In this issue

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- Klaus Kramer - DL4KCK
- E Neijenhuis - PA3HCM
- Drew Wollin - VK4ZXI

TSA8G1 USB Mini Spectrum Analyzer

TSA8G1 is a very cost-effective USB mini spectrum analyzer. It can do most of all basic test items that a general spectrum analyzer can do. TSA8G1 is a very tiny instrument, but it can cover very wide measurement range. It covers frequencies up to 8.15 GHz, powers up to 1 W, noise level as low as -110 dBm. The test data will be displayed with calibrated level, linearity and frequency.

TSA8G1 is very suitable for field test because it is very small and convenient to carry. It can be used as a device to monitor RF signal. It is also suitable for EMC test with near field probe.

Remote feature allows the product to be controlled remotely from far end computer via the internet. This allows easy setup of RF monitor system.

Features:

- *Accurate and stable in frequency / level*
- *Extra low cost, extra low weight, best performance price ratio*
- *Digitally synthesized RF system*
- *Frequency range up to 8.15 GHz*
- *Input Levels - 110 dBm to +30 dBm*
- *Connect to PC through USB without battery pack*

website: www.triarchytech.com

DATV on 2m

The UK now has 145 to 146 MHz with special conditions.

All of the amateur NoVs for 146-147 MHz expire on 31st October 2015. The RSGB hopes that amateurs will have demonstrated innovative use of this new spectrum in that time, so we can make the case to Ofcom to enable the NoVs to be renewed for a further period.

What frequency and what sort of bandwidth can I use for DATV in the 146-147 MHz band?

If DATV is used in the 146-147 MHz band it should be centred on 146.5 MHz to make sure all of the sidebands are contained within the band. The recommendation for initial experiments is to use no more than 700kHz total bandwidth as measured at the transmitter output in order to ensure protection of other users above 147 MHz and amateur satellite users below 146 MHz. For DVB-S modulation this may limit the

maximum symbol rate used to no more than 350kS/s. Some enthusiasts might claim far lower theoretical bandwidths for higher symbol rate DATV. However these are rarely realised due to degradation from real amateur amplifier chains when measured at transmitter outputs. The spectral standards that amateurs have previously applied on the microwave bands are simply not adequate at VHF. This is particularly the case on the 146-147 MHz band where high spectral purity is required at the edges of the band, to protect users of adjacent bands. As amateur radio access to the 146-147 MHz band has been granted on a non-interference basis it is important that amateurs adhere to these guidelines in order to ensure that there is no interference with users of adjacent bands. In the longer term it might be possible with bandwidth tailoring and pre-distortion techniques to produce cleaner transmitters to permit greater symbol rates and possibly higher definition DATV.

http://rsgb.org/main/files/2014/03/146-147MHz_FAQ.pdf

ARISS contact without HamTV

An ARISS educational radio contact was planned with Gymnasium Siegburg, Germany.
The event was scheduled Monday September 1st, 2014, the Ham Video transmitter should possibly be tested during this contact.
30 radio amateurs from DARC led by DL3YAT and DJ5KX had prepared over several months the direct 145 MHz radio contact to ESA astronaut Alex Gerst, KF5ONO, in the Columbus module on the ISS.
Monday September 1st, 2014 at 13.12 UTC Alex as DP0ISS answered the call by school station DN6KW, and 20 students in a row asked their questions as usual.
After 17 students the radio contact vanished already, but a big applause by nearly 600 listeners in the auditorium thanked for this event.

Some 12 reporters were present, also the regional TV station WDR.

Originally a first HamTV contact had been planned, and therefore the French ARISS and "Tutioune" specialist Jean Pierre,F6DZP had come to Siegburg.
Sorrily the ISS schedule was changed at short notice and no HamVideo signal got distributed on the BATC video server ISS channel, where several german OM waited in vain for the premiere.
A video report with interviews before the event and some live contact athmosphere in the auditorium was shown later on the Cologne DATV repeater DB0KO.

Klaus, DL4KCK

Problems on 70 cm

Concerning a police-induced shut-down of our Berlin ATV repeater DB0BC´s narrow-band DVB-T output on the 70 cm amateur radio band I want to diskuss some topics:
The 434.5 MHz output was replaced by a 436 MHz output licensed by our telecom authority non-bureaucraticly.
The police justified the 434.5 MHz shut-down with an assumption that the transmission could be used for criminal actions against cars nearby (blocking the wireless key switch).
This is possible as some car manufacturers are still using the 434 MHz ISM band (Industrial, Scientific, Medical) for their wireless key - others have already changed that to the more secure, better to say protected band 868-870 MHz (Recommendation CEPT/ERC 70-03).

A special note for ISM users declares: "Primary and secondary users may not get disturbed by ISM applications. On the other hand ISM users have to accept interference by other radio services."
In our case "the tail wags the dog", and I am asking:
1. How is it possible that amateur radio operators as the primary users of the 430-440 MHz band have given up to use this ISM section without a struggle?
2. How can the car industry explain their use of cheap 70cm wireless key switches while some car manufacturers like BMW have avoided that by using the 868 MHz band?

The amateur radio 70cm band is affected hard by the ISM/SRD applications, but most OM do not note it: FM repeater in- and outputs in Germany are placed outside the ISM section, also the weak-signal modes and beacons.
Only direct users of 434 MHz like DATV and packet radio are affected by for instance DGPS reference stations (5 W!), wheather stations and baby monitors.
My appeal for solidarity goes to all radio amateurs, if using the ISM section or not.

Our frequency change to 436 MHz is not an ideal solution: amateur radio satellites are using the 435-438 MHz section. But: a) there are not many amateur satellites, and b) there is a software-based solution "RGBZS" built by Heinz, DC6MR, many years ago for the Dortmund ATV repeater DB0TT, that was shutting down the 70cm output during a registered satellite flyover.
This produces my next question: there are far more satellites using the 435-438 MHz section that are not "OSCAR"-registered by AMSAT - they are used commercially by university institutes all over the world.
Our IARU organisation is sanctifying that quietly although it is against our ham spirit. The amateur radio license is easier to obtain than a commercial one, and the needed radio equipment is a cheap buy.
As an alibi sometimes a morse code beacon with amateur radio call is installed on those satellites - how dull are we supposed to be?

Concerning our ATV repeater DB0BC I have arranged a compromize with our neighbour "Technical University Berlin" who are flying the "Beesats" and some others.
I have installed a modern version of RGBZS (PC based time schedule controlled shut-down) at DB0BC for tests. The local police station will hand over the informational flyer from the telecom authority about ISM/SRD devices to any complaining car owner, and they will advise to use alternative keys...

It is worrying me that we are giving up our wide 70cm band MHz by MHz, in some neighbouring countries this subtle breakup has become manifest by law already. I would like to start a constructive discussion.

Joerg, DF3EI

Comment on 70cm DATV recommendations by IARU

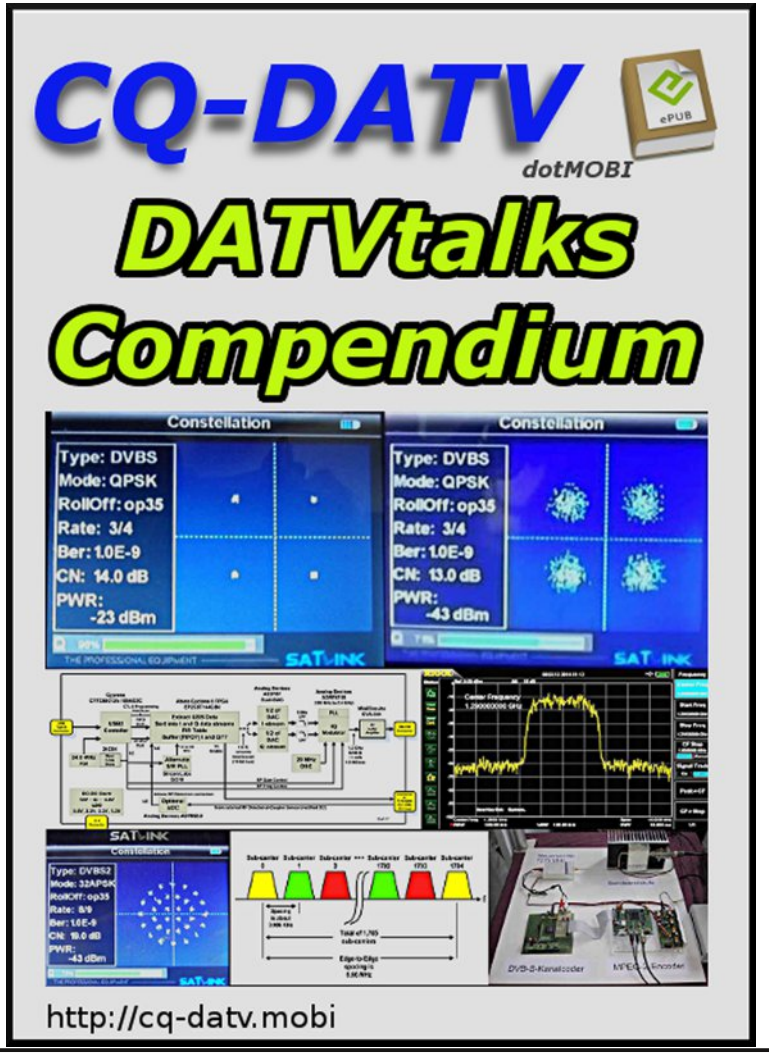
Actually we should only comment on the finalized IARU conference protocols, but some details were leaked out already and there are different reactions.
So the board of AGAF wants to explain essential results of the C5 recommendations on 70 cm DATV, not knowing when the new VHF managers handbook edition will be released.

