



The British Amateur Television Club

# CQ-TV

No. 253 – Autumn 2016

**The ADF4351 flexible signal source**

**A 7-band local oscillator**

**ADF4351 driven by an Arduino**

**GB3HV 70cms input update**

**A 437 MHz DVB-S Transmitter  
Using a Raspberry Pi**

**The Making of 'TXFactor**

**CAT16 - the full story**

**VMix to RpiDATV via FFmpeg**

**Noise Power meter for the  
Minitiouner**

**DN1JKG calling OR4ISS**

**DATV-Express on Windows**



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11 and 12 March 2017

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



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# CQ-TV 253

## Contents:

- 4 News from the Chairman
- 5 Members News
- 7 Contest and Activity Day News
- 9 The ADF435 I flexible signal source
- 9 7-band local oscillator
- 13 ADF435I driven by an Arduino
- 15 GB3HV 70cms input update
- 16 A 437 MHz DVB-S Transmitter  
Using a Raspberry Pi
- 20 The Making of 'TXFactor'
- 23 CAT I 6 - the full story
- 26 VMix to RpiDATV via FFmpeg
- 27 Noise Power meter for the Minitiouner
- 28 Video Fundamentals 8
- 30 DNIJKG calling OR4ISS
- 32 DATV-Express on Windows
- 34 Here and there...
- 35 New and renewing members
- 36 Turning Back the Pages - CQ-TV 65
- 38 High Tech Wearables

**Cover:** The impressive display hangar at the  
RAF Museum in Cosford. Photo - M0AEU

## Contributions

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

Alternatively you can write to us at:  
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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.

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## From the Chairman...

Noel Matthews - G8GTZ



It was great to see many of you at CAT16 and preparing for such events makes you realise just how much has been achieved by the ATV community in the last 2 years – in that time, the ATV community has risen to the challenge of RB-TV and proven to Ofcom that we can be responsible and use the new spectrum efficiently. We have upgraded the streamer to HD, launched the BATC Wiki and seen the introduction of applications such as Vmix which can enable a revolution in how we all produce video in the shack.

And this development of new technologies continues at a pace - in this edition of CQ-TV we include 2 articles based around the ADF 4351 chip. Who would have thought 10 years ago that you could generate a high quality signal on any frequency up to 4.4 GHz from 1 chip and a few components? The new releases of Tutoune and Datvexpress have enabled the ATV community to experiment with DVB-S2 and very early tests by G4GUO and G8GKQ have shown there are clearly gains to be had in certain applications. DVB-S2 will feature heavily in the Eshailsat geo-stationary satellite project due for launch in late 2017 and which, if all goes to plan, will revolutionise ATV operation.

At the General Meeting after CAT16 you voted for 4 members to join or rejoin the committee including Rob G8NXG as membership secretary – this is an important role and please join me in thanking Robert for volunteering to undertake this vital role.

However, the committee are just one part of the story and the success of BATC and the ATV community is very

reliant on volunteers. It is unfortunate that we don't have any BATC presence at the 2 major events in the UK amateur radio calendar - RSGB Hamfest and Convention, although Steve MIERS did fly the flag for us at Hamfest. This is purely down to lack of man power – let us know if you would like to get involved and help promote our hobby at these and other events and we will support you with banners and publicity material.

One of the things that I ponder about is, how do we get more of you to become actively involved in ATV and the BATC? We have approximately 800 members in the UK and yet we only hear of perhaps 100 people being regularly involved in ATV related events. We need your feedback on what you want from your club and what it would take to get you more involved.

And finally, I will quote an email from Charles, G4GUO, where he said that he believes we are on the cusp of a new golden age for ATV. New skill sets being developed, that mesh well with emergent internet, video and radio technologies and we are not hindered by the type of constraints the professionals have. Our aspect of amateur radio covers all skill levels from beginner to seasoned professional and all interests including propagation, antennas, RF design, studio, video editing, software development, SDR, DSP, FPGA, latest devices and techniques. And then of course, you get to see each other projects over the air or send back live video of testing.

What other aspect of our great hobby has so much to offer – enjoy reading through this edition of CQ-TV and then decide how are you going to get involved! 📺



▶ The CAT16 dinner on Saturday night - a great chance to meet and chat with fellow ATVers



## Members News

Dave Mann – G8ADM

### TV Repeaters

Our TV repeater details are almost constantly changing. A good source of information to see the current state of both the inputs and outputs is to look on the BATC streaming page, [www.batc.tv](http://www.batc.tv). The text channel and the information on each repeater page can be useful. Many repeaters have an activity night that can also be interesting.

**GB3YT** Mirfield, West Yorkshire, IO93DP, is now fully operational with both analogue and digital receive on 1276MHz. Digital is 4MS/s auto FEC. This is a fairly new repeater and it would be good to see more activity now that both inputs are working. The repeater is operated by Kay, G8NZR.

**GB3TZ**, near Dunstable, has recently started streaming on the web, [www.batc.tv](http://www.batc.tv). This is a 13cm repeater with a digital output and both digital and analogue inputs.

You can find a list of new TV repeater applications on the UK Repeater Net web site, <https://www.ukrepeater.net/repeaterlist5.htm>. These include: GB3AT, 10GHz, Isle of Wight. GB3ET, 23cm, Banbury. GB3EY, 23cm, South Cave. GB3FT, 23cm Blackpool. GB3IF, 6cm, Birkenhead. GB3IV, 6cm, Cosham (change of location). We look forward to opening up these new areas of the country.

### Activity

**Vic, G3SDQ** lives in a fairly low location in East London. He has recently been experimenting with RB-TV on 4 metres using a DATV-Express module at 71 MHz feeding an amplifier producing 7 Watts into a homemade cubical quad antenna. The receiver uses a 4m to UHF up-converter feeding an existing SUP2400 module plus a NIM tuner together with MiniTione software on a Windows PC. There's not much activity on 4 m ATV.



This maybe because a special research permit is required from OFCOM in order to be able to use the extended band. Vic uses 333KS/s with an FEC of 7/8. He is very keen for more contacts, email: [vic@nbtv.org](mailto:vic@nbtv.org)

**Dave, G8GKQ**, and **Noel, G8GTZ**, have been testing RBTV on the 10GHz band (333KS 7/8 H264). The original tests were over a 32Km path and on 3rd July 2016 over a 93Km path. The tests were very successful with received MERs in the range 6 - 12db with fading over the almost-LOS path. G8GTZ/P was at Walbury Hill, near Newbury and G8GKQ/P was on Povington Hill, near Lulworth. G8GKQ/P used DigiThin into G3WDC Transverter with Qualcomm PA. 250mW out. MiniTioner RX and 60cm dish. G8GTZ/P used DATV Express into DB6NT Transverter. 3W out. MiniTioner RX and 60cm dish. Their next steps are to make some equipment improvements, and then try a longer path.

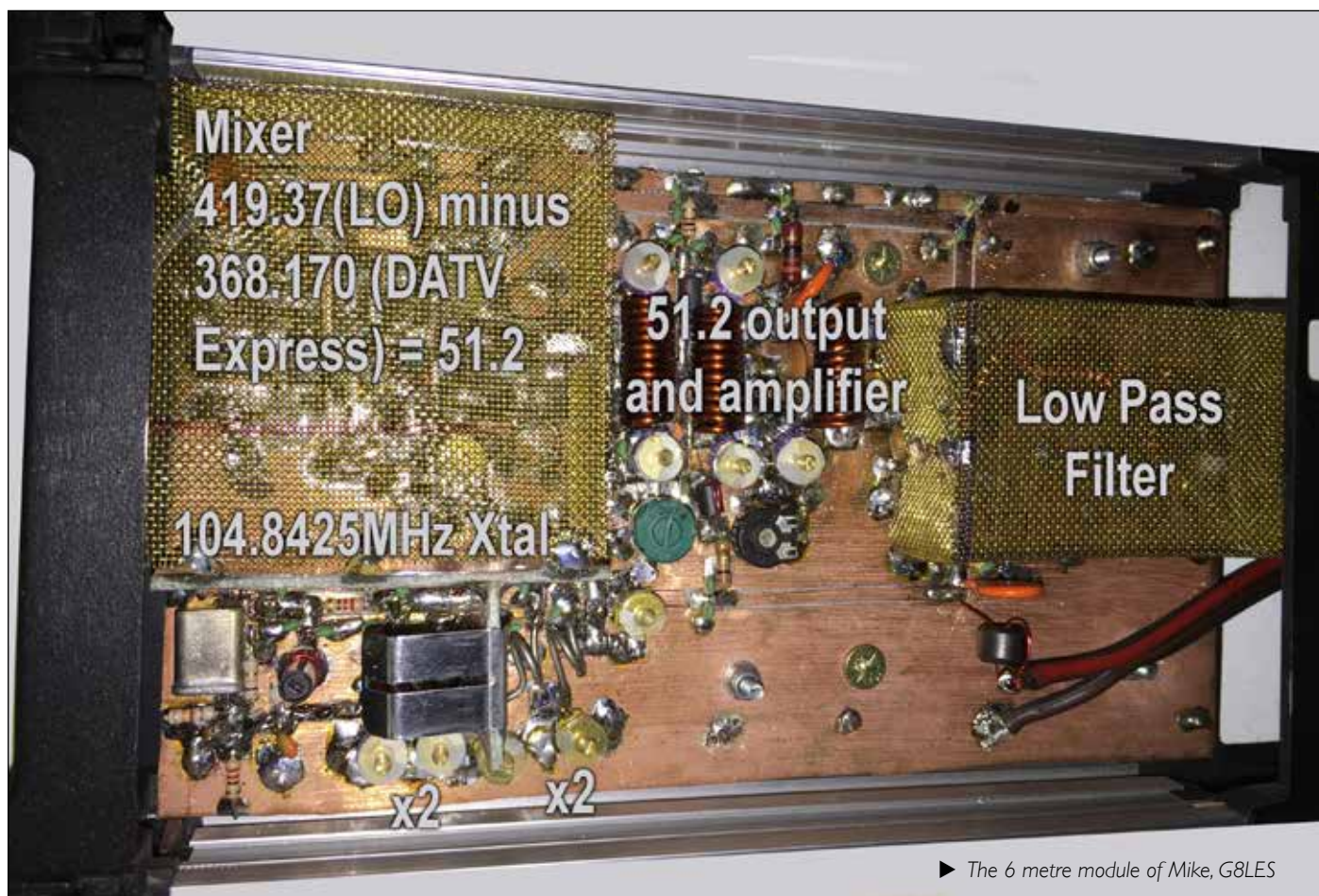
**Petrie Owen, GW4WVO** in West Cardiff, IO81IL, is transmitting DATV on 437MHz mostly beaming ESE so towards Bristol and beyond. It's great to see some activity from Cardiff. Reports are most welcome.

**John, G8BXH**, in Watford is starting to get active on ATV. He can currently see the 10GHz output of GB3BH on his spectrum analyser but has yet to successfully demodulate the video signal. We look forward to hearing more.

**Mike, G8LES** has made a transverter board for 51.2MHz which mixes with a UHF local oscillator to work with DATV Express. The circuit uses the PCB layout, in that the LO feed track round to the mixer is resonated by a trimmer, peaking the drive to the mixer. See the picture of his module (over the page). If he made another version he would make it larger to cope with the bigger coils required for 6m and would add a 6m low pass filter on the end of the pcb. For more information or to set up a sked please contact Mike directly.

### GB2RS News

Previously I mentioned that Roy, G8CKN, who has read the news every Sunday since 1995 in sound and more recently also in vision is retiring from this role. His last transmission was at the end of September. Alison G8ROG is taking over in speech via the GB3BN 70cm repeater, and in vision via the GB3HV ATV repeater as well as by Internet Streaming, [www.batc.tv](http://www.batc.tv). This will be slightly earlier on Sunday morning at 9.00am. We wish Alison good luck in her new role.



### Australian News

The weekly news from Australia is also available via the BATC streaming, [www.batc.tv](http://www.batc.tv). Due to the time difference this starts at Midnight on Saturdays. Click on 'Members Streams' and select VK7AX. This is an interesting compilation by various readers and usually lasts for about 90mins. This is in addition to the Australian members personal news streamed on Monday and Tuesday mornings at 10am UK time.

### Distance Records.

With the use of the lower VHF bands long distances are now possible for DATV. Currently the longest distance for RB-TV on the 2m band is 182Km. This record will probably be broken by the time you read this. A good source of information about DX on ATV is Facebook, look at the British Amateur Television Club group and also look at the BATC Forum: <http://www.batc.org.uk/forum/>.

### DATV on the HF bands.

FreeDV+Video is a system developed for showing DATV on the HF bands using Frequency Division Multiple Access (FDMA). This mode uses 66 sub-carriers, with 49 sub-carriers for video and 17 sub-carriers for digital

voice (FreeDV "I 600" mode) and may be used with a fully digitally synthesized HF transceiver. Full details and free software download: <http://www.qsl.net/wa6nut/FreeDVplusVideo>. Recordings of the results can be found on youtube, search for: 'FreeDV+ Video TX'. Please let us know if you have any contacts.

### Es'hail 2 satellite – update.

The launch of this geosynchronous satellite that includes an ATV transponder, as previously reported, is now estimated to be in the 3rd quarter of 2017. It will be positioned at 25.5 degrees east. There is a very comprehensive article on this satellite in the latest Dubus magazine, 3/2016.

### ATV Contests and Activity Weekends

The next ATV Activity weekend is from 12.00 UTC on Saturday 10th December to 18.00 UTC on the Sunday, see: <http://www.batc.org.uk/forum/>. 

Please send any news for CQ-TV 254 to me by the end of November [secretary@batc.tv](mailto:secretary@batc.tv)



# Contest and Activity Day News

Dave Crump – G8GKQ

## Awards

It was good to see some Activity Day and Contest participants presented with awards at CAT 16. Those recognized included Arthur G4CPE and Noel G8GTZ for the best RB-TV contact during the December 2015 Activity Weekend between Walbury Hill, Berks and Upper Sundon, Beds at 95 km. During the same weekend, the certificates for best DX went to Rob M0DTS and Brian G4EWJ (operating as G3NWR/P) for their contact between the North York Moors and Holme Moss at 114 km. Lastly, Noel G8GTZ and Rolf F9ZG took the award for the best digital contact during the IARU International Contest in June 2016, from Hastings, Kent to Saint-Lô in Normandy at 231 km. Well done to all the winners.

The Committee will be offering three awards for the December Activity Weekend:

- ▶ Best DX RB-TV contact  
(one or 2-way, bandwidth < 800 KHz)
- ▶ Best DX Digital TV contact  
(one or 2-way, bandwidth > 800 KHz)
- ▶ Best DX Analogue TV contact  
(one or 2-way, FM or AM)

To be eligible for the award, at least one of the stations must be a BATC Member operating from the UK, and full details of the claim must be submitted to me at [contests@batc.tv](mailto:contests@batc.tv).

## ATV Activity Weekend 9/10 July

Although only a month after the contest, there was a good level of activity during this weekend. Shaun G8VPG went out to Lansdown near Bath Racecourse (IO8ITK) with Martin G7NSY and Brian G6AUR. Noel G8GTZ went out to his local hill (Farleigh Wallop) and both Rob

M0DTS and Colin G4KLB were active from their home stations.

Best DX that I heard of was a 2-way on 146 MHz between G8VPG/P and G8GTZ/P at about 91 km. They also managed a one-way on 437 MHz digital.

Call	Location	Locator
G8VPG/P	Lansdown, Somerset	IO8ITK
G8GTZ/P	Basingstoke, Hants	IO9IKF
M0DTS	Yarm, Cleveland	IO94IL
G4KLB	Bournemouth, Dorset	IO90BR



▶ G8VPG/P near Bath Racecourse during the July Activity Weekend

## Contest and Activity Weekend Calendar

1200 UTC 10 December 2016 - 1800 UTC 11 December 2016:	ATV Activity Weekend
1200 UTC 11 March 2017 - 1800 UTC 12 March 2017	ATV Activity Weekend
1200 UTC 6 May 2017 - 1800 UTC 7 May 2017:	ATV Activity Weekend
1200 UTC 10 June 2017 - 1800 UTC 11 June 2017:	IARU International ATV Contest
1200 UTC 8 July 2017 - 1800 UTC 9 July 2017:	ATV Activity Weekend
1200 UTC 12 August 2017- 1800 UTC 13 August 2017:	ATV Activity Weekend
1200 UTC 9 September 2017 - 1800 UTC 10 September 2017:	ATV Activity Weekend

## ATV Activity Weekend 13/14 August

Really good weather for this weekend brought out many stations. Noel G8GTZ/P went to Dunstable Downs. Peter G8DKC went out near Twycross Zoo with 146, 437 and 1255. Shaun G8VPG went out with Brian G6AUR to Bloreng Mountain near Abergavenny and managed to work G8GTZ/P, G0MJW and G8LES. Brian G4EWJ went out to 2 sites with G6NOI.

