 7 – band local oscillator

Steve Marshall - MOSKM

*This document is a guide to producing a PIC for the 7 – band local oscillator project by Ron Mount G7DOE. Ron's article can be found in CQ-TV 253.*

My example follows an installation in Windows 10.

## Part 1. Downloading and installing the free software MPLAB X.

You will use two software packages which when installed combine to compile and directly program the PIC chip. While Ron describes two PIC type numbers we will use the 12LF1552 for this example.

First download the IDE.

MPLAB X (IDE) Integrated Development Environment  
<http://www.microchip.com/mplab/mplab-x-ide>

At this point it is OK to install the package but don't run it yet. Next download and install the XC8 Compiler. It is important that the two packages are installed in the order described.

MPLAB XC8 Compiler  
<http://www.microchip.com/mplab/compilers>

The XC8 compiler is for the 8-bit PIC so will be suitable for both PIC types mentioned in the article.

Following installation you will have icons for the IDE but not the compiler. At the appropriate time the IDE will run the compiler.

Both downloads are sizeable and will take a while to install. On first run of the IDE you may be asked to give firewall access; you can OK this.

## Part 2. Running the software and programming the PIC.

MPLAB X IDE can be used to generate C code for projects, in this instance we are introducing code generated by Ron and possibly modified by you. This externally generated code will have to be inserted in the project folder at a given point. Some knowledge of the Windows file system is required to insert the file. Most Windows users should have no difficulty and the path is described further down.

My example assumes you will compile and program the PIC so we need to look at the programming hardware used.

Microchip produce a device called a PICKit3 which is available through many suppliers including Farnell. Part code SC09874. The PICKit3 is supported by the MPLAB X IDE.

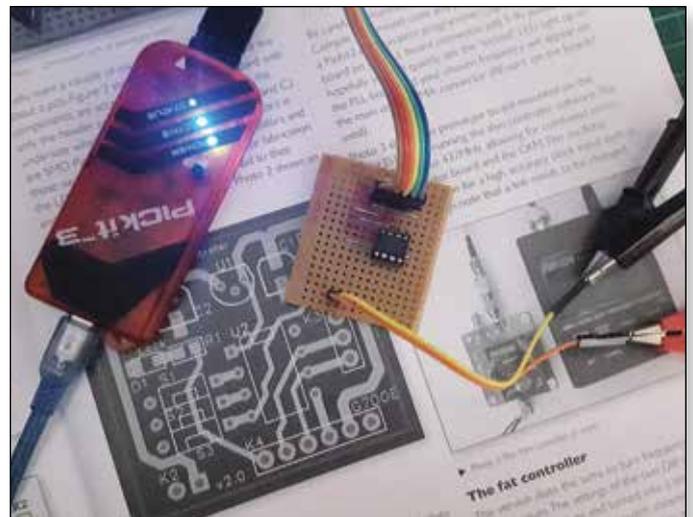
My own programmer is also labelled PICKit3 but it's a copy purchased through a well known auction site; it was a lot cheaper than other sources.

PICKit3 connects to your PC via a supplied USB cable. There will also be a ribbon cable to interface to the programming connector on your oscillator PCB.

You may find a ZIF socket in your kit but mine was not compatible with the 8-bit PICs used in this project.

In use with the MPLAB X IDE you may find the IDE updates the PICKit3 firmware. This is why you need to OK firewall access during software install.

Your hardware and programmer can be connected at this point. Please ensure you have read Ron's comments about PIC voltages for programming.



I use a little strip-board rig for programming but you can just as easily use the project PCB. Croc clips are supplying 3.3 volts from my bench PSU; 5v is required to program a 12F629.

Now we will go through the steps to introduce your C code, compile and program your PIC. I have taken a series of screen grabs to illustrate the process.



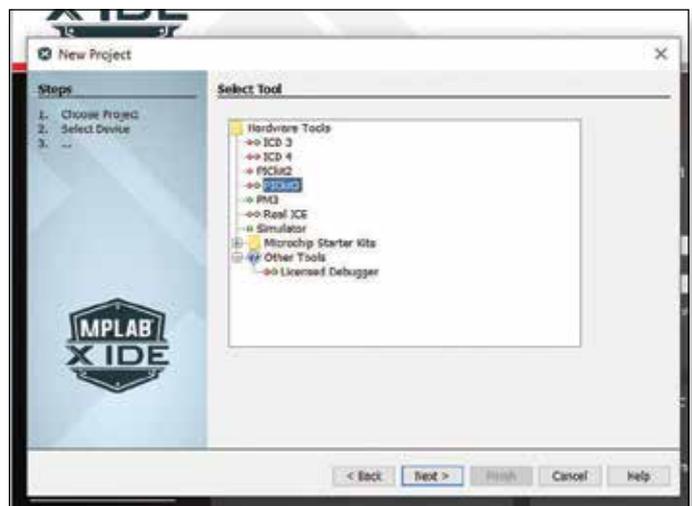
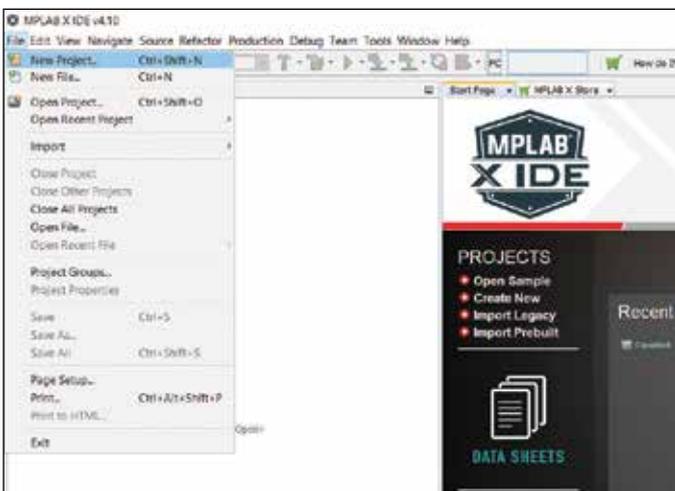
On first run of the IDE your screen should look something like this.

Device will be the PIC type number; in this case I2LF1552. Click Next.



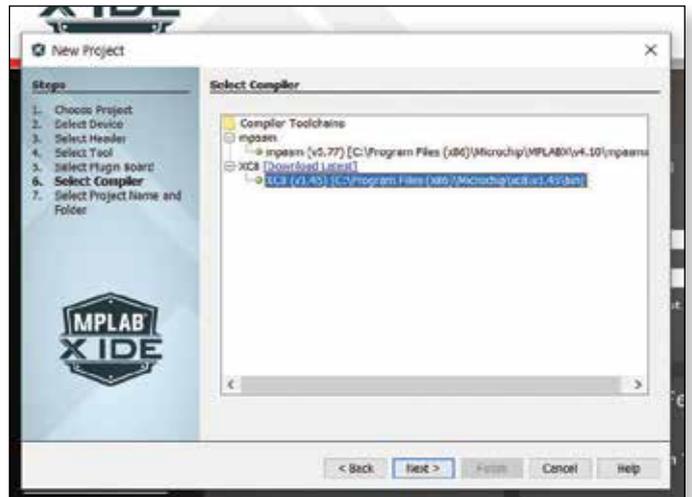
Click on the File drop-down menu and select New Project.

Select Tool is the programming tool. Select PICKit3 or whatever alternative you may already have. Click Next



When this dialogue opens you should accept the default settings. Microchip Embedded and Standalone Project. Click Next.

Select Compiler is the XC8 you installed. Select it and click Next. Since you have recently downloaded XC8 you can ignore the option to Download Latest.