An essential result is that DATV is acknowledged as an important technology for 70 cm, and the section 435 - 438 MHz can be used by both amateur satellite and DATV service with regard to each other.
Since the most important amateur satellite activities are placed just above 435 MHz, direct DATV contacts should use the upper part of the satellite section.
The RSGB bandplan has devised 437,0 MHz as "Experimental DATV Centre of Activity". Because of different national regulations there is no such recommendation by IARU, this shall be arranged according to national bandplans.

In order to protect the amateur satellite service no DATV repeater outputs are recommended, only repeater inputs.
Our telecom authority will not approve any more DATV repeater outputs on 70 cm, but existing licenses will stay valid.
Another IARU recommendation sets the 70 cm DATV rf bandwidth to 2 MHz maximum, preferably lower. The austrian sorrow that the 23 cm band will vanish in part from amateur radio use because of the Galileo navigation system, should not cause panic.
Our telecom authority has no such informations by now, any concerning news will show up on our AGAF home page.
vy 73, Uwe DJ8DW, AGAF president
Translations Klaus, DL4KCK

We are pleased to announce that a compilation of all the DATVtalks to date is now available for download from the CQ-DATV web site (Click the picture to be taken to the page).

New readers to CQ-DATV may not know of the wide assortment of DATVtalk articles that have been published over the history of CQ-DATV. These articles contain an introduction to Digital-ATV as well focusing in on various aspects and areas of DATV.



Editorial

Welcome to CQ-DATV 18 our Christmas and New Year edition.

When we started producing CQ-DATV back in February 2013, I think a lot of people back then thought producing a free ATV magazine was a non starter, especially when we announced we were going to publish bi-monthly, at a time when other ATV magazines were having problems producing quarterly magazines.

In January 2014 we announced that we were taking CQ-DATV to monthly publication and added a PDF download option. Again this raised a few eye brows, but now 12 months later we are still in production, our circulation is growing with at least one issue looking like it might go through the 10,000 download barrier.

This is all down to those of you who like what we are doing and have supported us with your contributions.
We are finishing 2014 with the largest issue we have ever produced, our Christmas and New Year present to all our readers and contributors, throughout the world.
Thank you for your support, CQ-DATV is now the world's favourite ATV magazine

It is time to plan what we are going to do in 2015. We are going to continue producing CQ-DATV as a monthly magazine, in both eBook and PDF formats.
We have introduced the CQ-DATV award which will be presented every year to the contributor submitting the best article during the last 12 months.

The very first every recipient is Fabrizio Bianchi IW5BDJ who has taken ATV construction to a new height, he was closely followed by runner up John Hudson GB3RFL, who designed and built GB3FY, the first ever ATV repeater to use a YIG in the transmitter. John has continued his work with power meters aerial rotators and dummy loads which we hope has put home construction back on the statute books.

John was closely followed Mike Stevens G7GTN and his series of, on screen display projects.

It was a difficult decision to make, but I think Fabrizio bowled everybody over with his cross band ATV repeater, his Evanescent Filters and in this issue his 1200 MHz power Amplifier for the DigLite Project.
Fabrizio has let everyone know that ATV is alive and well in Italy

For any ATV magazine to survive it needs two things, support and input from its readers, who produce the articles that we hope you enjoy reading, and a dedicated team to edit and produce the magazine. Here at CQ-DATV we have both and this should enable us to build on what we have for 2015. At the time of going to press we have had in excess of 17,000 downloads for the 6 2013 issues and 37,000 for 11 of the 2014 issues.

Please enjoy CQ-DATV 18, please keep the emails coming to editor@cq-datv.mobi, we value your input.

Can we now, on behalf of everyone who has worked on CQ-DATV and taken it from a standing start to where it is today, wish you all a Merry Christmas and a Happy New year.

Production Team

- *Ian Pawson - G8IQU*
- *Trevor Brown - G8CJS*
- *Terry Mowles - VK5TM*

Corrections to DATVTalk11

Following reader feedback, the following corrections apply to the DATV talk 11 article in issue 17.

ITU-T_J.83B Bandwidth

The ITU-T_J.83B standard defines the RF bandwidth as 6 MHz wide "channels". In a manner similar to DVB-S protocol, the RF bandwidth of an ITU-T_J.83B transmission is defined by its Symbol Rate (SR). That is:

RFbw = SR x 1.18 (roll-off factor)

So if we have a 6 MHz bandwidth, the Symbol Rate should be approximately:

SR = 6.0 MHz / 1.18 = 5.057 MSymb/s

The "gross data-rate" (that is: with protocol overhead) at this SR would then be ~30.3 Mbps. This is enough to carry a HD signal using MPEG-4 encoding with a "payload" data-rate of about 20 Mbits/sec. Ron W6RZ pointed out to me that: "At the 26.97 Mbps TS rate, you could easily have a 26 Mbps video stream (or two HD programs at around 13 Mbps each)".

Acknowledgement

I want to thank Ron, W6RZ, for providing the mathematical answers to my estimates and providing obscure ITU-T_J.83B protocol specification details for this article.

Ken W6HHC

DATVtalk12 - Using ODROID with DATV-Express board

by Ken Konechy W6HHC

Reproduced from the Orange County Amateur Radio Club newsletter. www.W6ZE.org

[Please Note - This is the twelfth article in a series of DATVtalk articles to introduce Digital-ATV to hams and to explain various aspects of this new area of ham radio. In the CQ-DATV5 issue, the DATVtalk02 article was an introduction article about basic Digital-ATV.]

In DATVtalk01, I discussed how to use the DATV-Express exciter board with an Intel based Linux PC. In this follow-up article, I will discuss the next stage of the project, which is replacing the PC with a small, more portable, low powered ARM-based board. In particular, I will concentrate on the ODROID model U3 platform.

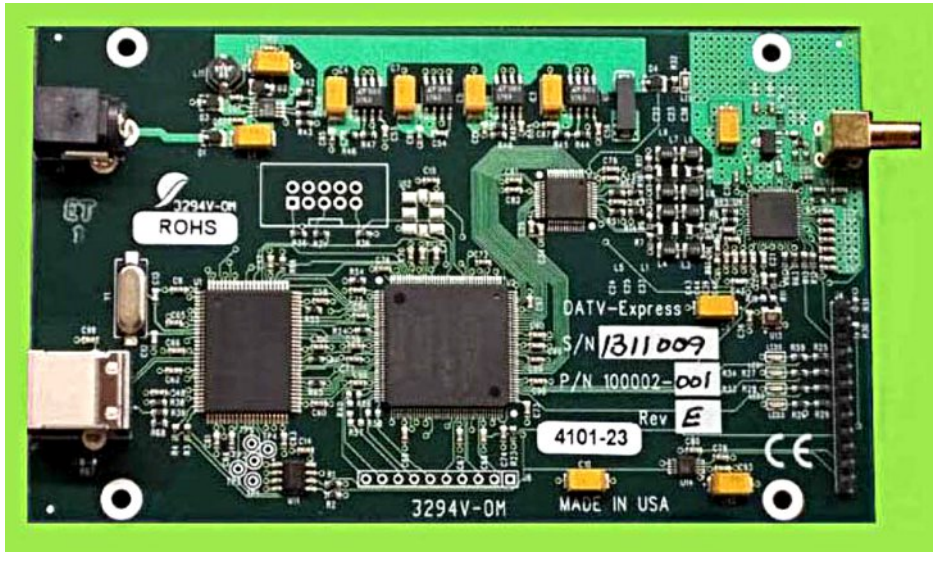


Figure 1 - Production DATV-Express hardware board for Digital-ATV

After the main Linux DATV-Express software was released earlier this year, the project team looked at the possibility using the following "micro-PC-s" to drive the DATV-Express hardware board:

- *Raspberry Pi (single-core-ARM based)*
- *RikoMagic MK802iv (quad-core-ARM based)*
- *HardKernel ODROID U3 (quad-core-ARM)*

ODROID Model U3

The Raspberry Pi and the MK802iv units that were tested with the DATV-Express hardware board and software - each had problems with our project. The single-core-ARM Raspberry Pi, running at 700 MHz, was underpowered for our particular use. Both the Raspberry Pi and the MK802iv had issues with the completeness of their software repositories' that prevented easily recompiling their linux kernel software. The small ODROID U3 (see Fig03), quad-core-ARM CPU running at 1.7 GHz, was tested and proven to be suitable for meeting our DVB-S goals.

