



The British Amateur Television Club

CQ-TV

No. 248 – Summer 2015

**Out-and-about
with ATV this Summer**



Plus...

RB-TV Roundup

The Low SR World Conquest

DATV Developments in North Wales

Minitiouner - USB Tuner Module

Narrow band DATV on the BATC DTX1

Product Review - PE1RKL 23cm four pole filter

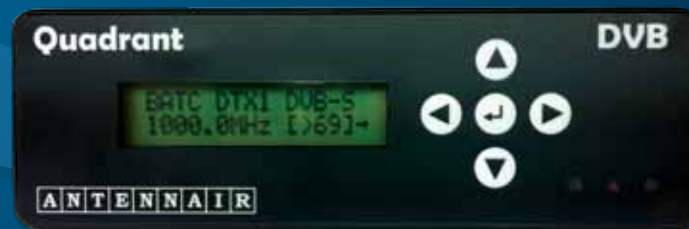
Video Fundamentals - Part 3: Picture Monitor

Video Sync generator

A Field Day station with PC6REC

... and all the regular features

BATC DTX1 Digital TV Transmitter



MPEG-2 encoder and DVB-S modulator

- ▶ Self contained unit - computer not required.
- ▶ Composite and S-video input
- ▶ 2 audio channels
- ▶ Single PCB design
- ▶ Plug in option for 2nd video & audio channels
- ▶ Size: 165mm wide; 120mm deep; 55mm high
- ▶ Tunes the 70cm and 23cm bands. Tuning range from 150Mhz - 2Ghz
- ▶ -5 dBm output
- ▶ Power 500mA at 12 volts
- ▶ LCD front panel and keypad control
- ▶ RS232 control port



Available from BATC shop

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

Specification subject to change without notice

CAT15 - Sept 5/6th 2015



- 2 day program including talks and demos
- Test and measurement area
- Members flea market and demo area
- RF and specialist traders
- Presentation of BATC RB-TV awards

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- 5 minutes from Robin Hood International Airport





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Summer - Please submit by May 31st

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Winter - Please submit November 30th

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

From the Chairman...

Noel Matthews - G8GTZ



Summer seems to have arrived at last and we actually had fine weather for most of the country during the Summer Fun contest last weekend but it didn't seem to produce any good conditions. However, that didn't stop Rob (MODTS) and Terry (GILPS) going out and having the first 100+ Km QSO on the 146 band and thereby winning the BATC award to add to the 10+ Km award they won early in the year! Congratulations to Rob and Terry – very well deserved recognition for all the effort they put in to the hobby and they will receive the awards at CAT15 in September.

Activity in the Summer Fun contest was fairly low with many operators known to have equipment not appearing on the air – maybe the word “contest” puts a lot of people off? So in an effort to encourage activity BATC is organising an ATV activity weekend on 12/13th of September when we will be encouraging as many people as possible to “get on the air”. Whether it's just making an effort to get on your local repeater, trying to work someone simplex who you've only ever seen by the repeater, getting that piece of gear that's been on the bench for months finished and on air, having a first QSO on RB-TV or going out portable on the local high spot we encourage you to “get on air”.

BATC will be giving out certificates for the repeater with the most QSOs over the weekend, the best DX worked on every band and a newcomers award – we're still working out the details but keep an eye on the forum and spread the word to encourage others to get on the air on the 12/13th September - which coincides with a Dutch activity weekend, so let's see if we can have more activity on www.dxspot.tv than in the Netherlands!

Another reason to “get on air” is the Worldwide ATV party on August 22nd. The event is organised by Peter Cossins VK..... and last year involved ATV operators from Australia, the USA and the UK with www.batc.tv being used to link up repeaters on the 3 continents. It is likely that GB3HV will be one of the UK repeaters involved – for more details watch the BATC forum, Facebook and Twitter pages.

And a big welcome Ian Parker (G8XZD) who has joined the committee to take on the publicity role – as well as making sure BATC gets a mention in other publications, Ian has taken on reviving our Facebook and Twitter accounts and we have already seen a huge increase in interest in our pages. The RB-TV developments have really raised the profile of the ATV community and we made headline news on the RSGB news and Ofcom (UK regulator) was so impressed with the initiatives taken to do “something different” on the 146 MHz allocation that they published a special RB-TV edition of CQ-TV on their website – a big thanks to all concerned.

Whilst we welcome Ian to the committee, Dave Mann (G8ADM) has decided it is time he let go some of his responsibilities and we are therefore looking for someone to take over as membership secretary for the club – this is largely an admin role and can be done by someone who may not be an active ATVer but is looking to play an important role in the day to day running of the club. If you feel this is something you would like to do please contact any member of the committee.

Finally, we are putting together plans for CAT15 at Farningley September 5/6th – a program of talks including workshop sessions to help sort out and test your ATV gear and plenty for discussing your plans for the activity day on the following weekend with other members. We would welcome your ideas about what you want to see on the agenda - full details will be published on the forum and we look forward to seeing as many members as possible there. 📡

ATV activity weekend 12/13 September 2015

- Not a contest – just a weekend of ATV activity
- All bands from 50 MHz to 24 GHz
- Digital and analogue modes
- Repeater and simplex contacts
- BATC certificates for
 - Repeater group with most QSOs
 - Best DX contact on any band
 - Best DX contact on RB-TV (800Khz or less)
- See the BATC forum for more info



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



Members News

Dave Mann – G8ADM



Rallies

The BATC has attended four radio rallies so far this year. The main reason is to attract new members but it's also a good meeting place for current members and friends and to see our mobile equipment in operation. There is a list of rallies on the rear cover, come and say hello!

TV Repeater Linking.

There is a growing interest in linking repeaters together to extend the range and increase activity. This is controlled by sending the appropriate DTMF tones from your microphone keypad usually on the repeater control channel like 432.500 MHz or on the video's audio channel. The instructions are either on the BATC repeater streaming page, <http://www.batc.tv> or on the repeaters web site. Recently GB3TZ near Luton can now link with GB3BH near Watford that can link with GB3HV near Farnham in Surrey. The link can be either way depending on the DTMF tones used. There are plans to arrange for linking to other repeaters also. Maybe one day we will be able to link from Cornwall to County Durham?

Station Reports

Tim G4WIM in Lytham St. Annes, Lancashire is now active on 23cm digital. His transmitter can generate 60W but he has had some good contacts with just a few milliwatts of power. He is still unable to access repeaters GB3UD or GB3TM though.



Tony G1HBD near Reading can now get into GB3HV and GB3BH repeaters using 70cm digital transmission.

G3SDQ in East London is now testing two way 70cm digital TV with G8JZT across the River Thames in North Kent and also with the Luton area.

The **Luton** area has become very active again with much activity on the local repeaters, GB3TV and GB3TZ, as well as activity on RB-TV, this includes, 2E0EAZ, G0WFT, G4CPE, G4WYQ, G6JIE, G6OUA, G8XTW, M0LTN, M0SKM and Ian G3KKD from East of Cambridge also often joins in.

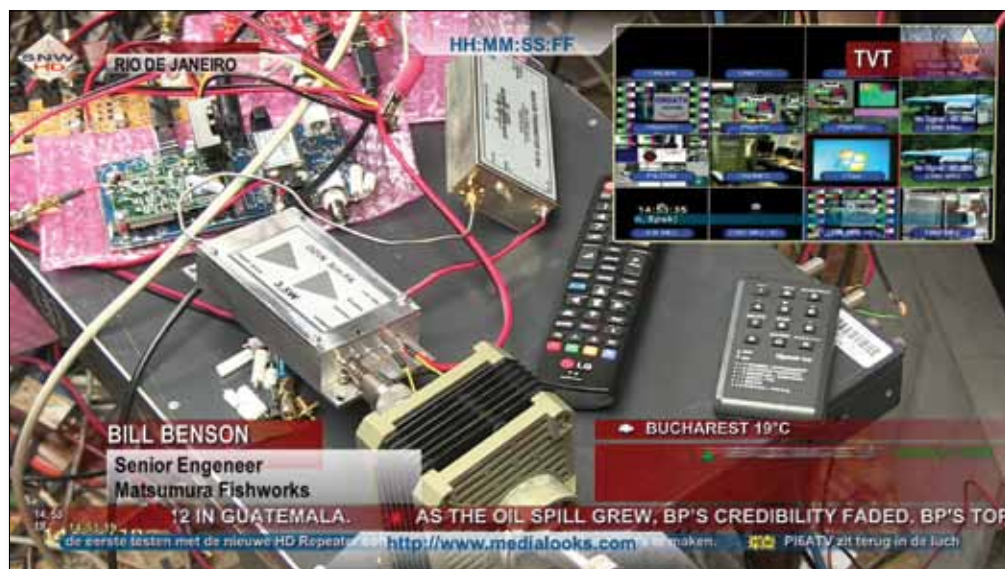
John, GW3JGA reports that the Anglesey Repeater GB3TM will be updated to be a digital repeater. The hardware and software for the new version is being built by Chris, MW0LLK.

Paul, G6MNJ, St Austell, Cornwall, reports that he now has an antenna up that is able to receive the Plymouth ATV repeater, GB3WV. Having got all this working the repeater keepers have announced that the repeater will be closing down due to the high electricity costs. If you can help to keep GB3WV on the air then please email me.

Australia: some members and some repeaters are on the BATC Streaming Service in the UK mornings (their evening) usually after 10 am BST. See: <http://www.batc.tv>. VK2CRJ is usually active on Monday and Tuesday, if you are free on these mornings it is well worth watching.

HDTV.

Remarkably good pictures have been demonstrated recently using reduced bandwidth television, RB-TV, but you cannot beat the real thing! Many people view amateur television via the BATC streaming facility. This system simply reflects whatever signal is fed into it so even though most people use it for low resolution images it is capable of relaying HDTV signals. To see HDTV correctly your computer needs to have a widescreen monitor. Having found a widescreen or HDTV transmission click on the full screen button to the left of the on screen volume control. An HDTV signal is available from ON0SNW, go to the streaming facility and click on Members Stream's, find ON0SNW-HD and if it's not



streaming press the 'Switch on streamer for 10mins' button. Remarkably good pictures can be seen here. We hope that HDTV will be available from some repeaters also in the near future..

Please send any news for CQ-TV 249 to me by the end of August: secretary@batc.org.uk

Overseas News

Dave Crump – G8GKQ



The Netherlands

The April Issue of Electron reports on 24 GHz testing between Renny PE1ASH and Richard PA3CGG over a distance of 15 km. In clear weather, they consistently achieve P5 (FM) between their home QTHs. Renny describes how he has found adjustment of elevation as well as azimuth to be important for optimum alignment. Photos of their antennas are below.



► Antennas at PA3CGG, left, and PE1ASH, above

USA

The latest newsletter from ATCO (the Amateur Television in Central Ohio Group) includes a reminder that the next DATV QSO Party will be held this August. This event provides a great overview of ATV activity in USA, Australia and UK. More details to be published on the BATC Forum nearer the time.

The newsletter also describes Power Amplifiers for DVB-T, which seems to be a more popular mode in the USA, despite the increased bandwidth and linearity requirements.

Please send me all your overseas news – it would be great to share it with the wider community!



Social Media

Ian Parker – G8XZD

Recently I've taken over the position of trying to raise the profile of the BATC and one of the first things I did was to revamp the club's presence on Twitter and Facebook.

Hardly a day goes by without seeing the expression "follow us on Twitter" or "like us" on Facebook somewhere on the internet or in the high street. So what does this mean and why should I be interested? Think of both as ways of building a community around people who all enjoy a shared passion for a topic - in this case ATV.

With **Twitter** you have up to 140 characters - slightly less than a text - to get your message across to your followers. And within that tweet you can embed a picture or a web link for people that want to find out more.

A bit like a newspaper headline and summary - carefully written you can draw people's attention, and, if they find it interesting, can re-tweet it (or pass it on) to their followers. As an example I sent out 25 tweets during May and June and these have been eventually seen by about 5,000 people.

So what do you put in a tweet and why?

Mainly something that you find particularly interesting and think others would like to see or should know about

Here are a few examples that did particularly well.

- ▶ "M0LDZ has managed to stream MP4 video from a Pi into the DTX1 with help from Evariste."
- ▶ "Read the latest about the Digithin project in the BATC forum. Brian, G4EWJ, explains all the technical details."
- ▶ "International ATV Contest and Activity Weekend - 13/14 June 2015. £50 Amazon voucher for best RB-TV DX."
- ▶ "New beta firmware for BATC DTX1 released which supports the ts dock board."

And on **Facebook**, as well as the BATC posts we've encouraged others to post items of ATV-related news. Here you are not limited to 140 characters and can add pictures, links and short video clips. If a picture paints a thousand words just think what a video will do.

Both feeds are searchable so anyone Googling BATC contest, for example, would be able to find the information. Hopefully as well as a service to members this will help draw others into the hobby. Contrary to popular belief it's not all youngsters on social media - the average age of a Twitter user is 37 with 55% over the age of 35. (<http://adweek.com/socialtimes/twitter-age-gender-2012/469369>) And some 46% of people aged 65+ are active on social media (<http://pewinternet.org/fact-sheets/social-networking-fact-sheet/>)

Looking at the analytic tools for both mediums we can see there is a rapid take-up of the information. So something which is posted at 9.30pm has already been seen by half-a-dozen people within five minutes perhaps sending them off to the forum to read more - or work that exotic dx on 23cm.

Of course none of this will replace forum posts, DxSpot, tv or CQ-TV, but is a quick

way of pro-actively spreading the word and alerting them to something interesting they might not otherwise see.

So follow the BATC on Twitter <http://twitter.com/BATCOnline> or like our Facebook page <http://facebook.com/groups/BATCOnline/>

Ian Parker, G8XZD, Hon publicity officer



Contest News

Dave Crump – G8GKQ



International ATV Contest 13/14 June 2015

The International Contest certainly encouraged some activity, although it seemed to be concentrated in 2 areas: Central Southern England and the North-East. This plot from DXSpot.TV shows some of the contacts.

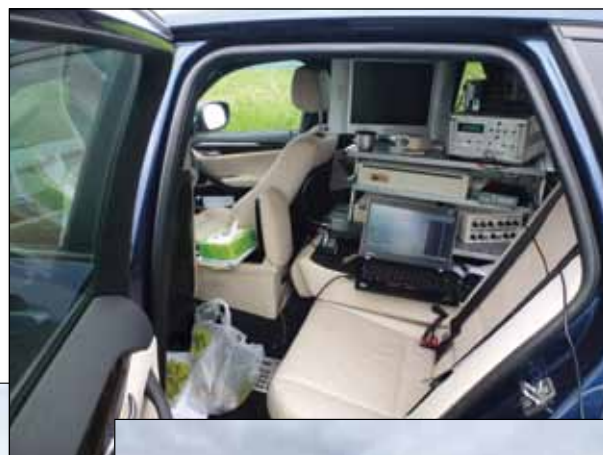


So far, I have received 8 entries for the IARU Contest and 5 entries for the BATC RB-TV distance award. Most participants were using digital modes and many were using the chat facility on DXSpot.TV for coordination. Propagation conditions did not seem too good, and Rob M0DTS reported heavy rain on Sunday.

The weather in the South was better. Pictures of portable operation by myself and Noel, G8GTZ, shown here.



► The mobile shack of Dave, G8GKQ above; and Noel, G8GTZ, top and right.



RB-TV

The biggest news so far is that Rob M0DTS and Terry G1LPS managed a 2-way RB-TV contact on 146 MHz over 114 Km; the path is shown on the next page. Rob activated 2 sites during the contest and reports:

"It was not the busiest of ATV contests but activity was fair in the North, I managed QSO's on all bands from 146MHz to 10GHz.

24GHz still eludes us in the contest, unfortunately I had a fault in the transverter so even if we had tried it would have failed... Hope for next year!

Saturday was great, the ideal day for /P activities at 22°C and the sun was shining. I made most of my contacts on Saturday and it was nice to hear a few stations on the talkback including M0IKB, G3KJX, GW3NWR and G7AVU.

Contest Calendar

1200 UTC 12 September 2015 – 1200 UTC 13 September 2015: *BATC Autumn Activity Weekend*
 1200 UTC 12 December 2015 – 1200 UTC 13 December 2015: *BATC Repeater Contest*
 1200 UTC 26 March 2016 – 1200 UTC 27 March 2016: *BATC Repeater Contest*
 1200 UTC 12 June 2016 – 1800 UTC 13 June 2016: *IARU International ATV Contest*



Sunday was not great at all, I did not set out for the /P site as early as usual because there was not even a hint of tropo forecast. I got on site at 10am and it was dry but thick fog, equipment for 2/70/23 was setup and then the rain started and didn't stop until I was packing up at about 4pm.

I managed a 1-way QSO on 23cm with Gus M0IKB via a very reflected path, quite amazing really looking at the path plot. I also managed a 1-way on 23cm with G7AVU but band conditions were way down on normal, Bob is normally an easy P5 contact.

Later I managed the I46 RB-DATV contact with Terry G1LPS/P and thanks to Eddie G0EHV for assisting at the even more northern /P site in IO85, it was great to see such a good signal on 2m at this distance while 70cm talkback was not so great.