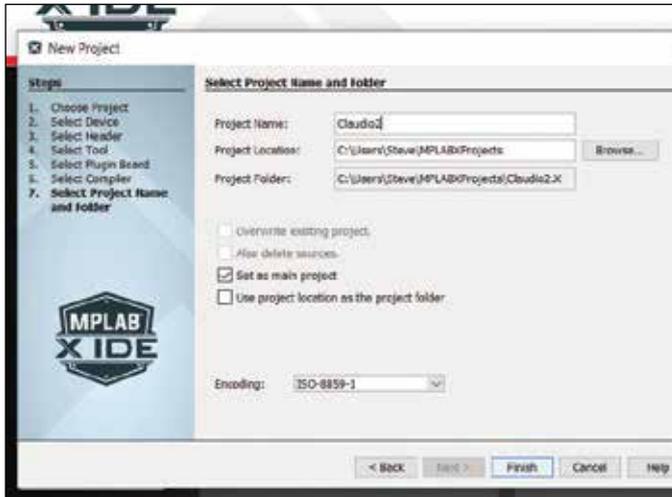


This will be the next dialogue Select Device; it refers to the type of PIC you will be using for this project. Using the Family drop-down menu select Mid-Range 8-bit MCUs (PIC10/12/16/MCP).

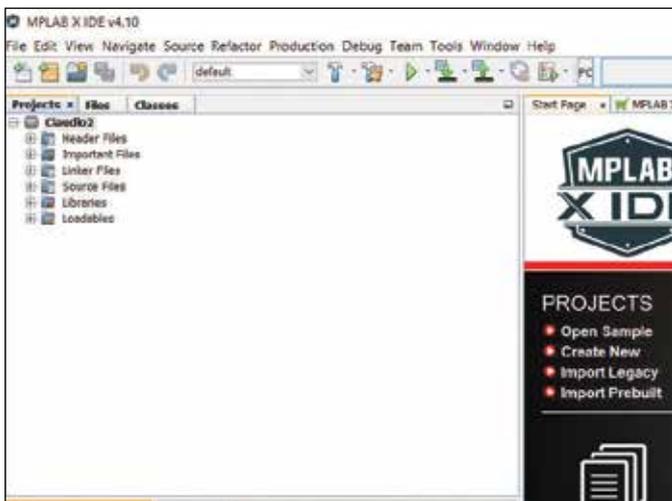
Select Project Name and Folder. Project Location and Project Folder will have been applied by the software so

you only need give the project a name meaningful to you. Click Next.

Leave check boxes as default.



At this point there will be a small delay while the IDE sets up the project folders; these will appear top left of the window. Click on the plus sign next to the project name to see the folders. At this point we need to introduce the C code. As mentioned earlier this will be achieved using Windows File Manager.



Leave MPLAB X software open and proceed as shown here.

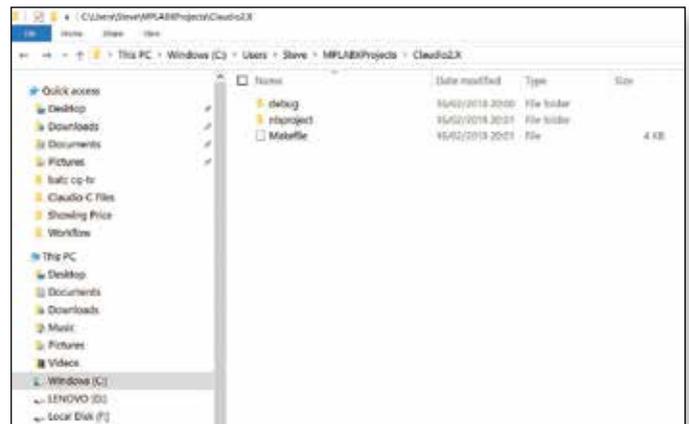
Using Windows copy and paste we need to copy the C file generated by Ron and navigate to the project folder. I will use my path as an example.

**Windows > (C:) > users > steve > MPLABXProjects > Claudio2.X**

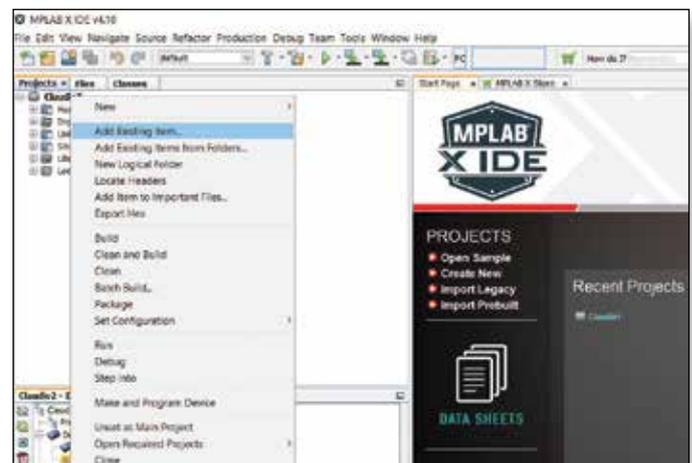
Where **steve** will be replaced with your user name and **Claudio2.X** replaced with your project name.

Paste your C code file in the area below Makefile.

You can exit the file transfer procedure and return to the IDE.



At the top of the folder list right click on the project name to open this drop-down menu. Select Add Existing Item.



The Select Item dialogue will open and included in the list should be your C file. In my example fat8sw-2.c. Highlight the file and click on Select leaving other options as default.

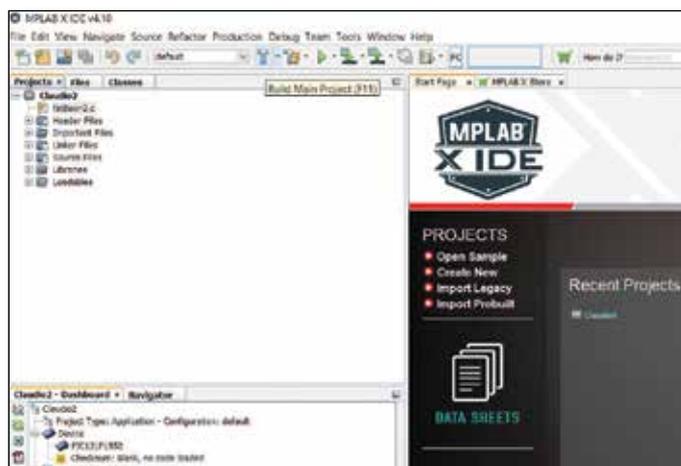


You should now see your C filename in the file list under the project name. We have reached the point where we find out whether it will compile. I have chosen to select

the next process using one of the icons. Of course there will be drop-down menus to do same; it's your choice.

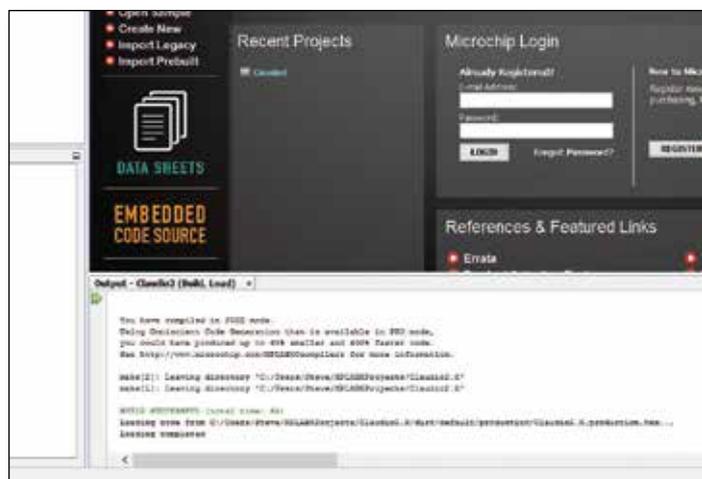
On the toolbar there's a hammer just to the right of the drop-down menu; hover the mouse pointer and it reads Build Main Project (F11). Click on the hammer to start the compiler and watch the progress at the bottom of the window.