Fig02 (next page) illustrates a typical transmitter set-up for using the ODROID U3 to drive the DATV-Express board in a typical DVB-S operation. This approach uses a USB2-based

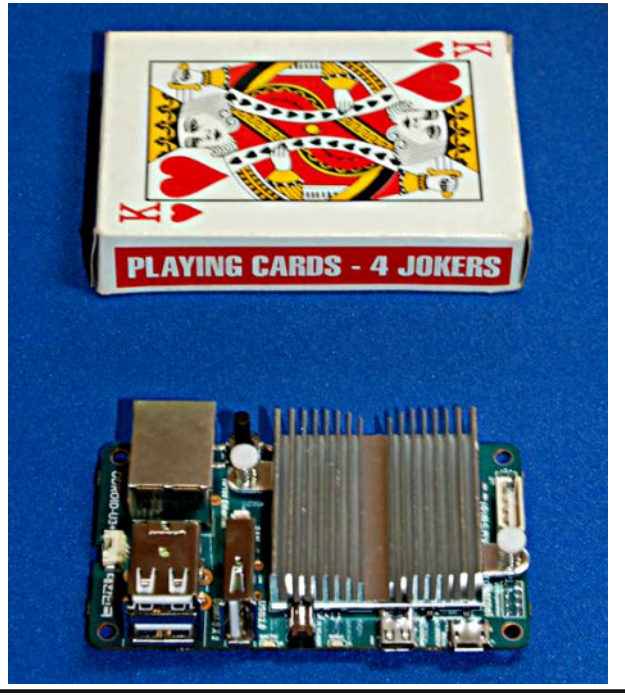


Figure 3 - Size of quadcore-ARM ODROID-U3 board is about the same size as Raspberry Pi

Hauppauge model HVR-1900 (PAL) or the HVR-1950 (NTSC) to perform video capture and MPEG-2 encoding. The MPEG-2 video and audio elementary streams are sent by a USB2 interface to the ODROID for processing into a Transport Stream (TS).

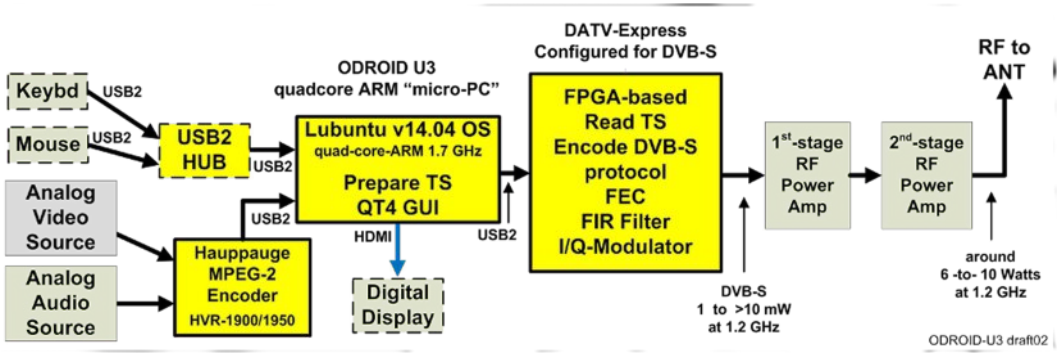


Figure 2 - Typical Block Diagram of ODROID DVB-S transmitter using DATV-Express

The first step that project-member Charles G4GUO took to get ready for allowing the software program to work with the "micro-PC" ARM computers was to move the DVB-S protocol processing into the FPGA coding, in order to off-load the processing on the ODROID. The quad-core-ARM is not as powerful as an equivalent Intel quad-core i5 or i7 CPU. The ODROID U3 runs with a light-weight version of Ubuntu 14.04 LTS operating system that is called Lubuntu 14.04 LTS. Lubuntu uses a small desk-top-environment called LXDE. It is recommended that the image of the Lubuntu 14.04 LTS OS be placed on a micro-SDI memory chip, not the available eMMc memory module.

You either need to: (a) purchase a micro-SD from HardKernel with the OS installed or (b) just purchase a "class 10 speed" 8 GB (or larger) micro-SD chip from your local computer store, down load the OS image from HardKernel (no cost) and burn the OS image onto the micro-SDI chip. Plug the micro-SD memory chip into the slot shown in Fig05.

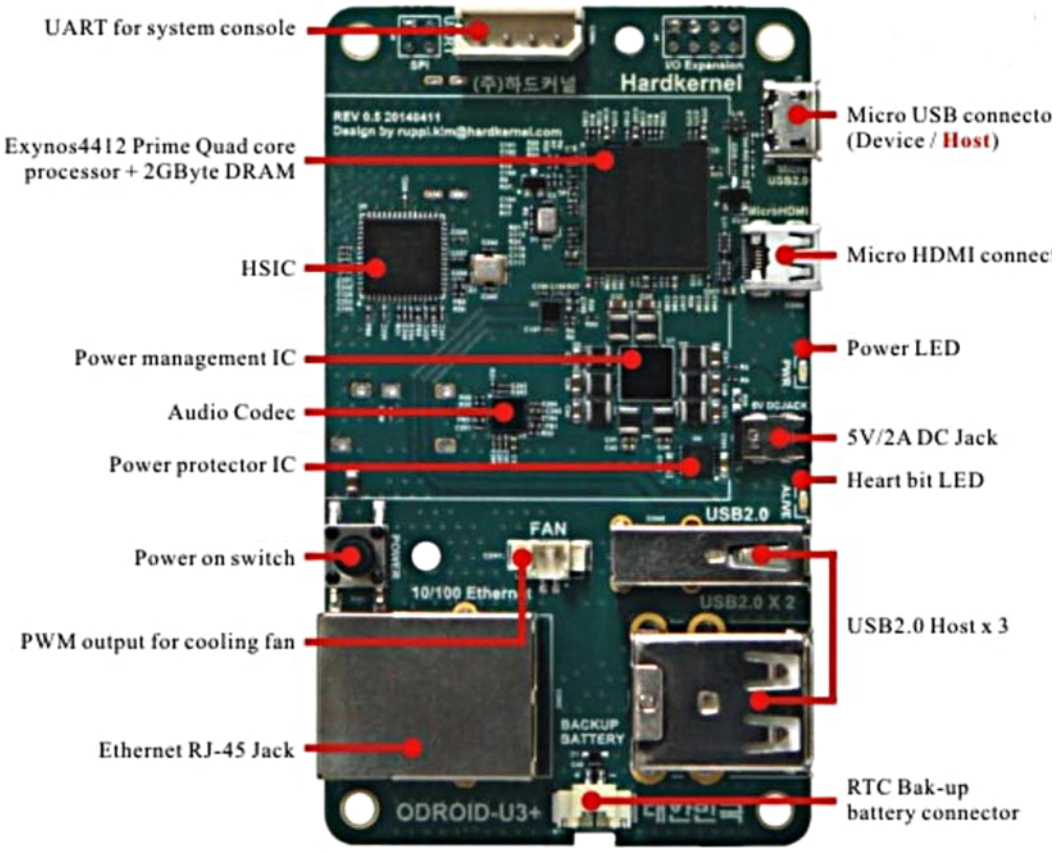


Figure 4 - The top side of the ODROID U3 board. The Heatsink on top of the Exynos Quad-Core CPU is not shown. Three USB2 connectors shown on right side, near bottom.

Running ODROID with DATV-Express

The first steps to operate the ODROID are to attach the WiFI or Ethernet connection for the ODROID, leave off the hardware board & Hauppauge cables, connect the micro-HDMI-adapter-cable to a display and connect the power-adapter (wall-wart) to the ODROID to power-up. You should see the ODROID boot-up on the display (with a blinking blue LED on the ODROID board). At this point it is necessary to enable the WiFi or Ethernet connection to internet.

More detailed instructions will be available in the DATV-Express User Guide for ODROID (coming soon to the www.DATV-Express web site).

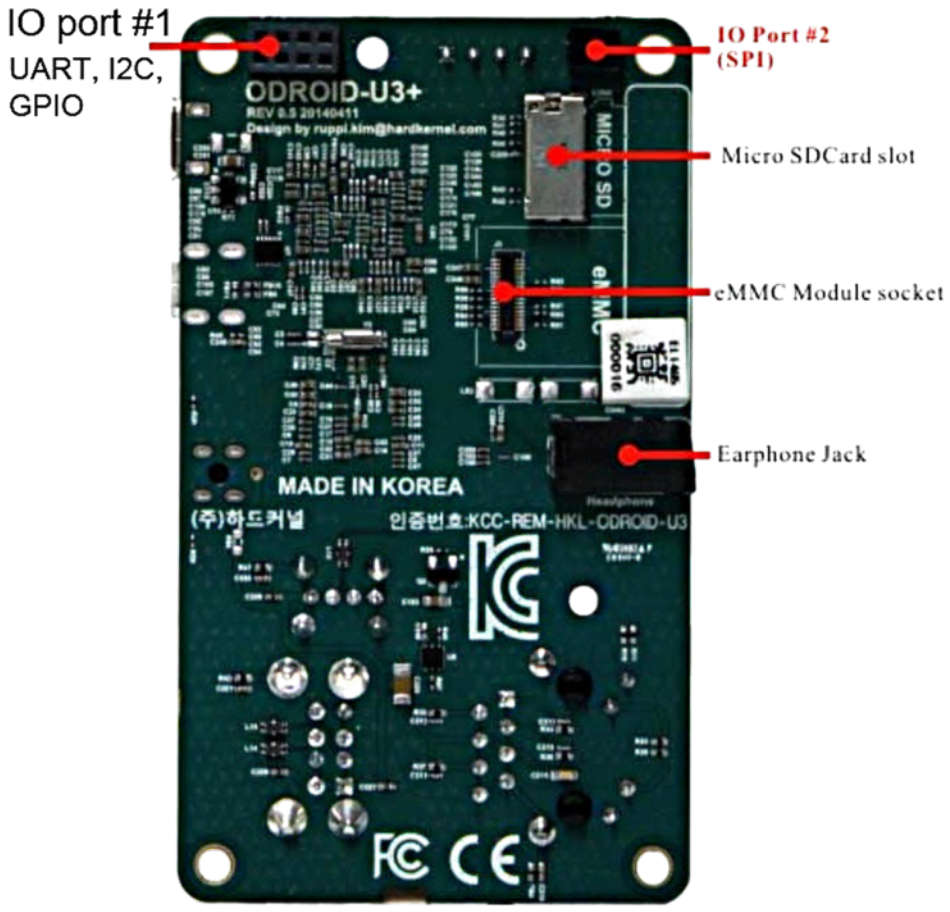


Figure 5 - The bottom side of ODROID U3. The micro-SD memory slot is shown on right side near the top

Place the correct DATV-Express .deb file (for ARMhf) on the ODROID desktop and double-click the file to install the DATV-Express software. You will need to modify one system file for access rights for USB (same as PC versions) and then you can remove the internet connection and attach the hardware board and Hauppauge video-capture unit.