Tests with stations further south did not go well because the conditions were just so poor, the only southern UK station I did hear on 144.750 talkback was G4CPE but that was very briefly via aircraft scatter."

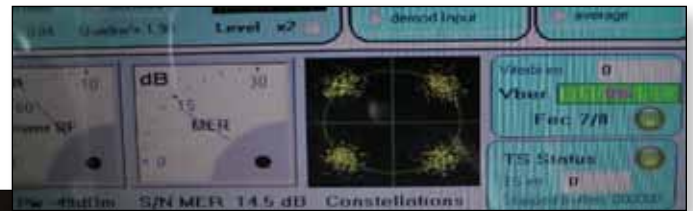
Well done to Rob and Terry!

Future Contests

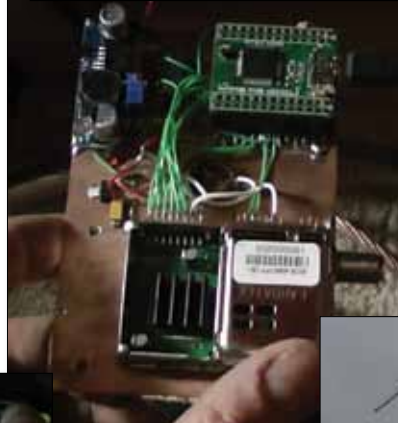
I know a lot of stations who could have been active during the contest, but just did not seem to come on the air. I wonder whether this was due to it being a "Contest"? Perhaps we ought to change the name to "Activity Weekend" or something similar. What do you think?

Latest News

Remember that you can always find the latest Contest News on the BATC Forum. There are links to the rules and the entry spreadsheets there and on the BATC website. 📡



► Images from M0DTS: Signal from G1LPS; The NIM Tuner; portable aerials and inside the mobile shack of M0DTS



RB-TV Roundup

Noel Matthews - G8GTZ



A lot has happened since the last CQ-TV where we described a lot of the initiatives that were taking place to enable ATV operation in less than 1 MHz and in particular in the newly released 146 MHz spectrum in the UK.

The initiatives have given the ATV community a lot of positive attention and in particular was brought to the UK regulator's (Ofcom) attention when G4SWX (RSGB VHF manager) presented to their Business Radio Interest Group who were so impressed that we generated a special edition of CQ-TV containing all the RB-TV articles which has been posted on the Ofcom website.

At least 5 stations are now active on air and congratulations to Rob M0DTS and Terry G1LPS who have won both of the BATC RB-TV awards for the first RB-TV QSO's over 10 and 100 Km! There are a number of stations on RB-TV in the Luton area using MPEG-2 at 543 kSymbols and I completed a one way 95 Km QSO with Arthur G4CPE during the Summerfun contest. The picture of Rob's FT706 front panel shows the relatively low level of signal required for RB-TV pictures to be received on 146 MHz.



One area which needs more attention is filtering both on transmit and receive where 2mt band repeaters and packet relays may cause problems when using the relatively wide front ends on L band tuner modules. Peter G3PYB has designed a double notch filter which can be easily constructed in a diecast box and YU1LM has a number of easy to construct band pass filters on his website.

Anthony M0UPU at HAB supplies sells a very good low noise pre-amp with built in SAW filter which will keep out of band transmissions such as paging but will not help with in-band transmissions.

Several other stations are known to be building RB-TV

equipment and are planning to go out portable during the summer and particularly during the activity day during September. In particular a number of operators south of Birmingham are keen to prove this not just a band which works well in the Durham / Newcastle area! We hope to see more of you on air soon. 📡



The BATC shop is now stocking the Digithin short kit containing all the hard to get parts needed to build this simple plug in QPSK modulator for the Raspberry Pi and Digithin's were used by several stations in the BATC summerfun contest.

Jean Pierre (F6DZP) has completed the design for a USB tuner capable of receiving RB-TV and normal DATV. The BATC shop is now stocking the tuners and USB modules and will be stocking the PCB designed by Brian (G4EWJ).





The Low SR world conquest: The great battle!

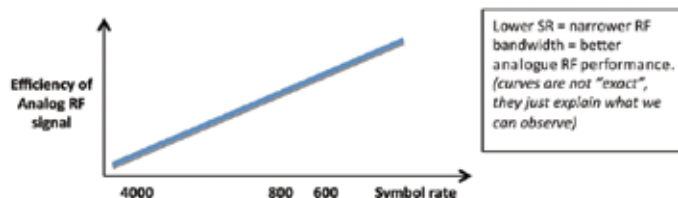
Jean-Pierre - F6DZP

Introduction

- ▶ In September 2015 a number of French ATV operators wished to explore a new world for DATV using very low Symbol Rates (SR) between 100 kS/s and 500 kS/s.
- ▶ Concurrently there was a new opportunity for UK ATV operators to use the new 146 Mhz band during 2015 for testing narrow bandwidth transmission
- ▶ Evariste F5OEO was developing the PiDATV solution that could code the video using H264 and be a useful tool for creating a DVB-S modulator that could work in the low SR world.
- ▶ Whilst there were solutions for generating low SR transmissions, it became clear that reception of low SR would be the real challenge!

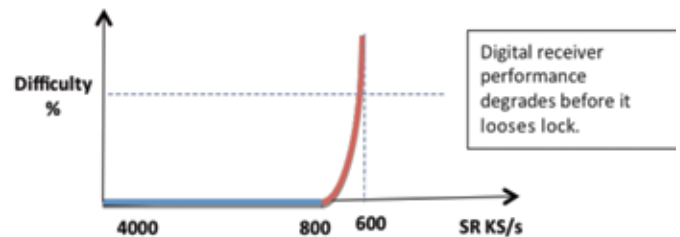
The low SR problem

Conventional thinking would say that the lower the symbol rate, the narrower the RF bandwidth is and therefore system performance must improve at lower symbol rates.



However, almost all documentation about DVB-S tuners, including chip datasheets say that they cannot work under 1MS/s and we can see that most of firmware in STBs (Set Top Box) doesn't allow operation below 1MS/s. Some STB tested a few years ago were even unable to receive a signal at less than 1200 kS/s, meaning that they could not receive SR1000 and may even have problems receiving SR1500. This means that with some STBs, although the signal bandwidth is less, it may not be more efficient to use SR1000, because at this SR the demodulator performance is already degraded, and we will have better results using SR 1500. So the idea that because of the reduced bandwidth that it is better to use a lower SR for more analog efficiency, is not always the truth, depending on the performance of the receiver we are using.

However, tests I made 4 years ago at SR lower than 1MS/s with my TT S2-1600 or TT S2-3200 PCI card, using the official BDA driver and TransEdit, had shown that the tuner



card could continue to receive under 1MS/s but that MER went down as the Symbol Rate decreased until the tuner stopped receiving the signal - the "dead-end" value.

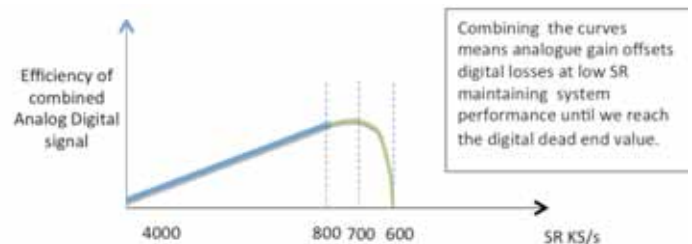
So I asked the question "where do 2 curves cross?" to know the limit of gain we have when we try to lower the SR in a DVB-S DATV transmission.

<http://www.vivadatv.org/viewtopic.php?f=58&t=59>

(article in French published in March 2011)

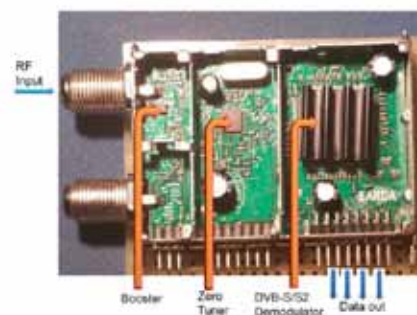
And so in September 2014 I set out to find the answers to the following questions:

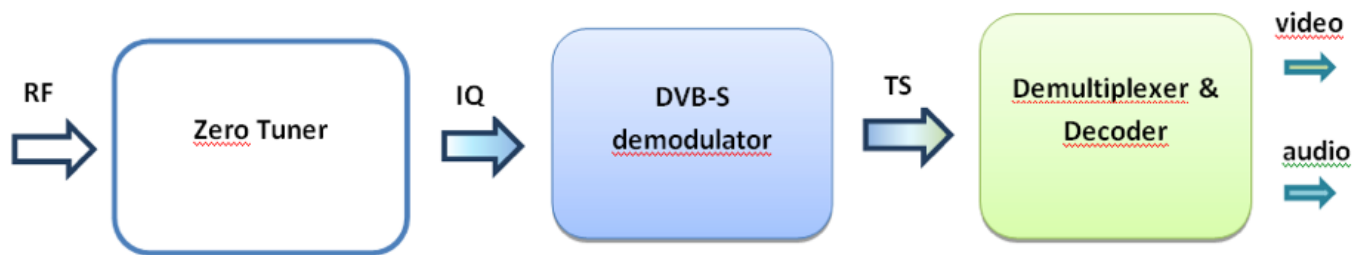
- ▶ Is it possible to lower the "dead end" value?
- ▶ If we lower this "dead-end", is the value when MER begins to deteriorate also lowered?
- ▶ If it can be done, how can it be done, as the chips datasheets say that they don't work under 1MS/s and no setup example exists for these low SR values?



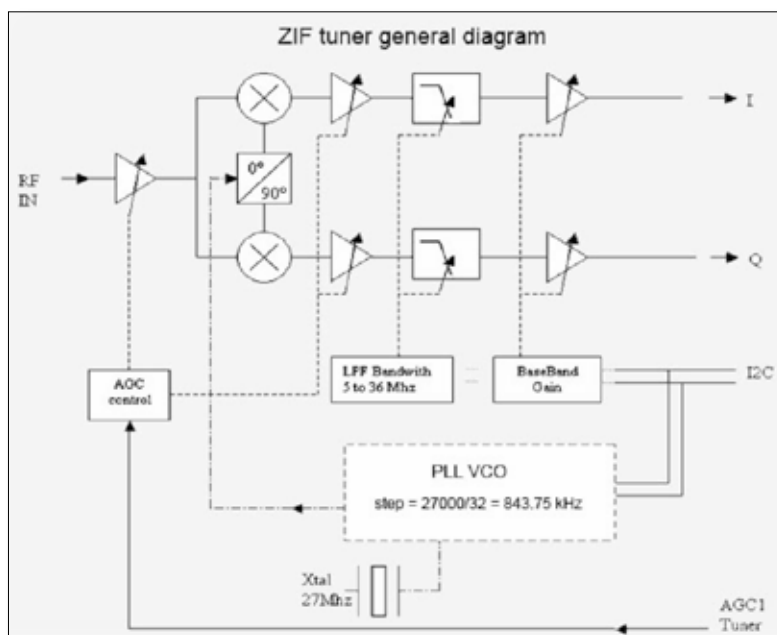
Preparing the weapons: How a DVB-S receiver works

Most modern DVB-S NIM tuners are made up of 3 elements and have the same general structure.





<ul style="list-style-type: none"> • RF Pre-amp • IQ extraction • IQ amplification • Band Pass Filter 	<ul style="list-style-type: none"> • IQ is digitized • Derotator lock on frequency • Error Correction and TS extraction 	<ul style="list-style-type: none"> • TS is sent to the <u>demultiplexer</u> and decoder • <u>Demultiplexer</u> look at DVB tables • <u>Demultiplexer</u> separate packets for video and packets for audio • Video and audio decoders process the packets
First part of the NIM (Half NIM)	Demodulator chip	<u>Demux</u> & decoder chip in STB or PC software



The Zero Tuner

The zero tuner takes in the L-band signal, determines the receive frequency and outputs the IQ data signals – a practical example is shown in the ZIF tuner diagram:

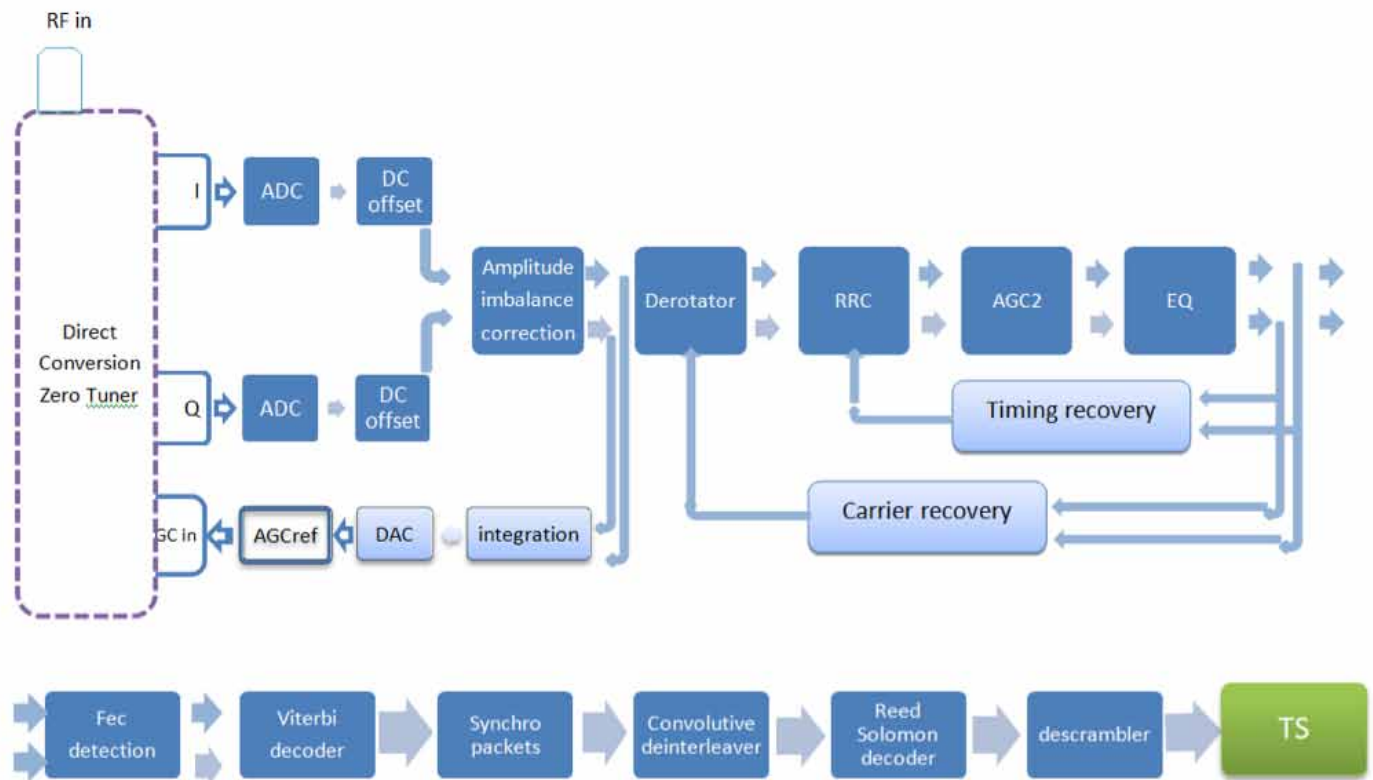
When you ask to receive a specific frequency, the PLL synthesizer is set to the nearest frequency, but the step can be very large so for example the STV6110 chip the step size is the reference crystal freq/ 32 = 27MHz/32= 843.75 kHz.

That means that the tuner is never exactly on the frequency requested, but on a multiple of 843.75 kHz, so the IQ signal output from the zero tuner is not directly usable, and is “rotating” at a beat that depends of the difference between frequency set and frequency received.

We must keep in mind that we have

- the frequency we ask (but that is not always the real exact frequency received ,
- the frequency received(it depends of the frequency modulator; the exact value of quartz and PLL oscillator that can change with temperature, doppler for ISS...
- the frequency that can be set in the Zero Tuner; that depends of the step (exact quartz value and divisors)

So the tuner is “listening” on a frequency that can be up to 400 kHz away from the frequency requested and the IQ signals obtained are unable to be used as they are. This is one of the greatest difficulties to overcome in a DVB-S receiver: we are never on the frequency wanted (and we never know also the exact frequency) and the resolution of this will be only done by digital computing inside the demodulator chip.



The Demodulator Chip:

The main object is to extract the Transport Stream=TS (data packets that contain video and audio).

Note that the analog part (in white) is very small as the IQ signals from the zero tuner are immediately digitized and only digital processing takes place inside the chip. There are no traditional analog components inside the chip, besides the analogue output AGCref to manage the base band gain of the Zero Tuner.