Call	Location	Locator
G8GTZ/P	Dunstable Downs	IO81FD
M0DTS/P	North York Moors	IO94MJ
GW8VPG/P	Bloreng Mountain	IO81LT
G8DKC/P	Tamworth, Staffs	IO92FP
G4EWJ/P	Axe Edge nr Buxton	IO93AF
G4EWJ/P	Merryton Low near Leek	IO93AD
G4CPE	Upper Sundon, Beds	IO91SW
G0MJW	Harwell, Oxon	IO91IO
M0SKM	Dunstable, Beds	IO91RV
G0WFT	Dunstable, Beds	IO91RW
G8LES	Alton, Hants	IO90ST

Credit must also go to G1LWX, who went out with the intention of working G4EWJ/P but found his primary site on the A537 near Wigan barred, and was also chased off his secondary site.

## ATV Activity Weekend 10/11 September

The weather on Saturday 10 September started off with strong winds and heavy rain. I went out to my usual site on the hills above Lulworth and sat in the car for 2 hours before the wind and rain abated enough for me to start putting aerials together. When I finally got the mast up, I managed to transpose the 146 and 437 MHz feeders, and did not find the problem until late in the day. However, I did work Malcolm G0UHY in Torbay on the wrong aerial! Apologies to Viv and Ivor G1LXE and G1LXF who were also out portable but could not receive my poor signal. Shaun G8VPG went up to Bloreng Mountain with G6UAR again, but did not manage any TV contacts. The Sunday weather was better and Charles G4GUO was active with DVB-S2 8PSK transmissions.



► G7NSY/P as received by G8GTZ/P

Call	Location	Locator
GW8VPG/P	Bloreng Mountain	IO81LT
M0DTS/P (10 Sep)	North York Moors	IO94MJ
M0DTS (11 Sep)	Yarm, Cleveland	IO94IL
G8LES	Alton, Hants	IO91LC
G8GKQ/P (10 Sep)	Lulworth, Dorset	IO80WP
G8GKQ/P (11 Sep)	Portsdown Hill, Hants	IO90LU
G7GNA	Waterlooville, Hants	IO90LV
G0UHY	Paignton, Devon	IO80FJ
G1LXE/P	Paignton, Devon	IO80EK
G4GUO	Worthing, Sussex	IO90ST

## Ad Hoc Activity Days

On Saturday 3 September, John G7ACD arranged for Noel G8GTZ to have access to the summit at Brown Clee in Shropshire. The white landrover made the trip to Shropshire without mishap and, through the BATC Forum, 6 other stations made arrangements to be active. On the day, activity was seen from G8GTZ/P, G8VPG/P, G7NSY/P, G8GKQ/P, G8DKC, G4CPE, G0UHY. Two new sites were tried in the South and the 146 MHz RB-TV record was broken twice during the day: first G8GTZ/P to G8VPG/P at 169 km, and then G8GTZ/P to G8GKQ/P at 182 km.

If you are planning something special, please post details on the BATC Forum – you may be surprised at the response! 📺



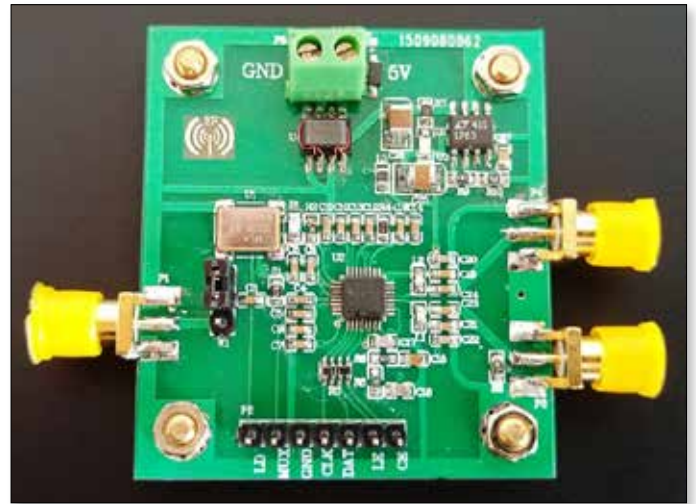
► G7NSY/P and G8VPG/P at Win Green, Wiltshire



# The ADF4351 flexible signal source

*The incredibly flexible ADF4351 VCO/PLL chip with a few external components forms a very wide range high stability signal source with a clean output which is programmable from 35 MHz to 4.4 GHz. Such a device would have been unthinkable 10 years and is ideal for user in the ATVers shack as a test signal generator or a local oscillator source for all bands up to 5.6 GHz.*

*Ready built and tested boards are readily available from a number of Far Eastern sources on eBay for around £20 and the unit can be programmed in a number ways as described in the following 2 articles.*



## 7-band local oscillator

*Ron Mount – G7DOE*

### Introduction

Modules using the ADF4351 VCO/PLL chip are available at a reasonable price through eBay from China and offer output frequencies from 35MHz to 4.4GHz. If you want a general purpose oscillator over this range, Alain Fort, F1CJN<sup>1</sup>, has developed an Arduino based controller. Instead, I wanted a configurable DATV local oscillator and developed this PIC based solution for that purpose, starting from Alain's fine material. The PIC holds four frequencies selectable by two small switches, extendible to eight frequencies from three switches if required. It is easy to change the C source code for any appropriate frequencies and the circuit is very simple. As a second thought, if you just want to set and forget a single frequency, I include an ultra simple controller for that purpose too.

For the 4-frequency version I chose the 12LF1552 PIC. I like the small ones with few pins (less to wire!) but my usual standby, the 12F629, has insufficient RAM for the processing needed. The 12F629 is perfectly adequate for the ultra simple controller, though, and uses exactly the same physical layout. Both run happily with a 3v supply.

I see this project as a replacement for those Ultram VCOs in the BATC shop that are no longer stocked due to the

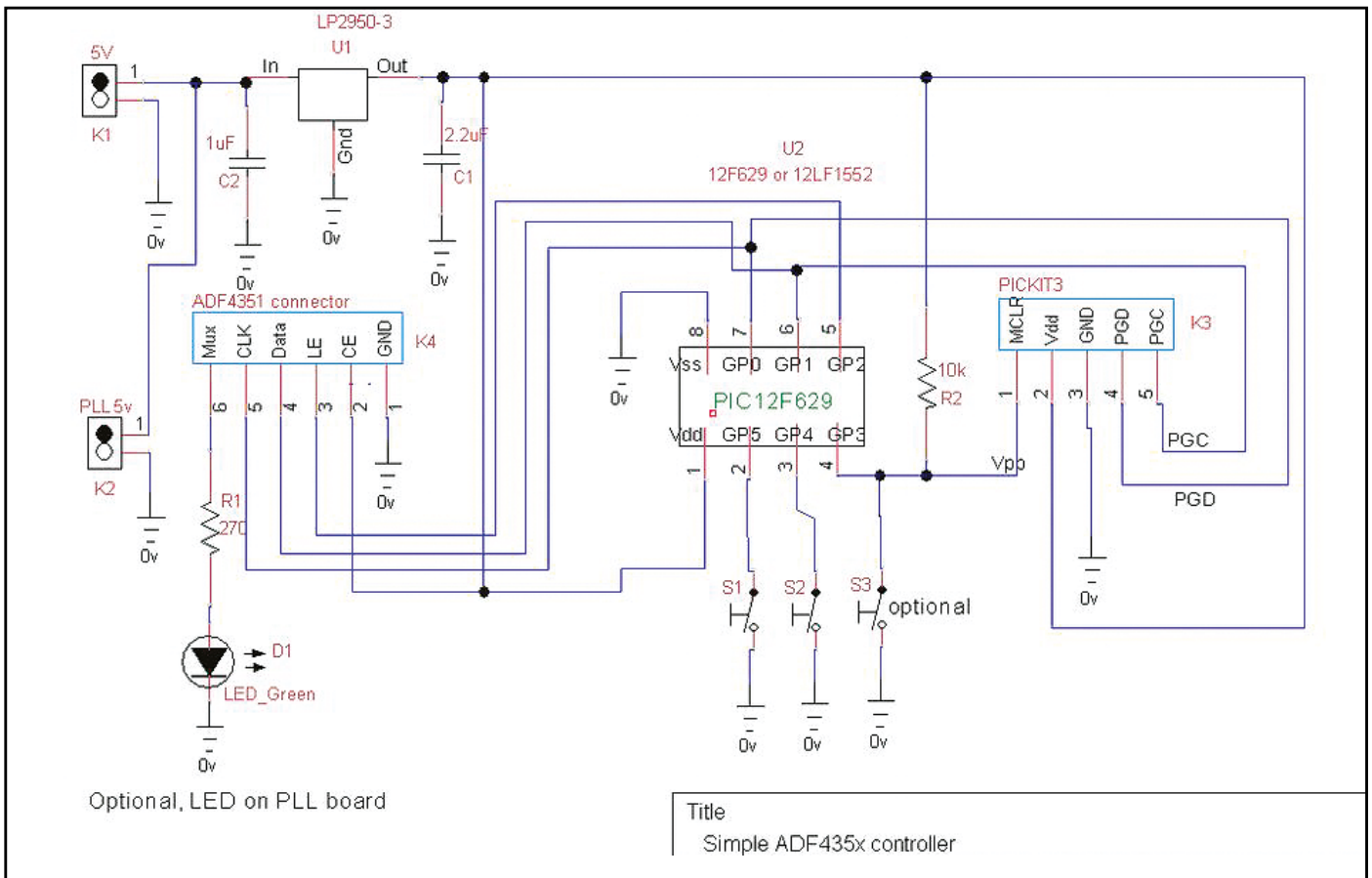
supplier increasing the price significantly, and at around £25 in materials it's cheaper too.

### The ADF4351 and the ADF4351 board

The ADF4351 is a wideband synthesiser with integrated VCO. As such, its outputs have low harmonic content. The VCO/PLL boards seem to be based on the AD evaluation board and are available from a number of Chinese vendors on eBay. There are a few different types of board. My controller's mechanical configuration suits the cheapest, for example <sup>2</sup>, but the control pins on the second most common board<sup>3</sup> take the same configuration and you just have to sort out power separately. If you have no need for a signal below the 2m band you could save a couple of quid by buying a similar board using the ADF4350 chip. This covers 137MHz to 4.4GHz. Of course, it's then only a 5-band local oscillator ;-)

Andy, G4JNT, has warned of possibly fake chips in some of the ADF4351 boards which only work over the ADF4350 frequency range, though I have had no problem. As we mostly work 2m and up, perhaps the cheaper board minimises the risk of disappointment.

► Figure 1. Controller circuit



### The controller circuit

What could be simpler? An 8-pin PIC connected to the usual in-circuit programming connector; to a couple of DIP switches for frequency selection and to the 3-line control pins of the oscillator module. For the ultra simple version, omit the switches. There's a 3v regulator for the PIC, to keep its output levels compatible with the ADF4351. The 5v supply is passed from the controller board to the ADF4351 board (which has its own 3v regulator). See Figure 1.

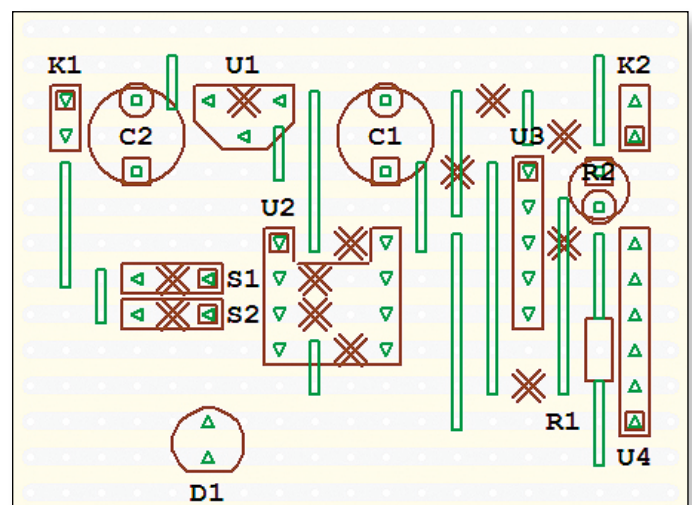
Note that the 12LF1552 can be programmed with a 3v supply as provided on this controller board but the 12F629 cannot be programmed at this voltage. To use the 12F629, program it some other way, with a 5v supply and then you don't need the ICP header. It will of course run satisfactorily at 3v. Alternatively, use a 12LF1552 for the ultra simple version. Code will be made available for all three options.

There is an LED on the PLL board to show lock has been achieved but in case you want to bring one out (to show to the Ofcom engineer!) there is also provision on the controller board.

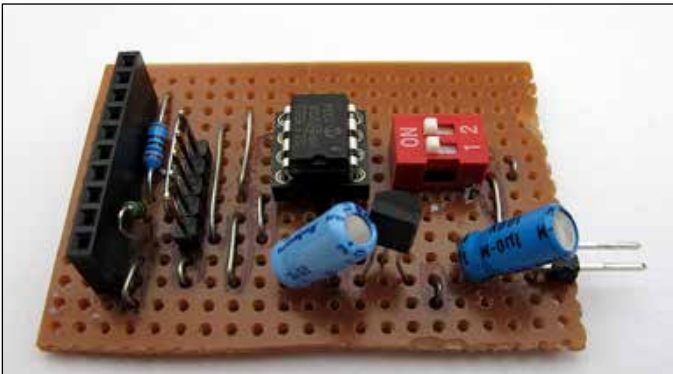
### Construction

As ever, I've used a bit of stripboard for the prototype circuit layout. See Figure 2 and Photo 1. This approach

is not without its difficulties though as I have chosen to mount the board on the header pins of the ADF4351 board and, really, one needs components on both sides of the board. The result is the switches are not easily accessible, which is a shame. As a plus though, it does force you to separate the boards if you wish to re-program the PIC, which is necessary because of the way the pins are shared. Stripboard is a good approach if you want just one such oscillator.

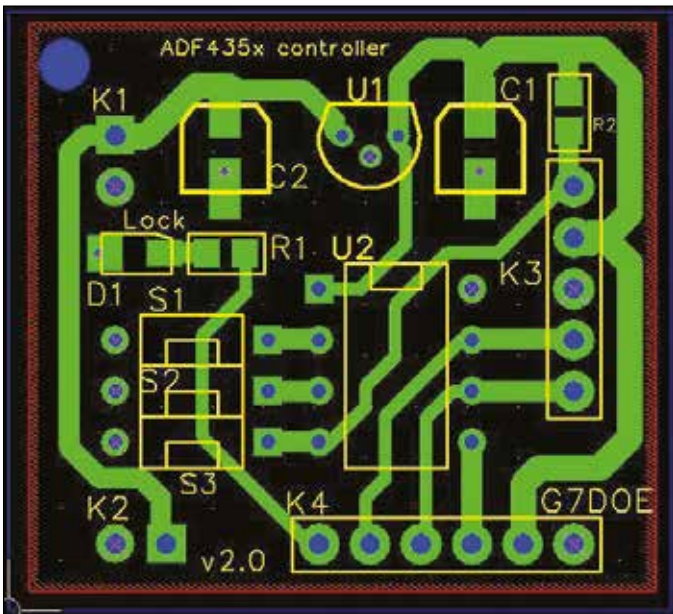


► Figure 2. Controller stripboard layout.



► Photo 1. Component side of prototype board

If you want a couple of oscillators it's worth thinking about a pcb. Figure 3 shows a layout I have used. All the components are accessible on the top of the board with only the header connectors to the PLL board on the underside which is otherwise a ground plane. C1 and C2 are SMD Panasonic aluminium electrolytic capacitors in those sweet little cylinders. R1, R2 are 0805 resistors and the LED a 1206 SMD unit. I use OSHPark<sup>4</sup> for fabrication and a suitable zipped file of Gerbers named to their standards is available on the wiki page. Photo 2 shows an example completed board.



► Figure 3. Example PCB layout

**The thin controller**

Let's start with the ultra simple version. The register values needed to set the ADF4351 to your frequency are simply loaded as the initialisation of a registers array, sent to the PLL board over three control lines from the PIC and then the PIC goes to sleep.

The values to be programmed into the six control registers can be found using the Analog Devices design tool<sup>5</sup>. Alain's boards seems to have had a 25MHz clock but mine are 10MHz. This affects the register values, so look carefully at the oscillator block on your own board. The values for your chosen frequency should replace the default values, currently set for 437MHz with -1dBm output:

```
// *****
unsigned long registers[6] = {0xAE8018,
0x8008029, 0x18004E42, 0x4B3, 0xB5002C,
0x580005} ;
// *****
```

Be careful to maintain the brackets and the semi-colon. Compile the revised code and program the PIC using a PicKit3 or equivalent programmer. Clip the controller board on the PLL board connector, add 5-9v power and hopefully you will quickly see the "locked" LED light up on the PLL board and your chosen frequency will appear on the main output SMA connector (RFout+ on the board I used).