During compilation you may see messages which suggest all is not right but I think it's a ploy to get you to spend money on a licensed version; I ignore them as my Pics have always worked.



If you got your C file edit right you will see the message below in green BUILD SUCCESSFUL (total time 6s). Total will vary. At this point a project hex file will have been generated and could be extracted from the file system for programming elsewhere.

If you have your programmer connected and power applied to the Pic you can proceed with programming. Click on the icon with the green down arrow to Make and Program Device Main Project.



As the programming process starts you will see the warning below. I'm sure you will have checked this stuff anyway.



This is the one you've been waiting for. Programming/Verify complete. Remove PIC and Rejoice.



### Questions Raised

**Q. Can I erase and reuse the PIC devices? How do I erase them?**

A. MPLAB X will erase them automatically when you send another file for programming.

**Q. Can I edit the C file in MPLAB X?**

A. Yes you can do edits when the file is open. Right click the file name and select open. There is a save option under the file menu. In my opinion files are easier to edit in a plain text editor; I use an excellent free editor called Notepad++.



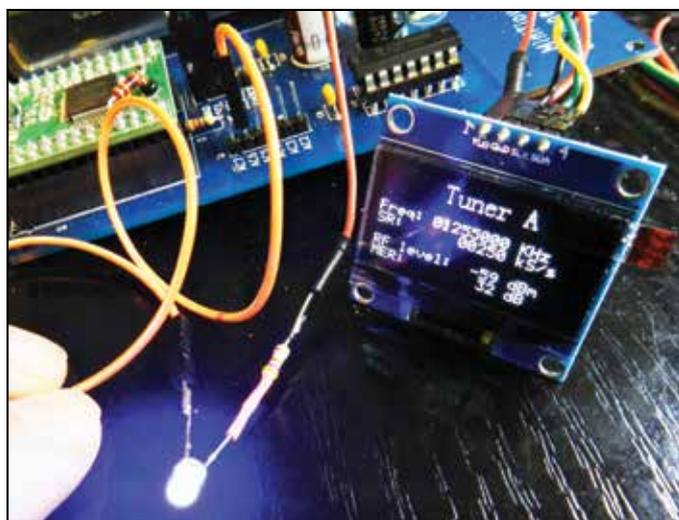
# Adding a display to the MiniTiouner-V2

Jean Pierre F6DZP

With version 0.8 of the MiniTioune software you can now add a TS lock LED and a display to your MiniTiouner-V2. If the MiniTiouner is being used in a repeater, the TS lock LED connections can also be used to give a signal present indication to the repeater logic.

## LED TS OK:

For the led you need 2 wires and a 330 ohm resistor in serial: Cathode is connected to AC6 (connector J8) and anode to VCC via a 330 ohm resistor.



## Display:

You have the choice of an OLED 1.3" or a Digole color TFT 1.44" or 1.8" or 2.2" or 2.4" or 2.6"

**Oled 1.3":** <https://www.aliexpress.com/item/IPCS-I-3-OLED-module-white-color-I28X64-I-3-inch-OLED-LCD-LED-Display-Module/32683739839.html>

(take care : I2C model = 4 pins only)

## Digole TFT:

<http://www.digole.com/index.php?categoryID=208>



► MiniTiouner V2 and Digole color TFT 2.2"



► OLED 1.3"

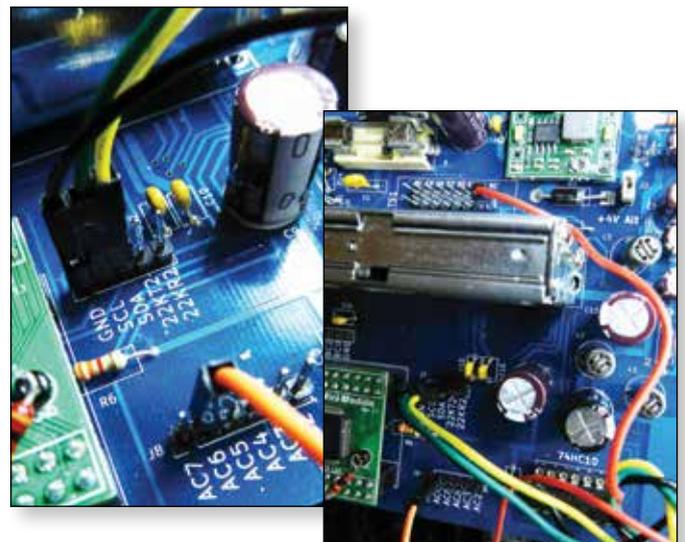


► Digole 1.44"

For the display, you need 4 wires: VCC, GND, SDA and SCL.

GND, SCL and SDA can be found on J7 connector

VCC (3.3v) can be found on TS1 connector



Before using the display, you must tell the MiniTiouner s/w about the display by modifying the .ini file in your Minitiouner directory as follows:

```

; .....
[Display]
; you must indicate here if you are using
a Display with your MiniTiouner
; OLED 1.3" : yes or no

; Digole 1.44" or 1.88" => Digole=14
//      Digole 2.2" or 2.4"  =>
Digole=22 // 2.6" =>  Digole=26
//      NO Digole => Digole=0 or
Digole=no

OLED=no

Digole=22
    
```



# Updates from Germany from TV-AMATEUR 187

Translation: Klaus, DL4KCK

## NI201SA antenna analyzer for 140 to 2700 MHz (Rainer Mueller, DM2CMB)

The NI201SA from China [1] is a simple to use mobile antenna analyzer for vector impedance measurements, that include amateur radio bands from 2 m up to 13 cm. It has four graphical user interfaces that are: one-point-measurement, scanning, calibration and system information. An internal high-power Lilon-accumulator with 2000 mAh capacity gives long duration usage time mobile. It is charged via an USB connector with 400 mA, so any USB recharger can be used.



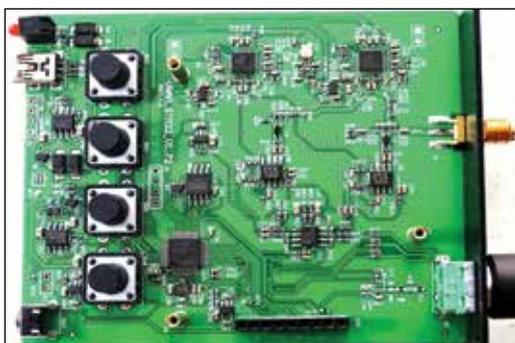
### Operation

In order to activate the analyzer you have to press the control button together with the OK button. This prevents from activating the unit unintentionally during transport. For switching off the OK button is pressed for more than two seconds.

After activating the user interface for one-point-measurement is shown. Then you have to set the measurement frequency by turning the rotary encoder on top and changing the digit with left/right buttons. The other measurements

like impedance, capacity, induction and S-parameter are activated by pushing the OK button.

The user interface for scanning is more detailed with diagrams of five scanning parameters like S11, VSWR, Z, R and X. At first the start- and the end-frequency as well as the wanted parameter are set. Additionally you can change the scaling, see picture 6 with VSWR of a 13 cm patch antenna between 2300 and 2600 MHz.



Picture 2 is showing the PCB without display, on the back side the accumulator is placed. An LED as charging control sits next to the USB connector. At the other edge of the board the reset knob is placed accessible through a small hole in the unit's plastic housing.

For antenna analyzing (S11) an internal resistance bridge is used, the test object is connected at the SMA port (there are no circuit diagrams available). Picture 3 is showing the input part of the PCB with the reflection matrix, the reference resistor (R38/R39) is connected via a capacitor (C48). The transformer (T1) sends a symmetrical measuring signal to the mixer IC (U8).