Main functions of the demodulator chip are:

- ▶ Digitization of I and Q
- ▶ Integration of signals for AGC1 calculation and sent signal back to the tuner
- ▶ Locking on the RF frequency
- ▶ Locking on the Symbol Rate frequency
- ▶ EQ filter to remove echoes in the coaxial cable or inter symbol interferences
- ▶ Puncture rate detection (Fec) and Viterbi decoding
- ▶ Tracking of header bytes (SYNC bytes) and detection of the 90 ° phase on IQ
- ▶ Synchronization on the packets of 204 bytes
- ▶ Convolutional interleaving
- ▶ Reed Solomon decoding
=> packets of 188 bytes

- ▶ Removal of energy dispersive coding and correction of reverse bytes SYNC
- ▶ Transport Stream (TS) extraction (detection of header bytes, packet...)

Looking in some detail at these functions will help to have a better understanding of the reception process and how to obtain a better setup for low SR.

The IQ signals from the tuner are converted to digital by two 8-bit converters operating in standard mode at 135 MHz and low rate mode (54 MHz with a 27MHz reference). DC offset compensation on IQ and amplitude imbalance between I and Q are then carried out. The IQ signal is then integrated to give a value that goes into a Digital-Analog converter to generate the analog signal AGCref that will manage the AGC tuner.

The IQ signal is then sent to the Derotator that will look to lock it to the right frequency and phase. The output signal of the equalizer is returned to the PLL of Derotator to perform the "Carrier Recovery" process.

The Derotator output signal then goes into the RRC module (Range Rate Correction) managed by the process of "Timing Recovery" to allow the lock on the SR (Symbol Rate), using the signal in the PLL loop output of the equalizer.

The IQ signal will then be processed by the AGC2 after the Nyquist filtering corresponding to roll-off of 35% used in DVB-S. On leaving the treatment with AGC2, the signal goes in the equalizer that detects echoes or otherwise



Inter symbol Interferences. The equalizer applies inverse filtering to remove these troublesome inter symbols Interferences.

The signal is then analyzed by the FEC detector (FEC state machine) to find the puncturing rate (1/2, 2/3 ... 7/8) and then processed by the Viterbi decoder. This process is not able to remove the 90° doubt of phase, so we then research the header Bytes (bytes SYNC detection) and their inverses. This detection will then, if necessary, reverse the I and Q phase.

Finally we will de-interleave the data, operate the Reed Solomon decoder that will transform packets of 204 bytes in packets of 188 bytes and perform the last action Descrambling to generate the TS.

LOW SR reception

The challenge of low SR reception is to lock on the Frequency and to lock on the SR. The parameters to change are the parameters that are involved in this part of diagram and a search must be made on the parameters of the double PLL "Timing recovery" and Carrier Recovery.

When we have overcome this and locked on to the Carrier and SR timing, the remaining processes are the same and easy to do.

Note that the choice of FEC will never have an impact on the possibility of locking or not locking, so to allow the max of bandwidth data for the video and audio, we will choose FEC 7/8.

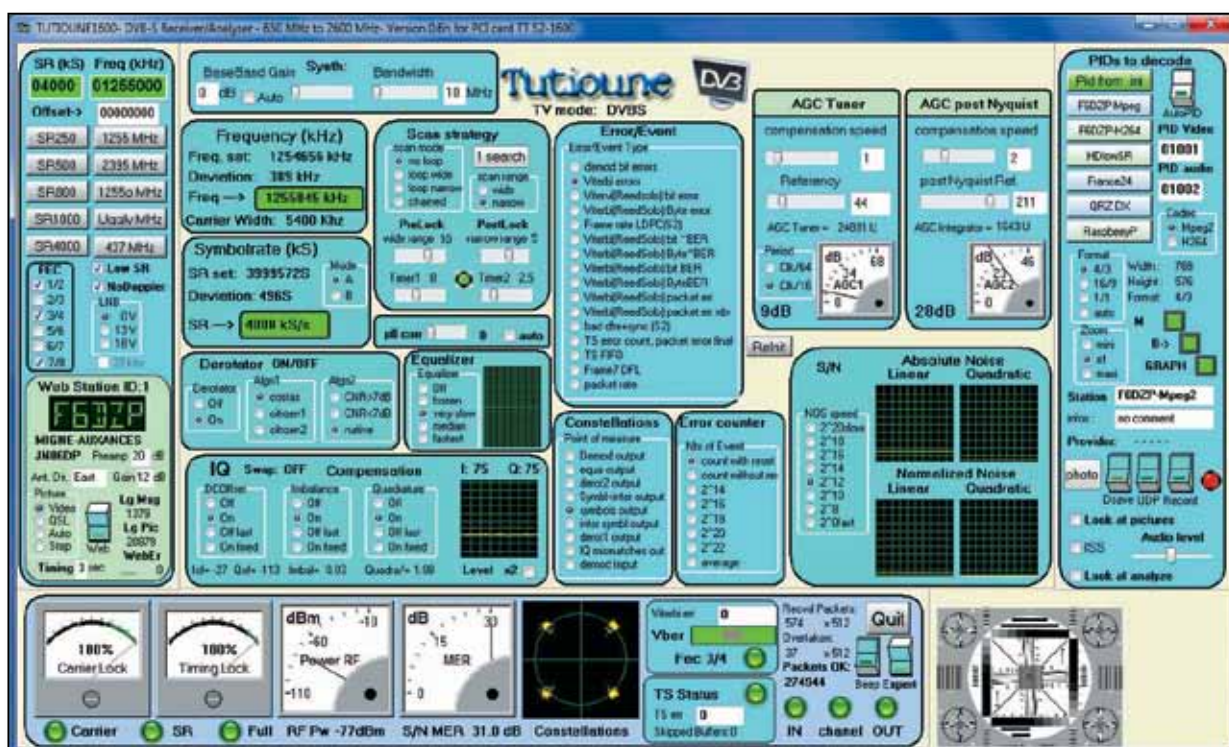
First Armada: Tutioune software and PCi cards (Oct 2014-Jan 2015)

Since 2010 I had been developing special software for use by ATV operators to receive and decode DATV signals, particularly under weak signal conditions. This software, Tutioune, used the TT S2-3200 and TT s2-I 600 PCi cards from Technotrend.

Without modification, to my great surprise, Tutioune3200 with its little button << very low rate >> was more efficient to lock on low SR signal than Tutioune I 600 which had not this button as I had not implemented it yet. So I decided to work on TT S2-I 600 to add this option and also lower the quartz frequency and make research about derotator/double PLL parameters. The S2-I 600 has a more recent chip STV0903 than the older S2-3200 with STB0899. STV0903 has several way of search the frequency/SR (blindscan, cold search, warm search...) that the STB0899 has not and the S2-I 600 can work from 650 MHz to 2600 MHz.

Improving the low SR performance

I began a program of work on Tutioune I 600 to give Low SR lock down to 100 kS/s and fast lock times under poor signal conditions. In order to lock on low SR we have just to lower the MasterClock frequency, and set



the decimator option to avoid the chip to be overloaded by too much data at low SR, however that is not all the picture as we must also obtain fast lock times under poor signal conditions.

Fundamentally, to obtain fast lock times we must help the derotator and I have tested different ways of locking using all the different search modes the STV0903 offers with the main objective to lower the scan width the derotator has to search.

If we use the existing parameters, the derotator uses a scan that can be up to + or – 2 MHz from the desired frequency. For example to receive 437 MHz, with a converter LO of 900 MHz, the desired receive frequency is 1337000 kHz. Due to the tuner synthesizer step, the actual frequency set will be $843.75 * 1585 = 1337343.75$ kHz, which is about 344 kHz far up from the signal frequency we search to lock. If we work in the “classic mode”, the derotator will scan in zigzag step by step up to 1 or 2 MHz up and then will scan in zigzag step by step down to -1 or -2 MHz – a very time consuming process.

For DATV, we know the frequency we want to listen within a few tens of kHz so derotator scan can be reduced and can be set at start with the offset corresponding to the value that gives a search from the frequency we asked. But if we set the derotator scan width to very narrow, we must set first the offset of starting for a search around 1337000 kHz. So now, when we ask 133700 kHz, synthesizer is set to 1337344 kHz and Derotator offset is set to -344 kHz. After that setup we can now set the scan width to narrow and will gain time before locking.

A second study has locking at if we have already locked a signal at very low level in the QSB and we need to relock, can we stay very near the last frequency received to be able to relock as soon as the signal comes back without rescanning. During these 4 months I spent 8 to 10 hours a day testing in laboratory different kinds of setup and locking strategies to be able to lock and relock very quickly on very low signal at SR250. At the same time, F9ZG tried almost every day to get contact on 437MHz from Normandy to Paris (280km).

Development and on-air testing

The process was “modification - test on air 437MHz @280 km modifications test on air 437MHz @ 280 km” We discovered that sometimes a new version that I have tested at home works very well for me but was very different using his own home brewed modulator. So, when a setup was very good at home using my DVB modulator at SR250, it was not so good for an instant lock on the F9ZG

modulator. Through this process I discovered that, only at very low SR, some value in the PLL depends on the format the shape of DVB-S modulation is. It became clear that from one modulator to another, in particular homemade modulators, the Nyquist filter is not always well adapted, some linearity or shoulders not exactly perfect and the shape of the RF signal not always symmetric.

With these differences, for a low level signal at Low SR, the double Derotator PLL must have a compensation factor for the shape of the RF signal. As a result I have added a PLL compensation factor in Tutoune 1.600v0.6h which you can adjust to see what the best value for each kind of modulator.

Conclusions

With careful tuning and the correct software the Technotrend TT s2-1600 PCi card can give very good results on low SR signals.

It should also be noted that during all our tests, we have seen that, at very low SR, when the signal level is sufficient to get a lock, there is very few % of Viterbi error; and setting a high value of FEC makes no difference to the decode success. Therefore it makes sense to use FEC 7/8 which lets us the maximum amount of payload data for the video and audio.

In part 2 of the article Jean Pierre will describe the development of a USB tuner module. 🗨️

Links:

In English

About MiniTioune and Minitiouner:

<http://www.vivadatv.org/viewforum.php?f=80>

<http://www.batc.org.uk/forum/viewtopic.php?f=15&t=4102>

About Tutoune:

<http://www.vivadatv.org/page.php?p=tutoune-en>

<http://www.vivadatv.org/viewforum.php?f=72>

About TiouneMonitor:

<http://www.vivadatv.org/page.php?p=monitor1>

In French:

About MiniTioune and Minitiouner:

<http://www.vivadatv.org/viewforum.php?f=79>

About Tutoune:

<http://www.vivadatv.org/page.php?p=tutoune>

<http://www.vivadatv.org/viewforum.php?f=81>

The download section:

<http://www.vivadatv.org/viewforum.php?f=60>

DATV developments in North Wales

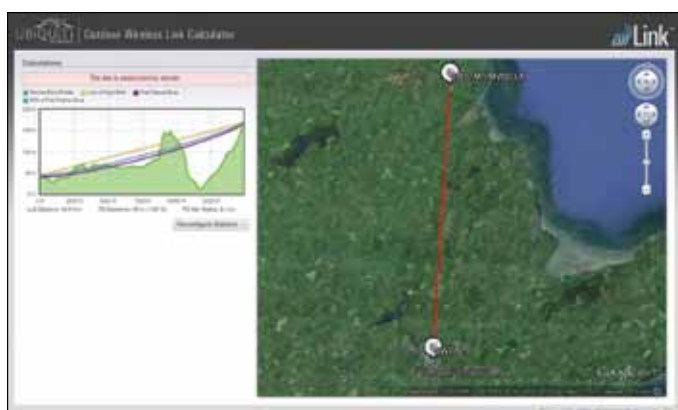
Chris MW0LLK working in collaboration with Peter GW7BZY

A small but active group of enthusiasts meet every week on GB3TM amateur television repeater. Recently some of us have been evaluating the use of DVB-T using the recently released, low cost transmitter and receiver from HiDes. This has lead us to some very interesting activity evenings with multiple modes in use, both by different participants and in combinations by some of the group.

North Wales is well known for having fairly mountainous terrain and getting direct paths can prove challenging however we do benefit from having an ATV repeater located on the Isle of Anglesey. This is situated in the North East of the island at Nebo at an elevation of about 150m.

The repeater is relatively visible from many parts of North Wales as well as from much of the island so our activity nights regularly include participants from Prestatyn (GW3JGA), Caernarfon (GW4KAZ) and Holyhead (MW0AQZ) as well as points in between. A number of contacts from as far away as Lancashire and Ireland are able to get into the repeater when conditions are right although it seems to be harder for them to receive.

One of our group, Peter GW7BZY is located in Llangefni and, as luck(?) would have it, has one of the island's larger features: Mynydd Bodafon, between his QTH and GB3TM. Getting into the repeater has always been challenging from this location even using DVB-S with 40W power. This works in good conditions, albeit with regular drop outs as soon as things change. Another amateur who used to be active on analogue and who has his QTH along a similar bearing, albeit a few miles closer, reported that he could not get into the repeater - which is (sadly) why he is no longer active on ATV. Peter was very keen to test DVB-T modes as soon as the equipment became available - in the hope that this would improve his signal into the repeater.



Later analysis using Ubiquiti's link calculator (albeit at 2.4GHz) suggests that it should not be possible to achieve a link as we don't have line of sight.

Conveniently another of our group: Chris MW0LLK has his QTH located only 300 meters from TM so we were able to work on setting up and testing the equipment at odd moments when convenient rather than having to set aside time to make site visits.

The setup:

The HiDes HV-102E transmitter was set up with an existing 70cm PA and antenna (usually used for dvb-s) at 6m agl. pointing towards TM. The UT100d dongle was set up with a 7 element 70cm ZL special yagi antenna at 8m agl. pointing towards the transmitter. No preamp or filtering was employed.

Initial testing:

On receipt of the equipment from HiDes some basic functional testing across the room was done, with no PA and the manufacturer supplied antennas. This was sufficient to determine what software worked (and what didn't) so the supplied "digital television" application was fairly quickly disposed of! We found that Videolan player or VLC worked well with the receiver dongle.



With 14 miles distance and half a hillside and a mountain between transmitter and receiver things were a little more challenging - however early success was achieved with 720x576 pictures being received as soon as everything was configured correctly.

Much tinkering with parameters to see what could be achieved ensued and on 2 November 2014 full HD pictures were transmitted and received successfully between Llangefni and Nebo.



► Peter GW7BZY HD image via DVB-T.

During GB3TM activity night the following week the group, together with viewers on the BATC stream were treated to a bit of fun and games.

MW0LLK's station at Nebo set up a virtual studio using Vmix and "introduced" GW7BZY. This took the form of a _huge_ television studio with presenter desk occupied by MW0LLK and a wall mounted "screen" on which GW7BZY appeared. During the course of activity nights the "mic" is usually passed around the active participants in the usual way when group working. On this occasion GW7BZY was visible on screen behind MW0LLK when transmission commenced and while MW0LLK speaking, and then - when "introduced" - GW7BZY alternately spoke from the virtual screen in the studio or was seen full-screen. The different shots or views were selected using Vmix to transition between them.

Subsequently we reversed roles, with GW7BZY sending a green-screen image which was rendered into the virtual set after reception by MW0LLK



Multi-mode relaying

So what - in technical terms - was going on? GW7BZY was using a local copy of Vmix to generate an hdmi video feed with him either against a green screen or locally inserted into a very smart radio room.

This was transmitted to MW0LLK using dvb-t on 70cm.

The received picture and audio was re-streamed via VLC into vMix where it was combined with local camera (again using green screen) and virtual set to generate a final digital HDMI feed for the combined stations. After conversion to analogue video this was transmitted to GB3TM on 23cm fm from where it was retransmitted on 23cm dvb-s to the rest of the group.

Local members of the group were able to view this directly, with others viewing on the BATC stream thanks to John GW3JGA who was streaming received pictures and audio via the internet.

It was only after activity night was over that it was realised that GW7BZY hadn't once transmitted directly into GB3TM. His dvb-t signal held up for the entire duration of the session not having dropped at all - although sound was lost for the last few minutes (more on this later). This contrasts with his overs usually being punctuated by regular drop outs on dvb-s.

Another interesting comparison was the power being used to achieve the link. On dvb-s 70cm GW7BZY usually uses around 40W to open the repeater; on dvb-t 70cm only around 4W was required to maintain a steady signal. In fact when more power was applied (by reducing the transmitter output attenuation) the received signal was found to be harder to decode - probably due to nonlinearities in the "linear" PA.

There is a significant gain difference between the repeater receive antenna (crossed dipole) and the antenna used at MW0LLK station (7 element ZL Special 11.5dB) which accounts for this difference in power however on dvb-s signal is lost at regular intervals so we believe there is some benefit.

In subsequent tests with a more powerful PA (an ex-Tetra site 80W Nokia unit) we found, surprisingly, it was impossible to decode a signal. More work is being done to test this combination - it is suspected that PA nonlinearities were again the issue.

More work is required to carry out a direct comparison between DVB-S and DVB-T however initial results are certainly encouraging.

Data rates and DVB-T vs DVB-S

One major benefit of DVB-T over DVB-S is its ability to work in different modes. QPSK carries 2 bits per symbol which limits the bitrate on a 2MHz DVB-S link to around 3mb/s depending upon error correction settings. DVB-T supports QAM16 and QAM64 giving 4 and 6 bits per symbol respectively. This proportionally increases the bitrate for a given bandwidth allowing much higher resolution pictures or multiple channel operation - the addition of a guard band reduces the bitrate a little but the overall effect is a much increased data rate.