Photo 3 shows the prototype board mounted on the ADF4351 board running the thin controller software. The output is close to 437MHz, allowing for combined errors from the oscillator board and the DFM. The oscillator board has provision for a high accuracy clock input such as a GPSDO though note that a link needs to be changed.



► Photo 3. The thin controller at work.

**The fat controller**

This version does the sums to turn frequencies into register values. The settings of the two DIP switches are read as binary values and turned into a small number. This number is used in the switch statement to select a frequency. The default values, suited to my requirements, are shown in Table 1:

SW1	SW2	Frequency
0	0	1152 MHz
0	1	146.5 MHz
1	0	437 MHz
1	1	2048 MHz

► Table 1. Default frequencies

You may notice that the numbers used in the code to represent these frequencies are all ten times bigger. To ensure all calculations can be performed in integer arithmetic, I use the unusual unit of frequency, the 100kHz. Each figure must be expressed as a multiple of 100kHz or, equivalently, the frequency resolution I have chosen is 100kHz. All readily changed if you are vaguely familiar with C or good at mimicking code in any language.

The program works out the values for the basic divider, INTA, the fraction, FRAC, and the modulus, MOD, that need patching into the control register values. The code eliminates small numeric factors common to both FRAC and MOD because the spur spacing narrows if MOD is divisible by 2, 3 or 6. The AD tool does this too and, with luck, my code will get the same register values as the AD tool.

The frequency chosen can be selected while running. The code loops perpetually looking for a change of frequency, updating the PLL registers when it finds one.

Only registers 0, 1 and 4 change in the code as the required frequency changes but that means other parameters are preset through the initialisation of the registers array. If you want other than -1dBm output, for example, get the Analog Devices design tool mentioned above, change the parameter of interest, and modify the registers initialisation in the code to suit. The output of the AD tool with settings corresponding to the default initialisation is shown in Figure 4.

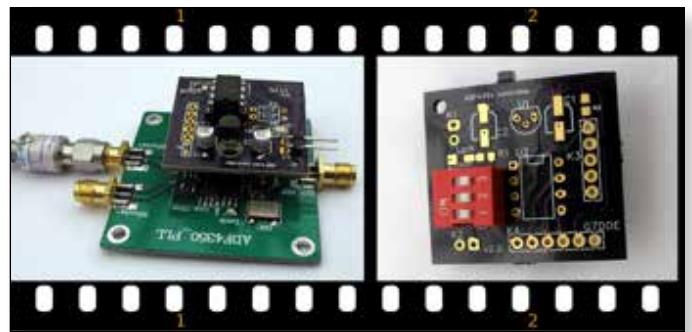


► Figure 4. The Analog Devices ADF435x design tool


By the way, when you install the AD tool, I suggest you skip the options to install USB device drivers. The Chinese engineers only copied the RF section from the AD evaluation board, not the USB feature! To use the tool, select the appropriate ADF435x option on the leftmost tab and manipulate the registers from the 'Main Controls' tab.

### Availability and references

There are four pcb configurations, each with slightly different code, two of which are shown in Figure 5. The right-hand image shows the version 2 board compatible with the version 1 board, just improved here and there.



► Figure 5. (L-R) '629 thin, '1552 thin. '1552 fat 4-frequencies and '1552 fat 8-frequencies.

The source code and Gerber files for the pcb will be available on the BATC wiki site. 

### References

1. [http://f6kbf.free.fr/html/ADF4251%20and%20Arduino\\_Fr\\_Gb.htm](http://f6kbf.free.fr/html/ADF4251%20and%20Arduino_Fr_Gb.htm)
2. e.g. eBay item number: 201571228023
3. e.g. eBay item number: 331671222117
4. <https://oshpark.com/>
5. <http://www.analog.com/en/design-center/evaluation-hardware-and-software/evaluation-boards-kits/evaladf4351.html#eb-overview>

# ADF4351 driven by an Arduino

## An RF Generator from 34.5 to 4400MHz

Alain Fort – F1CJN

This circuit uses an Arduino Uno (5€), a standard "LCD buttons shield" from ROBOT (5€), with buttons and an ADF4351 Chinese card found at EBAY (40€). An equivalent card (without Xtal oscillator) can be bought on the SVIAFN site for 37 dollars.



The frequency can be programmed between 34.5 and 4400 MHz with a minimal step of 10KHz. Twenty frequencies can be saved into the Arduino EEPROM. If one or more frequencies are saved, then at power on, the memory 'zero' is always selected.

The cursor can be moved with the LEFT and RIGHT buttons. Then the underlined digit can be modified with the UP and DOWN buttons - for the frequency; the memories and the frequency reference (10 or 25 MHz):

- ▶ to modify the frequency, move the cursor to the digit to be modified, then use the UP and DOWN buttons,
- ▶ to modify the memory number, move the cursor to the number to be modified, then use the UP and DOWN buttons,



- ▶ to select the reference frequency, move the cursor on 10 or 25 and select with UP and DOWN.
- ▶ to read or write the frequency in memory, place the cursor on the more left/more down position and select REE (for Reading EEPROM) or WEE (for Writing EEPROM).

The cursor disappears after few seconds and is re-activated if a button is pressed.

### Saving Memories

- ▶ For the frequency, select WEE, then select the memory number, then push the SELECT button for a second. The word MEMORISATION appears on the screen. This memory save works then the cursor is anywhere except on the reference 10 or 25 position.
- ▶ For the reference frequency, move the cursor to 10 or 25, then press the SELECT for one second.

**Note:** to use an external 10 MHz signal, R6 must be removed on the ADF4351 PCB.



### Hardware

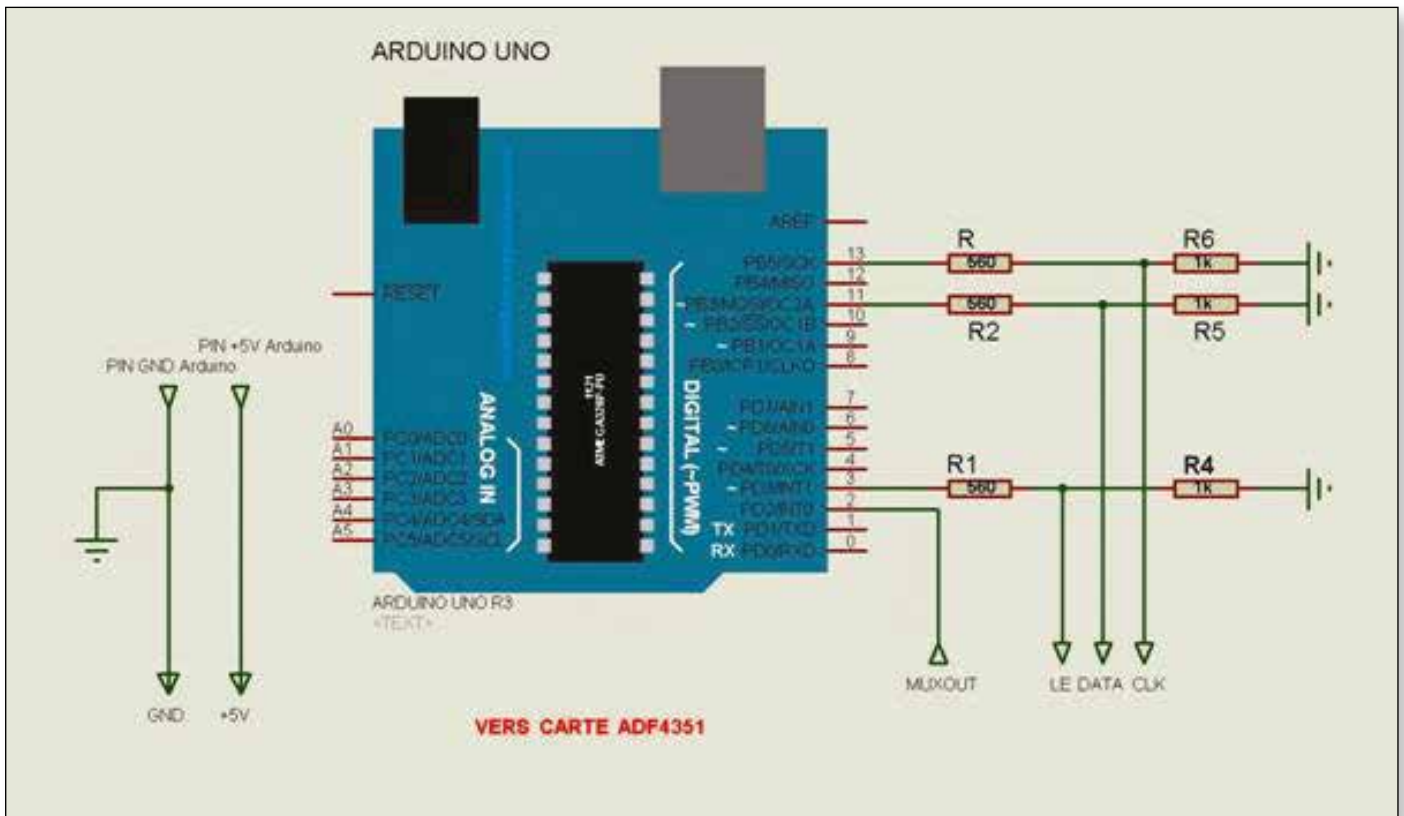
See Schematic.

With an Arduino UNO use a resistive divider to reduce the voltage, MOSI (pin 11) to ADF DATA, SCK (pin 13) to ADF CLK, Select (PIN 3) to ADF LE

Resistive divider 560 Ohm with 1000 Ohm to ground on Arduino pins 11, 13 and 3 to adapt from 5V to 3.3V the digital signals DATA, CLK and LE sent by the Arduino.

Arduino pin 2 (for lock detection) directly connected to ADF4351 card MUXOUT.

The ADF card is 5V powered by the ARDUINO (PINs +5V and GND are closed to the Arduino LED).

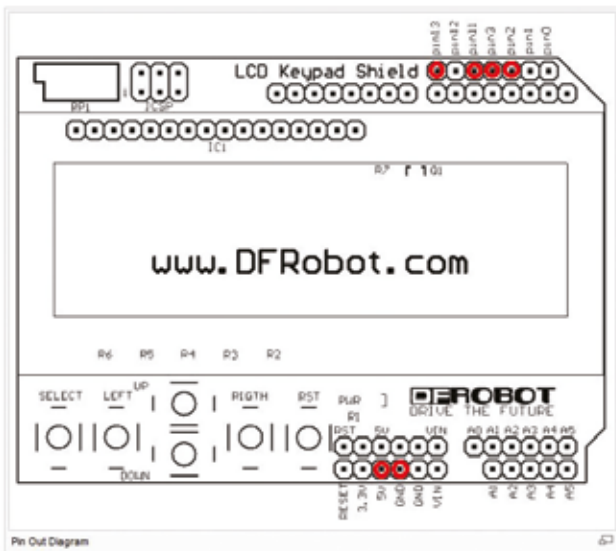


**Important:** in order to get a “clean” output spectrum, power the Arduino with an external PSU and not with the USB port. The PSU voltage must be set between 8 or 9V to limit the power dissipation of the Arduino internal regulator.

### More from CAT 16...



- ▶ Top: Henry G3REH admires the impressive EMI display
- ▶ Bottom: the 146Mhz amplifier control box of Dave, G8GKQ



### Software

Follow the link:  
[http://f6kbf.free.fr/html/ADF4351\\_LCD\\_07032016.zip](http://f6kbf.free.fr/html/ADF4351_LCD_07032016.zip)

If you are using a LCD Shield ROBOT version 1.1. instead of 1.0, please read and modify the ino file.



## GB3HV 70cms input update

Noel Matthews – G8GTZ



*Recently the 70cms DATV input on GB3HV, the 3.4 GHz output TV repeater in IO91OF, has been upgraded to improve sensitivity and provide an RB-TV input.*

The existing system consisted of a rotatable 5 element yagi connected to a narrow band pass 70cms cavity filter followed by an SPF 5053 pre-amplifier at ground level. The signal is fed in to a modified Key Radio 450 base station front end module providing a 3 stage helical filter followed by a gain stage and a second 3 stage helical filter. The output of the front end block has a 25 dB notch filter on 433.375 to remove GB3FN (the local 70cms FM repeater) and is then fed into the input of a modified Zinwell SUP 2400 up converter. The resulting 1963 MHz signal is fed in to a Comaq SL30 receiver which is set to receive 2 Msymbols DATV with auto FEC sensing. The receiver is modified to include a lock sense relay (see [https://wiki.batc.tv/Technical\\_topics\\_for\\_ATV\\_repeater\\_builders](https://wiki.batc.tv/Technical_topics_for_ATV_repeater_builders)) which switches the AV signal to the phono connectors on the rear of the receiver.

The 5 element yagi is mounted on a rotator controlled by a K3NG Arduino board (<https://blog.radioartisan.com/yaesu-rotator-computer-serial-interface/>), which interfaces in to the system PC running PSTrotator to provide a web page where remote users can set the antennae direction. Work undertaken recently included upgrading the receive system by moving the pre-amp and filter in to a weather proof enclosure at mast head eliminating 2 -3 dB of cable loss.



GB3HV also has a Tutuione monitor page provided using a TT3200 PCI card fed by the L band output on the Comaq SL30, enabling users on 70cms DATV to see their incoming signal strength and constellation. Upgrading the PC on site has enabled us to run a USB Minituner set to 333 Ksymbols to receive RB-TV signals – however,



interfacing these signals in to the repeater logic, which needs a composite video feed, was not as easy as first thought!

As the Tutuione PC is also used for the GB3HV Skype input, it was not possible to derive a clean composite video signal dedicated to the RB-TV input from the PC. To overcome this, the UDP output from Tutuione is fed in to a Raspberry Pi running a specially configured version of OMX player. This was developed by Phil, M0DNY, to display the HamTV feed from Goonhilly for the ARISS Principia project and the code is available on Github. When no valid stream is received from the Tutuione UDP feed, the composite output of the Rpi displays a still caption which switches to decoded video and audio when a valid stream is received.



The next problem was how to tell the repeater logic when a valid RB-TV signal is being received. This problem was solved by Peter, G8DKC, who discovered that when the box

next to the TS\_OK label on Tutuione version 4 was ticked, a 22 KHz tone appeared on pin 12 of the Sharp and Eardatek tuners when a valid TS stream is being received. This 22 KHz tone is fed in to a simple NE576 detector circuit which drives a 5 volt relay and is used to switch the Raspberry Pi video output when a valid RB-TV signal is present.

This switched video feed is sent to an analogue input on the repeater controller where the logic sees it as a valid video signal and switches in to repeat mode.

These improvements have made a significant difference to the 70cms receive system and tests with the new rx system by G8ADM showed he could now access HV with approximately 50 milliwatts running 2 Msymbols / sec  $\frac{3}{4}$  FEC over a 56Km path.

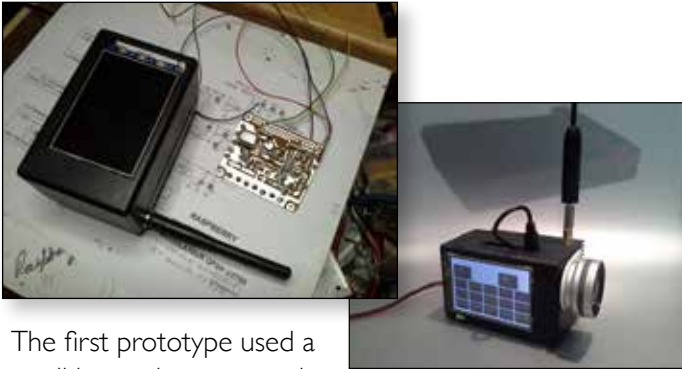


During the recent lift conditions G8DKC near Leicester has successfully accessed GB3HV using both 333 Ksymbols/sec and 2 Msymbols/sec on 70cms and on one occasion achieved an MER of 30 dB running 2 Symbols / sec. Initial tests seem to indicate that the system will decode a 333K symbol/sec RB-TV signals at signal levels 6 dB lower than a 2 Msymbol/sec DATV signal and we look forward to seeing more DX RB-TV signals through GB3HV in the future. 🗣️

# A 437 MHz DVB-S Transmitter Using a Raspberry Pi

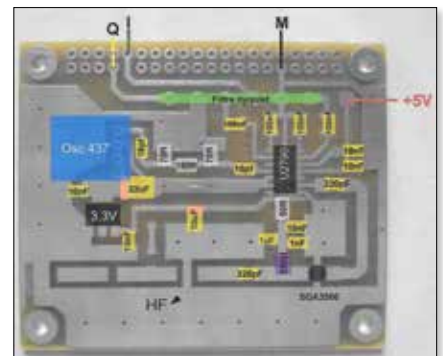
Jean-Yves Durand - F1DJ0

The aim of this project was to build a simple self-contained DVB-S transmitter based on a Raspberry Pi. The project started in 2015 and was a collaboration between F5OEO, F1HUS, F4FGW, F4NAS and F1DJ0.