This VSWR scaling is set to X=1.0, so it shows S=1 to S=6. With X=0.1 the range from S=1 to S=1.5 would show up.

### How do the parameters get set?

There are modes for parameter selection and for parameter setting changed by pressing the OK button. For parameter selection you can press the left arrow or the right arrow button or turn the rotary encoder. With pushing the OK button or the rotary encoder knob you can switch to the parameter setting mode. Alterations are

set by pressing the left arrow or the right arrow button or turning the rotary encoder.

If you are pushing the CTRL button and then the M button, the system information interface is shown for changing the time of automatic power-off. With another pushing of M and CTRL the calibration mode is activated, and with sequentially pushing the M button alone the user interface for one-point-measurement is shown.

The NI 201SA has been calibrated by the manufacturer, but if you want to do it again, you have to possess the needed calibration elements. These are SHORT, OPEN and LOAD, available for instance under [2]. Frequency calibration is simple as well.

#### Specification:

- ▶ Working range: 140~2700 MHz
- ▶ Actual range: 137.5~2700 MHz
- ▶ Stepped frequency: 1 kHz
- ▶ Display: 2.4" TFT trdp
- ▶ Resolution ratio: 320 x 240 (QVGA)
- ▶ Battery capacity: 2000 mAH (7.4 Wh)
- ▶ Power consumption: <1.5 W
- ▶ Charge current: 400 mA
- ▶ Charge port: USB
- ▶ Auto power off can be set 5-60 minutes.
- ▶ Measured parameters: Resistance, Reactance, Standing wave, S11
- ▶ Resolution ratio: 4 number
- ▶ Frequency accuracy: about 5 ppm
- ▶ Connector: SMA-K

#### Measurement range:

- ▶ Impedance: 0.1~1000 Ohm
- ▶ Standing wave: 1.000~65
- ▶ S11 (dB): 0dB~-60 dB
- ▶ Working temperature: 0~40 degr. Celsius

#### References:

- [1] [https://www.banggood.com/NI201SA-UV-RF-Vector-Impedance-ANT-SWR-Antenna-Analyzer-Meter-Tester-140MHz-2.7GHz-p-1090983.html?currency=EUR&utm\\_source=criteo&utm\\_medium=cpc&utm\\_content=all&utm\\_campaign=electronic-DE-English&cur\\_warehouse=CN](https://www.banggood.com/NI201SA-UV-RF-Vector-Impedance-ANT-SWR-Antenna-Analyzer-Meter-Tester-140MHz-2.7GHz-p-1090983.html?currency=EUR&utm_source=criteo&utm_medium=cpc&utm_content=all&utm_campaign=electronic-DE-English&cur_warehouse=CN)
- [2] [http://www.wimo.com/messtechnik\\_d.html#21010.SMA](http://www.wimo.com/messtechnik_d.html#21010.SMA)

## Thoughts about DATV via EME (Uwe Kraus, DJ8DW)

In TV-AMATEUR 186 we reported about a test by AMSAT-UK and AMSAT-DL to send and to receive a DATV signal via EME using big dishes in Bochum (20 m) and in Goonhilly (32 m) at 3400 MHz. Unfortunately this failed - otherwise we would have got a great publicity for DATV.

I have been thinking about that too, but some preliminary considerations have discouraged me. The DATV mode GMSK would be advisable, with its constant envelope any nonlinear PA can amplify the signal without spectrum widening. Using radio amateur devices it would be possible to produce 1000 W on 70 cm equal to 60 dBm. A long-yagi group antenna for TX and RX would enable a gain of 25 dB in each direction. That sums up to 110 dBm - but the attenuation on the way to and from the moon over 800.000 km is about 260 dB on 70 cm...

The reflected signal would produce a power of -150 dBm at the receiver input. Our home-made 70-cm-GMSK-DATV-RX is able to reproduce a stable video signal with -90 dBm and 2 MHz rf bandwidth - how do we get the missing 60 dB? A higher TX power is not feasible, and antenna gain cannot rise accordingly. Receiver sensitivity might be further improved by some dB, and also bandwidth reduction to a quarter (RB-DATV) gives only some dB more. So obviously we cannot succeed, even not with ideal conditions.

In practice the problem gets even worse due to polarisation turns in the earth atmosphere, long multi-echoes from the convex moon surface and space noise. In the end for DATV via space we need an active repeater, may be in the earth orbit like ISS or on a geostationary satellite. With a future moon mission the astronauts could leave a DATV repeater with appropriate TX power on the moon surface.

## AMSAT-DL symposium 2017 in Bochum (Jens Schoon, DH6BB)

The 2017 symposium on 30th of September in the IUZ observatory Bochum had two topics. At first Thilo Elsner, DJ5YM, gave an overview on 60 years since Sputnik and the developments in Bochum. In 1946 Heinz Kaminski founded the observatory Bochum as part of the adult education centre. It developed after launch of Sputnik 1 in 1957 to "Institute for space research / observatory Bochum". The first received Sputnik signals in the western hemisphere came from there, and the antenna and RX systems got improved afterwards. So in 1969 the audio signals from the first moon mission have been received directly in Bochum. In 1982 the observatory was renamed

to "Institute for environmental and future research" (IUZ in German). Nowadays the 20 m dish is used by AMSAT-DL for data reception from the "STEREO" sun observation satellites for NASA. During the 2017 symposium a weather balloon was launched with much publicity. Because of bad weather conditions the prepared Sputnik 1 model stayed on earth...

The second topic was Es'Hail-2 with P4A-transponders. Achim Vollhardt, DH2VA, reported on a double down-converter for SSB and DATV reception, that processes amateur radio signals from Es'Hail-2 on 10 GHz. Normal PLL-LNBs have a disadvantage - the IF comes out on an unusable band at 745 MHz. The AMSAT-DL down-converter transfers this to 2 m for the narrow-band transponder signals. Using an LNB with two outputs the IF is mixed to 1340 MHz additionally, so the wide-band transponder signals with DATV are handed out to a usual DVB-S2 receiver.



One oscillator (middle of the picture) mixes the narrow-band signal to the 2m band section (above). The same oscillator signal is used in the lower section for mixing the wide-band transponder signals to a usable DVB-S2 RX range. On the left side the power supply for the LNB (14V/18V per channel disconnectable). Added are some filters and a microcontroller, that programmes the oscillator frequency. The F-connectors for input and for wide-band output have 75 Ohm impedance, the BNC connection for 2m has 50 Ohm. During the symposium a working down-converter proto-type was tested, it is planned to provide a construction set after a successful launch of Es'Hail-2.

Then Jens Schoon, DH6BB, reported on AMSAT-DL ground stations in Bochum and in Doha (Qatar). As the radio amateurs have no controlling hardware and software on the geostationary satellite their beacons and control signals must be generated in their ground stations. The backup-station in Bochum shall also give a testing platform for software developments. Near the big 20m parabol dish radome a 3m dish for TX and a 2.4m dish for reception

from Es'Hail-2 are available. AMSAT-DL will also construct a mobile ground station for presentations at big events like HAMRADIO Friedrichshafen.



Thomas Kleffel, DG5NGI, then reported on DATV devices within the ground stations. There are the modes DVB-S, DVB-S2 and DVB-S2X, where DVB-S2 is the right choice for the beacon transmission. DVB-S2X would be interesting for future operations, but at present there is no affordable user equipment. Thomas also presented a special mode to transfer software updates via Es'Hail-2 to the ground station hardware in Doha.