In our SD tests on DVB-T with H264 encoding compressing the HD video to around 2500 kb/s and the link giving 3000kb/s so there was a reasonable margin although some picture breakup and pixelation was seen when large movements were made.



Using 16QAM or 64QAM and lower forward error correction ratios it is possible to achieve much higher bitrates however the tradeoff is that you need much better signal to noise ratios

to successfully receive these signals. We managed a link on 64QAM at 7/8 FEC giving a bit rate around 7.9mb/s which is more than enough for full HD. We did struggle to maintain this link due to interference / inadequate signal to noise ratio.



This does however demonstrate that with digital television

modes it is possible to adjust the transmission parameters to suit a wide range of conditions - sending fantastic quality high definition pictures when conditions are good and progressively reducing the bitrate as conditions worsen. In this regard DVB-T does give a great deal more flexibility as there are many more parameters that may be adjusted as well as supporting several modes of operation.

Prior experience and licensing concerns:

Our somewhat unorthodox method of working the repeater at GB3TM had its origins a few weeks earlier in experimenting with Vmix. MW0LLK linked to GW7BZY using Skype. This feed was inserted into a virtual set using Vmix and the combined signal sent to the repeater on 70cm dvb-s. This was partly just trying out Vmix capabilities, but was done mainly so that MW0LLK could appear on the repeater in digital mode for comparison with his own, analogue FM, signal. It was a pretty convincing argument for MW0LLK to make some investment in DATV equipment!



The reverse setup was also tested with MW0LLK transmitting live a Skype feed from GW7BZY which gave us the idea for the work with DVB-T links.

Much debate was had about the situation regarding licenses. We concluded that we were working within the amateur radio license conditions since all participants were licensed radio amateurs and gave their call signs either on-screen or verbally at start, end and periodically during transmissions.

Limitations:

One of the major limiting factors with the setup was the lack of look-through at GW7BZY station. When transmitting, his 70cm output signal has the effect of desensitising his 23cm receiver. This meant that he was reliant on seeing the streamed output via the BATC stream which meant we had some very long pauses while waiting for him to respond to a hand-over. An attempt to provide a Skype feed from MW0LLK to GW7BZY towards the end of the session resulted in the audio from GW7BZY being muted - little did we know!

On a subsequent activity night we attempted to mitigate this problem by using Skype to provide a reverse talkback/picture channel from MW0LLK to GW7BZY. This appeared to work well in tests prior to the activity session however on the night we were beset by audio problems. GW7BZY could only occasionally be heard, and MW0LLK audio disappeared a couple of times too. It appears that Skype and Windows between them are very good at grabbing audio devices and/or muting whatever is currently playing so we are going to have to work on this.

Ideally GW7BZY should install his 23cm bandpass filter achieving proper look-through however these things take time to organise.

Next steps:

We continue testing and improving the set-up. GW7BZY is able to send full HD pictures and audio although the computer at MW0LLK sometimes struggles to do the necessary processing to handle pictures at this resolution - let alone mix them into a combined programme output! Given that the station output at MW0LLK is currently SD this is an academic nicety in any case.

June 2015 update:

Since this piece was written at the start of the year, we have also tested a HiDes HV-110 DVB-T receiver recently purchased by GW7BZY and found this to be both easier to set up, and much more sensitive than the receiver dongle.

MW0LLK has invested in a DATV Express board and is working on different ways to generate transport streams to drive it. 🗣️

Equipment used:

GW7BZY Station

- ▶ Green screen: Wall hung photographic cloth
- ▶ Lighting: Daylight bulbs in desk lamps
- ▶ Camera: JVC GY-DV500
- ▶ Video capture: Firewire direct connection
- ▶ Computer: Generic Intel Q6600 Quad core running vMix and Open Broadcast
- ▶ Transmitter DVB-S: SR Systems
- ▶ Transmitter DVB-T: HiDes HV-102E
- ▶ P.A. 70cm: Nokia Dolphin modified for amateur use 70W
- ▶ P.A. 70cm: DG0VE PA70 40W
- ▶ Tx Antenna 70cm: 19 Element Yagi
- ▶ Rx Antenna 23cm: Yagi
- ▶ Signal Monitoring Generic Satfinder 7" screen (70cm DVB-S)
- ▶ Signal Monitoring: HiDes UT100 dongle (70cm DVB-T)

MW0LLK Station

- ▶ Green screen: 6' lime green roller blind (yes really)
- ▶ Lighting: Overhead Fluorescent and LED strips
- ▶ Camera: Budget domestic DV camera - composite output
- ▶ Video capture: UVC USB Dongle (£7 eBay)
- ▶ Computer: i3 laptop approx 4 years old running vMix
- ▶ Signal output: HDMI to composite converter (£11 eBay)
- ▶ 23cm FM 5W Transmitter: Homebrew FM transmitter (loaned from GW7BZY)
- ▶ Tx Antenna: Homebrew double quad loop
- ▶ Rx Antenna 70cm: Moonraker 7 element ZL Special
- ▶ Rx Antenna 23cm: Homebrew double quad loop (physically separated from Tx antenna)
- ▶ Signal monitoring: (23cm FM) LMW Electronics VR3M-2400
- ▶ DVB-S receiver: (23cm) Ross HD DVB-S2 1203
- ▶ DVB-T receiver: (70cm) HiDes UT100D (loaned from GW7BZY)



Minitiouner - USB Tuner Module

Jean-Pierre - F6DZP

In part 1 Jean Pierre (F6DZP) gave an overview of the theory behind improving low SR reception and the development of the Tutioune software using the Technotrend PCi cards. In part 2 he describes the latest developments including development of the USB tuner module Minitiouner which enables the Tutioune software to be run on any Windows PC to receive DATV and low SR (RB-TV) signals. Components for the Minitiouner module are available from the BATC shop and support is available on the BATC forum.

Defeat and counter- attack (Feb-2015)

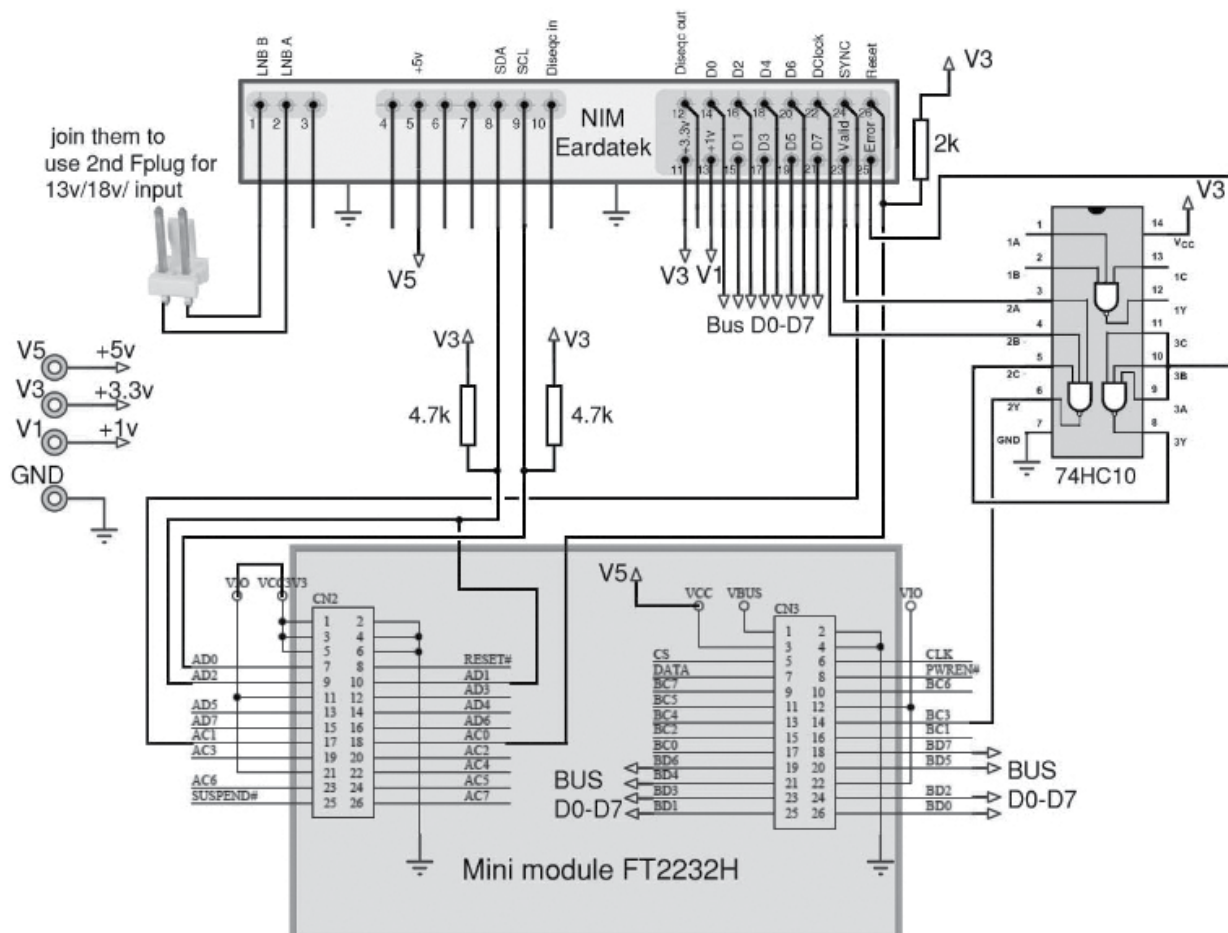
In late 2014 it became clear that the TT s2-1600 and TT S2-3200 PCi cards were no longer in production and not available from any retailer in Europe and so replacement hardware was urgently needed.

The first requirement was to keep the same chips as those there are on the S2-1600 card as I know them well (working with Tutioune since 2010) and they have proven to work well at SR down to about 100 kS/s since the Tutioune 1600v0.6h version. There was also a desire to

produce a tuner with a USB interface which can be used on any PC rather a PCi card which requires a desktop machine.

I found TBS and Prof Revolution products and bought a TBS5980 and one Prof 7500 but using the BDA driver and software given by the manufacturer they would not go under SR1000 kS/s. I contacted the suppliers and got the SDK and began to develop with them, knowing that the actual tuner cards could receive down to SR120 kS/s. However, it soon became clear on the BATC forum that Prof7500 was also very difficult to buy and we would soon be in the same position as that we had with the Technotrend cards.

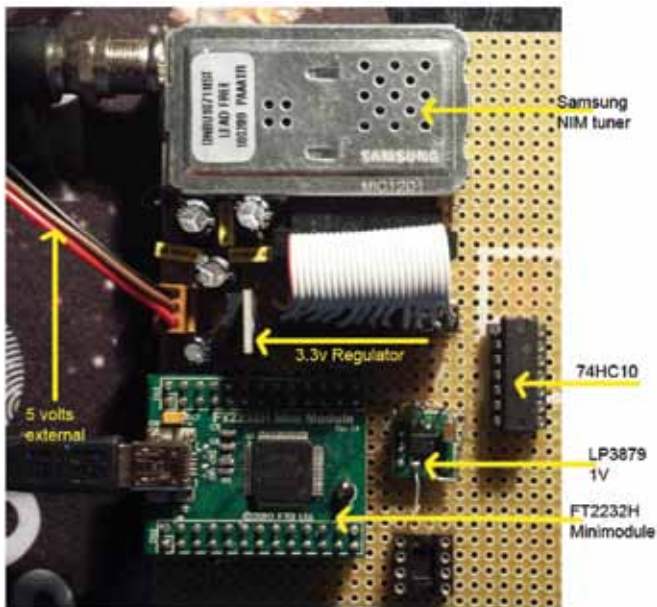
So, with no commercial units available I decided the best solution, in true Hamradio style, was to design and build our own USB Tuner. Looking at the commercial units, it was clear that only a limited number of components were needed, namely a NIM tuner, USB converter, PSU components and 22 kHz generator - that's all! And so I started to work on this idea and the hardware project was born.



New flagship: The Minitiouner USB hardware

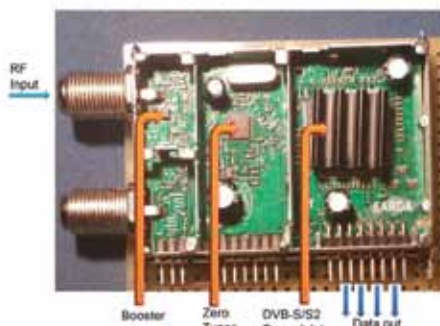
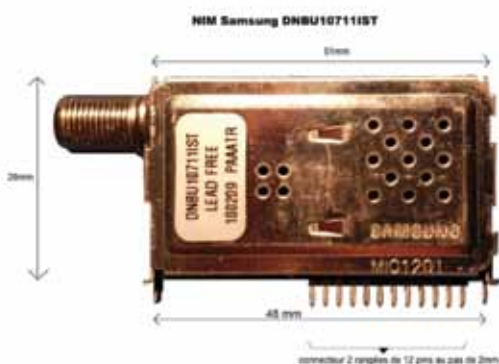
As can be seen from the schematic there are only a few components in the Minitiouner USB tuner.

Operation of the hardware is very simple and we will now look at each component in detail:



NIM tuner module

As described in part I of this article the NIM tuner is a compact module which takes in the L band RF signal and produces transport stream data out. The MiniTiouner software sends the commands using I2C to set the Zero Tuner (Frequency) and demodulator (Symbol Rate) and the NIM hardware returns the locking status, RF level, MER and constellations.



Which NIM to use?

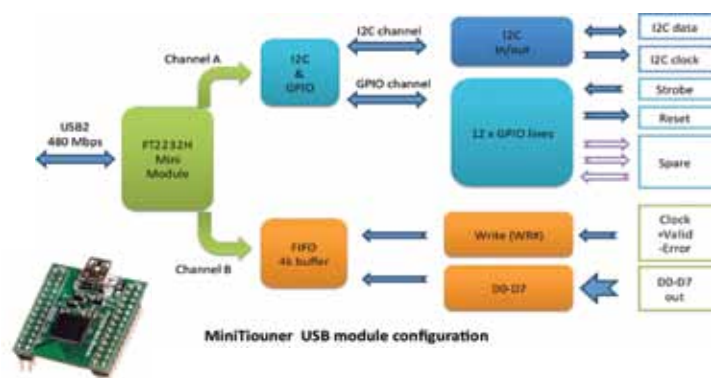
The target is to be able to lock on low SR down to SR120 kS/s and lock quickly when QSB is a problem. In order to do, this we need the same demodulator chip (STV0903) as the S2-I 600 so we can obtain the same performance.

Eventually I selected the Sharp BS2F7VZ0169, Eardatek EDS-4B47FF2B+ and Samsung DNBUI07111ST units and bought a small number of each from Ebay / AliExpress and started to build my own USB tuner card. However, it was more difficult when we wanted to buy large quantities of units but eventually 100 units of the Eardatek units were sourced by BATC and are available in the BATC shop.

It is very difficult to find documentation about what kind of chip is used inside a NIM and the only documentation I have found was for the Sharp BS2F7HZ0169. For the 2 other models, I had to examine other USB Tuner cards (Prof 7500) or Set Top Boxes to find what is each pin for.

USB interface

The USB module is the interface between the PC software and the tuner hardware. I started using two different USB interfaces, the Cypress CY7C68013 and the FTDI FT2232H which is the same model used by the Digilite project and stocked in the BATC shop. After a week of fighting against the documentation, drivers and DLL, the bad chip on Chinese Cypress module where the chip's name is sometimes changed, I decided to keep only the FT2232H mini module to finish the first version of MiniTiouner.



The FT2232H is used in the Fast Speed D2XX Direct mode (480 Mbps) so data is exchanged with the PC in burst mode and the USB cable must be good enough for this data rate.

Channel A is set for the I2C dialog (2 lines) and remaining 12 lines for GPIO, 1 is used to reset the demodulator and a second is strobe to know when a packet is starting to be received (so 10 GPIO lines remain for future extensions). Channel B is set as a FT245 FIFO and is used to carry the data coming from the NIM output data bus D0-D7.

The FT2232H must be programmed before use in MiniTuner and pre-programmed units are available from the BATC shop. If you wish to program a module yourself or have a Digilite module you wish to repurpose the procedure is described here: <http://www.vivadtv.org/viewtopic.php?f=80&t=363>

Future versions of MiniTuner will not only be a DVB-S receiver but also a Measuring tool that will show in real time RF level, MER, constellations etc. All this information is carried via the I2C dialog and I2C latency will be a critical factor and in order to get the lowest latency, you must use the last version of Windows driver version 2.12.0.0.

Power supply

The power supply has proved more challenging than at first thought as we need the following supplies:

MiniTuner with Eardatek NIM consumption when locked

	Low SR mode	High SR mode
5v	300 mA	300 mA
3.3v	60 mA	70 mA
1v	200 mA	350 mA

These values are when the signal is locked. During search or change of Frequency/Symbol rate, some transient consumption values are higher. In the Sharp NIM, the transistor booster and the zero tuner are powered by the 3.3v line, so the 5v is only used by the FT2232H (70 mA) and 3.3v will need about 300 mA.