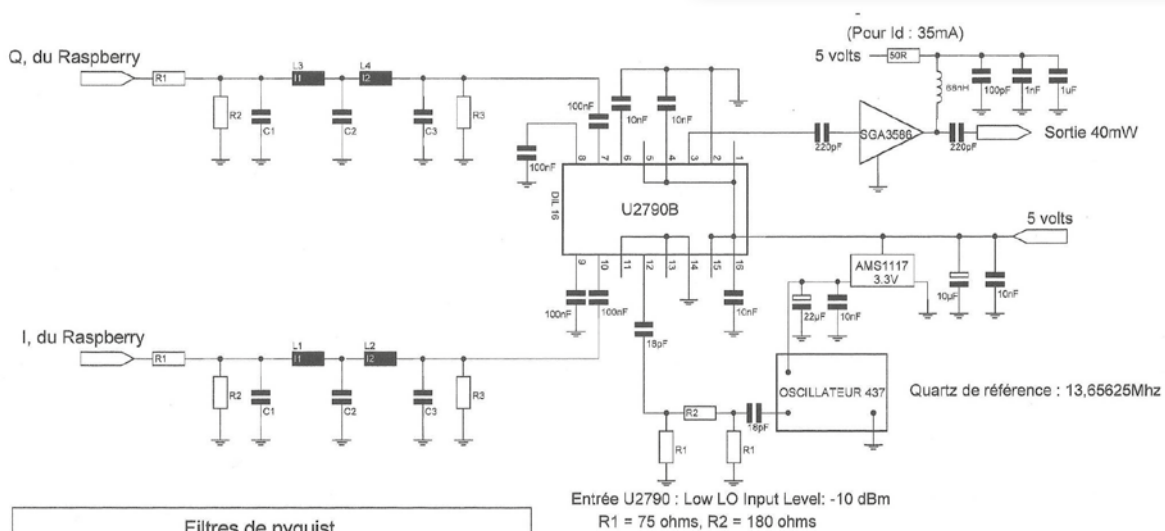
The first prototype used a small internal camera and Raspberry Pi with software written by F5OEO. It was used by the team to test the modulator and develop the software.

The 3.5 inch screen connected to the Raspberry Pi, is used for control of the transmitter and can also display the transmitted image. This means that the unit is self-contained. Of note is that the video latency is less than a half second using MPEG4. The modulator is a U2790; a 433Mhz band pass filter, to limit harmonics, is mounted at the base of the vertical antenna. The antenna is available in the UK: [http://www.hobbyking.com/hobbyking/store/\\_25646\\_RMILEC\\_433MHz\\_SRC771\\_1\\_2\\_Wave\\_Length\\_UHF\\_Antenna\\_FPV.html](http://www.hobbyking.com/hobbyking/store/_25646_RMILEC_433MHz_SRC771_1_2_Wave_Length_UHF_Antenna_FPV.html)



The I and Q outputs are taken from pins 32 and 33 on Raspberry Pi GPIO connector. The ground is pin 9. The SGA3586 monolithic amplifier provides about 35mW. There

is provision for a second amplifier stage on the PCB. The plated-through holes are provided by the French manufacturer CIMKO



Filtres de nyquist							
R1	R2	C1	L1	C2	L2	C3	R3
SR250 :	470R	1K	5.4nF	122uH	17.5nF	150uH	5.4nF 100R
SR1024 :	470R	1K	1.2nF	27uH	3.9nF	33uH	1.2nF 100R

MODULATEUR DVBS U2790 POUR RASPBERRY

F1DJ0-2016/ SOFT-F5OEO

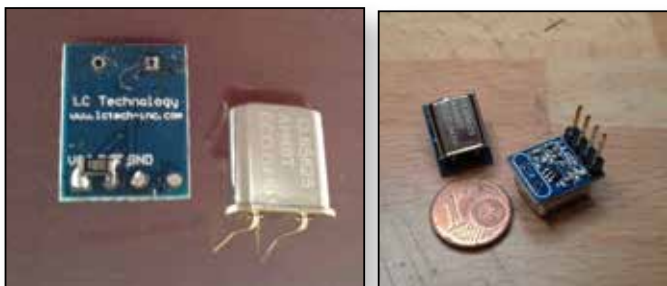




The synthesized oscillator is on 437 MHz. It uses a SYN115 433MHz ASK transmission module, as used in many domestic remote controls, to generate a signal on 437 or 438.5 MHz. All that is required is to change the crystal. This oscillator is a good replacement for the 432CT or other more complex oscillators.



The phase noise generated by the synthesizer does not impact the MER, as shown here during testing by F4NAS.



It is necessary to connect the positive supply (Vcc) to the input data (DAT) through a low value resistor of about 10 ohms for example to enable the output.



You can adjust the frequency with good accuracy. Mount capacitors of 10, 12 or 15 pf between each leg of the crystal and ground. The oscillator is stable and has an output of between 4 and 5 dBm.

The crystal (HC49T-13.65625 MHz) is available from:

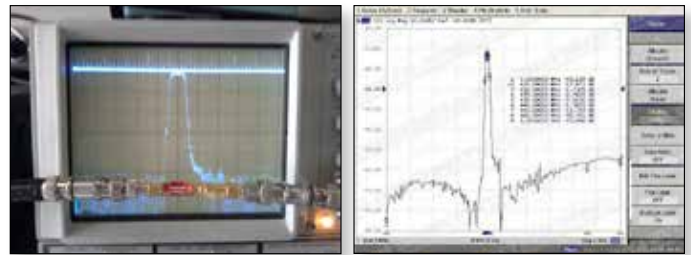
Hybrico,  
ZAE The Glaises 2  
bis rue Léon Blum  
91120 Palaiseau

**Cost:** 24 Euros (1 off), 16 Euros (20 off),  
13.20 Euros (50 off)

The synthesizer is available on eBay:

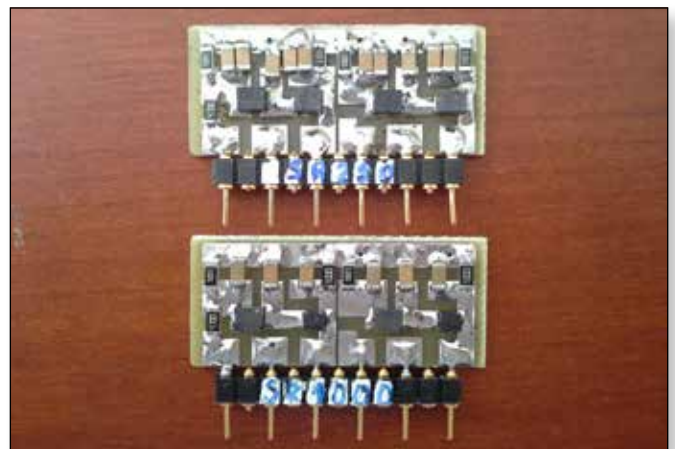
[http://www.ebay.fr/itm/231509373152?\\_trksid=p2060353.m2749.i2648&ssPageName=STRK%3AMEBIDX%3AIT](http://www.ebay.fr/itm/231509373152?_trksid=p2060353.m2749.i2648&ssPageName=STRK%3AMEBIDX%3AIT)

### Band Pass Filter

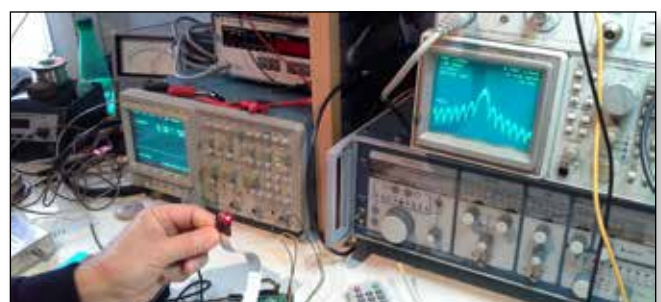


The band-pass filter can be found here: <https://www.foxtechfpv.com/433mhz-band-pass-filter-p-1220.html>

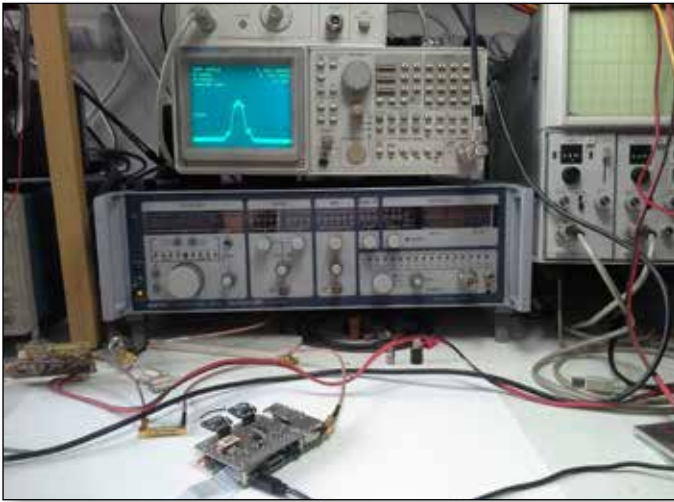
### Plug-in filters



The Nyquist filters are interchangeable. We tested SR 1500, SR 1000 and SR250. See the component values in the table.



► Modulation without Nyquist

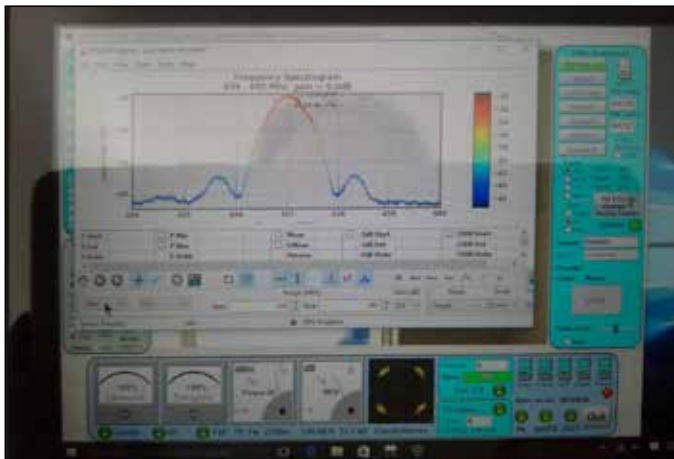


► Modulation with Nyquist filter.

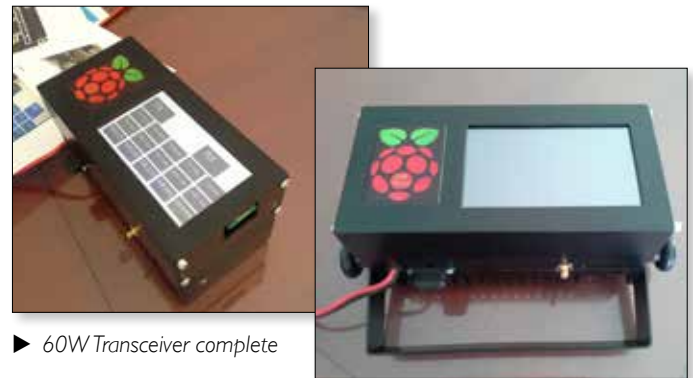


► Receiver with DVB-T dongle

With these developments, we can construct a complete transceiver using a single Raspberry Pi.



► Transmission at SR1000 using an SR1500 Nyquist filter, received on a PIPO with MiniTiuner. Spectrum display from an RTL-SDR.



► 60W Transceiver complete

The transceiver will not be described in detail, because most of the components have already been described.

Some pictures from the camera prototype with an MHW2723 power amplifier:



After these encouraging tests of the transmitter, we switched to the study of a transceiver, as Evariste F5OEO had developed a prototype receiver using the Raspberry Pi.



The complete unit includes a receiver with DVB-T USB dongle, preamp and filter. Note the presence of an HDMI connector for connecting the camera with an HDMI cable classic: <http://www.lextronic.fr/P36916-raspberry-pi-camera-hdmi-cable-extension.html> To use an HDMI camera other than the Raspberry Pi

Camera, there is also an HDMI interface:  
<http://www.auvidea.eu/index.php/theme-styles/2014-12-30-22-32-06/b101>

The audio connections to the Raspberry Pi are through a USB connection and Bluetooth headphones (microphone and speaker).



► The 60W amplifier

The version with a 60W amplifier uses an RA60H4047 amplifier module and a 5 inch touch screen. During transmit, 3.3V appears on GPIO pin 40. This voltage controls the RF changeover relay and the PTT of the amplifier.

Three self-contained transceivers were constructed which can be used mobile or portable. The LED on the top illuminates during transmit.



► The 5 inch touch screen and controls

Note that for other construction methods, the modulator could also be directly plugged into the Raspberry Pi GPIO connector, and the monitor connected through the HDMI socket.



► Plug-in modulator without screen.



► The Nyquist filters are interchangeable through the side of the case

## F5OEO Software

The software developed by Evariste F5OEO for the Raspberry Pi allows the amateur radio community to access to digital television for a modest cost. We salute and thank him for his efforts and tenacity. The program written by Evariste is installed on a Micro-SD card. It may be provided on request. For experts, everything is here: <http://f5oeo.fr/index.php/Accueil> and <https://github.com/F5OEO/rpidatv> and <https://github.com/F5OEO/rpitx>

## Software Specification

- Video encoding: MPEG-2 and MPEG-4.  
Latency less than 1/2 second in MPEG-4.
- Symbol Rate: Configurable from 150 to 4000 in IQ mode. Configurable from 150 to 1000 in "ugly" mode.
- FEC: 1/2, 2/3, 3/4, 5/6, 7/8.
- Test Pattern: Image from JPEG on disk or TS file from disk.
- Sound: from a USB adaptor (possibly Bluetooth)

Receiver: In development by pabr. See <https://github.com/pabr/leandsr> and <http://www.pabr.org/radio/leandvb/leandvb.fr.html>

## CONCLUSION

This compact transmitter and receiver enables the transmission and reception of DVB-S on a small budget. It has plenty of scope for incorporating your own ideas! 🎧

Original written by Jean-Yves Durand, F1DJ0.  
Translated by Google, G8GKQ and the Editor.  
Thanks to Jean-Yves for describing this great project!

# The Making of 'TXFactor'

Nick Bennett - 2E0FGQ



*TX Factor is an on-line, high definition TV show dedicated to all things radio. The show is produced in the UK by TX Films, a not-for-profit company set up by three UK amateurs with experience in the world of TV and radio broadcasting. Their aim is to promote amateur radio in an informative and entertaining way, with a positive remit of encouraging young people to explore the benefits of the hobby and discover how to get involved. [www.txfactor.co.uk](http://www.txfactor.co.uk)*

It all began when three chums re-established contact with each other in the spring of 2013. Bob McCreadie G0FGX had the notion that there was a gap in the market for a well produced video programme featuring all aspects of amateur radio. Bob, a busy radio station MD and breakfast show presenter was already in contact with Mike Marsh G1IAR, an audio mastering engineer of international renown, the pair having kept up their friendship since working together on Somerset's Orchard FM Radio station during the 1990s. They contacted their former colleague Nick Bennett (then a newly-qualified M6 Foundation Licence holder) to ask whether he would be keen to be involved. Nick was busy working on various daytime TV shows such as Bargain Hunt, Flog It! and Homes Under The Hammer and instantly played down any enthusiasm for the project. However, the three met up in Taunton for a curry session to discuss the idea. Following a healthy meal and a pint or two of Kingfisher, TX Factor was conceived, and plans were made to film a pilot show for pitching to potential sponsors. Incidentally, curry meetings are still very important events at TX Films, and recommended as highly conducive to forming good programme-content ideas!



▶ Interviewing Don, G3XTT at the Friedrichshafen HamFest

## The pilot show

In November of 2013 the pilot show for TX Factor was filmed at the Marconi Centre, Poldhu, the Norman Lockyer Observatory in Sidmouth and atop Stiperstones, a distinctive hill in the county of Shropshire - quite an adventurous running order for a show yet without a sponsor. The three main topics covered in the programme (still available, along with all the subsequent episodes, via the TX Factor website) were Marconi's 'Atlantic Leap', two metre repeater operation and Summits on The Air (SOTA). In January of 2014 a sponsorship pitch-document was written and emailed to one of the UK's main dealers of amateur radio equipment, Martin Lynch & Sons, who was top of our list of potential sponsors. Martin himself was on the phone within minutes of receiving our email, having viewed the episode immediately!