In the following general assembly of AMSAT-DL the chair Peter Guelzow, DB2OS, stated, that the launch date of Es'Hail-2 seems to emerge early in 2018, but not yet officially. During coffee breaks some equipment was being tested, i.e. a dummy transponder that transferred signals from 13 cm to 10 GHz. So besides CW and SSB contacts experimental DVB-S transmissions were performed. The narrow band contacts showed that stability of PLL-LNB and down-converter is sufficient without external reference. DVB-S signals showed typical difficulties with reflections and multi-path in the room - later on via the real transponder in orbit that will vanish.

But a look at the signals on a spectral analyzer revealed another problem: you have to control your rf bandwidth! Only because of a warm PA taking up much energy the signal must not be good - in the room this was easy to repair, but "on satellite" that can be a bigger task. Now in winter it is time to construct your own receiver and transmitter units - also take a look at new developments on SDR and RB-TV technics. 📡

**For more information:**  
[www.agaf.de](http://www.agaf.de)

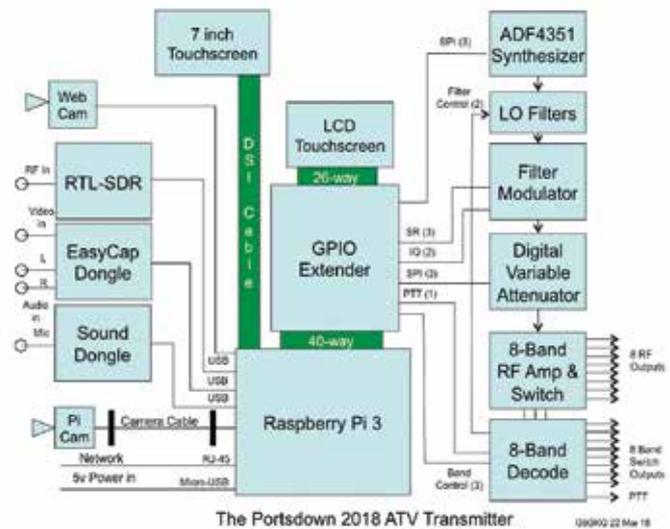


## Portsdown 2018

Dave Crump - G8GKQ

When I started working on the Raspberry Pi based DATV transmitter at the end of 2016, I had no idea that it would become the focus of my ATV activity for the next few months, let alone well into 2018.

Towards the end of 2017, I realised that I was reaching the limits of what could be achieved using the original Portsdown Menu system, and that it needed a major rewrite; the result was the “Portsdown 2018” software with sub-menus to choose the video source and encoding, and also an alpha-numeric keyboard to allow entry of settings and labels from the touchscreen.



BATC Portsdown Transmitter Main Menu				
TX		RX		M2
Modulation	Encoder	Output to	Format	Source
DVB-S	MPEG-2	UGLY	4:3	Pi Cam
Freq	Sym Rate	FEC	Band/Tvtr	Att Level
1255 MHz	4000	7/8	23_cm	-10.00
EasyCap	Caption	Audio	Atten	
Comp Vid	On	Auto	NONE	
Preset 1	Preset 2	Preset 3	Preset 4	Store
146.5_333	437_1MS	1255_HD	437-Ugly	Preset

► The Portsdown 2018 Main Menu

I intend to continue to develop the software, with more “applications” on Menu 2 and more “settings” on Menu 3. However, in this article I want to concentrate on the hardware changes that are supported by the Portsdown 2018 software. Existing users need not be alarmed – I am committed to retaining backward compatibility with the original Portsdown design – it’s just that some new features cannot be accomplished without additional hardware.

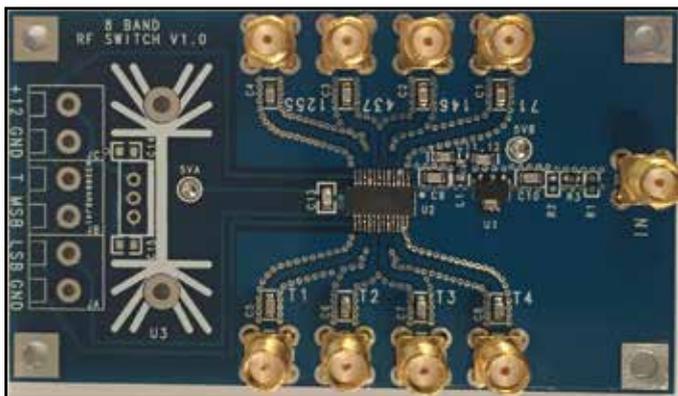
One of the problems reported frequently by Portsdown users has been their difficulty in setting the correct drive level for power amplifiers and transverters on each band. Also, some users have requested additional outputs, above the 4 band-specific outputs already catered for. The Portsdown 2018 design addresses both of these issues.



► The PE43703 Attenuator

### 8 Switched RF Outputs

I asked John, our excellent hardware designer, to research an 8-way RF switch with an amplifier to allow an output power of +10 dBm on all bands. He came back with a very simple design that can replace the existing 4-way switch if required.



► Partly-assembled 8-Band RF Switch

It has an optional input attenuator, and also an optional amplifier. Together with the variable attenuator, it boosts the Portsdown to output up to 10 dBm on 71 MHz, 146 MHz, 437 MHz or 1255 MHz. Four of the outputs are tied to the original frequency bands, and the other 4 outputs can be programmed to operate at any frequency, enabling them to drive microwave transverters.

The latest construction details can be found on the BATC Wiki: [https://wiki.batc.org.uk/8-Band\\_RF\\_Output\\_Switch](https://wiki.batc.org.uk/8-Band_RF_Output_Switch)

As with any amplifier handing digital signals, care needs to be taken not to overdrive it. Choosing values for the input attenuator to be around 15 dB avoids this possibility at 146 MHz, but reduces the maximum output on 1255 MHz.

### 8-Band Decode

To enable the selection of one of 8 outputs, another GPIO line from the RPi has been dual-purposed to select the transverter outputs T1 to T4. Its other role is to indicate that streaming is active on dedicated streaming set-ups. The transverter outputs can be in any of the 4 normal transmission ranges; one sticking point was that the correct VCO filter needs to be selected for each of these outputs and there were insufficient spare GPIO lines from the RPi to control the VCO filter independently.

The solution is that the desired VCO filter is selected on one of 4 pairs of DIP switches and the VCO filter and band select outputs are all controlled by a PIC. Again, John has designed a board that is a replacement for the 4-band switch, but enables the selection of 8 bands.

The PIC is available from the BATC shop ready-programmed, or the code is available on GitHub to enable you to program your own.

The PCB has no surface mount components and is very easy to construct. Full construction details can be found on the BATC Wiki:

[https://wiki.batc.org.uk/8-Band\\_Decoder](https://wiki.batc.org.uk/8-Band_Decoder)



► 8-Band Decode Board (without PIC)

### Webcams

With the help of members lending me their webcams for testing, I have been able to add support for a number of Logitech webcams. All will provide 640x480 pictures for H264 or MPEG-2 encoding, and the more capable ones work at 720p widescreen with audio.

The most impressive has been the Logitech C920, which has an on-board H264 encoder outputting at a fixed bitrate of about 3.5 Mbits/s. The Portsdown can be set to transmit H264 1080p widescreen pictures with stereo audio using an SR of 2MS and 7/8 FEC.

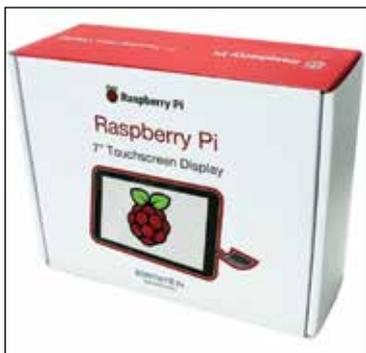
There is a list of supported Webcams on the Wiki. Each supported webcam is identified by name in the software, so just because a webcam is similar to a supported one does not mean that it will work; in fact, it is unlikely to work without a software change. Please post on the Forum if you would like your Webcam to be supported.