Testing DATV-Express with ODROID

The DATV-Express software binary can be launched from the System Menu in the lower left-hand corner of the Lubuntu desktop. As shown in Fig06, the DATV-Express application is listed in the SOUND & VIDEO area in the system menu. Just click on it and it launches the app. The DATV-Express graphic user interface (GUI) looks essentially the same (see Fig07) as the GUI that displays on the Ubuntu PC installations. The set-up and configuration is also essentially the same - except most operating will use EXPRESS-AUTO mode (in HW Tab) to offload processing from the ODROID for DVB-S operations.

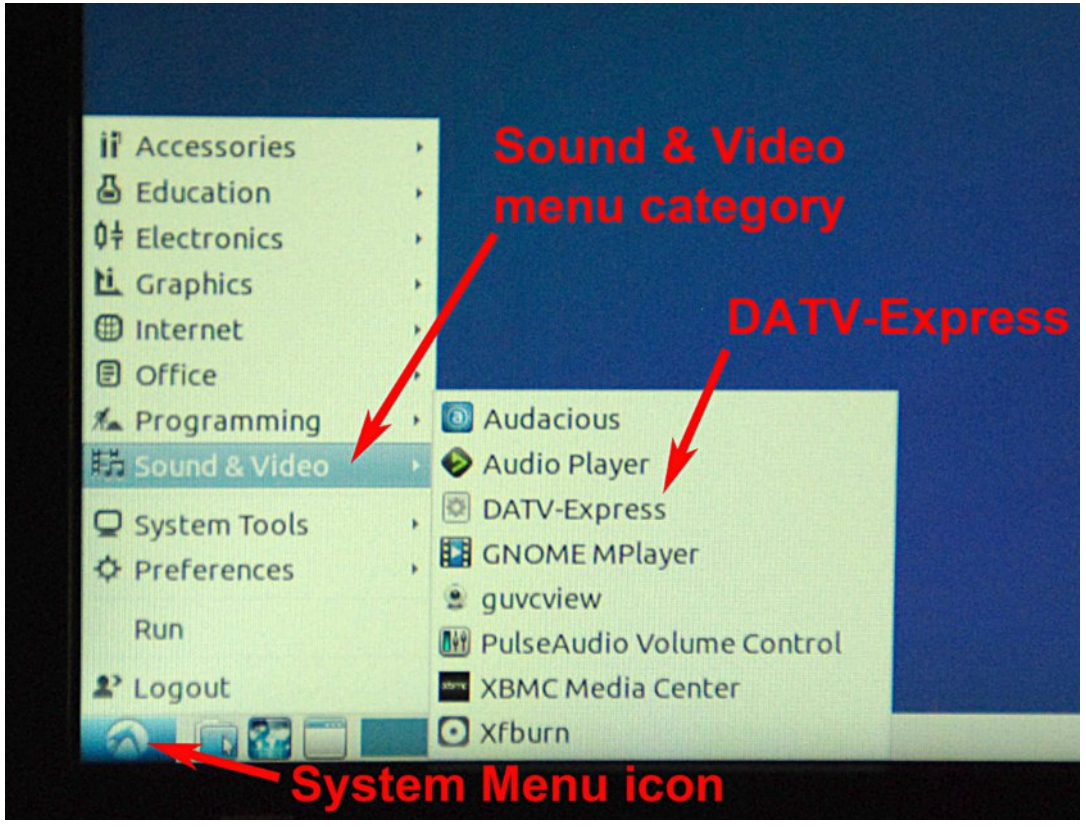


Figure 6 - The DATV-Express application can be launched from the System Menu of the Lubuntu Desktop

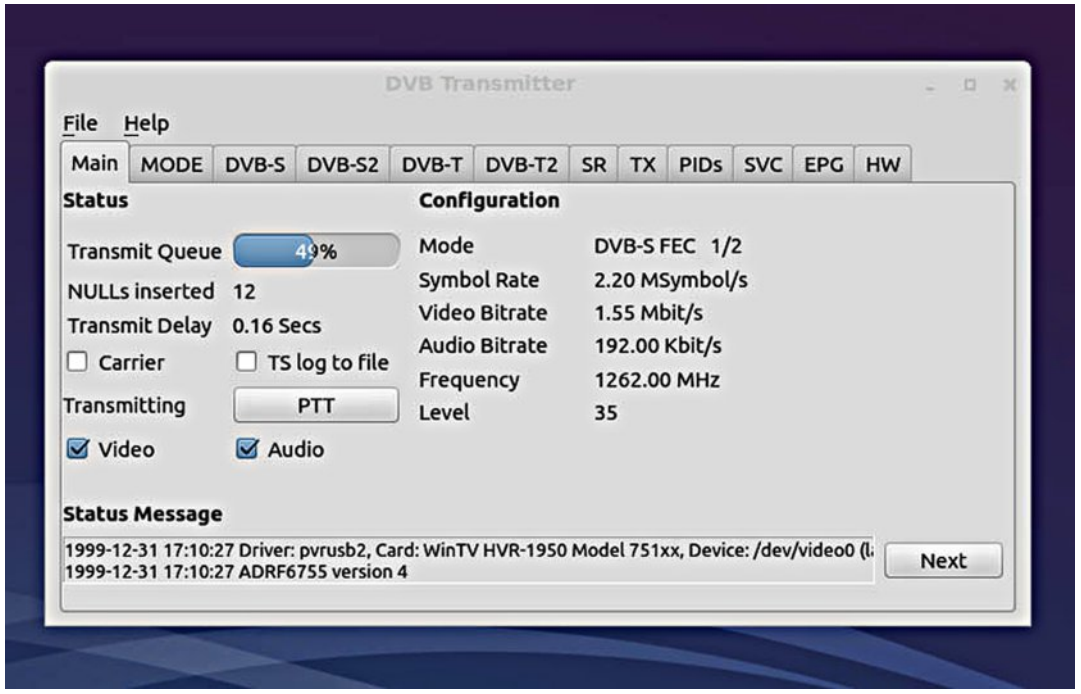


Figure 7 - The DATV-Express GUI for ODROID looks essentially the same as when installed on Ubuntu on a PC

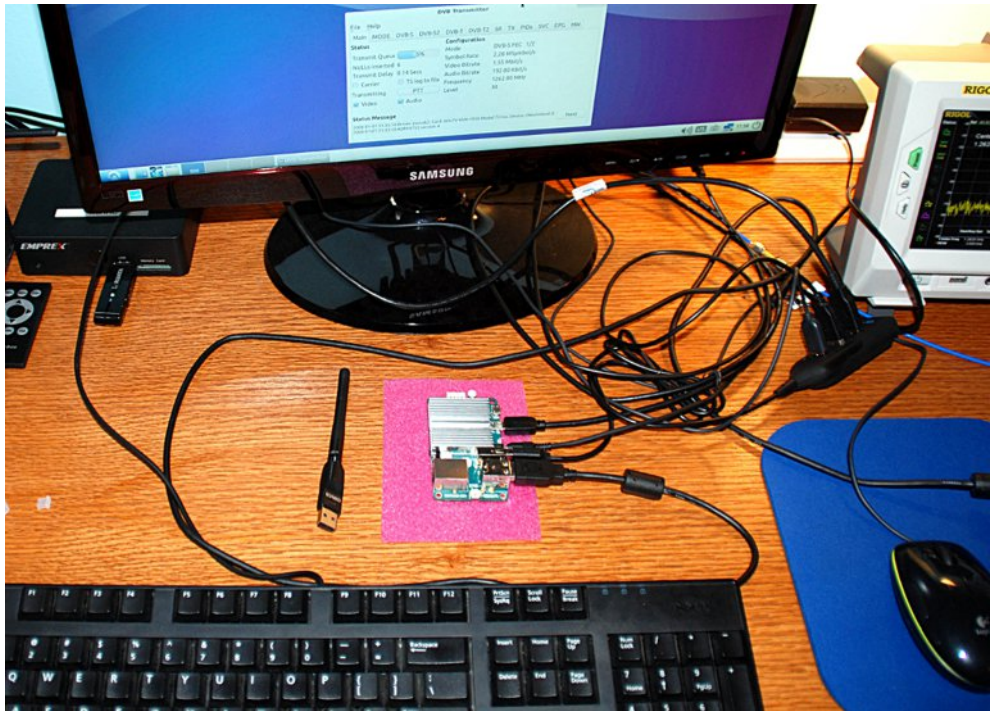


Figure 8 - Set-up to use ODROID U3 to test with DATV-Express board at QTH of W6HHC

Fig08 shows the ODROID set-up to operate and drive the DATV-Express board (not shown - off to the right). A non-powered USB-hub can be seen to the right of ODROID for connecting a mouse and keyboard. The Cisco USB WiFi unit, purchased from HardKernel, can be seen lying unconnected on the desk to the left of ODROID.