▶ Bob, G0FGX in the famous Radio Caroline studio

Following a meeting at his headquarters in Chertsey, a series of six episodes was planned and we welcomed ML&S and Yaesu Musen Co of Japan as our main sponsors. The rest, as they say, is history! Sadly, Yaesu Musen Co was unable to continue its funding following the first year but we are currently in talks with another potential co-sponsor for 2017. Funding has also been supplemented by donations for some of our loyal viewers from around the world and for this we are very grateful.

So, episode one went live in February 2014 and, to our amazement and relief, was extremely well received from amateur radio operators in the UK, across Europe, North America and down under. The viewing figures for the twelve episodes to-date have exceeded our initial expectations meaning TX Factor is set to continue well into next year and beyond!



► Cameraman Giles, with a Sony PMW-500 camera

Making regular, quality TV programmes such as TX Factor doesn't come cheap. The presenters aren't paid at present, but receive expenses. Our main outlay is for fuel, hotel bills, equipment purchase / hire and, of course, post-production costs. It was always our intention that the format of TX Factor would be entertaining as well as informative, and we hope this comes across in the presentation styles of Bob, Mike and the occasional appearance of Nick - who incidentally does the main voice-over for each episode. The suggestions for content come from many sources including viewers around the globe, and we have a long list to cover that will probably last the next ten years! Our sponsors don't influence the editorial content in any way, although we do feature rig reviews and other items that are filmed at ML&S premises as well as at Icom UK HQ in Herne Bay.

### The technical aspects

So, from a technical aspect, how do we make the shows? The two main cameras used are the Canon XF-305 and its smaller sibling the Canon XF-105. The former is still used on many daytime TV shows and provides the minimum spec for BBC HDTV in the UK. Occasionally a Sony PMW-500 camera is used, depending on the operator (much better lenses!). Raw footage is shot at 1080 progressive, 25fps at 50Mbps 4:2:2 resolution. Radio mics tend to be Audio Ltd 2040s or Sennheiser EW system, again depending on the type of shoot - on location, the presenter and contributor are each recorded onto their own, separate audio track, directly to the camera(s). Other boom mics, hand held mics and smaller cameras, such as the GoPro range, are used when required.

Post production is by Media Concepts who edit on Final Cut Pro X (FCPX) - a truly versatile and amazing product, sometimes used in Hollywood to cut feature films! We're

often asked, how many cameras are used to film a typical item, as we're told it appears that three cameras are each covering a different angle. Well, typically for interviews there may be two, but often just the one. For rig reviews and similar items, there may be a locked-off camera shooting close up on the rig, but that's not always the case. The secret of the multi-camera look is the way the item is filmed and edited. In order to maintain a sense of interest during what is often a straight one-plus-one interview, the camera operator will vary the shot size and angle between presenter and contributor, and offer a two-shot (both together). Other types of shot include the non-sync wide, the 'dirtytwo' (over the presenter or contributor's shoulder) and the reverse angle, revealing what the two are looking at and talking about. The art is to change shots between questions and responses, and let the editor tighten it all up in the edit. Then there are the all-important cut-away shots - basically close ups of anything and everything the interviewee has referred to. In documentary-making parlance: 'If it moves, or even if it doesn't, shoot it!'



The shows are then compiled in the edit suite over a period of several weeks. The modern non-linear editing (NLE) workflow allows for very complex edit sessions to progress according to the availability of the material, as has always been the case for example when cutting and splicing traditional 8, 16 or 35mm film. In past times however, electronic video tape editing was strictly linear: you started with the opening titles and finished at the end credits, and it was tricky to overlay or insert anything in the middle, as this required the creation of another copy, resulting in a slightly degraded picture quality on each occasion. When in 'post', the TX Factor workflow allows for the following processes: a rough cut of each item, the addition of captions and graphics where required, followed by an audiosweetening session, where the two



▶ An 'editorial dispute' between Mike, G1IAR and Nick, 2E0FGQ at the Friedrichshafen HamFest

audio tracks are separated from the picture to allow for J-cuts and L-cuts. For an L-cut, the dialogue continues as the camera cuts to another image. For a J-cut, the dialogue plays while we see contextual images, but then cuts to the source of the dialogue. There are many other editing techniques that help to keep the flow of the edit moving without making the programme boring - the subject of another article perhaps! Separating out the audio tracks (but maintaining the vital sync between sound and picture) also enables for varying the levels and equalisation (EQ) to ensure the viewer receives a constant loudness throughout the entire programme - now a legal requirement on broadcast TV programmes.

The addition of voice-over announcements, commentary and music are vital to the continuity and flow of the various items, and TX Factor has access to several libraries of non-copyright music to enhance the viewing experience and help the flow of the narrative. Finally, every shot is colour-corrected using FCPX's extensive video-scope and colourcorrection capabilities to smooth out any discrepancies in white balance and exposure present on the original footage. We make the show 'broadcast legal' by ensuring the video levels are kept within the required range. Colour-correction can be used creatively to create a mood or 'theme' for a programme and the results can be seen on so many dramas and feature films today. Finally, there is the technical review where the executive producer views the entire programme and a check is made on technical quality, and for spotting errors and omissions in the editorial content (sadly, they sometimes still get through!).

**It's not all about the filming**

The TX factor theme tune is a bespoke composition that was made on New Year's Eve 2013 by Mike Marsh and Rob Perkins. It was written, composed, recorded

and mixed 'in the box', in Logic Pro-X. The aim was to encapsulate the feel of radio into the music, along with the letters T and X in morse code. For example, the lead piano riff is making an attempt at playing these letters whilst sticking to the rhythm. There were various edits created to be used in time-specific situations as well as provision for the individual stems that make up the multi-track mix. In the final cut of a TX Factor episode the lead piano riff often gets inserted as a teaser, ahead of the

entry of the theme tune over the episode credits. The theme tune was recorded, mixed and mastered at 44.1kHz / 24Bit.

When everyone is happy, the show is put to bed and the website, show notes and media publicity material is prepared in readiness



▶ Ivan G3WBA, recording a piece to camera



▶ Bob conducting an interview on the 'Ross Revenge' - home of Radio Caroline

for the launch of the episode. The final version of the show is outputted from FCPX at full native resolution for archive purposes, and a 1920 x 1080p, 25fps version is uploaded to YouTube for viewing on our channel. The size of the .mp4 or .mov output file for a 60 minute episode is around 6.5GB.

The show is launched with automatic notification to our YouTube subscribers, and postings via Facebook, Twitter, various websites such as Southgate ARC and QRZ.com, and to an emailing list of about 650 other subscribers. It's always fun to watch the YouTube viewing figures clock up the instant the show is released and it's very satisfying to see the figure increase steadily over the next few weeks as our viewers find a quiet moment to catch up on the show. It's what makes working on TX Factor so worthwhile!

**Nick, Bob and Mike**

TX Films Ltd

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## CAT16 - the full story

Rob Burn - G8NXG

*Held within the confines of the RAF Museum in Cosford, near Telford, this years CAT16 followed the time-honoured format of having a few displays and merchants promoting ATV parts and products, plus a lecture stream all held over two days.*

The venue itself was inside the main visitor centre of the RAF Museum, where the BATC had hired two rooms; one for displays etc., the other used as a lecture theatre. Both rooms are modern, well equipped for this kind of use and have full AV facilities.



It would be remiss of me not to promote the RAF Museum. Situated next to RAF Cosford, the home of RAF Engineering, this is no small-scale operation and manages to display historical planes and relevant paraphernalia in four hangers and around the grounds. The main visitor centre is a modern, futuristic glass-fronted building and houses a café and shop in addition to the conference rooms. The museum site is one of two, the other is in North London.

By far the largest and eye-catching ATV exhibition was given over to two 1960's EMI broadcast cameras, complete with CCUs and power supplies. Brian Summers, our Treasurer is the custodian of such items and I suspect that he houses the most complete collection of broadcast TV cameras and associated gear in the UK! As a testament to the construction of these cameras Brian advised that the last time that they were used in anger was about 10 years ago; small wonder then that one or two teething troubles developed over the two days but nothing serious.



Chris Tanner MW0LLK brought along his 'Soft Repeater'; a software repeater control system using off the shelf hardware and software. In addition to providing the practical demonstration Chris was persuaded to provide a short talk about his system. As he also brought along a green backcloth, it was great fun to see Chris at various times superimposed into a radio or TV studio!

The BATC Shop was also in evidence, with stocks of DATV centric parts available at discount prices; the savings of postage and bank transaction costs being passed onto purchasers.

A table of specialist parts was offered by Antennair; the company who make the BATC DTX1 DATV transmitter. Kevin Avery of G3AAF Electronics displayed a large selection of products from RFDesign occupying the rear section of the display/selling space.





Finally, the selling space was completed by the 'Bring and Buy' section: the revenue from sales of equipment from Mike Cox was donated to the BATC.

**Presentations**

A comprehensive range of Lectures and Presentations (available on the Wiki at: [https://wiki.batc.tv/Presentations\\_from\\_CAT\\_16](https://wiki.batc.tv/Presentations_from_CAT_16)) was delivered over two half-day sessions and after the initial introduction by Noel Matthews G8GTZ, Phil Crump M0DNY commenced the first session with the plans to update the BATC web presence. Amongst the proposals to focus on the use of open-source software is the intention to introduce for members one log-in name and password for all sites. This was followed by a comprehensive study of VHF and UHF propagation by Dr Mike Willis, G0MJW. Next up Dave Williams G8PUO outlined his project for an Audio/Video Matrix ATV Repeater Controller – at the moment a 'work

in progress' however once the samples are tested and proven, the hope is that the board will be available as a finished product for purchase. Used in conjunction with a Raspberry Zero, this project also seems as if this could become one of those indispensable shack items.

After coffee, Frank Heritage M0AEU revealed some of the techniques that he uses to produce CQ-TV; the quality of which, under his editorship, has improved dramatically and continues to be a beacon of excellence. There is no doubt that CQ-TV is a premium magazine and a significant membership benefit. Next Jean-Pierre Courjaud F6DZP revealed his thoughts about the next generation of Tutuone and surprised the audience by introducing a new version of his software and suggestions of a new receiver PCB design concept. Some of this is covered by Art Towslee in CQ-TV 252, however the proposed project has since moved on to that discussed by Jean-Pierre. If you have something to contribute to the discussion I am sure that Jean-Pierre would welcome your thoughts.

The first session came to a conclusion at this point and later in the evening members and guests were able to meet for dinner at the Ramada Inn, Telford. This was an informal event very ably handled by attentive Ramada staff and enjoyed by the 30 or so folk who attended.

The following day's session was introduced again by Noel G8GTZ and was about 146 MHz RB-TV – A Practical Operators Guide, delivered by Shaun O'Sullivan G8VPG.





Shaun brought along his 146 MHz equipment to demonstrate and I was struck by the thought that the station was small enough to fit onto a trestle table; analogue equipment of only a few years ago would have required much more space!

After coffee the time for Graham Shirville G3VZV and Dave Crump G8GKQ to update us on Es'hail-2 had arrived. This geostationary transponder will no doubt provide the opportunity for exciting experiments with DATV, to a much enlarged reception base. Indeed, one of the concerns raised is about operator control and management. Unfortunately the launch period for Es'hail-2 has been delayed to at least Q4 of 2017 however this does mean that for some of us we have that extra time to get a satellite system in place...

Finally, by means of a recorded presentation Charles Brain G4GUO delivered his thoughts on DATV Express and future development. Faced with the prospect of key electronic components becoming 'end of life' the DATV Express team are considering a new hardware design. This is a common problem in industry where component manufacturers cease production of parts or are absorbed into other companies only to have product ranges trimmed or obliterated altogether. UK/EU stocks of the current DATV board are exhausted, pending a decision on future direction.

In addition to live steaming at the time, all of the presentations have been recorded and are available on the BATC YouTube channel.

Every two years the BATC holds its Biennial General Meeting for members. This year the meeting was held after the lecture sessions and the minutes of this meeting are published separately in CQ-TV and online. The video recording is also available to view on YouTube. <https://www.youtube.com/channel/UCUWLnUZllytlcCFd93tnBzw>

This year attendees were also able to take advantage of a Guided Tour of the venue, which brought to an end this year's CAT16 in style.

### Finally...

My personal interest in ATV has recently been rekindled and attendance at CAT16 clarified many concepts for me. It is astonishing how, in about four years, the world of amateur TV has expanded to take on digital TV and we as amateurs are fortunate to have additional transmission space to experiment with new equipment and techniques. All of this does not arrive automatically; much work goes on in the background for the benefit of amateur radio. However, some of the effort to provide additional frequencies and TV repeaters will come to nought if we do not make use of these opportunities. As Noel has said in one of his talks and no doubt before 'use it or lose it!' 🗨️



► Tony, G1HBD, brought his ATV Outside Broadcast Van to show during the coffee breaks. It is a very well equipped vehicle, complete with 6 mtr mast!



# VMix to RpiDATV via FFmpeg

Alain Fort - F1CJN

This tutorial is made to show how to send video to the Raspberry RpiDATV program written by Evariste F5OEO, from real time video realized with the Vmix program. The video stream is sent through the local Ethernet network.

The Vmix2Rpi.bat file has been made from the .bat file from Chris, MWOLLK - Transport Stream generation.

## Requirements:

A PC with Windows7 minimum and a graphics card compatible with DirectX11.

1. Install Vmix, it is a very useful and easy tool to use as a real time video mixer for up to four sources (free version) including webcam, usb video grabber, video file from many formats, images, text for overlay. - either the free version. It permits to use 4 different video sources with one as overlay. I suggest to use this one for ham radio use. - or the trial version limited to 60 days but with an unlimited number of video sources, image resolution, overlay channels. After the 60 day trial the program is limited.
2. Install FFmpeg Windows version on the C drive at the root C:\. If it is installed in another directory, the last command line must be modified, according to the install location of FFmpeg.
3. Download or copy the text Vmix2Rpi.bat and place it on the desktop. (The .bat file is available from the BATC Wiki: [https://wiki.batc.tv/Project\\_software](https://wiki.batc.tv/Project_software) )

## Use

1. Start Vmix and select the input video source and select and output on the right video window, then click on "External" ( down on the screen) ."External" changes to red in colour.
2. Then double click on Vmix2Rpi.bat icon to start the .bat file.
3. Start the RpiDATV program with the I/Q mode (other modes have not been tested) with for example a SR1500, input mode IQTSIN with the 230.0.0.2 address.

Then later, to be done by the user in the Vmix2Rpi.bat file.

1. Replace in the long command line "Vmix2Rpi" with your call.
2. Modify the file with your own PID, Program Steam ID.

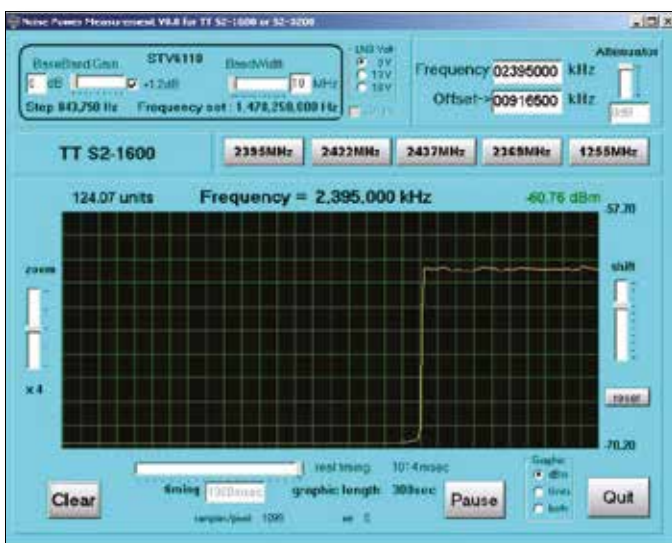




# Noise Power meter for the Minitouner

Noel Matthews - G8GTZ

Jean Pierre, F6DZP, has just released Noise Power Meter, a really useful software application for use with the standard minituner USB hardware. The Noise Power Meter application works on any PC already running the Minitoune software and provides a real time display of the noise / power level on any frequency within the range of the Minitouner hardware. It can be used to measure noise power levels on other bands such as 437 MHz and 10 GHz simply by running an SUP2400 or suitable converter in front of the Minitouner.