► The C920 Webcam

### Alternative Touchscreen

The recommended 3.5 inch touchscreen is small and easily damaged. The Element 14 7 inch touchscreen works with most Portsdown functions and is a good alternative. The only real issue at present is that it will not work properly with the FreqShow spectrum viewer.



► The 7 inch Display from Element 14

The Element 14 touchscreen uses the Display Serial interface, so has a fast update rate without using HDMI or occupying the GPIO pins.

### Raspberry Pi 3+

The Raspberry Pi 3+ has just been released with gigabit Ethernet, 5 GHz Wi-Fi and a slightly faster processor. However, it does not work with the current Portsdown software as this is based on Raspbian Jessie, not the latest Raspbian Stretch operating system. Whilst it might be possible to upgrade SD Cards with the old operating



system to work with the new Raspberry Pi 3+, I have decided that the development time would

be better spent rebuilding the Portsdown software to work with a new build of the Raspbian Stretch operating system.

The advantage to be gained from the Raspberry Pi 3+ for us is about 10 - 15% increase in processing speed. This should mean fewer dropouts in the 720p widescreen webcam and test card modes where the current processor occasionally hits the limits.

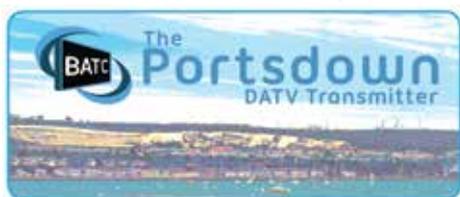
### Further Developments

Once the Portsdown 2018 software is working on the new operating system, I am considering adding touchscreen menus to set the callsign, locator, ADF4351 reference frequency and RTL-FM receive frequency. Evariste F5OEO is working on a number of developments that may enable audio with H264. I will incorporate these as soon as they are available.

Other facilities such as a locator range and bearing calculator and better integration of the LeanDVB receiver are also possible – it's just a matter of time!

If you have any features that you would like to see integrated into the project, and are prepared to write some software, the team would be very pleased to hear from you. 🗨️

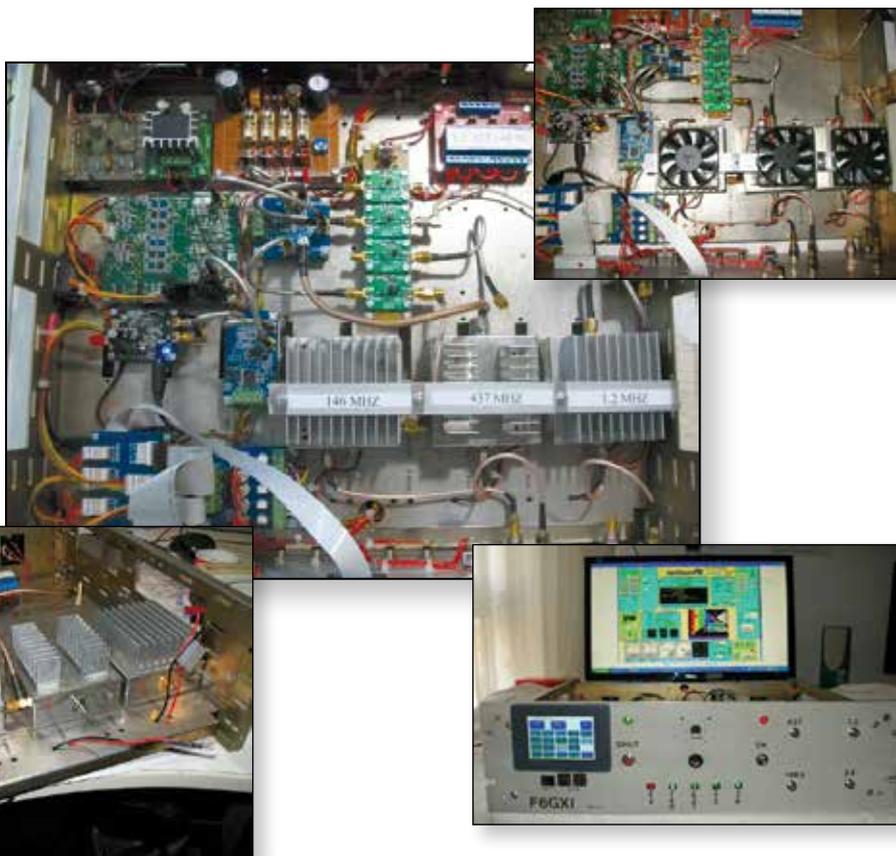
## Member's Projects



### This edition: F6GXI

A few photographs showing the detailed work that's gone into this Portsdown build by Denis, F6GXI.

If you'd like your work displayed here, please send your images, with a few words describing your build to [editor@batc.tv](mailto:editor@batc.tv)





# Touchscreen control of the DATV-Express

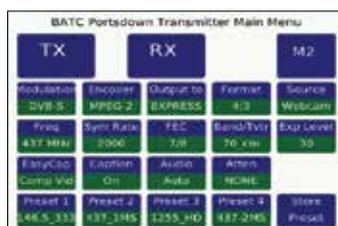
During the last 6 months, Dave G8GKQ has developed a number of excellent additional features for the BATC Portsdown project including the 4.2 GHz signal generator, the Freqshow based spectrum monitor and a USB interface for the DATV-Express board.



The Portsdown to DATV-Express interface has not been particularly well publicised and offers DATV-Express owners

the opportunity to build a DATV transmit system which combines the superb RF performance of the DATV-Express with all the features, including touch screen control, of the Portsdown system.

This article is really aimed at operators who already own a DATV express card and want to utilise the flexibility and usability of the Portsdown system.



The combined system offers the following:

## DATV-Express RF board

- ▶ RF output from 65MHz to 2450MHz typically +10 dBm output
- ▶ Output level fully adjustable over 47 dB range
- ▶ Excellent spectral regrowth with ~ 50dB shoulders across the frequency range

## Portsdown system features

- ▶ Portsdown touch screen interface on 3.5" or 7" display with no PC required
- ▶ 4 Presets setting source and output parameters
- ▶ 125KS to 4MS QPSK DVB-S modulation
- ▶ Composite video via Easycap, RPi camera and webcam inputs
- ▶ Optimised ffmpeg MPEG-2 and hardware H264 encoding
- ▶ On-board test patterns and vMix interface
- ▶ 4/8 port RF switch and PTT steering for transverter operation

Noel Matthews - G8GTZ

- ▶ Full control of the DATV-Express RF board including frequency, symbol rate and RF level
- ▶ Control of the DATV Express digital ports
- ▶ Additional "Signal Generator" mode to directly control your DATV Express as an RF Sig Gen

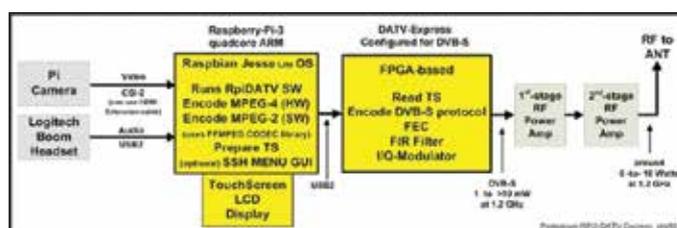
## Building the system

You should first ensure your DATV-Express system is operating correctly and then build up a Portsdown system by following the details on the BATC wiki. You will not need a Filter Modulator card or local oscillator filter board but you will require a touch screen, the 4 or 8 port RF output switch and band decoder board. You should then configure your Raspberry Pi 3 with the Portsdown software, either by buying an SD card from the BATC shop or configuring your own.