Fig09 (next page) shows the normal DVB-S "haystack" during "barefoot" testing as displayed on a Spec-trum Analyzer. This test was operated on 1262 MHz with a 3 MHz bandwidth (BWallocation) using 2.2 MSymb/sec Symbol Rate (SR).

The RF coming from the DATV-Express hardware board driven by the ODROID should not be any different than when the board is being operated with a full-size PC. To confirm this, I hooked up a model MKU-P1301A first-stage RF Power Amp made by Kuhne (in Germany). This RF amp is rated at 1 W (FM) and is the same amplifier that I used to bench test the DATV-Express board driven by a PC. As expected, Fig10 shows that same reasonably shaped DVB-S "haystack" that was also produced when testing with Ubuntu on a PC.

The average output power measured in Fig10 was about 40 mW - enough to easily drive my DownEast second-stage RF PA (30 W FM) on the 1.2 GHz to about 6-to-8 W average power out.

The DATV-Express board was originally designed to just run DVB-S protocol. But, the project team is always curious if it can also run DVB-T. One of the first tests I ran on the ODROID U3 was to try the new 1 MHz bandwidth mode for DVB-T that was added in the v2.03 release of software.

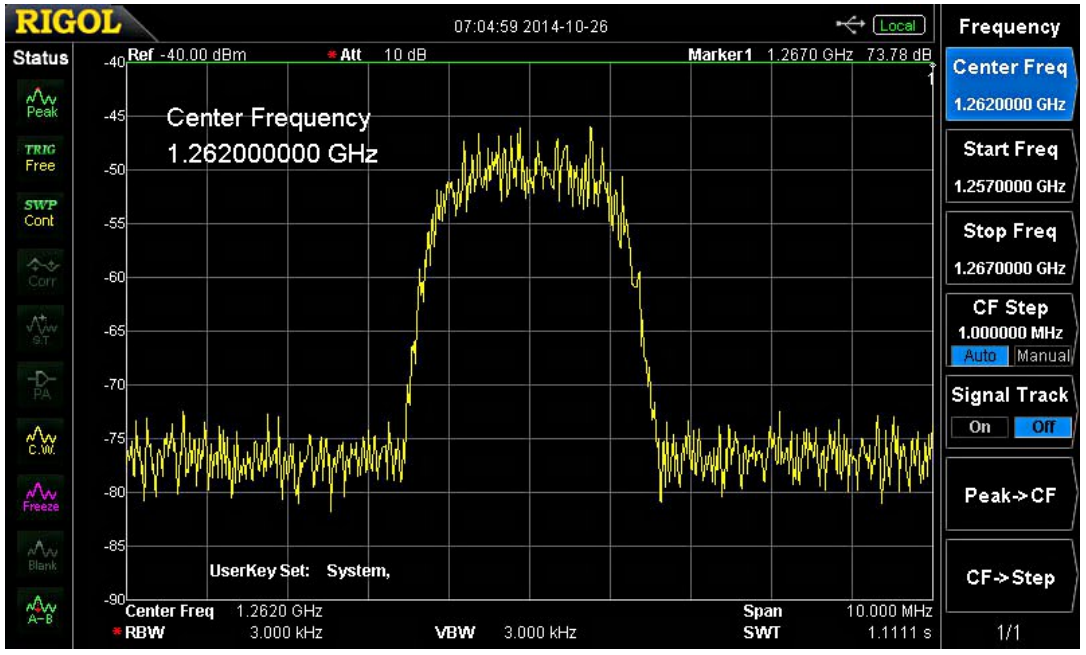


Figure 9 - Spectrum Analyzer display of "Barefoot" testing of DATV-Express exciter board using DVB-S on 1.2 GHz band.

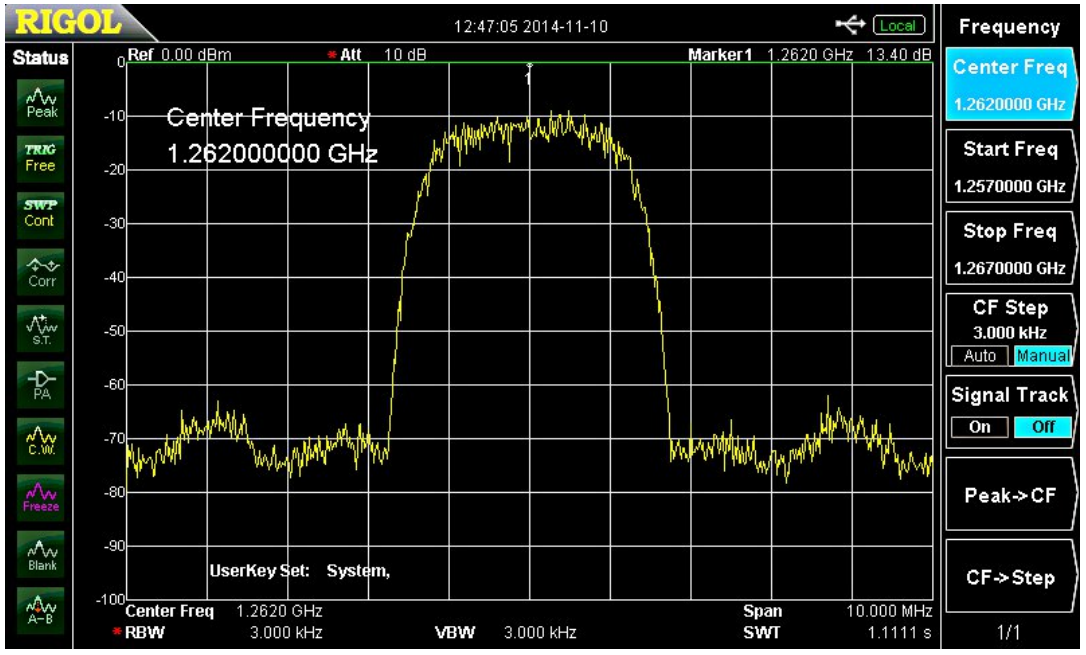


Figure 10 - Spectrum Analyzer display of DATV-Express driving a Kuhne 1.2 GHz RF Power Amp rated at 1W (FM)

Fig11 was taken using QPSK modulation and FEC=1/2. I do NOT have a DVB-T receiver, so I can not view the video quality. With that modulation and FEC setting, the GUI reported the video data rate at about 0.3 Mbps, which would only support a slow video display frame-rate. If I change the FEC setting to 7/8, then the GUI reports the video data-bit-rate increased to about 0.7 Mbps. Of course, the modulation for the 1 MHz bandwidth mode could be changed to use QAM-16 in order to support a higher video data-rate (although with some loss of signal robustness introduced by the increased-modulation-complexity). I also tested DVB-T with QPSK in the 2 MHz BW mode.

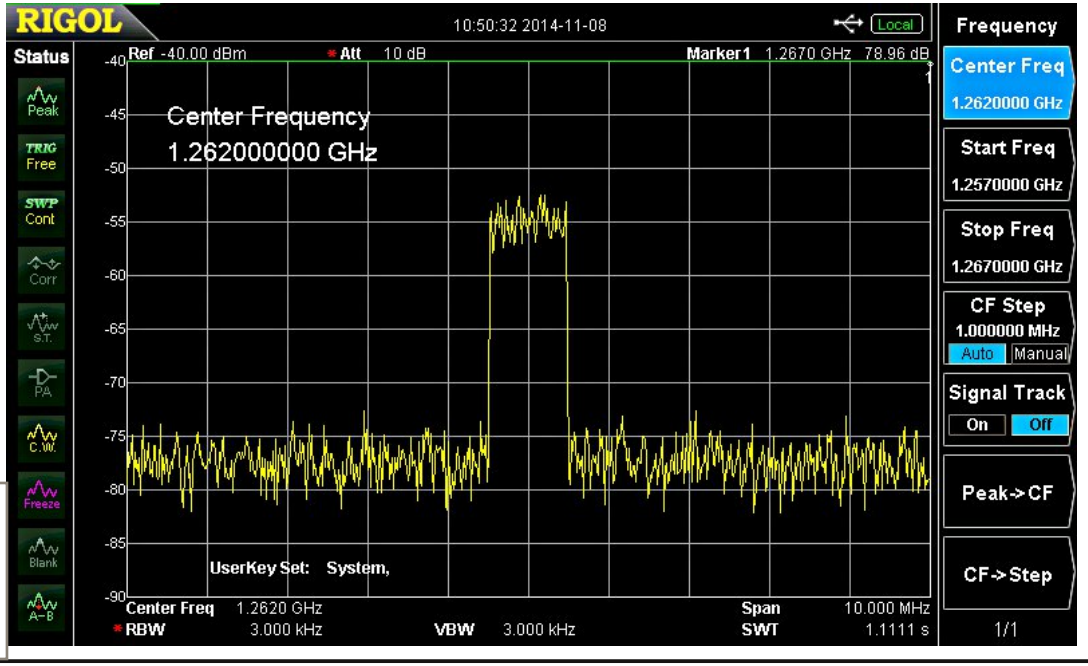


Figure 11 - right - Spectrum Analyzer of the ODROID driving the Hardware Board in the 1 MHz BW mode with DVB-T protocol. The SA display span is 10 MHz.