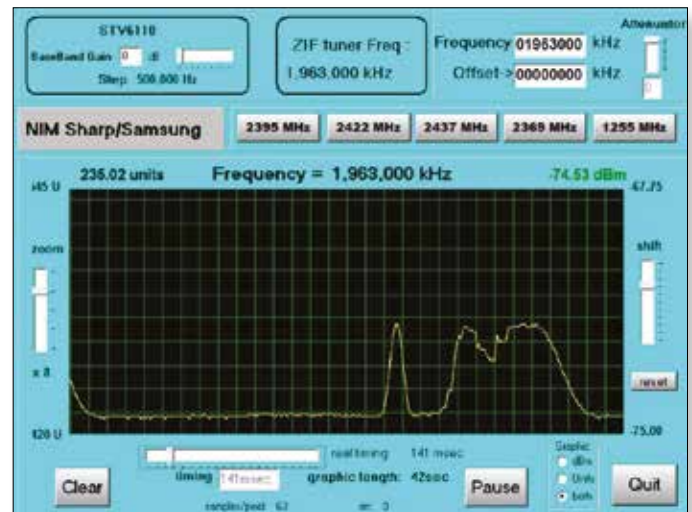


► NPM software being used to measure sun noise on the Goonhilly 3.8m dish

Previously only available for the Technotrend I 600 and 3200 cards the software can be used for antennae testing / alignment, measuring sun noise on a dish system and adjusting filters and pre-amplifiers.

To use the software, set the frequency either by using one of the presets (set in the .ini file) or enter in the frequency box, connect up the test signal, adjust the zoom so you can see the trace change when you make adjustments and then use the shift control to keep the trace in the screen. You may find it more useful to set the timing slider to a shorter time than the default and select dBm only in the graphic box. I found I didn't need to adjust any of the other controls.

To set up filters and pre-amplifiers, connect a low level signal source to the RF input and set the controls as described above. As you make adjustments the trace will increase or decrease and with filters it is very easy to adjust for minimum insertion loss on the wanted frequency and maximum rejection on the unwanted frequency.



► NPM measuring sun noise on 10 GHz 432 MHz IF transverter

The software can be used to check the alignment of dishes on the higher bands by looking for sun noise – this is a very useful check for dish feed alignment and can be used to compare cold sky noise and sun and can even be done on a cloudy day!

The software can also be used to peak antennas for maximum signal – the following figure shows the results from measuring the signal level of GB3HV on 3.4 GHz as the dish was rotated through the signal.



► NPM software being used to adjust dish heading on 3.4 GHz

The software, whilst not a calibrated instrument, does provide a very useful measuring tool when adjusting RF circuits and antennae – download it from [www.vivadatv.org](http://www.vivadatv.org)

# Video Fundamentals 8

## What's on the Cable

*In the last issue I got as far as the camera output and it is helpful to look at the most simple of signals and work forwards from there. It is useful to know the origins of video to work out where we are now. This, like the earlier notes, is a very light touch at a big subject. Links are provided for further reading and enlightenment.*

### Monochrome

So black & white or monochrome, a more recent term for B&W, is where TV started. Each picture, or half picture in the case of interlace, sent sequentially.

### Colour

When colour started there were 3 pictures to deal with, Red, Green & Blue and simplistically 3 cables were used. This was far from a convenient arrangement, 3 of everything was needed and if there were any distortions or gain inequalities very noticeable changes in the hue of the picture could occur. Now when all was correct the RGB pictures looked very nice, but as RGB, you could not transmit them in a way that would be compatible with the large installed base of monochrome equipment and sets.

### PAL

This was one of the solutions to a compatible system<sup>1</sup> It has been well described before, but the point I want to make here is the way the colour components were created and their bandwidth reduced.

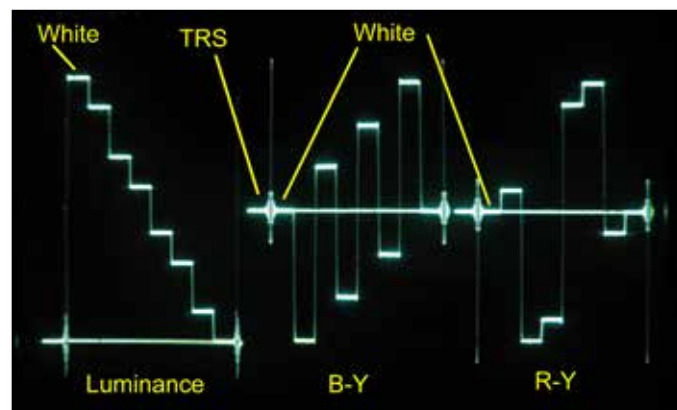
- First you make a high resolution monochrome picture, called luminance in this usage, from the RGB signals.
- Now as the luminance signal<sup>2</sup>  $Y = R+G+B$  and if we subtract  $Y$  from  $R$  we get the colour difference signal  $R-Y$  and similarly we can make  $B-Y$ . At this stage these three signals contain all the information contained in the RGB signals.
- Next as the colour resolution of the eye is less than the monochrome resolution the bandwidth of the colour difference signals can be reduced without any visible loss.

PAL as a coding system is very robust and ideal as a transmission format, but it is not without defects one of which is known as the PAL footprint, due to this further processing or digitization is difficult. This "footprint" is visible on the edges of colour changes as a subcarrier pattern, most noticeable as the deep valley between Green and Magenta on colour bars. A more complex PAL

Brian Summers – G8GQS



decoder, called a Comb Filter Decoder can mitigate the footprint problems. It's worth noting that as a system PAL is over half a century old<sup>3</sup>.



► Component waveform showing the colour difference signals, note when the signal is white the colour difference signals are zero

### Component Video

This is a 3 channel system using Luminance and the colour difference signals, the big advantage is there is no PAL footprint and the need to maintain 3 accurate channels is less than that for RGB. Also for low saturation pictures the amplitudes of the colour difference signals is small. Variants of the component system were much used for directly recording camera outputs<sup>4</sup> but the precise signal levels did vary between different formats.

### Digitisation

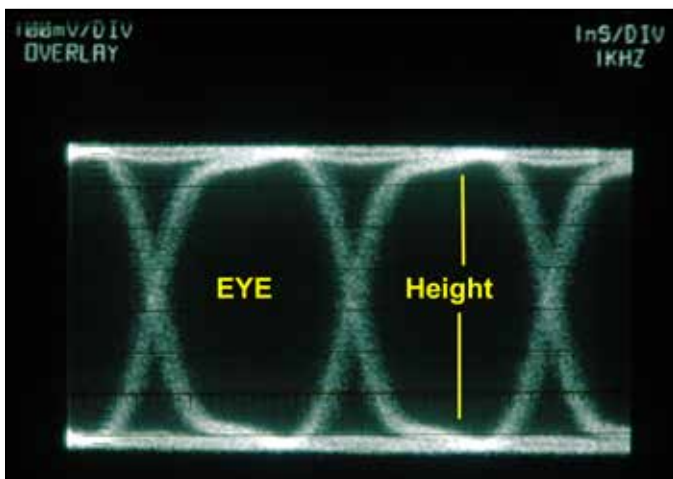
If we digitise our component signals they can conveniently be sent sequentially down one cable with a suitable choice of clock rate. Considering the broadcast Rec 601<sup>5</sup> which has a luminance sample rate of 13.5Mhz and 6.75Mhz for the colour difference signals with 8 or 10 bit samples. This gave 720 luminance and 360 colour pixels per line known as YCbCr 4:2:2<sup>6</sup>. This became commonly known as "SDI"<sup>7</sup> at the uncompressed 270 megabits/sec. rate as used by the UK broadcast industry. There is a whole range of different sampling rates from 4:4:4 down to 3:1:1 as used in Sony HDCAM recorders. All to reduce the data rate!

### TRS

In the Component Waveform figure an arrow points to "TRS" this is the timing reference signal that occurs immediately before the first active sample on every line, and immediately after the last active sample. It is not part of the picture and in a waveform monitor such as the Tek601 it can be viewed or turned off.

## SDI

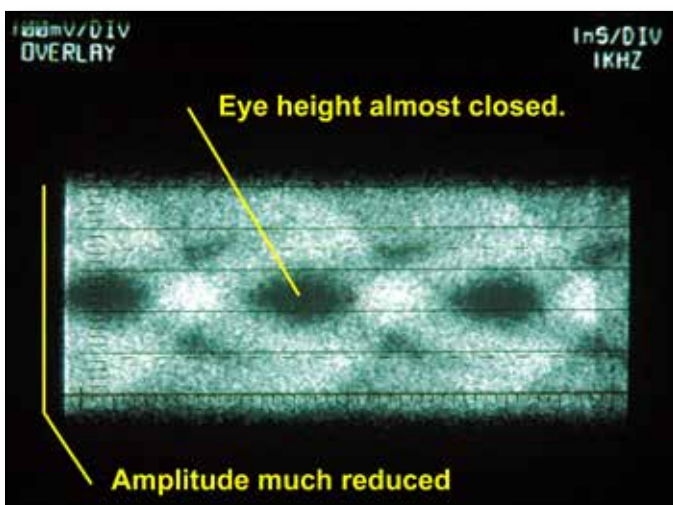
A few words about using SDI, although it is a digital signal and it can pass over the same cables as PAL, it suffers from a different set of problems, jitter, loss of eye height, relatively short cable distances, does not degrade gracefully and fails spectacularly in a cliff edge fashion. The distance an SDI signal will travel depends very much on the quality of the cable used, think 270 MHz cable attenuation, and how many connectors are involved. Each connector introducing an additional loss. The signal level for SDI is 800mV and each SDI input device has, or should have, an auto equalising circuit to compensate for these losses.



► This is an SDI waveform showing a good Eye

## SDI & Eye Height

This is the most useful SDI measurement<sup>8</sup>, and a digital waveform monitor such as the Tek 601i must be used. A conventional waveform monitor or oscilloscope can't be used. The term eye-height is somewhat self explanatory, see the figures. As the losses increase the eye closes until the signal is unrecoverable. A re-clocking device can be used, before this point, to obtain a further run of cable.



► The same signal after passing along a longish length of poor cable. Note even with the poor eye the picture was still perfect. The blessings of the SDI error correction.

## SDI surplus equipment

Broadcast TV kit has a life cycle and for most broadcasters SD SDI is no longer used. This means that kit that cost tens of £1000s is now on popular auction sites for a few £10s of pounds. Most of it still has useful life and worth experimenting with. Providing the original pictures have not been though PAL or over compressed the pictures are very good quality.

## Connectors in use

I recommend BNC's as my favourite. For analogue video 75Ω cable and connectors are the correct choice, but in practice it makes little difference if 50Ω connectors are used but the cable should be 75Ω. However for digital use each impedance discontinuity reduces the distance the signal will travel.

I would like to state categorically that 75Ω & 50Ω BNC connectors are mechanically inter-matable, impedance differences are achieved by differing dielectric arrangements.

There are many other connectors such as the now obsolete PL259, or UHF connector and the domestic phono connector.

Wikipedia has a useful list of connectors<sup>9</sup> 📄

## References:

1. Other common coded solutions were NTSC and Secam
2. Added in the proportions Y = R30% + G59% + B11%
3. Dr Walter Bruch proposed the PAL, Phase Alternate Line, in 1962
4. Sony Betacam was one such system.
5. REC 601 information = [https://en.wikipedia.org/wiki/Rec.\\_601](https://en.wikipedia.org/wiki/Rec._601)
6. YcrCb 4:2:2 info = [https://en.wikipedia.org/wiki/Chroma\\_subsampling#4:2:2](https://en.wikipedia.org/wiki/Chroma_subsampling#4:2:2)
7. Now known as SD SDI or standard rate to differentiate from HD SDI
8. A useful Tektronix Guide to SDI measurement = <http://tw.tek.com/dl/2BW-18906-0.pdf>
9. Connector list = [https://en.wikipedia.org/wiki/List\\_of\\_video\\_connectors](https://en.wikipedia.org/wiki/List_of_video_connectors)

## DN1JKG calling OR4ISS

Rolf Gerhardt – DG8AR



***ISS school contacts are becoming more and more popular. It is an efficient vehicle to get young people interested in technology in general as well as in natural sciences, astronomy, space technology, environment and several related subjects.***

Talking to the ISS requires the support of ham radio operators and organizations which is a win – win situation for our ham radio community and clubs in recruiting and motivating young members.

HAMTV, the ISS video system makes school contacts more attractive, which was excellently demonstrated by Tim Peake and the Principia mission.

The amateur radio club in Bruchsal (DL) decided in 2014 in conjunction with a large local event to organize an ISS contact with a local highschool (Justus Knecht Gymnasium).

Due to some delays and problems on the ISS this contact was finally scheduled for July 1st 2016, just after the Principia mission finished.

Beside the regular organization for the voice contact, I was in charge to establish the HAMTV equipment including hardware and software.

BATC (Noel, G8GTZ), F6DZP (Jean Pierre) and ARISS Europe provided some good starting information about HAMTV ground station requirements and I decided to follow these hints and started ordering the Technotrend TT 3200S satellite receiver card via eBay and set up a PC with Windows 7 and the Tutioone software from F6DZP (not a real easy task for a 64 year old ham veteran).

We luckily found a sponsor for the antenna, the rotator and the tower. Antenna dish kit (1.5m diameter, helical feed) came from RF Hamdesign in The Netherlands; the rotator (azimuth & elevation) was ordered from Prostel IT (Azimuth Pro E combo) and the tower construction and rotator integration was done by a local workshop, specialising in aluminium construction. Rotator control software was PST Rotator from Kodrut BudaYO3DMU.

We found an excellent location for the antenna, on top of a company car park 35m above ground with a 360 degree clear line of sight. We've installed a 5GHz wifi link between car park and school building and integrated the remote control car park PC into the school network. VPN access allowed us to do tracking and video recording from our shack at home.

The first big problem was antenna calibration in terms of elevation/azimuth and feed focus.

A first step to find the focus was the application of adhesive aluminum tapes on the mesh dish surface which reflected the sunlight.



We could use the sun for a rough visual feed alignment which worked fair in a first attempt. In a second attempt after contacting Noel Mathews we followed his advice to track the sun and measure the sun noise with a special software program from Jean-Pierre. We tried that several times but we did not see any significant noise. I parallel we tracked some ISS passes using the Tutioone software without success. We were running out of time and there was only one week left for testing and calibration. We meanwhile had the offer from BATC to provide the HAMTV signal from Goonhilly (thanks to Phil Crump, M0NDY) over the BATC multiviewer function and Jean-Pierre F6DZP, Claudio Ariotti IK1SLD and Daniel Cussen EI9FHB promised to stream their HAMTV signal via BATC for us. A perfect European network for a school contact was ready. That was a relief for us just in case

we would not be able to install an operating HAMTV receiving system on schedule. Not knowing if the ISS HAMTV transmitter was switched on, I did an Internet inquiry on the ISS fan club homepage. The last info about HAMTV was 6 weeks old – it was a report from Shane VK4KHZ down-under. I found his e-mail address in QRZ.com and contacted him immediately (it was 10pm DL local) His answer came quick and he expected an ISS pass within the next 20 minutes. 30 minutes later he confirmed the pass and an operating transmitter with a blank (black) screen. ISS was transmitting but we had no video reception with our own equipment. We made some changes at the antenna feed (shifted it closer to the antenna centre) and were able to receive a strong signal from the ISS, but no video picture. We gave Noel a VPN access to our equipment and he checked the settings. Everything seemed to be ok and we were a little bit clueless and were thinking about hardware replacements for the PC as well as for the satellite receiver card. Our IT specialist at school routinely started a general driver update on the PC and that solved our problem. Two days before the event, we were able to track the ISS and receive the black screen (with a blue line) for 8 minutes maximum.

In parallel we talked about the organization of the school event itself. Based on your UK experience with ISS contacts in the past, we started to install a 'separated' Internet access to avoid any overload and blocking by the rest of all school's internal PCs - and handheld Internet users during the event. Even our wifi connection between HAMTV equipment and school network was a direct link.

We saw your schematic media diagrams for the UK events with audio and video equipment required and decided to rely on some professionals. The school hired a media company to operate the camera equipment, and perform all recordings and streaming into the internet for the event. That turned out as a very wise decision. We were lucky to have the BATC test links for stream testing and event streaming in advance. As well as the multiviewer function for the HAMTV signal.



► Technical team (from front to back)  
Rolf DG8AR, Joerg DL9UL,  
Thomas DH8IAT, Chris DL2UC

Looking back now, we fully agree with your experience of the workload. The easy part is the ham radio voice contact, the real work starts with 'event media' including HAMTV.

We started the event on July 1st at 8.00am, two and a half hours before the scheduled contact and had different presentations and speeches. Internet streaming worked flawlessly. Some minor problems occurred because the media professionals mistakenly used the BATC test link instead of the officially installed streaming page. That was fixed after 10 minutes and everything worked well. We started the voice call 5 minutes prior to the estimated contact time. At this moment, I had the BATC multiviewer running and the Goonhilly Ham TV signal came up with a black screen (camera was switched off!). Two minutes later we picked up the ISS video signal directly but we knew it was useless for the event. We showed during the voice contact a picture from Jeff Williams. Nobody in the public really missed the live video (except all the guys who have been working really hard to get everything running). We now know the real meaning of NASA documents mentioning "HAMTV requested but not scheduled".