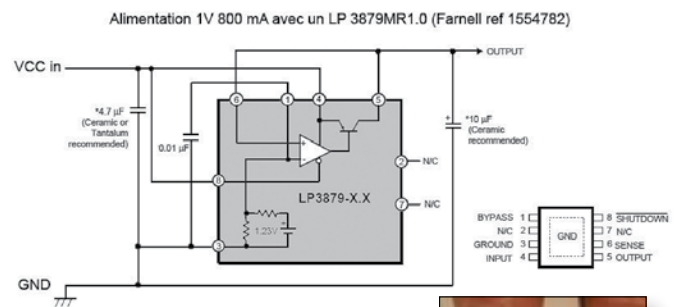


1v is produced by a LP3879-1.0

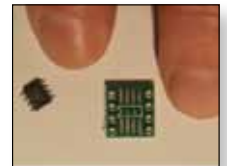
3.3v and 5v are produced by TO220 regulator as LM1117 and 7805

To run from 12v we can use an LP2596 switching power module to give about 7.3v to the first 5v regulator. But it is very important to get a very well filtered voltage. If you have noise or ripple remaining in your supply, the MER will go down and your MiniTuner will have performance problems at low level signals. You will find different solutions on <http://www.vivadtv.org/viewforum.php?f=80> or in French: <http://www.vivadtv.org/viewforum.php?f=79>

For the 1v rail, if we don't use DVB-S2 mode, the LP3879 chip is sufficient and we can use the Texas Datasheet schematic. (For DVB-S2 mode at very high SR up to 95 Mbps we would need 1v 1.8A and use a MP2503)



We only use the chip plus 3 capacitors and can use DIP converter pcb available on eBay.



Building the MiniTuner hardware

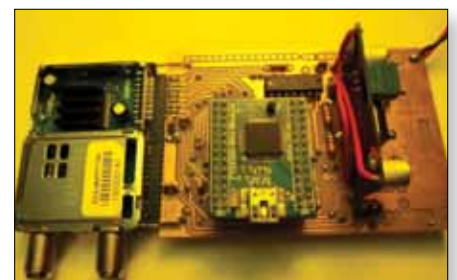
The MiniTuner hardware enables the Tutuionemini software to be run on any Windows PC to receive any DVB-S signal between 45 Msymbols and low SR (RB-TV) signals – note the NIM tuning range is 950 – 2150 and you will still need L band upconverters to receive 146 and 437 DATV and RB-TV signals. It is ideal for DATV reception and can be run on a laptop or desktop.



► MiniTuner built by Steve MOSKM

The major components of the hardware will be available from the BATC shop including a blank PCB, Eardatek NIM and the FT2232

USB module. Full constructional details can be found on the BATC and VivaDATV forums using the links at the end of this article.



► Prototype PCB from Brian G4EWJ

The Minitiouner's Admiral: Minitioune

The second part of the development was the MiniTioune software to work with the MiniTiouner USB tuner card and whilst still at early development the latest version (v0.1f May 2015) can receive DVB-S signals from SR120 to SR 45000. It already has same features as Tutioune 600 V0.6f and you can use the same strategy to lock on very low level signals, view RF level, MER, constellations and IQ data.

The current version of Minitioune doesn't yet decode and show the received video. In order to view the video you must use the UDP button to send the TS to VLC (or FMplay) and using VLC to show the video coming from the Network stream. You can send your data, but not pictures, to TiouneMonitor and you can record the TS received.

Running MiniTioune

Before using MiniTioune you must install the latest version of FTDI driver: for all versions of Windows, run the file "CDM v2.12.00 WHQL Certified.exe". After having plugged in the Minitiouner hardware, you can check the driver version using Windows Control Panel --> system --> Device Manager --> USB bus controller --> USB serial Converter A – Right click--> properties --> Driver = you must see "driver version 2.12.0.0". If you do not have the latest version, Minitioune will notify you when it will start.

As USB / I2C performance is critical for the program I have started to develop a program TestMyMiniTiouner that will test your I2C link efficiency by doing multiple I2C read/write cycles and displays the result.

Before running Minitioune you need to edit the minitioune.ini file to say which kind of NIM you are using by modifying the third line as follows:

; Type of NIM/ type de NIM : 0=None, 1=Samsung, 2=Sharp, 3=Eardatek

[TypeOfNim]

NIMmodel=1

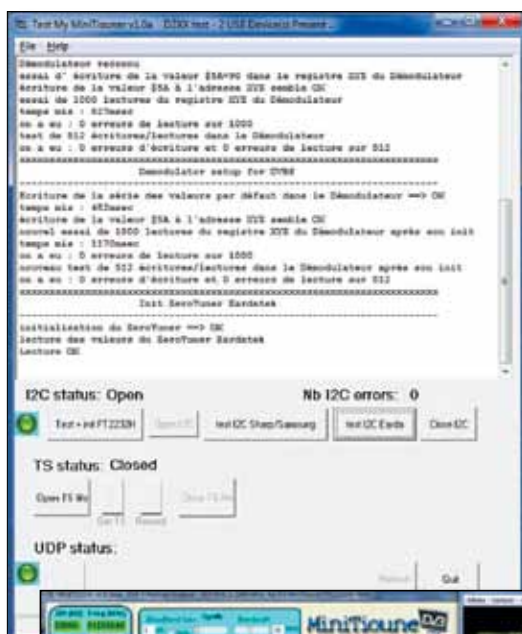
When starting Minitioune you need to set the transmission parameters using the Command Panel.



- ▶ You can preset your preferred values for the Symbol rate (SR) buttons, the Frequency buttons.
- ▶ If you use a down converter or LNB you set the Offset.
- ▶ Switch to low SR mode to go down to SR 120 kS/s
- ▶ "No Doppler" button is not checked when you are receiving ISS (we have about 100 kHz Doppler swift during one pass).

- ▶ ISS is checked to correct the TS that HamTV is sending (not implemented yet)
- ▶ You can select the FEC values that will be tested for the Viterbi decoder.

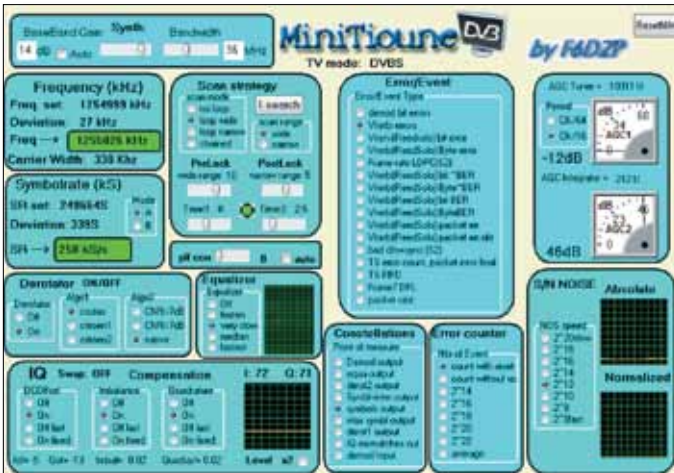
And then you will be ready to receive Narrow Bandwidth DATV (SR250) or Broadcast stations at higher SR (here: 25000)





As with Tutioune, MiniTione lets you see all the parameters such as MER in the Measurement Panel

The Control panel for Expert:



In the Web panel you will see all the information used to send to your TioneMonitor during your receiving.

(Sending picture from video is not yet implemented)

The transmitting station can monitor in real time how you are receiving him on the Web. A very useful tool!

Early results

The Minitiouner system has already been used by several stations on air and by M0DTS and GILPS to set the current UK distance record on 115 Km on the new 146MHz band. Reports from users indicate signal lock at levels as low as -107 dBm and successful decodes with an MER of 3 dB and a hardly recognizable constellation.

Conclusions

When I am writing this article, there are only a dozen of Minitiouner that have been built. We are at the first step, as and when we will build Minitiouner, we will improve the schematic and software.

As well as being an excellent tool to receive DATV and low SR RB-TV signals, I am sure that in one year, we will have discovered many other uses for this tool. Even now,

we know that it is easy to get the TS on data Bus and send it to a modulator like a DTX1 or an SR systems Minimod and there are many GPIO pins are available to extend the project for future use. We have not to wait for ideas, we already have many!

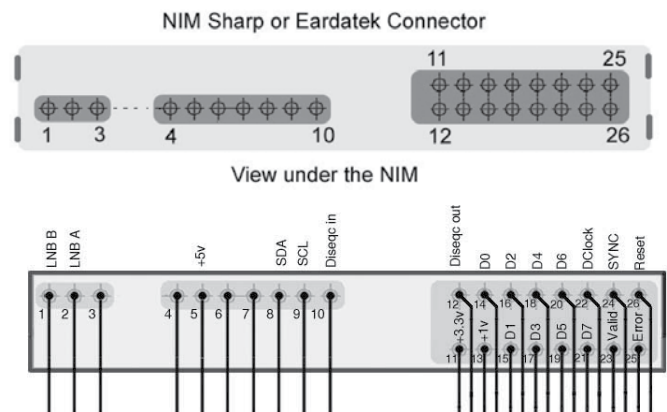
Links

For links to the software, please see part one of this article on page 17 of this issue.

Many thanks

Thank you to Noel G8GTZ that had corrected my bad English in this text, to Brian G4EWJ that is working hard for offering us a good PCB, to Rolf F9ZG that has built and tested the Minitiouner very early, to Collin G4KLB and Terry GILPS who have built the first English Minitiouner, to François FICHF who spend many time to collect the electronic parts for French OM and many others that encourage me in this project.

Appendix – NIM tuner pinout



The Sharp documentation doesn't give the pin out when we are looking on the under layer of the pcb - this picture makes it easier to see what we have when we are soldering. Sharp and Eardatek have the same implementation.

Beware – there are differences between the Eardatek and the Sharp NIM in pin out, names used and voltages used. Here is the description of the connection for Sharp and Eardatek I have deduced. The only question that remains to me is the use of pin3 in Eardatek (?). I don't connect it and it works well like that.

Connexions Eardatek				Connexions Sharp			
1	LNB B	2	LNB A	1	LNB B (B1B)	2	LNB A (B1A)
3	NC			3	+3.3v(B4)		
4	NC			4	+3.3v(B2)		
5	+5v			5	NC		
6	NC			6	NC		
7	I2C address			7	NC		
8	SDA			8	SDA		
9	SCL			9	SCL		
10	Disecq In			10	Disecq In		
11	+3.3v	12	Disecq out	11	+3.3v(B3)	12	Disecq out
13	+1v	14	D0	13	+1v(VDD)	14	D0
15	D1	16	D2	15	D1	16	D2
17	D3	18	D4	17	D3	18	D4
19	D5	20	D6	19	D5	20	D6
21	D7	22	CLK	21	D7	22	CLK_OUT
23	D/P	24	STR	23	D/PN	24	STRUT
25	Error	26	Reset	25	Error	26	Reset



Narrow Band DATV on the BATC DTX1 Project Update

Laurence Cook – M0LDZ

Introduction

In my previous article I mentioned that the BATC DTX1 DVB-S Encoder/Modulator has proved to be a very popular unit, and that there are now many of these out in the field giving good service on 23cms and 70cms, and how we tackled Narrow Band Digital transmissions when OFCOM made the 2m Band available for Amateur DATV.

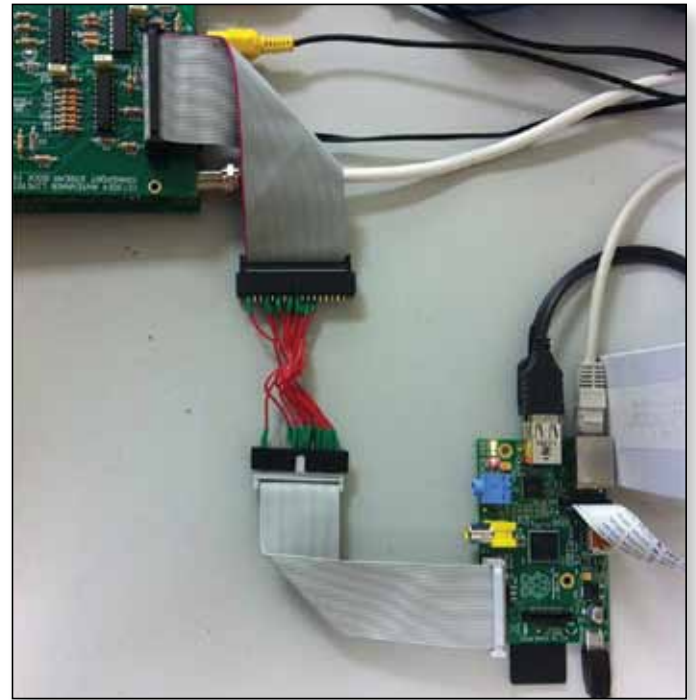
That article was concluded by discussions on how best to produce an H.264 Transport Stream to feed into the DTX1, and the thought was that Raspberry Pi was a good candidate. The Pi's SOC, made by Broadcom, has hardware H.264 encoding and the Pi has a handy dedicated camera sensor port too! It also has a USB port.

This last piece of the jigsaw is now in place, thanks to hard work by Evariste F5OEO and Carl M0ICS. Evariste has got software running on the Model B Pi which takes images from the Pi's camera and converts them to an H.264 transport stream, presented as parallel data on its GPIO pins. Carl has produced a version of the DTX1 firmware which 'unlocks' the DTX1 secondary encoder port and also adds many features to the DTX1 menu system. This gives great flexibility to accommodate various input streams at various bit rates, not just H.264.

The idea is that a ribbon cable can be routed from the board's output connector (a 34 way header) over the top of the DTX1 rear panel, to the Pi. A little judicious filing

can easily take of a few mm from the top of the panel – some edging strip can be used if required to prevent cable damage.

You could make up two ribbons like this one made by Carl, with wiring to make the above connections:



..or you could make up a 'special' cable with the various wires connected directly, but that's bit more fiddly!

TS-Dock Board to Pi Connections

TS Signal	Pi Assignment	Pi Header Pin No.	TS Dock Signal	TS_Dock Pin No.
TPCLK (SYNC)	GPIO 24	18	EXT-PSYM	7
D0	GPIO 2	3	EXT-SD0	22
D1	GPIO 3	5	EXT-SD1	20
D2	GPIO 4	7	EXT-SD2	18
D3	GPIO 14	8	EXT-SD3	17
D4	GPIO 15	10	EXT-SD4	16
D5	GPIO 17	11	EXT-SD5	15
D6	GPIO 18	12	EXT-SD6	12
D7	GPIO 27	13	EXT-SD7	11
CLK	GPIO 22	15	EXT_TSCLK	24
DATA VALID	3.3V	1	EXT_DVLM	10



Results so far

Good progress has now been made. The following is a screenshot of the first picture Carl saw on his PC running Tutioune software, when he wired everything up. I can't help but wonder what John Logie Baird would think of this... maybe he was onto something?

Bear in mind this was Evariste's Beta software running on Carl's own Pi, and Carl's Beta firmware running on the BATC DTX1. Not bad for a first stab, is it!!

There are still a few snags being ironed out and by the time this goes to press you should be able to get hold of fairly robust versions of both of these and have a play.

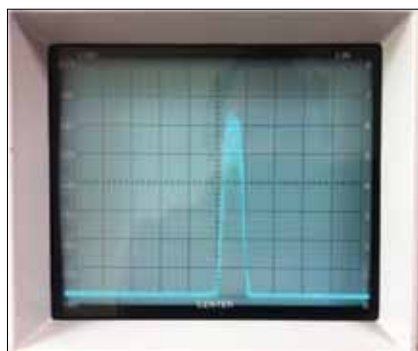
The TS-DOCK PCB is for sale on the BATC shop. DTX1 firmware upgrade and manual appendix are available from the DTX1 support site here:

<http://www.dtx1.info/downloads/firmware/Beta/>

and the Pi software should be on Evariste's own site here www.F5OEO.fr although in due course we hope to put these in a common location.

Below is an extract from the DTX1 User Guide's new Appendix, covering the TS_DOCK settings.

As the Pi is generating the transport stream clock, select External TS-Clock.



Settings of Bit-rates while using TS-Dock

Please always set the TS-2 (TS-Dock) Encoder System Bit-rate when using the TS-Dock, regardless of whether the TS-Clock is generated externally or internally.

For TS Clock rates, the effective Bit-rate is calculated from the Transport stream System Bit-rate, even though the TS-Clock may be generated from an external source. Setting the Transport stream System Bit-rate for the Encoders in the DTX1 menu will allow the system to track and control other bit-rates within the unit.

For DTX-1 generated TS-Clock using TS-Dock Interface Board (Internal TS-Clock)

Under this condition the TS-2 Encoder System Bit-rate will be set in order to generate the TS-Clock, as the DTX1 is generating the TS-Clock, then the bit-rate of the TS-Stream applied to the TS-2 is known.

For externally generated TS-Clock using TS-Dock interface board (External TS-Clock)

This is more important if TS-1 Encoder is active and set to AUTO for the bit-rate, under these conditions the DTX1 has to know the bit-rate of TS-2 in order to correctly manage and set the Auto bit-rate for TS-1.