Using an alpha-test build of the software, one of the four ODROID CPUs was NOT able to keep up with the required processing load for the 2 MHz BW testing. Charles G4GUO suspects that further DVB-T load-reduction improvements could possibly be done by rewriting parts of the software in assembly language (but, will not occur soon).

Release of ODROID SW for DATV-Express

The project team plan for ODROID release is to:

1. *need to complete the test of the resulting v2.03 in-stallation on ODROID-U3 to make sure that all fea-tures work well.*
2. *A stand-alone ODROID-version of the USER GUIDE needs to be prepared (many Lubuntu screens look different)*

My current expectation is that these tasks will all be completed, released, and available on the DATV-Express web site by the end of November.

Possible Future Roadmap with ODROID

The DATV-Express project team recognizes that currently, the Hauppauge approach for video-capture creates two large problems for our project:

(1) The timing on the Hauppauge PCR with a linux driver seems to be very jittery. G4GUO has retimed the PCR and re-stamped the packets, but not perfectly.

(2) Hauppauge has come out with two new HVR models; HVR-1905 (PAL) and HVR-1955 (NTSC) but have not yet come out with the Linux drivers - creating a DATV-Express problem for buyers of those new models.

Alex OZ9AEC has been experimenting with a Logitech web camera, that outputs the video stream with H264 (aka MPEG-4) encoding. The Logitech model C920 web camera is small and even has mounting for a tripod.

The only issue with this nice and affordable web camera is that the audio has not been encoded by MPEG-4. My personal suspicion is that Logitech may be attempting to avoid paying a license fee for AC3 (a licensed CODEC by Dolby), the normal audio for H.264. So one approach could be to encode the C920 camera audio processing via a CPU CODEC for MPEG-4 or MPEG-2 on the ODROID.

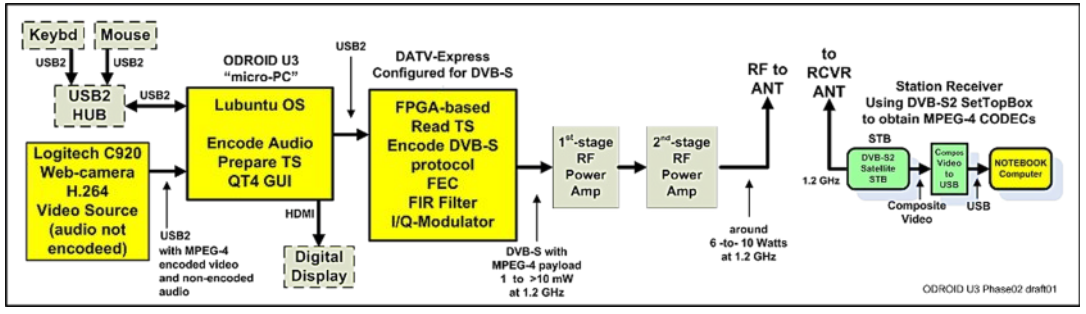


Figure 12 - Possible "concept" Block Diagram of ODROID DVB-S transmitter using C920 Web camera that outputs H.264 encoded video stream

Fig 12 is a concept block diagram of ODROID U3 using the Logitech C920 web camera to transmit H.264 video with DVB-S DATV protocol. The receiver is required to be a DVB-S2 STB receiver or DVB-S2 USB-dongle-receiver that is also capable of receiving legacy DVB-S protocols. Note that this is not a normal commercial protocol. Also note that Logitech does not supply linux drivers â€¦but do support the UVC standards supporting cameras in linux distributions. So there may be an issue with the Lubuntu distribution? But, the project team thinks this might work for DATV?? The team plans to take some time to investigate and sort out these potential C920 issues.

Conclusion

The ODROID U3 "micro-PC" works very well with the DATV-Express DATV exciter board, especially for the DVB-S protocol. It makes the use of a DATV-Express transmitting station more portable by eliminating a large PC or a bulky notebook computer. The ODROID U3 is fairly affordably priced at US$65 (70 Euro) plus plastic-case, 5V/2A power adapter (wall-wart) and shipping.

Contact Info

The author may be contacted at W6HHC@ARRL.net

Useful URLs

ATCO - Amateur Television of Central Ohio - see www.ATCO.tv

British ATV Club - Digital Forum - see www.BATC.org.UK/forum/

CQ-DATV online (free monthly) e-magazine - see www.CQ-DATV.mobi

DATV-Express Project for Digital-ATV (User Guide and downloads) - see www.DATV-Express.com

HardKernel web site for ODROID U3 - see www.hardkernel.com/

HardKernel USA Sales for faster shipping - see www.ameridroid.com

OZ9AEC discussions on using Logitech model C920 web camera - see www.OZ9AEC.net/index.php/gstreamer/473-using-the-logitech-c920-webcam-with-gstreamer

Orange County ARC entire series of newsletter DATV articles and DATV presentations - see www.W6ZE.org/DATV/

Yahoo Group for Digital ATV - see groups.yahoo.com/group/DigitalATV/

Mini Power Amplifier 1200 Mhz for Diglite Project

By Fabrizio Bianchi IW5BDJ

The Digilite ATV transmitter has an output of 0 dB at 1200 MHz, a power too low to be sent to the antenna.

With 3-4 mW power and a Mitsubishi M 67715 module, you can get an output of 2 watts.

In DATV-S, you must never reach the maximum power of the device, so with 0 dB of Digilite, you will get 1 watt of output from the module , excellent power for the first experiments on digital DATV.

If we want to drive other modules we have to do mini power amplifiers.

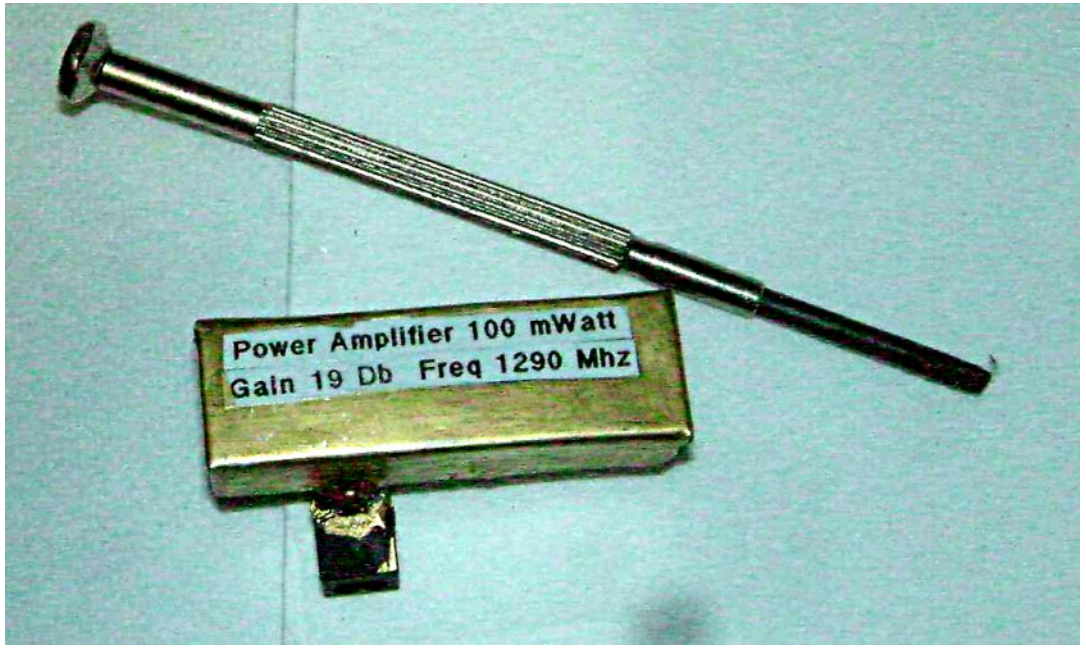


Fig1 The 100 mW amplifer

For the RA18H1213Gi module, we need 80-100 mW input, and 300-400 mW for the M57762 module.

This is an amplifier gain of about 19 dB.

We need to adjust the Input to the RH18H1213 Module with an attenuator to bring out a maximum power of 12 watts to avoid digital signal compression.

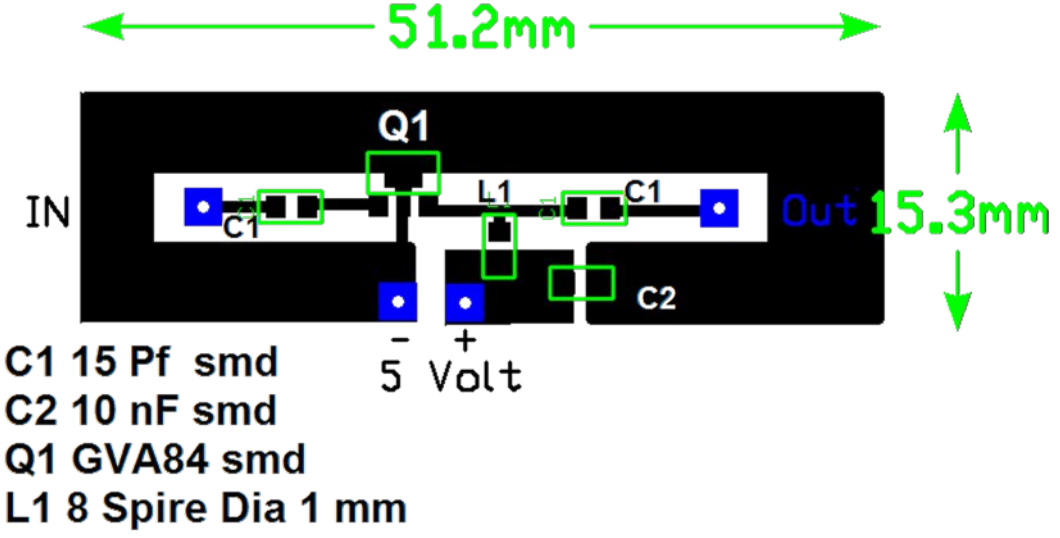


Fig 2 The PCB and component layout of 100 mW amp

The second amplifier uses a GVA84 MMIC amplifier and a BFG135 transistor powered by 12 volts.