During project preparation we assembled the antenna equipment with switchable circular polarization and an Arduino based sequencer for pre-amp and PTT switching.

We did some event simulation with pupils, simulating a bad connection, non-answering astronaut, request to switch to backup frequencies and some other 'accidents'. We luckily didn't need them.

Having successfully completed the voice contact (including: introduction; asking and answering all 20 questions; applause for the astronaut; and goodbye) it took us a while to realize that we had organized a 'once in a lifetime' event for pupils, audience and ourselves. Everybody was excited and even the professional TV and newspaper media guys were talking about a very emotional event.

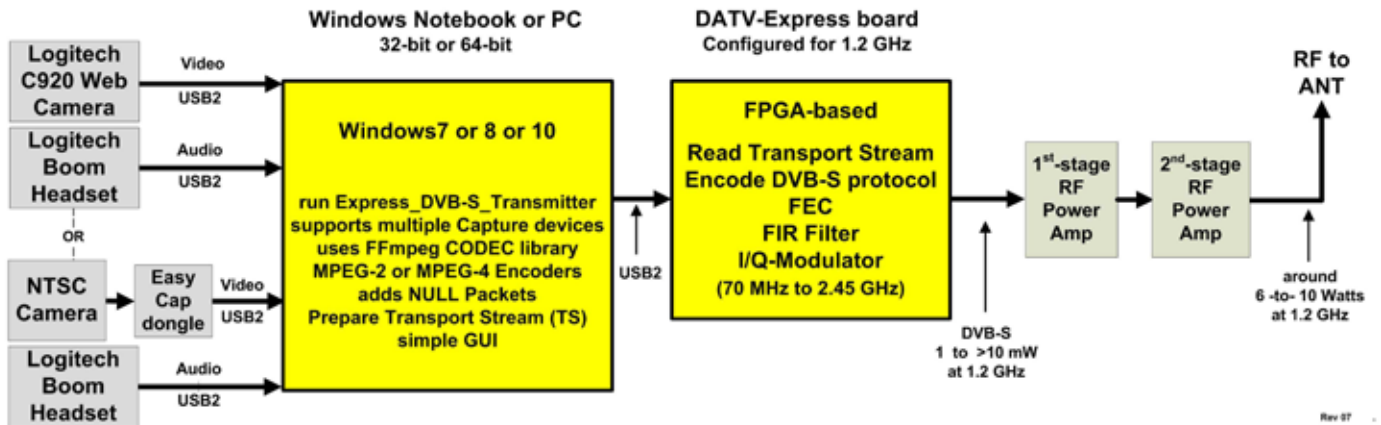
Looking back, all the work and money was well spent. We had a lot of fun and an excellent support from BATC. HAM Spirit at its best. To give something back to our HAM community and ARISS we are looking for a location for the dish to install a remote satellite and VHF/UHF station for the school, as well as a HAMTV receiving station available for future ISS school contacts

What next...? Well we are about to modify a commercial LNB for Es Hail Sat reception. DATV QSO via satellite? We'll see... and try to keep you updated!

**73 from DL  
Rolf (DG8AR)**

# DATV-Express on Windows

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► Fig 01 – Block Diagram for typical set-up running Express\_DVB-S\_ Transmitter software on Windows

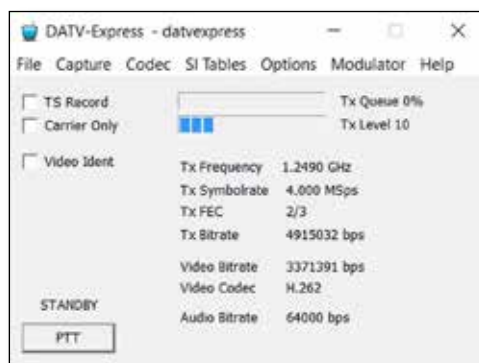
The DATV-Express Digital-ATV exciter board was introduced in January 2014 to provide a more affordable product for hams to transmit DATV. The original DATV-Express software product ran on LINUX operating system... a very useful OS, but 95% of hams do NOT use LINUX... and most of those hams do NOT WANT to learn a new OS!

## Express\_DVB-S\_ Transmitter software

The new Express\_DVB-S\_ Transmitter software was written by Charles G4GUO to allow the DATV-Express transmitter board to operate in Windows (Win7, Win8, and Win10). A block diagram of a typical set-up is shown in Figure 01. An important feature of this new software is that the video-capture-to-encoder function no longer needs to be performed on a Hauppauge video-capture board. The Express\_DVB-S\_ Transmitter software uses the FFMPEG CODEC library that is available in a Windows environment to perform the video encoding/compression (no more Hauppauge unit needed!).

## Transmitter software

The Main screen of the Express\_DVB-S\_ Transmitter software displays all of the settings that the owner has made - as shown in Figure 02. There are seven tabs across the top of the Main screen that control the actual settings for the DATV transmission. For example: the CAPTURE Tab allows selecting the video and audio

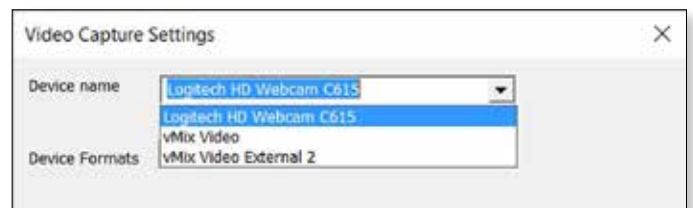


► Fig 02 - The Main screen of Express DVB-S

device and the MODULATOR Tab allows selection of frequency, Symbol Rate, FEC, etc.

## Choice of Cameras and Microphones

One big improvement made by this new Windows software for the DATV-Express hardware board is that there are many more camera models that can be used. Use a USB-based web-camera such as Logitech C920 and HD hand-cameras as well as using your old NTSC/PAL hand-camera through a video-capture dongle like EasyCap (USB-based). Even the camera and microphone on your notebook computer can be selected.



## Choice of CODEC

A CODEC is a compression encoder. The CODECS Tab allows you to send H.264 (MPEG-4) video as the video-payload even though the software is using DVB-S protocol. In the commercial DTV world, the DVB-S protocol does NOT transmit H.264 CODEC, but DVB-S2 and DVB-T2 do transmit H.264.

The radio buttons along the top of the Figure 03 allow you to select one of three different CODEC VIDEO encoding technologies for



► Figure 03 - the Codec settings window



your transmission.

- H.262 is the standard MPEG-2 video encoding that is used by commercial DVB-S DTV transmissions. It works well but does not compress as efficiently as H.264 or H.265. H.262 is more compatible on older SetTopBox receivers (such as FTA before MPEG-4 was introduced).
- H.264 is the newer MPEG-4 video compression that is used by commercial DVB-S2 HDTV transmissions. H.264 encoding provides higher bit stream compression efficiency than H.262, but may have a little longer latency (video delay) than H.262. The good news is that H.264 CODEC can be used as the 'payload' video stream inside the DVB-S protocol... as long as the receiver is capable of receiving both DVB-S and H.264... such as a DVB-S2 STB. Another advantage of the H.264 CODEC is that it works better (than H.262) in low Symbol-Rate environments under 1M Symb/sec. The significantly better low-SR video quality seen on the receiver is due to H.264 design using a more suitable macro block size. One caution is that if you insist on using HDTV quality video as an input, then the video bitrate will be very large and may require a 6 MHz BandWidth on the spectrum to receive that quality. Hams can tweak the video capture format and SR and frame-rate (FPS) to achieve acceptable BW and video quality as the RB-DATV hams do on 2 Meters and have shown to reduce DATV spectrum bandwidth requirements on other ham bands like 70 CM and 10 GHz.
- H.265 is a more recent video compression encoder that is also known as High Efficiency Video Coding (HEVC) can encode 4Kp60/10-bit video in real-time (with hardware encoder). H.265 can compress 480-line video with 50% more reduction and 1080-line video is reduced by 60% (both compared to H.264 CODEC). H.265 software encoding is very computer intensive and typically results in latencies of nearly 10 seconds.

### Simple Call Letters Overlay

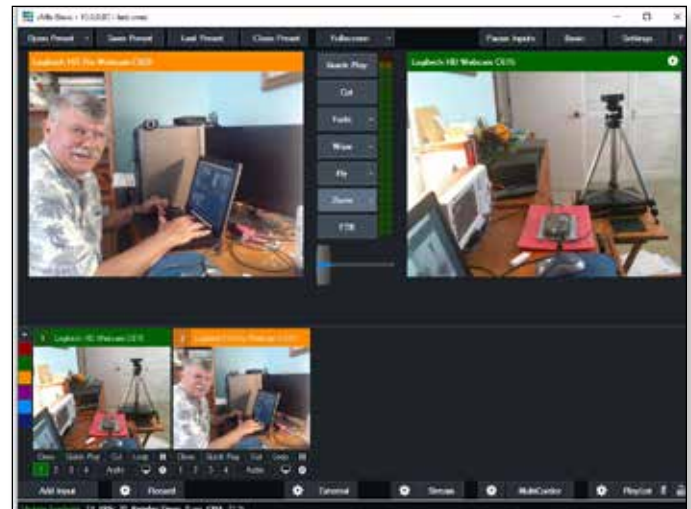
Another new feature introduced in this Window software application is a simple video overlay for your call letters. This feature can be enabled by "checking" the VIDEO IDENT box on the Main window. Figure 04 shows how the video overlay field appears (shown as the call W6HHC) on the receiver's screen.

► Figure 06 – The VIDEO IDENT feature can be enabled to display your call letters on the received transmission



### Adding optional vMix Video software

vMix is a great optional companion software tool. vMix Basic is a free video-editor software package for SDTV format video (Standard Definition) is available from vMix.com. There are more professional HDTV products of vMix available for sale, including the vMix Basic HD for US\$60. The free video-managing software allows you to control multiple cameras and audio microphones, create call letter overlays, create blue-screen and green-screen tricks, and perform fades-between-cameras. You can capture any video that you can get onto your Windows computer via USB, Firewire, ASI, or HDMI (using a HDMI-USB capture card). When running, vMix will display as one of the available devices under CAPTURE – Video Devices and CAPTURE – Audio Devices.



### Downloading Software and Manual

The Express\_DVB-S\_Transmitter software is currently available (and free) as a 'BETA release' of v1.1.1. This beta software does already have many successful users around the world and is expected to become 'production released' by September. The software install package, a beta-grade Users Guide for Windows and a readme file, called NOTES.txt can all be downloaded from the [www.DATV-Express.com](http://www.DATV-Express.com) web site on the DOWNLOADS page.

Installation instructions are included in the Users Guide for Windows. The instructions also explain how to use the ZADIG free tool to easily install a Windows device driver for the DATV-Express hardware board.

# Here and there...

## Good Tropospheric Conditions

Peter Yarde, G8DKC

When operating at home, and the transport is in use, I'm still chasing that chance of a signal in to GB3ZZ...

Great conditions this morning, 24th August, and I managed to access GB3HV, GB3TZ and the local GB3GV on 437Mhz.

Had a two way with Arthur G4CPE near Luton, on 437Mhz - he dropped his power down to 25w, I was using a 3 element straight into a SUP2400 up-converter; over 65 miles and 100 kilometre. Definitely my best without a repeater involved.

We tried 146.5Mhz but conditions were starting to drop off.

Steve M0SKM, who is near GB3TZ, was getting into GB3GV with his antennas down, beaming through next doors roof.

Also had a quick chat with Noel on 144.750Mhz, on his way to service GB3HV.

*A fun two and a half hours using tropospheric propagation.*



▶ Arthur, G4CPE, near Luton direct on 437 Mhz from Coalville, Leicestershire.



▶ Steve M0SKM, received via GB3GV.

## RB-TV from Dorset

Dave Crump, G8GKQ

About 90 minutes drive from my home QTH in Southampton is Povington Hill which sits within the MoD's Lulworth Range area. It is only accessible when the range is closed, but it has a very good take-off in all directions and a quiet RF environment.

It's a great site for testing RB-TV on 146 MHz and 437 MHz. You can find more details on the BATC Wiki at [https://wiki.batc.tv/Directory\\_of\\_portable\\_sites](https://wiki.batc.tv/Directory_of_portable_sites)



▶ Shaun G8VPG, received on 146Mhz using 333k/symb



▶ Noel, G8GTZ, received on 146Mhz using 125k/symb



▶ Noel, G8GTZ, received on 146Mhz using 333k/symb



▶ Noel, G8GTZ, received on 437Mhz using 333k/symb



## New and renewing members

*Rob Burn, Membership Secretary - G8NXG*

We would like to welcome old and new members who have recently joined the BATC and rather than publish just a list of names and call-signs, we present a list which also includes the forename, the county (where known) and country of residence of each member. The rationale

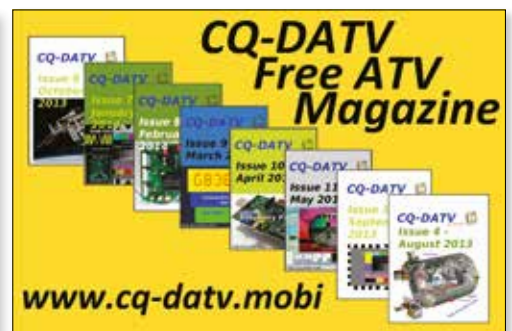
for this new section is to thank members for joining or rejoining the BATC and to acknowledge your support of the Club. Hopefully, the information will be of general assistance to members to determine who could be fairly local for a test transmission! 📡

Stephen	Hedicker	G8XJO	Hampshire	England
Bob	Leggett	G6KMM	Bedfordshire	England
John	Franks	G3SQQ	Nottinghamshire	England
Jamie	Lewis	MW0POB	Neath Port Talbot	Wales
Ian	Bailey	M0HVO	Hampshire	England
Barry	Sankey	G7RWY	West Midlands	England
Russell	Tribe	G4SAQ	Hampshire	England
Andrew	Garratt	M0NRD	Nottinghamshire	England
John	Hislop	G7OHO	Kent	England
Richard	Peterson	WA6NUT	Colorado	USA
Steve	Greaves	2E0XAY	Leicestershire	England
Kevin	Jacobson	AD7OI	Arizona	USA
Joel	Wilhite	KD6W	California	USA
Jouen	François	F1CHF		France
Bimbira	Tarsham Singh		London	England
Ron	Mount	G7DOE	Oxfordshire	England
Trevor	Gale	PA2TG		Netherlands
Eddie	Payne	G6HZW	Essex	England
François	Muller	F6AQO		France
Alison	Johnston	G8ROG	Berkshire	England
Charlie	Barnwell	G4YYA	Dorset	England
Darren	Rainer	G4VTQ	Berkshire	England
Robert	Anderson	GM0SCW	Renfrewshire	Scotland
John	Elliott	G3WFK	Cheshire	England
Nicolas	Harrold	G4IMO	Cambridgeshire	England
Michael	Goss	EI2JM	Co. Wicklow	Ireland
Mike	Harriman	G4SJX	Leicestershire	England
Don	Saunders	G0WFT	Bedfordshire	England
Mike	Edwards	G8CPF	Somerset	England
Peter	Green		Devon	England
Julian	Horn	M0NUX	Norfolk	England

Steve	Barrett	G4HTZ	Essex	England
Brian	Cutts	G1FNS	Berkshire	England
Ronald	Fredricks	K8DMR	Michigan	USA
Andrew	Mace	M0MUX	Middlesex	England
Viv	Green	G1IXE	Avon	England
Jean	Lemercier	F1YI		France
Clive	Andrews	2E0DSD	Hampshire	England
Craig	Braisby	M0XSG	Surrey	England
André	Wittmer	F1FDB		France
Shaun	Pratt	G8VHO	Somerset	England
Hilary	Bridel	VK2IUW	NSW	Australia
John	Bosch	PD2PRT		Netherlands
David	Hopkins	VK4ZF		Australia
John	Lukey	VK2JG	NSW	Australia
Michel	Vonlanthen	HB9AFO		Switzerland
Carl	Scholfield	M0ICS	Lancs	England
Jim	Stevenson	G0EJQ	Lincs	England
Dale	Hagert	W0IR		USA
Ian	Hill	G6ZVE	Derbys	England
Raymond	Newsome	G1MSD 9H4RN	West Yorks	England
Steven	Lovell	G8XPZ	Notts	England
Jan	Andersson	SM0OFV		Sweden
Gilbert	Ferand	F5CAU		France
Richard	Condie	VK2FAFG		Australia
Bevan	Daniel	VK5BD		Australia
Norman	Pickworth	2E1MNP	Middlesex	England
John	Hanney	G8BDF	Hampshire	England
R	Farmer		Monmouth	Wales
Benjami	Pinöl	EA3XU		Spain
Alan	Bolton	G1EAB	Nottinghamshire	England
Arthur	Lambriex	ON4FIN		Belgium