Example:

If DTX1 Calculated Channel Bandwidth = 2500Kb/s

TS-1 Encoder System Bit-rate = Auto

TS-2 Encoder System Bit-rate = 1000Kb/s

TS-1 Encoder will be automatically set to 1500Kb/s in order to fill the bandwidth of the channel.

If TS-2 Encoder System Bit-rate is set to an arbitrary low setting and an external clock is used to supply a TS-Stream to TS-2 then the DTX1 is not aware of the actual bit-rate being supplied to TS-2. As such the automatically Calculated TS-1 bit-rate could well fall outside the maximum bandwidth available channel. If this occurs then it will generate a multiplexor overflow in the DTX1 due to there being too much data supplied from the two combined Transport Streams to fit into the available bandwidth.

A typical spectrum is shown here, narrower bandwidths down to 250 kHz are achievable. The analyser is set to 500kHz/division in this shot.

Next Steps

We need feedback from users and suggestions for any enhancements or bug fixes! So far we haven't tried the Pi's sound channel which is available via an audio USB peripheral for example. However this will widen the transmission bandwidth.

You can contact the author and wider DTX1 support team on support@dtx1.info

Have fun!

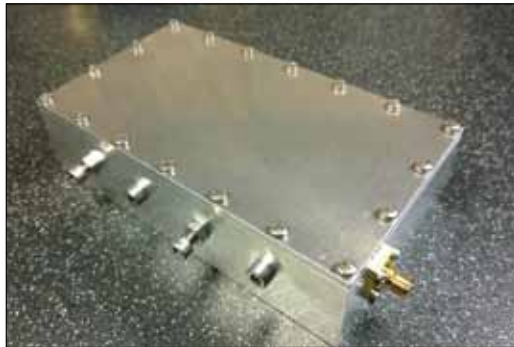


Product Review

PE1RKI 23cm four pole filter for ATV

Clive – G3GJA/G8EQZ

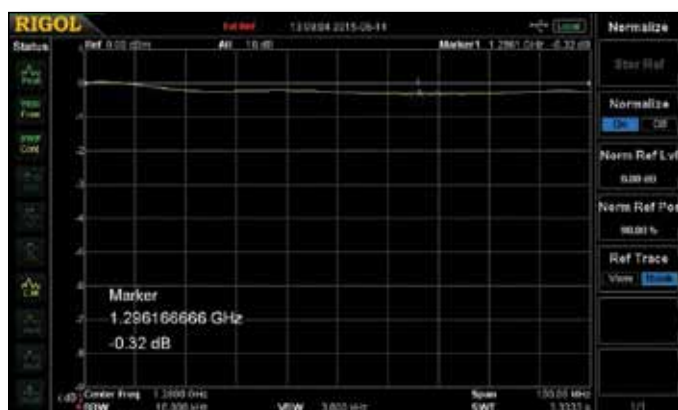
Bert Modderman, PE1RKI, offers via his website a number of modules of interest to the amateur operator that would need access to fairly sophisticated turning and milling facilities to produce. These include some very advanced high power MOSFET amplifiers for 23cm and 13cm, some with water cooling, slot antennas up to 24GHz and a range of filters for 23cm and 13cm.



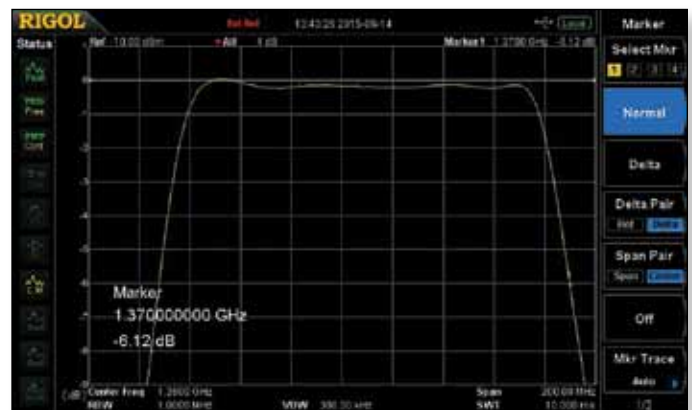
This review is of an inter-digital filter designed for bandpass use covering 1230MHz to 1330MHz in the UK where the 23cm extends to 1325MHz. Other versions are available that are optimised for narrow band use with 5 poles around 1296MHz and 1240MHz to 1300MHz for ATV in the rest of Europe. It is supplied with a choice of N or SMA connectors and is built from a box milled from a block of aluminium with a matching cover. It is 123mm x 69mm x 33mm. Stainless steel Allen screws and lock nuts are used for tuning throughout. No power rating is advertised but it should handle 100w peak with ease.

Test Results

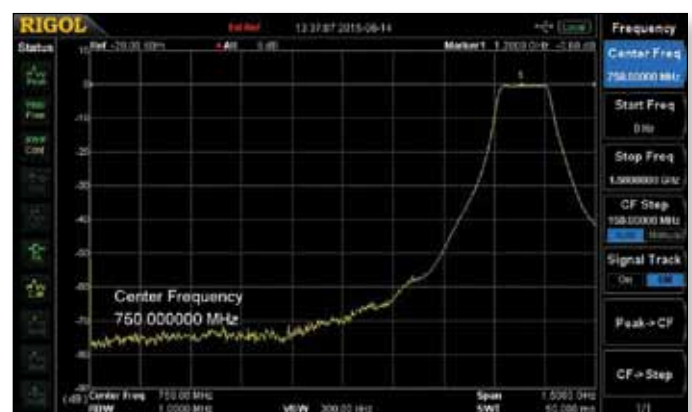
The first plot shows that within the passband of 1230MHz to 1330MHz the insertion loss is no more than 0.35dB with ripple about the same. This is an excellent result for a filter of this type and is as received from the manufacturer; no attempt has been made to adjust the filter.



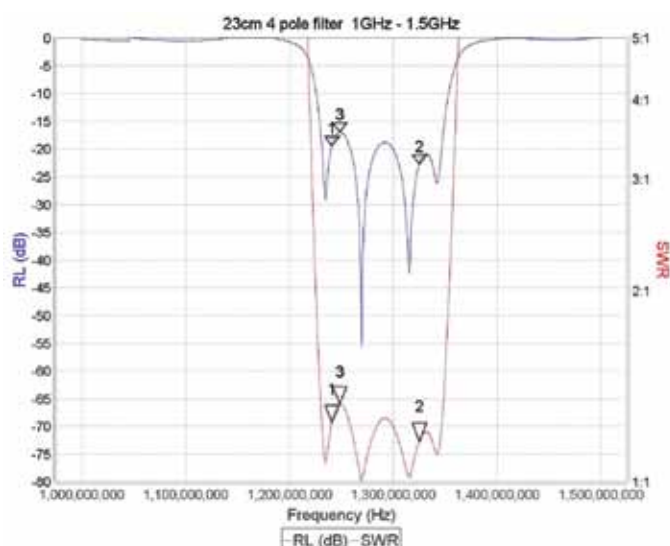
Widening the analyser's span to 200MHz shows the -6dB points to be 1207MHz and 1370MHz, showing a fairly steep roll-off either side of the UK 23cm. Again, the pass band ripple is negligible and insertion loss very good.



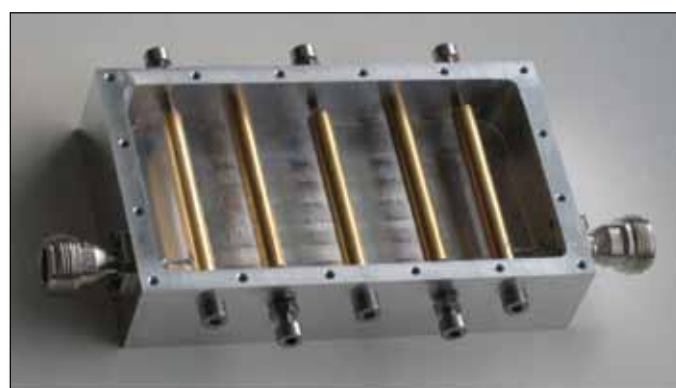
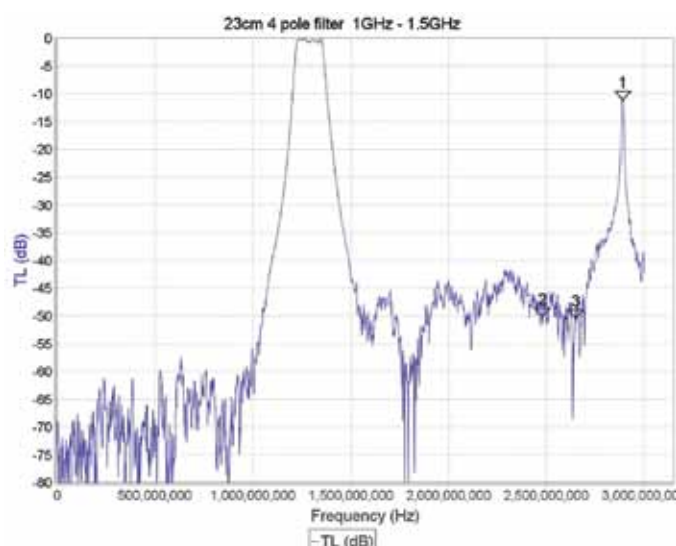
The next plot shows the performance of the filter from 1 to 1500MHz. There are no spurious responses within this range and the -60dB point is just above 900MHz giving a superb reduction of signals from GSM services that can overload pre-amps with noise matched front ends. All plots were taken with 3dB SMA attenuators rated to 18GHz fitted on both ports of the filter to reduce the effects of mismatches.



The next test result (top of the next page) looks at return loss & S.W.R. The band edges are indicated by markers 1 and 2, with marker 3 showing that the poorest return loss / S.W.R. is at 1248MHz although it is still a respectable -17dB / 1.33:1. Connecting a P.A. directly to the filter is unlikely to trip any S.W.R. protection circuits.



Another measurement particularly important for digital transmissions is group delay. Over the range of 1230 to 1311 MHz, tgr is fairly constant varying no more than 2ns. The feature to measure this parameter is a fairly new addition to the software that I use with my vector network analyser so it would need confirmation on more sophisticated test gear than I have available. The dip at marker 3 is coincident with a phase change through -180° to $+180^\circ$ so is probably a glitch in the measurement system. However, the test would suggest that this is a good filter to use with digital transmissions.

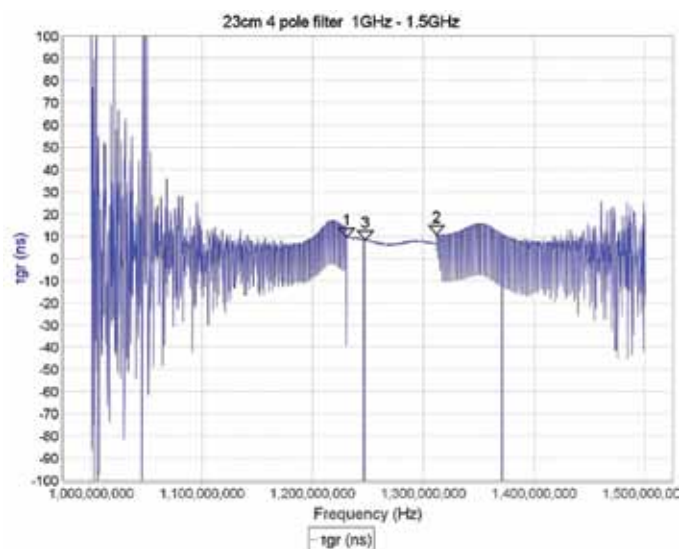


► Internal view of a similar 5 pole filter from Bert's website

Conclusion

This filter offers exceptionally good electrical performance and its mechanical construction ensures stability and ruggedness. It's a professional grade filter that's made to order by Bert Modderman PEIRKI for 100 Euros plus carriage. Details of how to contact Bert and ordering information is on his website at

<http://members.chello.nl/b.modderman/> It's easy to transfer funds from your UK bank direct to Bert in Euros and with 100 Euros currently costing around £72 it's a bargain. Bear in mind there's no VAT or Post Office handling charge for items from the Netherlands. 📡



The final test is a full sweep from 1 to 3000MHz to look for any spurious responses that can reduce the filter's effectiveness at harmonic suppression. This shows that there is a -11dB response at around 2.9GHz as shown by marker 1. The second harmonics of 23cm fall between 2.48GHz and 2.65GHz, shown by marker 2 and 3 respectively. Attenuation of this 2nd harmonic range is better than 50dB and the spurious response is unlikely to have any detrimental effect.



Video Fundamentals - Part 3

Picture Monitors

Brian Summers – G8GQS

The final destination of a television picture is the retina of the viewers eye, and the last item we have control of is the picture monitor. Today we are going to look at how to achieve the best result. For television purposes monitors & TV's can be put into four groups:-

Grade 1 monitors are devices for high-grade monitoring of the technical quality and evaluation of pictures. They should not conceal any picture defects or artefacts.

Grade 2 monitors are used when the precision, and cost, of a grade 1 monitor is not justified, they have wider tolerances on the accuracy of reproduction.

Grade 3 monitors, are equivalent to domestic or consumer displays. They often have improvements to the mechanical construction. Grade 3 monitors can have a high brightness, suitable for use in areas of high illumination.

Ungraded, Domestic TV's and computer displays all into this group.

All monitors & TV's have adjustments to obtain the best results. If you are going to make judgements about your picture quality and offer reports to others your monitor must be correct or errors could be made.

Setting up your colour monitor

There are 3 simple controls on the monitor to tweak:-

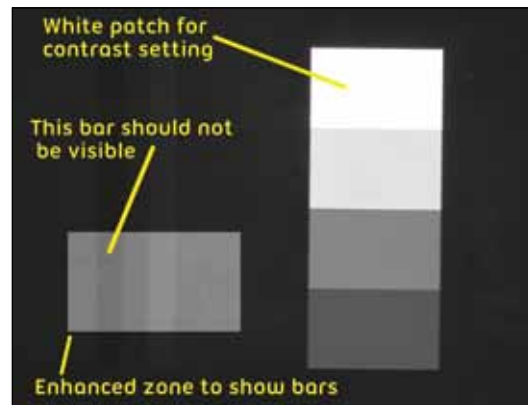
► Brightness ► Contrast ► Saturation

It is easy to just make the picture look good and while this is OK for a domestic TV, it is hardly suitable for a monitor that will be used to make engineering judgements!

A couple of test signals are need to ensure correctness. Pluge¹ is used first to set the picture levels.

Black Level (brightness)²

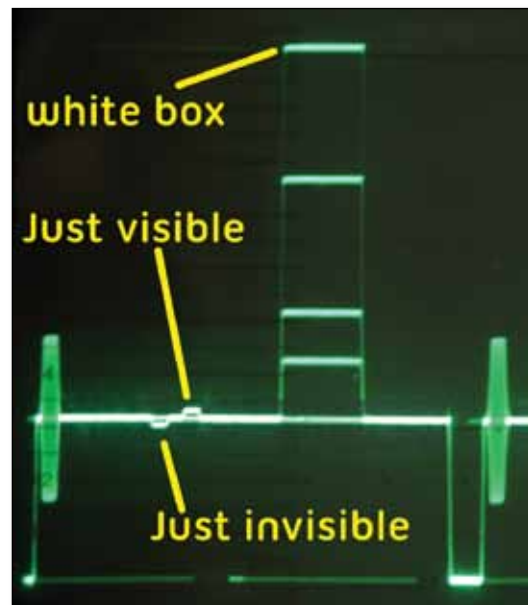
On the left side of the Pluge signal are two vertical bars $\pm 14\text{mV}$ amplitude, with the contrast at a reasonable setting adjust the brightness control so that the left most bar is invisible, but the right bar can just be seen.



► Fig. 1 The Pluge signal on a Plasma TV, it proved hard to photograph, so I enhanced the rectangular area to show the two bars.

Peak White (contrast)

On the right of the pluge signal are a number of grey to white rectangles, the contrast control is adjusted so that the white square has the correct light output. What this value is depends on the job that monitor is used for; a light meter is offered up to the white square and the contrast adjusted to give the desired reading. The important thing here is consistency, all monitors in an area should have the same output.



► Fig. 2 The Pluge waveform

¹ Pluge a BBC acronym for Picture Line-Up Generator.

² The terms "sit" or "lift" are sometimes used to describe the black level state.