The amplifier gain is about 26 dB and when fed by the Digilte, we will have about 400 mW, suitable for the Mitsubishi M57762 module.

Even in this system we will not let the power from the M57762 module be more than 12 Watt to avoid digital signal compression. This can be adjusted with a suitable attenuator at the input to the module.

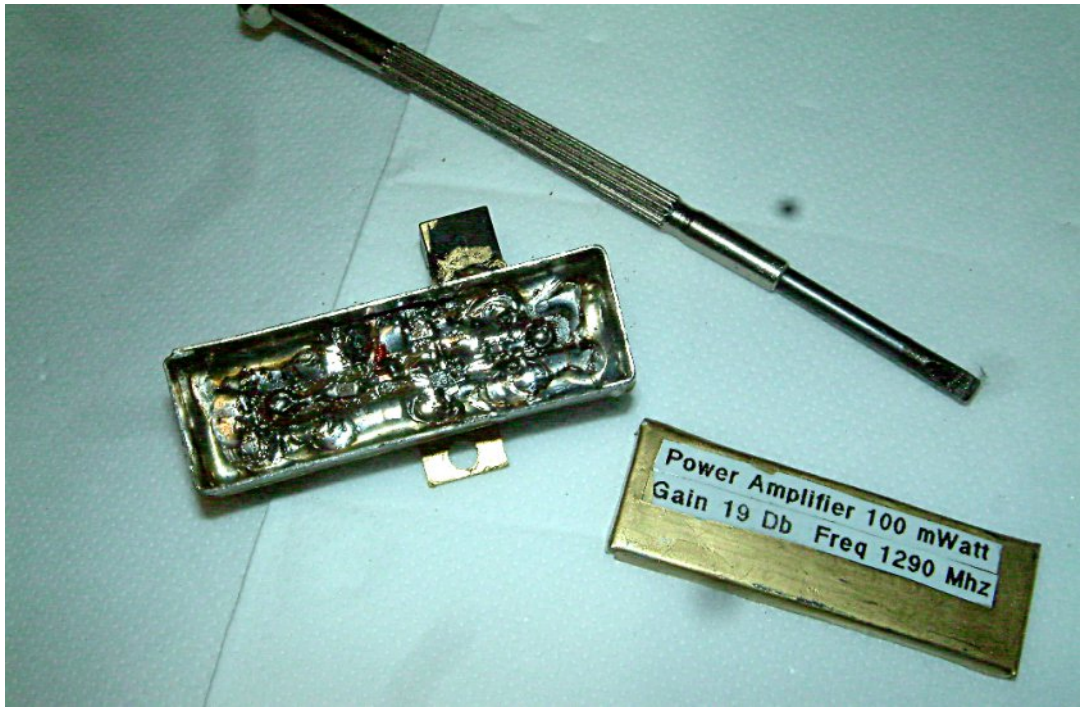


Fig 3 Inside view of the 100 mW amp

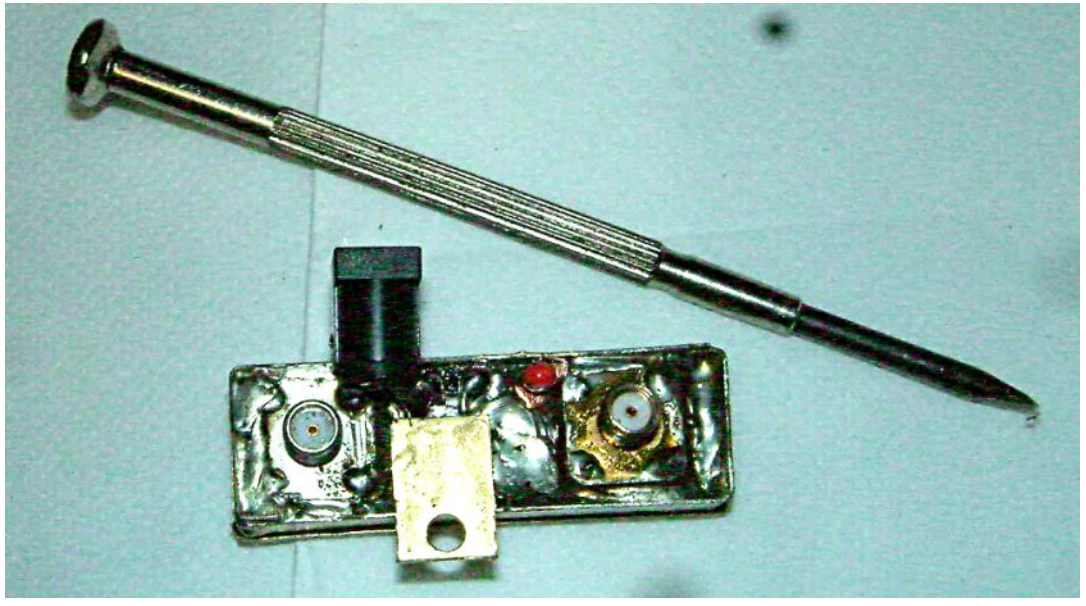


Fig 4 Bottom of the amplifier and 5 volt regulator

Fig 5 The 400 mW amplifier

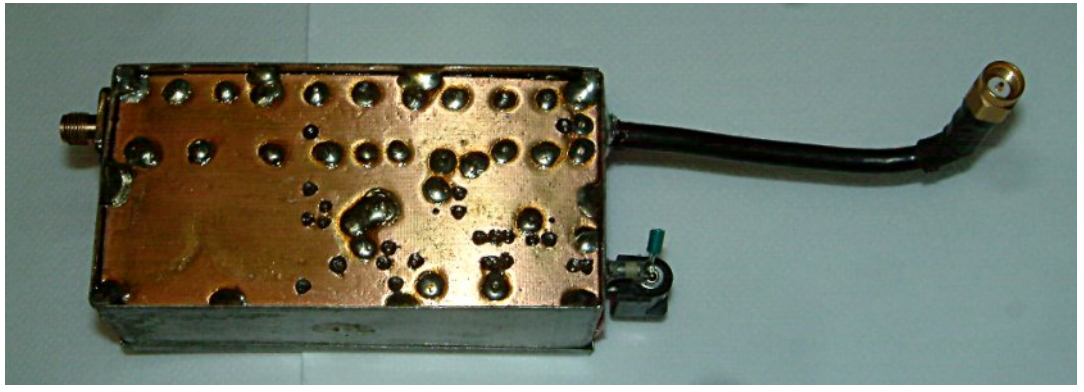
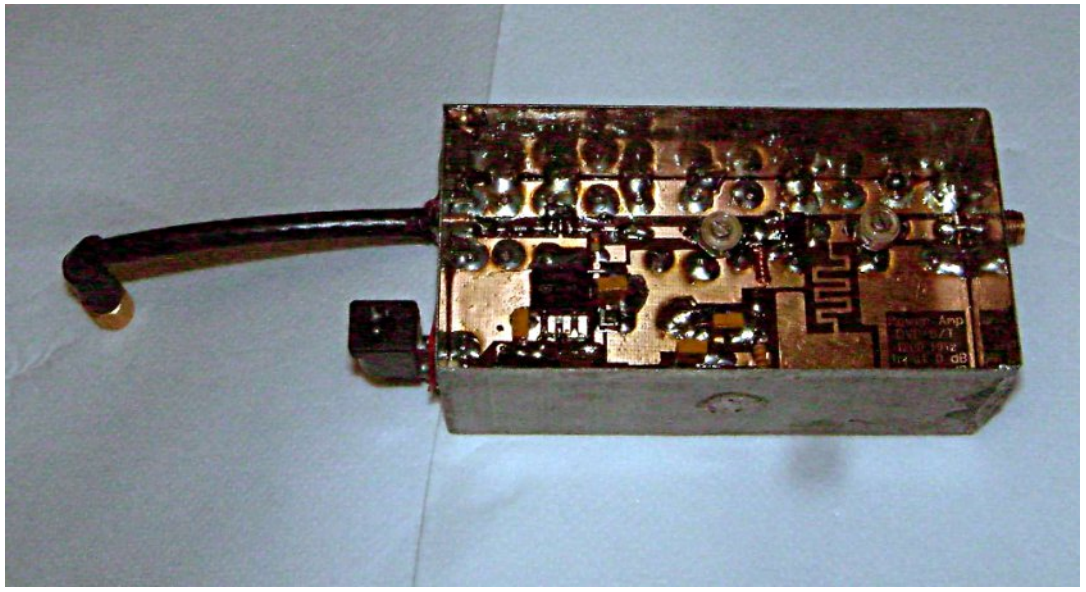
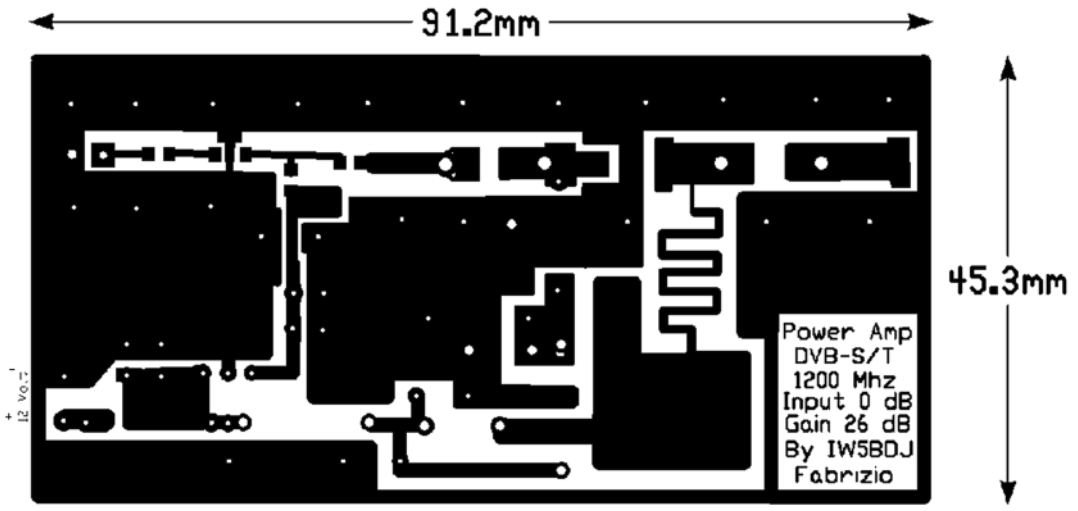