Once assembled you should test your Portsdown system, ensuring that the touch screen works and trying the Ugly or test mode.

## Connecting the DATV-Express card to the Portsdown

Once you have ensured both parts work separately, you simply connect them together using a standard USB cable and select DATVexpress in the Portsdown console menu or "EXPRESS" on the touchscreen.



Full details of the feature, limitations of use and configuration are available on the BATC wiki [https://wiki.batc.org.uk/Controlling\\_a\\_DATVExpress](https://wiki.batc.org.uk/Controlling_a_DATVExpress)

The combined use of the DATV-Express and Portsdown systems provides a high performance self contained DATV transmit system with a touch screen interface and flexible interface capabilities.

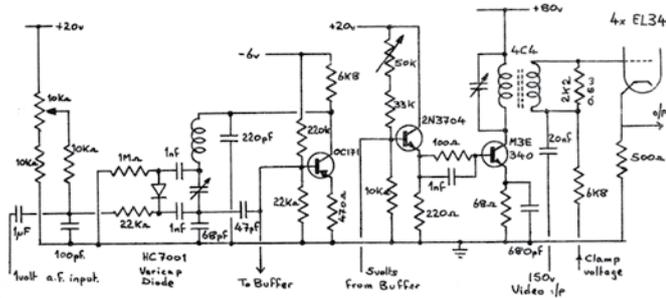
# Turning Back the Pages

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

Peter Delaney - G8KZG

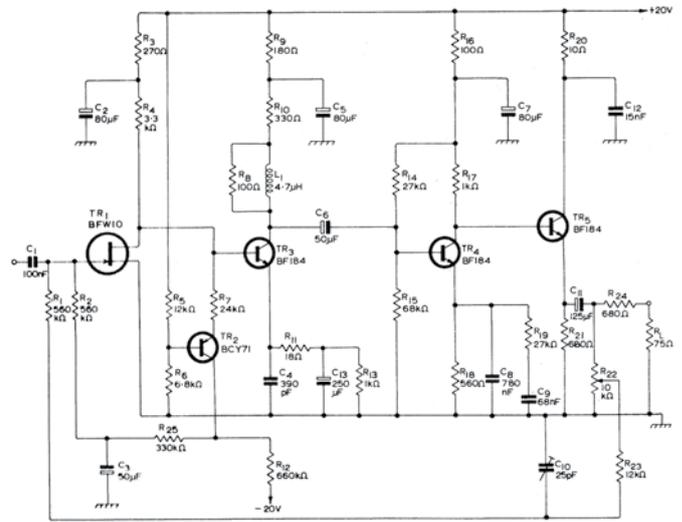
## CQ-TV 71

The cover of CQTV 71 was dated August 1970 and had a picture of Churchill College, Cambridge, on the front, with a reminder inside that there was just time to register for CAT-70, the amateur television convention that would take place in July. The programme would start with a 'Get together' on the Friday evening, and then would have exhibitions, lectures, and visits during the Saturday, with a Convention Dinner in the evening, with exhibitions, films, visits, and the Club business meeting on the Sunday.

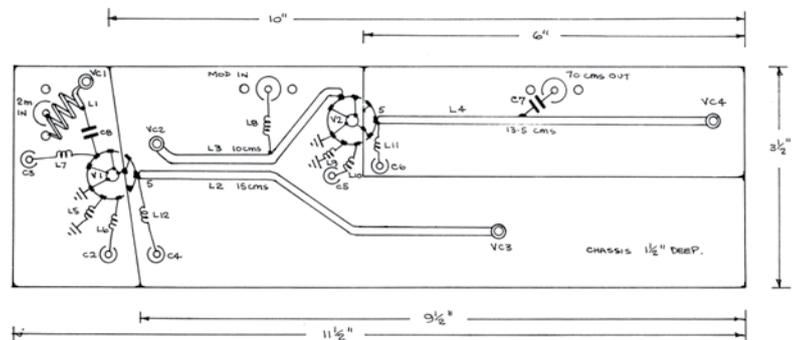


The first of the technical articles was for a video plus sound modulator, written by A Maurer, one of the Swiss members. In order to avoid having a separate transmitter for the audio channel, and the problems that created in keeping their respective frequencies stable enough for receivers designed intercarrier reception, this design mixed the audio and video signals in the modulator. The video modulator used four EL34 cathode followers as its output, and clamped the video black level at the grids, and to keep that meant the audio signal had to be added at a high level. The actual mixing took place by using a toroidal transformer made on a 4c4 type ferrite core, with an 8 turn primary and a 6 turn secondary. The audio input was applied to an oscillator built round the OC171 transistor which had a varicap diode in parallel with the tuning capacitor, and so produced an FM output. That was then buffered (not shown on the diagram) and limited before driving the high voltage M3E340 power transistor - which had to be air cooled - that had the toroidal transformer primary as its output load.

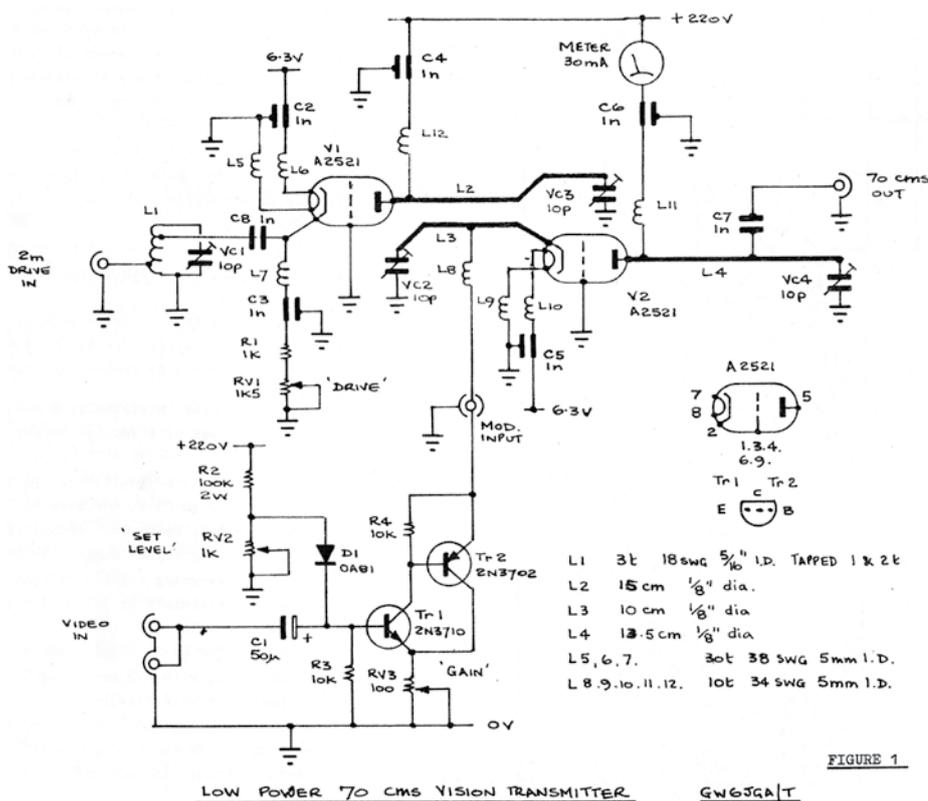
The vidicon camera tube used a light sensitive target layer made of antimony trisulphide, but a relatively new type at the time was a variant that used a lead oxide target layer, and commonly known as a Plumbicon (which was actually Philips trade mark name for these). The lead oxide tubes had a very low dark current, and