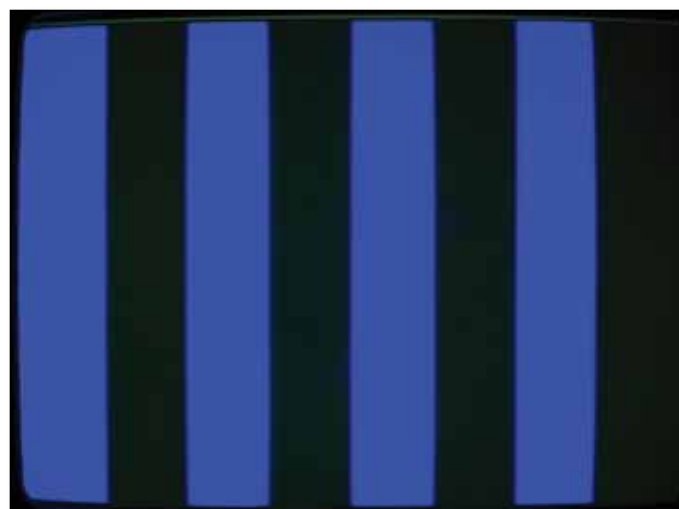
Saturation (colour intensity)

Colour bars are used for this, 100% bars are simplest to use, now a bit depends on what controls your monitor has, ideally it has a blue only switch, when this is operated a row of 4 blue bars will be seen, Fig.3 (sometimes the monitor produces white bars, depends on the make). Adjust the saturation control so that all 4 bars are of equal brightness. In the absence of a blue only switch, the best option is to use a known good picture source and adjust so that the face flesh tones look natural. It is worth mentioning that the instructions for BBC test card F recommends setting the saturation for a natural appearance of the child in the centre circle. It also has a Pluge like dot in the black step of the greyscale wedge and a white dot in the white square, both should be just discernible.

Other adjustments to consider are:

Colour temperature (an internal adjustment or a menu set-up option).

In broadcast PAL environments the white is CIE illuminant D, a colour temperature of 6500°K, is used. This approximates to average daylight illumination. It is a warmer white than the usual TV set white of 9300°K. If this is not a preset option, the white on the screen will have to be measured by a meter. These have three sensors that attach to the screen and a readout of some sort. Or just by eye, visually comparing with a lamp of known colour emission.



► Fig. 3 Colour bars showing 'blue only'.
The waveform can be seen in CQ-TV 247 fig.3

Black & white balance (& grey scale)

When displaying a grey scale, each step on the grey scale should be without any colour cast, e.g. the tracking of each of the three colours should be in the correct proportion to give a true grey.

Choice of monitor

Today, most users go for an LCD or Plasma display. A certain amount of care has to be taken when choosing one. They do tend to be big and quite bright but careful observation may well show defects. With the profusion of line standards, coding and interlace standards it has become a bit of a minefield. The EBU document called Tech 3320, User Requirements for Video Monitors in TV³, may help and is very revealing about the problems of flat panel displays. Many video engineers still insist on a CRT⁴ Grade I for final evaluation of pictures.

A trend in using large flat screen monitors is the use of "multi-viewers" to display up to 16 small pictures on the one big monitor. These often have UMDs (under monitor displays) showing the name of each picture and the cues, red or green.



► Fig. 4 A 42 inch display with 12 small pictures and UMDs showing the source

3 The EBU monitor evaluation guide. <https://tech.ebu.ch/docs/tech/tech3320.pdf>

4 BBC Engineering G.P.TV colour picture monitors. Specification TV1282. Dated 1984

Video sync generator for the “no-signal” videosquelch in monitors

Tjalling - PE1RQM

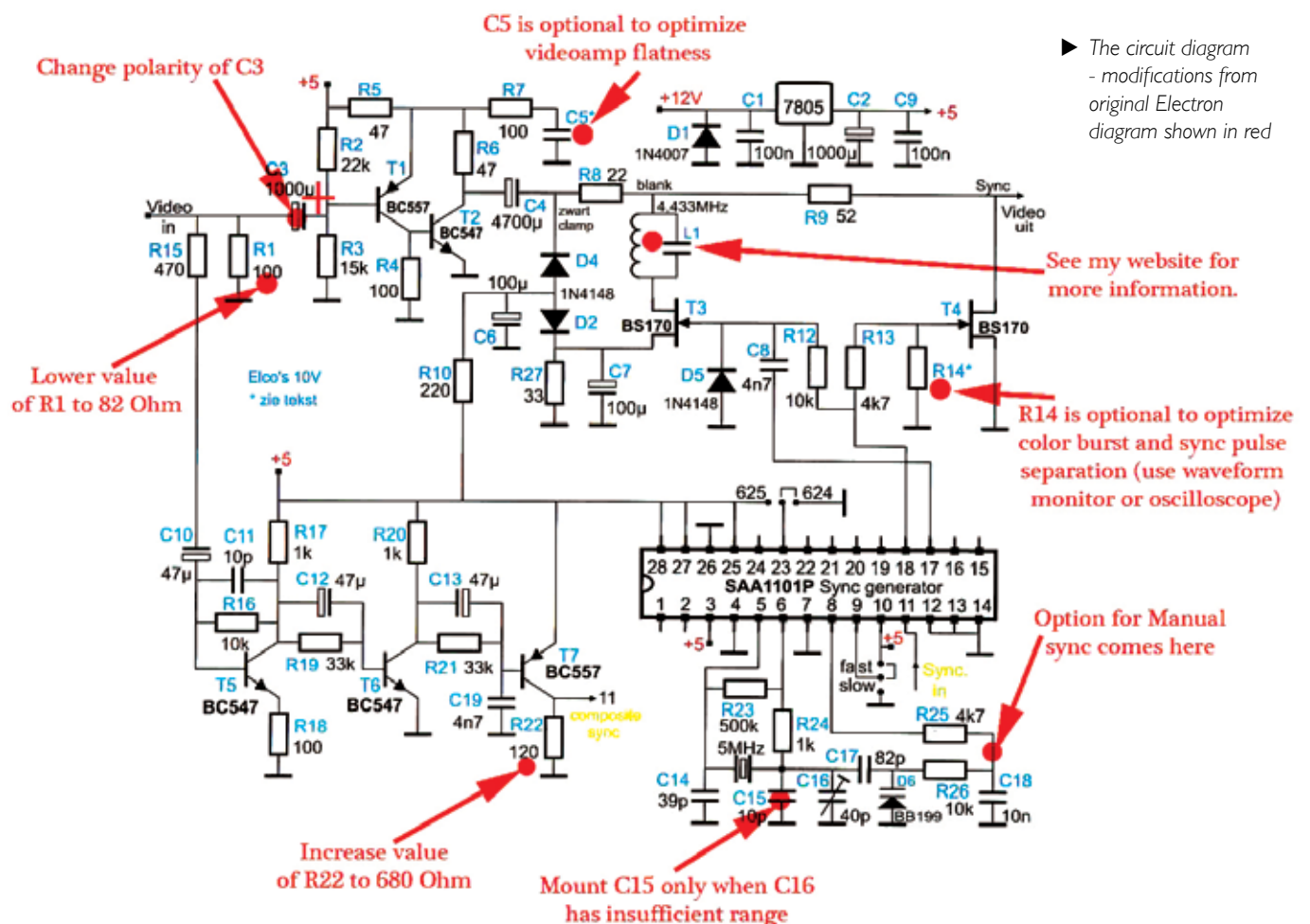
An idea from an article in Electron, written by Hans PA0JBB



Introduction

Most modern flat screen monitors are not usable for ATV signals as they will not display white noise. This circuit first published in electron December 2011 inserts locally generated sync pulses enabling very weak signals or white noise to be displayed. By using this circuit it will also clean up weak analogue television signals.

In very general terms what does this circuit do? The heart of the circuit is the next IC: the SAA1101P. This IC itself generates sync pulses for the horizontal synchronization of video. This is what activates most modern monitors (going from the squelch). The sync pulses are applied below the noise with weak signals, you will see that just as well on the modern (LCD) monitor.



► The circuit diagram - modifications from original Electron diagram shown in red

The original sync pulses of the received video are removed and then added back, so that there is no double synchronization pulses (from the sync generator IC and incoming video). If the incoming video is strong enough (enough recognizable synchronization pulses in the noise), the IC will automatically synchronize with the incoming video, so the image remains stationary. Without this synchronization to properly view the weak signals they walk slowly horizontally across the image. Further described is a manual mode, which allows you freeze the video with a potentiometer:

Construction

It all starts with a search for the parts.
The hardest parts are:

- ▶ SAA1101P IC
- ▶ BB199 varicap
- ▶ Two resistors with a value outside the range E12 (substitute as necessary in parallel to arrive at the required value)



ESD: The BS170 and the BB199 SMD components are very sensitive to ESD (Electro Static Discharge). The SAA1101P should be protected from unnecessary discharges too.

The SAA1101P can still be bought on Ebay. The BB199 is only in a very small size SMD available from the manufacturer NXP. Initially I couldn't find the right one, with only an equivalent found there with a slightly different value. More about that later:



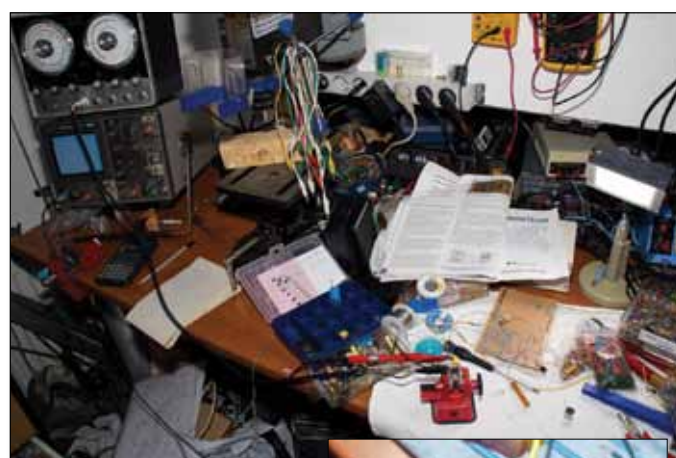
I got my first one built on prototyping board. Since the ground planes actually are important - because of interference from the IC and the fact that you still have to process signals from a few MHz wide - I solved that by Litz wire tinning and soldering as a ground plane. Bit primitive, but it worked well. But if you can get an etched circuit board, though I can recommend it.

The 4.433 MHz (4.43361875 MHz to be more specific) cut-off filter LI at first worried me. According to the description, you had to get a 10,7 MHz bobbin and get the resonance frequency down through a parallel capacitor. I had a whole tray with bobbins, but which was now 10,7MHz?



Using a signal generator and oscilloscope you can experiment to find the right values.

Note: I was measuring in parallel. Then it is no blocking circuit (series), but a resonant circuit. Then you go for maximum signal.



▶ Measuring LC circuit

Note: the leads used on this coil were other than described on the circuit board. The board is based on the two outer pins.



It is wise to confirm your measurements with the formula for an LC circuit (search on Wikipedia on "RLC circuit"). You have the inductance of the coil (in the middle) and therefore you can calculate 'C'. The 'R' value you can forget, because that refers to the internal resistance and since the coil is adjustable, you adjust it to suit preferably on the oscilloscope or other measuring device.

Resonant Frequency Calculator:

<http://www.1728.org/resfreq.htm>

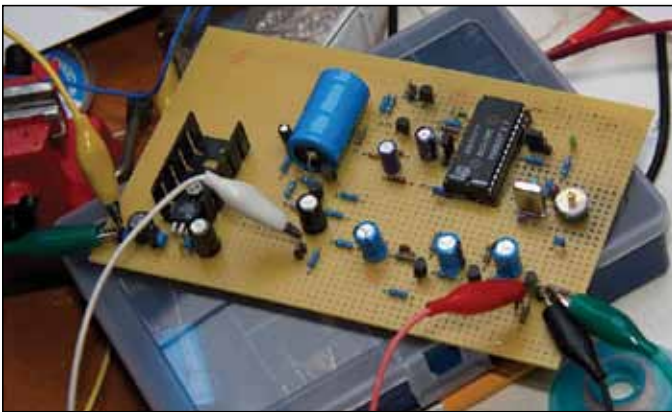
Then you have to question whether it is useful to have a high inductance and a small 'C', or vice versa. I chose the middle ground. My bobbin was about 1 mH and C was 1 nF. The adjustment is not critical according to the author, since this LC circuit is included in a low-impedance circuit.

Synchronisation separator

The synchronisation separator consists of three transistors and separates the horizontal synchronizing pulses from the incoming video, thereby only leaving a +5V pulse (in the frequency of the original horizontal sync, approx 15kHz) in order to offer to pin 11 of the SAA1101P.

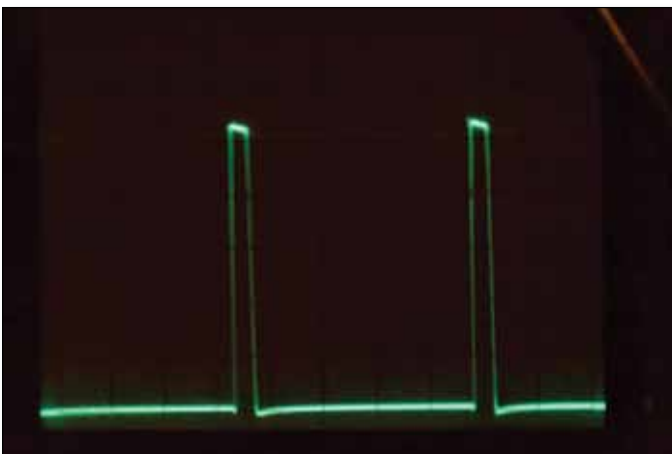
This IC can have a homemade synchronization pulse applied at the output "lock" at this 5V pulse, causing it to be in sync with the incoming video. The IC does this by varying a voltage on a varicap BB199 (pin 8), such that the 5 MHz clock will be just right.

When the circuit was almost completely soldered together, I first measured the synchronisation separator and noticed that the SAA1101P did not want to lock. Pin 8 remained at a fixed voltage, called the quiescent voltage which the IC pin 8 outputs when there is no incoming synchronisation present (at pin 11). So first let's see if the synchronization circuit works, recognizable below the three transistors between the leads:



► *Measuring the synchronizing circuit*

There was clearly a pulse on the scope visible in sync with the rhythm of the incoming video signal, but it was far too low: 1.5V. By raising R22 120 Ω to 680 Ω this was solved and pulses came out at approximately 5V.



► *Output of the synchronizing circuit (separator)*

The SAA1101P and its own oscillator with varicap

This IC has its own oscillator, which is controlled with a 5MHz crystal (for the PAL standard). By varying the capacitance in this circuit the 5MHz clock frequency can be changed. That affects the timing of the output horizontal sync pulses. The SAA1101P has an 8 pin voltage output (0-5V) that you can offer to a varicap in the oscillator circuit. By obtaining a sync pulse from pin 11 (from the synchronizing circuit as described in the previous section), this output voltage will vary until the output horizontal sync is locked with the incoming sync. And appears to a PLL and the IC used for this purpose as a phase comparator.



► *Outgoing sync pulses from the SAA1101P*

The design used a BB199 varicap. That type of varicap is already at very low voltages (0 to 3V) almost full capacity change through. At 0V the varicap has a capacity of 60pF; at 4V only 9pF. That is a difference of 51pF, so fairly large and ample to vary with the reference clock. However, there was one problem - the BB199 is difficult to obtain (update: NXP creates an SMD version). So I went looking for an equivalent and preferably a type I had in my boxes. The BB109 (rectangular model with yellow tape) seemed a prime candidate: 0V and 5V = 48pF = 19pF. A difference of 29pF. Much less than the BB199, but that seemed sufficient.

The SAA1101P at rest has a voltage of about 1V. That is the value at which it is going to settle; or down to 0V up to 5V. The BB199 has a capacity of 25pF and the BB109 approximately 45pF. Capacity in the circuit was thus slightly too high with the BB109. If I controlled the C16 almost turned to minimum, the SAA1101P would suddenly lock. In order to get this 'C' into a middle region I have replaced it for an adjustable C 2-20pF. The parallel C15 is omitted. It all worked perfectly! On various video sources, the SAA1101P managed to synchronize itself again and again. That was solved!

Update: I have the circuit right now including the BB199 varicap. I can get these through Cor PEI HIS. It is also evident on sale at larger electronics suppliers. Disadvantage is that it BB199 is very small. You have to solder small wires to it and then solder it in the circuit. The PCB produced by Cor PEI HIS has exactly a place where this diode can be soldered to the PCB without additional wires.

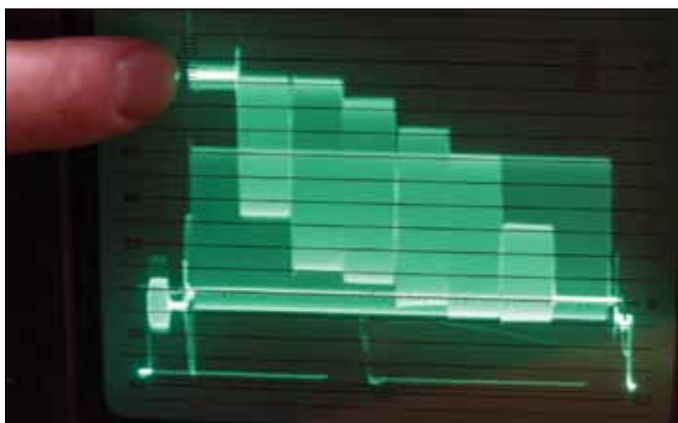
C15 does usually not more, but it depends on whether your C16 is roughly in the middle. Adjust the value of C15 and C16 so that you can get the desired control range.

In lock with good video reference, aim for the difference in the SAA1101P between R25 and R26 to be about 2v.