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

**Other ATV Magazines  
are also available!**



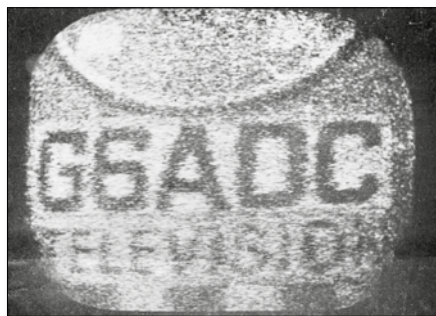
# Turning Back the Pages

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

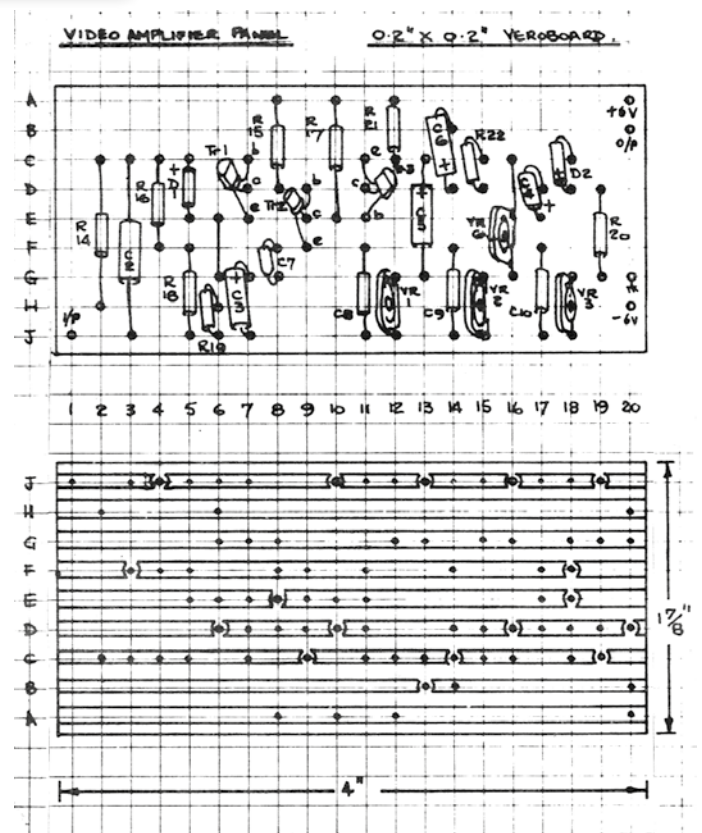
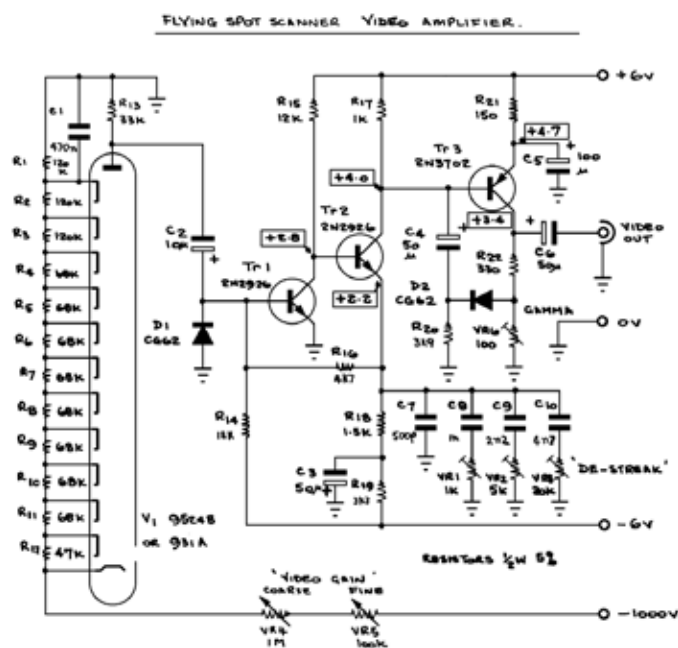
Peter Delaney - G8KZG

## CQ-TV 65

The front cover illustration greeting members when CQ-TV 65 arrived in the post in 1968 was of a 70cm transmission, sent from G6ADC/T in Somerset to G3ILD, north of Darlington. Other activity included what was thought to be the first amateur PAL colour transmission on 70cm. The path was only 1½ miles from G6ACW/T and G6LEE/T, but the BBC's colour service had only begun the previous year, with the televising of Wimbledon on BBC2.



adjustment of the overall sensitivity being by varying the EHT voltage fed to the tube dynodes via VR4 and VR5. The circuit was built on Veroboard (Veroboard is a proprietary board having copper strips with, in this case, holes on a 0.2" matrix, which was popular at the time (and still available in a 0.1" matrix version).

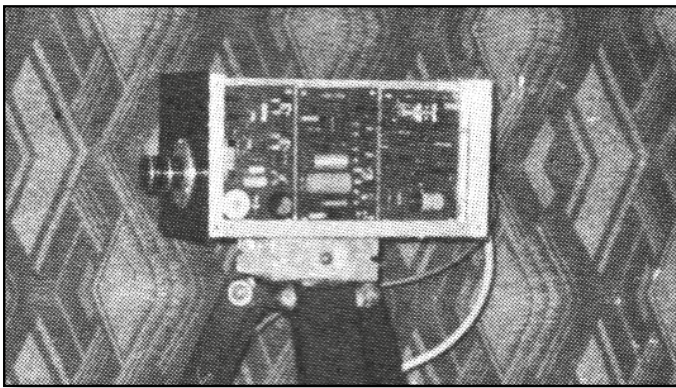


The main articles, however, were concerned with video sources. John Lawrence described a flying spot scanner head amplifier. The low level signal from a photomultiplier tube - about 100 µA peak to peak - was coupled to the input stage, Tr1 and Tr2. This stage was designed to have a low input impedance, to minimise the effects of stray capacity in parallel with R13. D1 was a protection diode, in case there was an excessive level of light falling on the photo-multiplier. D2 in the feedback around Tr3 gave a measure of gamma correction, adjusted by Vr6. The various preset controls were adjusted to compensate for the afterglow in the phosphor of the scanning cathode ray tube. - no video gain control was included in the amplifier;

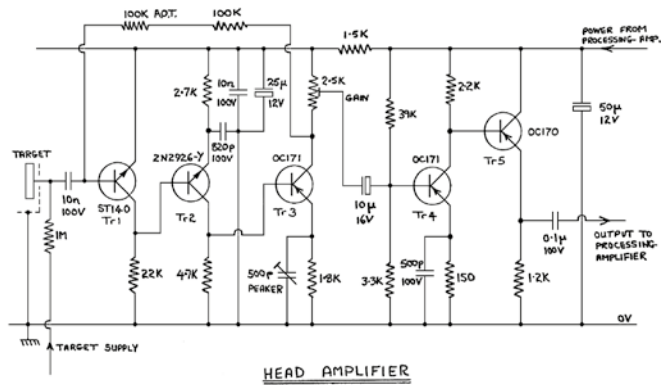
Notes on vidicon yokes were provided, detailing the specification and connections for sets of coils available through the Club. They consisted of a set of field coils (52mH / 150 Ω for the pair) and a set of line coils (1mH / 2.6 Ω for the pair), surrounded by a 130mH / 65 Ω focus coil. As such, they were intended for use in transistorised cameras, needing 100 mA focus current. The line coils were essentially inductive, and the field coils resistive, at the relevant frequencies.

The following 5 pages then had details of a transistorised vidicon camera "designed to give results of similar quality to off-air signals as received from the broadcast stations". Although the author included his thanks to John Tanner 'for his assistance and interest, and also for the use of some of

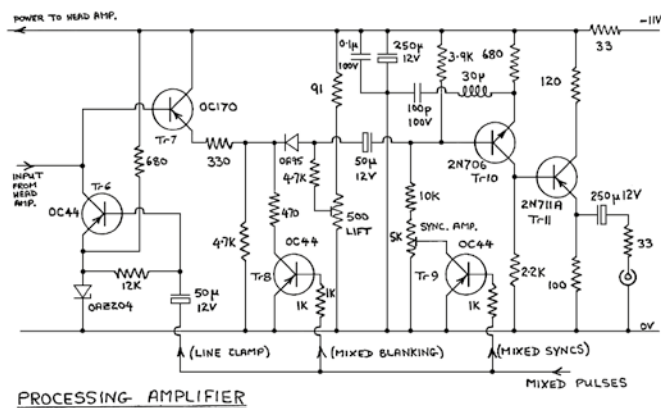
his equipment”, no clue was given as to who the author was! (A note in CQ-TV 67 revealed him to be R D Hanes of Wembley).



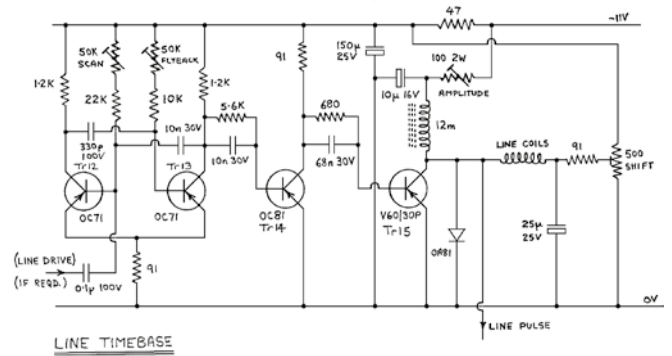
The camera was made using home-made scan coils based on information in an earlier issue of the magazine, but the Club coils mentioned above were also said to be ‘ideal for this camera’. Most of the transistors were germanium



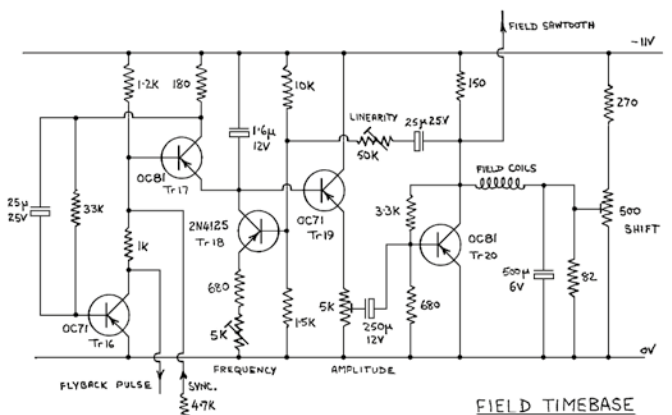
types, and the values given were appropriate for 405 line 50 field working. The signal amplifiers, therefore, were arranged for a bandwidth of 3MHz. The signal from the vidicon target was taken to the first stage of the head amplifier - for which a Sinclair ST140 transistor was used. This was an n-p-n silicon epitaxial planar device (probably only marketed by Sinclair), which was ‘state of the art’ for such low signal, low noise applications. The second stage was another n-p-n silicon device, followed by a germanium p-n-p OC171. The feedback around these 3 stages was

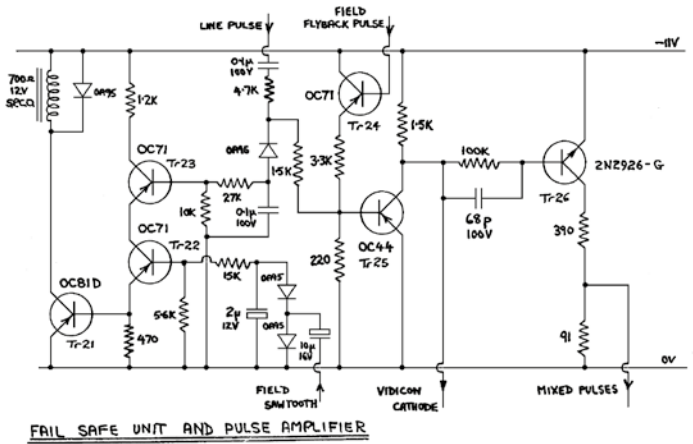
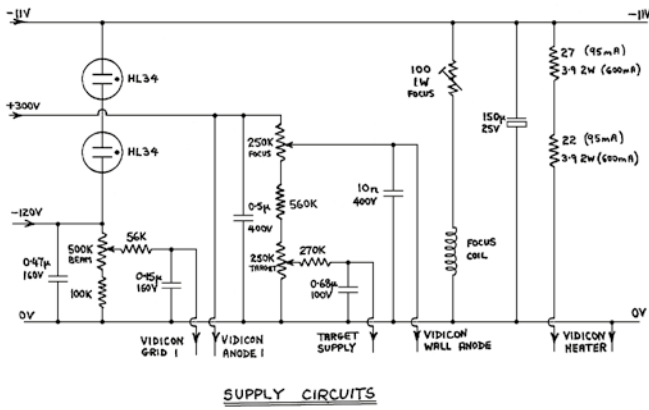


provided by two 100kΩ resistors in series - rather than a single component, to minimise the effect of shunt capacity at this point, these stages being built into a small tin enclosure as close as possible to the vidicon target. The two output stages then fed the processing amplifier, which applied dc restoration at Tr6, then added blanking at Tr8 and sync pulses at the base of Tr10, with an emitter follower stage to drive a 75Ω output into a coax cable.



The line timebase was based on a multivibrator, Tr12 and Tr13. The buffer stage, Tr14, then drove the Tr15 output stage, a 16V negative going short pulse appearing at its collector, to drive a suitable current through the line scan coils. The field timebase was an oscillator based on Tr16, Tr17 and Tr18, and could be locked to the mains supply via the 4.7 kΩ resistor to the base of Tr17. Across the 1.6 μF at Tr17's emitter was developed a 5 volt sawtooth waveform, Tr18 being a constant current source. The emitter follower stage, Tr19, ensured that the following output stage driving the scan coils did not load the oscillator.





The power supplies were fairly conventional, with a pair of neons to stabilise the negative supplies to the camera tube. An additional circuit was shown to protect the vidicon should the scans fail. It rectified samples of the line pulse and field sawtooth waveforms, combined them in an AND gate (Tr22 and Tr23), and then drove a relay via Tr21 - absence of either scan signal would cause the relay to turn of the high voltage supply to the vidicon. The line pulse, and a feed of field flyback pulses, were also used to apply a blanking signal to the vidicon cathode.

Apart from detailing the various inductances, no other construction information was given, although a photograph of the completed camera was included.

Slow scan television was still a popular mode, and another article in the magazine discussed ways to compress a video signal to pass along an audio channel. The article considered the available bandwidth, the advantages of Am or FM modulation, and the choice of suitable line standards. The article concluded by saying "by extending all the compression methods to the limit, it must surely be possible to improve the compression by a factor of 16 times... Can you devise a scheme for reducing the bandwidth simply?" (MPEG was many years to the future – and 'simply' is maybe not the adjective applied to the process).



## High Tech Wearables

At the CAT16 conference, our networking and streaming specialist Phil Crump, M0DNY, was sporting the latest in high-tech wearables in the shape of the ID badge from the recent EMF2016, held in Guildford in July. Not only does the badge include a microcomputer and full colour display, but it's also wifi enabled!

Phil had his badge configured with his name and callsign, as you'd expect - but he also had it displaying the current number of viewers on the BATC stream of the event, updated live over the wifi! Now that's impressive!

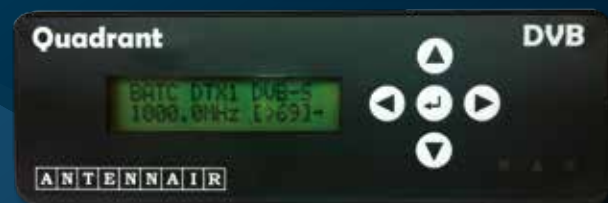


# The British Amateur Television Club

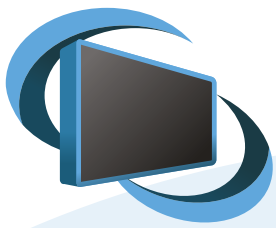


## The club provides the following for its members:

- ▶ 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 new **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 ATV stand:

6 Nov West London Radio & Electronics Show, Kempton Park, Surrey.  
[www.radiofairs.co.uk](http://www.radiofairs.co.uk)

### 2017

18 June, Newbury Radio Rally, Newbury Showground.

14-16 July, HAMTRONIC SHOW, FRIEDRICHSHAFEN, Messe, Friedrichshafen, Germany

16 July, McMichael Radio Rally, Reading Rugby Football Club,

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

### Activity weekends and ATV contests:

1200 UTC 10 December 2016 - 1800 UTC 11 December 2016: ATV Activity Weekend

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

1200 UTC 6 May 2017 - 1800 UTC 7 May 2017: ATV Activity Weekend

1200 UTC 10 June 2017 - 1800 UTC 11 June 2017: IARU International ATV Contest

**More volunteers are needed to run the BATC stand at rallies, especially in the North and West. If you are able to help, please contact the membership secretary.**