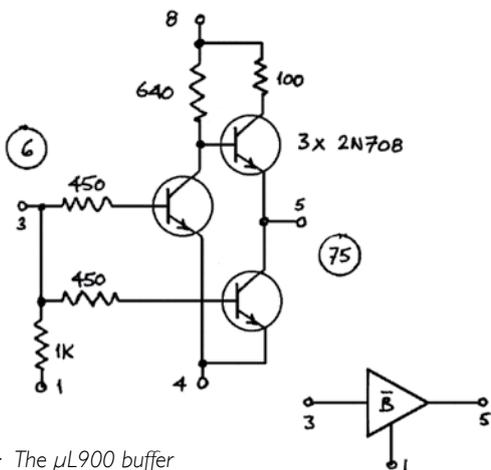
did not suffer from the problems of 'lag' apparent with vidicon tubes. To take advantage of these features, a design was shown for a camera head amplifier using field effect transistors, which inherently have a high input impedance. Although the earliest transistors developed by Shockley, Bardeen and Brattain worked on the field effect, practical devices, were again relatively new in 1970. The BCY71 transistor was set to stabilise the BFW10 field effect transistor input stage's drain current at 4mA, and then 3 low noise transistors gave sufficient gain to deliver up to 1.3V peak video signal across a 75Ω load. (The circuit had come from Mullard Ltd, who were then part of the Philips group of companies – the following issue of CQ-TV suggested that R24, in series with the output, should be 68Ω, as shown by Philips version, not 680Ω as in the Mullard version).



John Lawrence's 'Circuit Notebook' was for a low power transmitter for use to transmit video on the 70 cm band. A drive signal in the 2m band was applied to V1, which would act as a tripler amplifier, with its output coupled via L2 and L3 to the power amplifier output stage, V2. The video signal was amplified by the two transistor stage, with



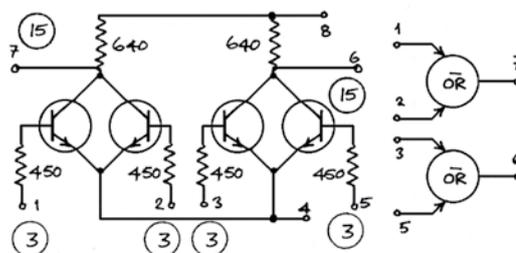
D1 restoring the dc level (as set by RV2). The output from this stage is then also fed to L3 - modulating the cathode rather than the grid resulting in a more linear output than if the modulation was applied to the grid. The RF section was built on a copper or brass chassis, with a full layout diagram showing the construction details - the inductor dimensions being on the circuit diagram. The transistor circuitry was housed in a small diecast box mounted on the end of the chassis.



The remaining technical article was on integrated circuits, and was the first in a long running series by Arthur Critchley. He commented that "various digital integrated circuits have been released to the amateur market over the last year or two at reasonable prices. ICs were very novel at the time, and this was an introduction to

the RTL µL9xx series made by Fairchild., which normally worked with a 3.6V supply. The µL900 was a buffer, and (at this stage of integration) the internal 3 transistor circuit was shown along with its logical equivalent. The buffer could drive pulses to a 75Ω load. The second type of IC was the µL914. This contained two identical circuits, each being a NOR gate (Arthur went on to explain the logic in these, as it was unfamiliar to most amateurs at the time. Again, both the circuit diagram and its logical equivalent were shown. The (to many engineers) strange aspect was that the internal circuitry did not have to be understood in order to use them - the numbers in circles represented a 'loading factor' -- in the case of the µL900 the inputs were value 6 and the outputs 15

(so one µL900 could drive up to 5 of the µL914 type, for example). Arthur went on to show how such gate circuits could be combined to produce complex pulse trains, such as are found in composite sync pulses, to form a bistable, a monostable or a Schmitt trigger.



► The second type of IC was the µL914 dual NOR gate

The magazine reminded members that there was a range of magazines, circuits and tapes that could be borrowed from the Club Library, and in particular listed those from the "Mullard Technical Communications" series that were likely to be of special interest to BATC members (from a "speed control for electric drills" to "Plumbicon camera tubes and their applications").

# The British Amateur Television Club



## The club provides the following for its members:

▶ A colour magazine, CQ-TV, produced for members in paper or .pdf (cyber membership) formats.

▶ Web site – where you can find our online shop stocking hard to get components, software downloads for published projects and much more.

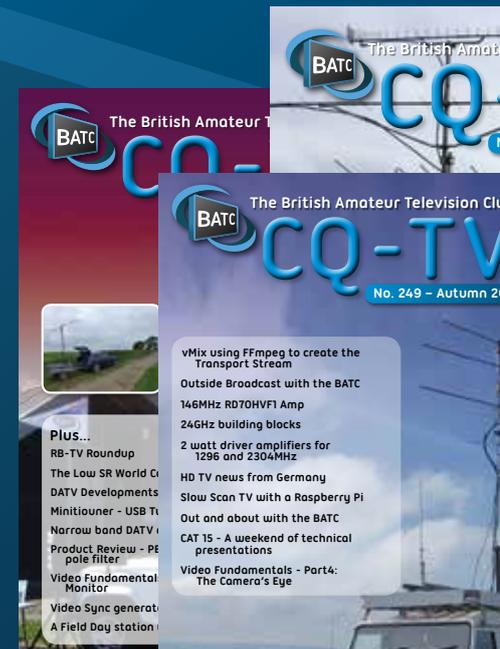
▶ A members forum at [www.batc.org.uk/forum/](http://www.batc.org.uk/forum/) for help, information and the interchange of ideas.

▶ A video streaming facility at [www.batc.tv](http://www.batc.tv) which enables repeaters and individual members to be seen worldwide.

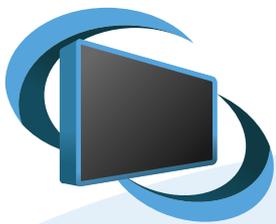
▶ An annual Convention held in the UK where you can meet other members, visit demonstrations and listen to lectures.

▶ Meet other club members at the BATC stand at local rallies across the country.

▶ The **BATC Wiki** for all the details of systems and projects for all things ATV. <https://wiki.batc.tv/>



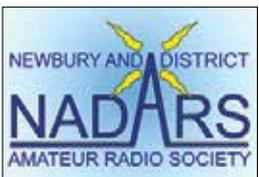
# [www.batc.org.uk](http://www.batc.org.uk)



# BATC

## Out and About

RadioFairs



**Rallies and events with an BATC stand:** (subject to change)  
More will be added as they become known.

### 2018

14/15 April	Martlesham MRT
15 April	West London
29 April	NARS Blackpool
20 May	Dunstable Downs
26 May	Norden, Rochdale
1-3 June	Friedrichshafen, DL
17 June	West of England
24 June	Newbury, Berks
22 July	McMichael
15-16 Sept	BATC Convention
28-29 Sept	National Hamfest
12-14 Oct	RSGB Convention
17 Nov	Norden, Rochdale

<http://mmrt.homedns.org>  
[www.radiofairs.co.uk](http://www.radiofairs.co.uk)  
[www.narsa.org.uk](http://www.narsa.org.uk)  
[www.ddrcbootsale.org](http://www.ddrcbootsale.org)  
[www.radars.me.uk](http://www.radars.me.uk)  
[www.hamradio-fredrichafen.de](http://www.hamradio-fredrichafen.de)  
[www.westrally.org.uk](http://www.westrally.org.uk)  
[www.nadars.org.uk](http://www.nadars.org.uk)  
[www.mcmichaelrally.org.uk](http://www.mcmichaelrally.org.uk)  
[www.batc.org.uk](http://www.batc.org.uk)  
[www.nationalhamfest.org.uk](http://www.nationalhamfest.org.uk)  
[www.rsgbevents.org](http://www.rsgbevents.org)  
[www.radars.me.uk](http://www.radars.me.uk)

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

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