The video amplifier

Then I'm going to watch the video on a waveform monitor. That you can do fine on an oscilloscope. Just make sure that you charge the video output with $75\ \Omega$. The $75\ \Omega$ load is always important for video. At the input of this circuit is therefore also included R1. Together with the load of the rest of the circuit would be the input resistance must be about 75 ohms. Which in my case was not quite like that, so the video level is too high. For example, R1 $82\ \Omega$, or more preferably $75\ \Omega$ ($2 \times 150\ \Omega$ parallel is also good).

Looking at the video amplifier (which strengthens 2x), consisting of T1 and T2 some tweaking will be required. With R5 and R6 and optionally C5 you can affect the linearity and the degree of amplification. This is not a truly perfect video amplifier; but you will hardly notice and is perfect for our application. C5 can be left empty if you do not know what to do, but if you've connected a waveform monitor and connect a good colour bar generator, apply several small capacitors (smaller than 500pF) on R5, R6 and C5 to see what effect it has. Example values: I posted about 330pF R6 at Renny's copy and I chose 470pF to C5.



► When done, place a capacitor across R6 (<500pF) and compensate the C5.



► Measuring with a colour bar generator and a waveform monitor. On the PCB are potentiometers R5 and R6 to tweak the adjustment.

Blank and sync portion

R14 is not described in the text of the Electron article, but I have put a temporary potentiometer around 12k. This can also be soldered in place. Adjust the potentiometer so that the sync does not collapse, but as little as possible of the colour burst is not nibbled. Somewhere find a balance. The potentiometer can then be unsoldered and measured. Replace with a resistance value that is approximately the same. Sometimes there needs to be placed no resistance, so omit R14, but on average 8k2 is a good value.

You preferably have an oscilloscope ($75\ \Omega$ close to T-piece); or even better a waveform monitor (also $75\ \Omega$ close) is required to view the sync and colour burst. Zoom in on the sync pulse and the colour burst. It just close with $75\ \Omega$ is very important!



► Left with R14; on the right without R14

Housing

This circuit was intended to be used mainly whilst out portable so I chose a sleek euro card box. For that reason, the big C4 is mounted as close as possible to the PCB.

Option: Manual operation

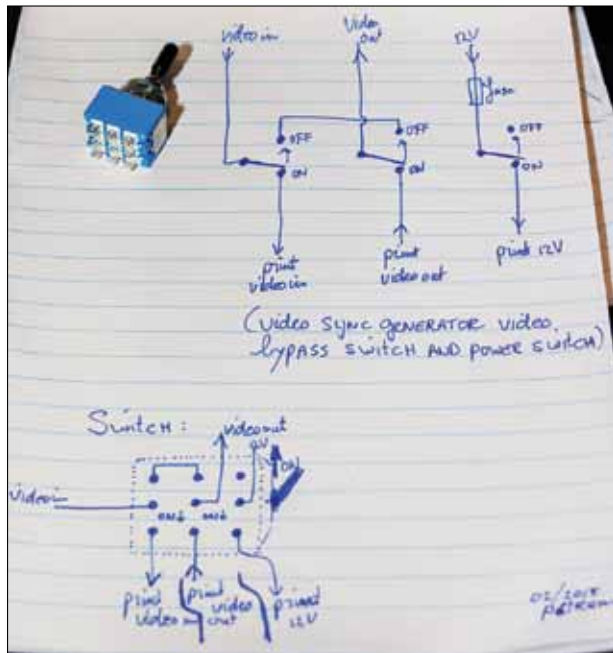
As an option, you can make it a manual operation. In the off position this transfers the video from the input to the output (bypass)

This can be done with a relay, but if you want to save power (associated with battery use for example), you might also consider a 3 position switch. See diagram.

I choose to turn off the video from the circuit in bypass mode. I did so to prevent loading of the video via R9.

If you want to quickly switch between bypass and active (during a contest for example), use the right bank (the

voltage) a separate single switch. The voltage may then be left on the circuit. The video can then pass on a double pole (video in and video out).



► Video sync generator built into a Euro Card Case



Full details of this project, and others can be found at Tjalling's website: <http://www.pe1rqm.nl>

► ATV at the Newbury Radio Rally - 21 June 2015





A Field Day ATV station with PC6REC

Ernest Neijenhuis PA3HCM



During the 2014 edition of the REC Field days I facilitated a live videofeed, broadcasted throughout the Netherlands. Using three cameras and a bunch of (mostly) vintage hardware, the live stream was uplinked to the local ATV repeater PI6ATV. Viewers could witness all activity on the field to get a glimpse of this annual event.

Receive station:

- ▶ Modified Chapparral LNB with 40cm dish antenna
- ▶ Amstrad SRX-200 satellite receiver
- ▶ TV to view the received signal



Transmit station:

- ▶ 3 Analog video cameras
- ▶ Akai AV-U8 video switch
- ▶ JVC JX-T66 title generator
- ▶ Homebrew test pattern generator
- ▶ Akai SS-V5 video switch
- ▶ Akai PS-V20E video processor
- ▶ Homebrew 23cm 1 watt ATV transmitter
- ▶ TV to monitor output signal
- ▶ Behringer Xenyx 1202FX audio mixer
- ▶ Philips SBC MD650 microphone
- ▶ Laptop with MediaMonkey and 1.2gb music, MP3 format, CC licensed
- ▶ 25 element yagi antenna



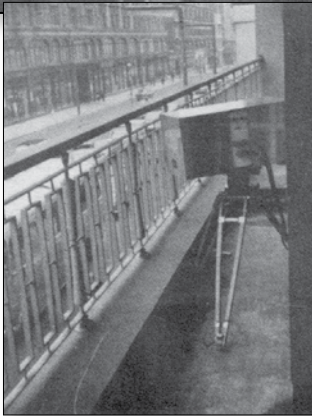
A video of the Field Day station in action, as well as some excellent construction projects can be found at Ernest's website: <http://pa3hcm.nl>

Turning Back the Pages

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

Peter Delaney - G8KZG

CQ-TV 61

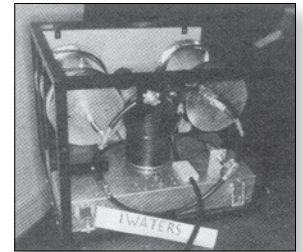


This issue of the magazine included a report on the 1966 BATC Convention, held at the Independent Broadcasting Authority headquarters in Brompton Road, London. Some 200 people attended - the Club's general meeting took

place during the afternoon - and some 'familiar faces' can be seen amongst the members - predominantly, but not exclusively, male. The 'main attraction', the magazine said, was the display of amateur colour equipment. Mike Cox's colour camera, featured in the last issue, was set up on the balcony to show the scene outside, whilst Mike Bues had a colour bar generator; and John Lawrence demonstrated his sequential colour monitor and colour flying spot

scanner. Amongst the items shown was a video tape recorder - at that time a relatively rare piece of equipment. This one was a helical scan open reel machine - slightly unusual in that the supply spool was lower than the take up spool, unlike the commercial Japanese

equipment that became available in the late 1960s. What is more remarkable is that this video recorder was 'home-made' by BATC member Gordon Sharpley. At this stage the mechanical part of the machine was complete, and the electronics was still being built. Another 'outstanding exhibit' was a combining unit for RF signals made by Ian Waters.

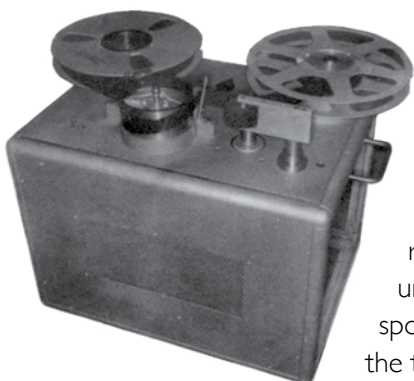
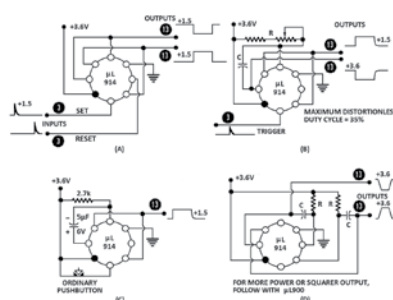
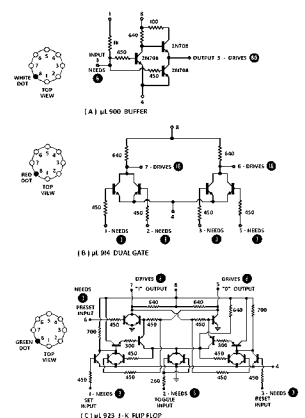
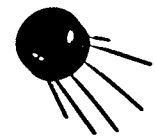


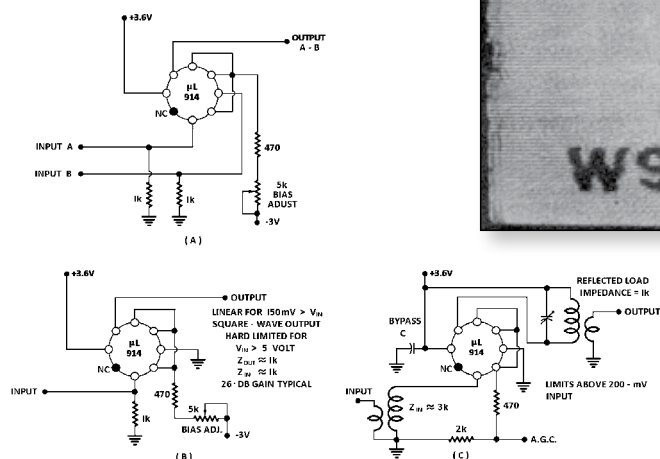
'So you've just stocked up on transistors, and still have lots of those - ugh - valves' wrote Mike Barlow, introducing the then state of the art new component, the 'integrated circuit'. These were the Fairchild μ L series devices. Integrated circuits had been available for a year or two - but 'containing several

transistors and resistors in one epoxy package' at a price of £30 were not really an option for the average amateur. (equivalent to £500 in 2014). The new devices could be bought for 7/6 for the 2 smaller ones, or 15/- for the μ L923. (equivalent to £5.50 or £11 in today's values). There was a basic buffer, a dual gate and a J-K flip flop. The magazine included diagrams of the internal circuits of each of them - even specifying the transistor type used in the buffer: (which was rather

usefully able to put a 1 volt signal into a 75 ohm load, using a 3 volt power supply). A useful piece of information added by each input or output was the drive capability (the white figure on a black circle). This made working out how to link devices easier - for example a single μ L914

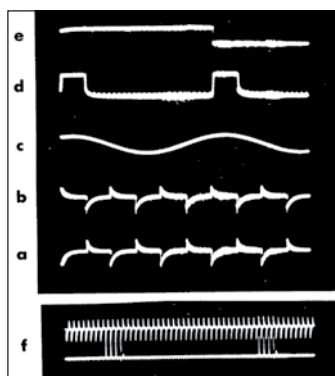
output could drive two μ L900 inputs. The article gave some application circuits - in Fig 2 are (a) a set-reset flip-flop, latch or memory; (b) a monostable, delay or gate generator; (c)



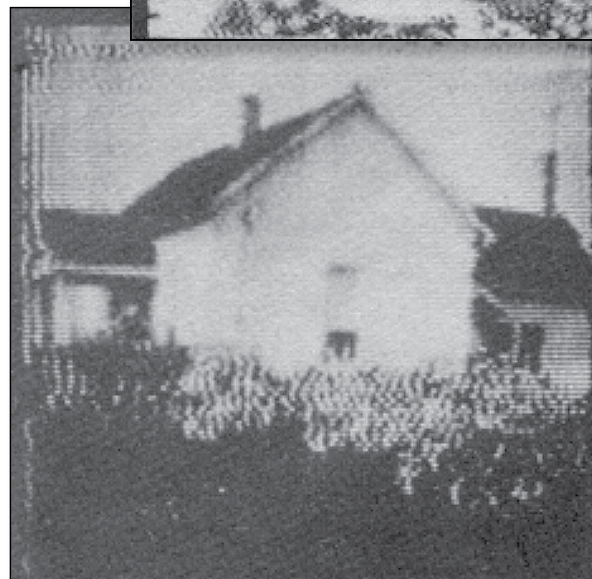
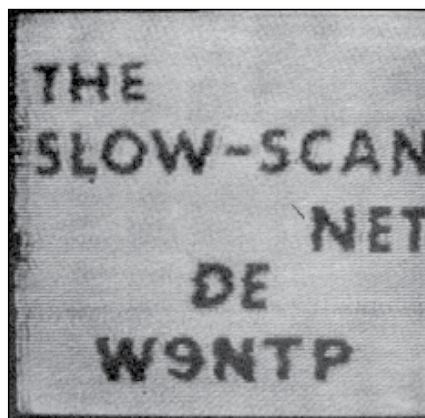


is a bounceless, noiseless push button and (d) an astable or square wave generator. Although gates and flip-flops are what would now be considered digital logic circuits, the long-tailed pair of the μL914 could also be used as a very stable linear amplifier. Examples, in Fig 3, were (a) a differential amplifier or comparator, (b) a DC to 7MHz amplifier, limiter or square wave generator, and (c) an RF amplifier or FM limiter useful up to 20MHz with a gain of 30 dB.

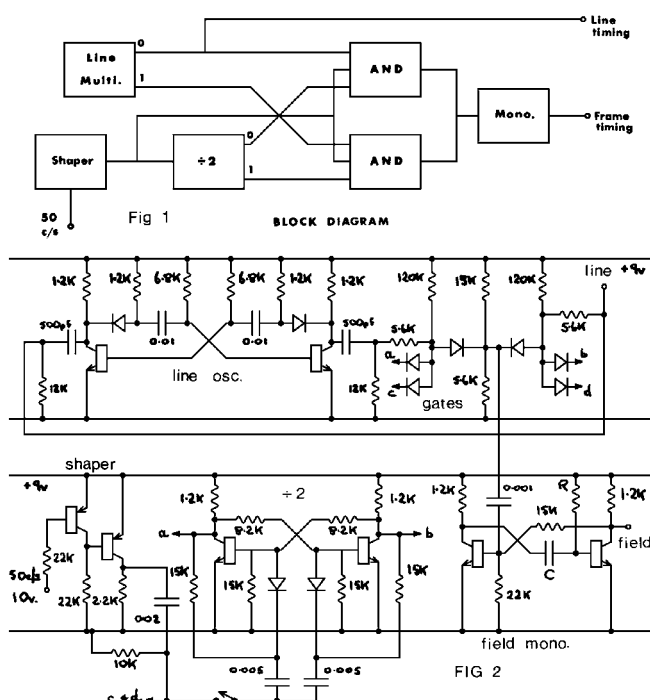
A topic that was often discussed at the time was the generation of sync pulses, and CQTV 61 included ideas on how to generate a set of pulses for interlaced fields. An odd number of lines



per complete frame would generate a $\frac{1}{2}$ line in each field, so interleaving the two fields of a single frame. A line multivibrator made 2 square waves, one the inverse of the other, so that the leading edge of one was half a line after the leading edge of the other (signals a and b). Signal c was derived from the 50Hz mains supply, and shaped as at point d., and gating the various signals together to drive a monostable that was also the output stage. The article noted that "further circuitry is required to make it into an "S.P.G.".



From the operating side of amateur television were some slow scan pictures, received in Australia from Indiana, USA, using the 20m band. Over a path of 9,000 miles, whilst the one of the house had been sent, also on 20m, from Indiana to Ecuador.



The British Amateur Television Club



The club provides the following for its members:

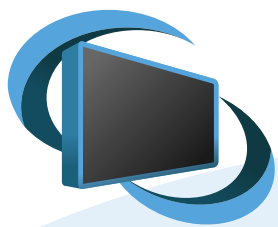
- ▶ A colour magazine, CQ-TV, produced for members in paper or .pdf (cyber membership) formats.
- ▶ **Web site** – where you can find our online shop stocking hard to get components, software downloads for published projects and much more.



- ▶ A **members forum** at www.batc.org.uk/forum/ for help, information and the interchange of ideas.
- ▶ A **video streaming facility** at www.batc.tv which enables repeaters and individual members to be seen worldwide.
- ▶ An **annual Convention** held in the UK where you can meet other members, visit demonstrations and listen to lectures.
- ▶ **Meet other club members** at the BATC stand at local rallies across the country.



www.batc.org.uk



BATC

Out and About

RadioFairs



You will be able to see the BATC stand at the following forthcoming rallies and events in 2015. Come and say hello!

19th July – McMichael Rally – Near Reading, Berkshire See: www.McMichaelRally.org.uk

9th August – Flight Refuelling Hamfest – Wimbourne, Dorset
See: www.frars.org.uk

5-6th September – BATC Convention – CAT 15 - Farningley
See: www.batc.org.uk

12-13th September – ATV Activity Weekend
See: www.batc.org.uk/forum

25-26 September - National Hamfest, Lincoln. See: www.nationalhamfest.org.uk

8th November – West London Rally – Kempton Park, Surrey
See: www.radiofairs.co.uk

If you would like BATC support at an event you are organising, please contact the membership secretary.

batc.org.uk