Fig 6 The bottom of the amplifier

The construction of the two amplifiers is made of double-sided FR4 epoxy glass 1.6mm

With the two amplifiers can be retrieved the final power of the old Analog system and use them for the new Digital TV with good results.





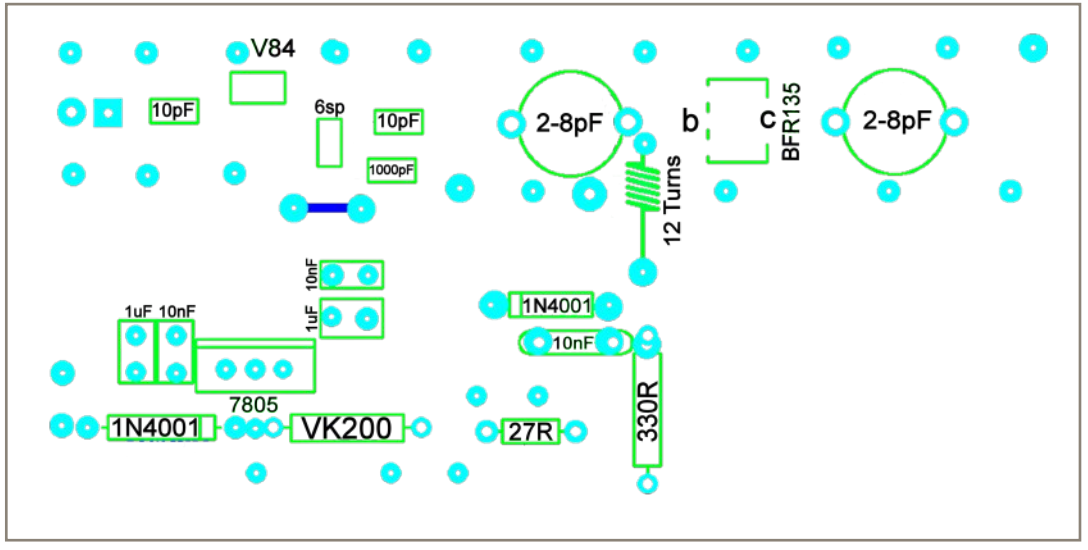


Fig 7 View of the inside, PCB Layout and component position.

New 70cm-DVB-T-TX at ATV repeater DB0QI in Munich

Thomas Altinger, DL1MFK

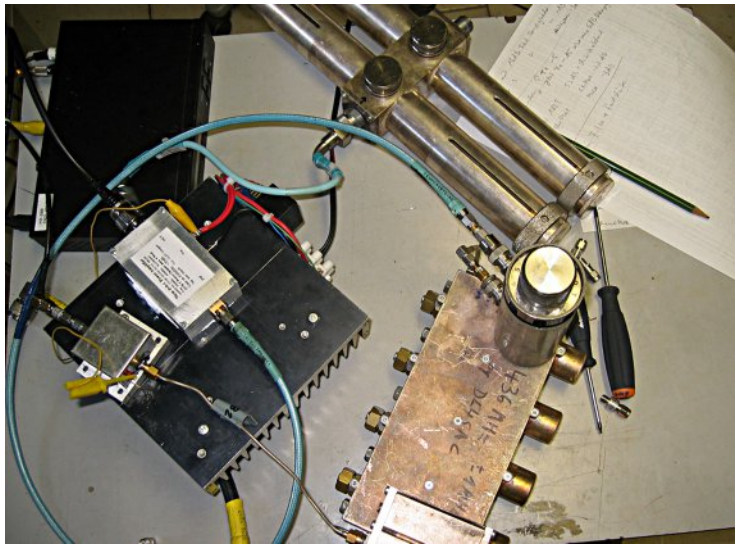
Translation from TV-Amateur 174 by Klaus, DL4KCK
www.agaf.de

Preface:

In 1987 the first ATV repeater in Munich was built by DH4ATV, and in 1993 DK8CD helped him to construct DB0QI on the Siemens building. From that time on a live ATV bulletin got distributed weekly from the private ham TV studio DL0BS to DB0QI, and several other ATV repeaters located in Augsburg, on Tegelberg (Bavarian Alps), at Lake Constance, in Ingolstadt, Nuremberg and in Salzburg (Austria) took over the 23cm FM-ATV signal from DB0QI. Up to 97 stations were able to receive the broadcast. In 1990 the local club "ATV working group Munic" was founded, the about 30 members have been preparing and distributing the weekly "ATV magazine" via DB0QI on 23cm digital and analogue as well as via web since 2004. From 2007 on a new modular repeater design was developed by DL1MFK, DJ7DA and DH1MMT and replaced the older ATV repeater. A prime target was to enable remote control of most functions via DTMF, Packet Radio and D-Star for users.
Klaus, DL4KCK

Previous history

Since some years already there has been a wish for a narrow band digital TV output on 70cm, but still no technical solution in sight. In early 2014 an official letter told us to switch off both ATV outputs on 23cm immediately because of interference to the Galileo navigation system control center near Munich! With that navigation system Europe wants to be independent from GPS. Now the only alternative besides 10 GHz analogue was to run with a new TX using COFDM modulation (similar to DVB-T standard) but 2 MHz bandwidth on 70cm. Application and approval followed soon, and Darko OE7DBH



lend us a DVB-T-TX made by HiDes together with PA for testing. Disillusion was heavy because no other 70cm control inputs were suddenly usable any more...

After some thought we added a steep filter in front of the aerial connection, and we found out that the DVB-T "shoulders" had too much energy on the control input frequency. So different filtering at the DATV TX and the NBFM RX side improved signal sensivity. Astonishing big and heavy cavity resonators did their duty. The resulting TX power was only about 1 Watt HF, and some stations were able to receive the test signal - so it should be possible to replace the lost 23cm output.

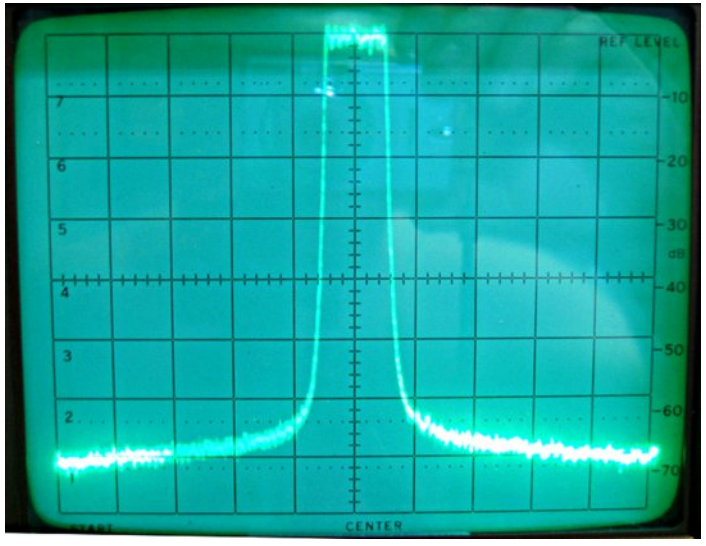
Just by the beginning of the HAMRADIO 2014 fair in Friedrichshafen the new TX from HiDes arrived and advance was givven to my laboratory bench. At DB0QI we are using a 2 MHz wide COFDM signal at a center frequency of 436 MHz with 1705 carriers, each one modulated with 16QAM. Informations are coded in phase, amplitude and frequency with 8 bits and FEC. Looking at the DVB-T signal on a spectral analyzer you can see the peak at -17 dBm - measuring the same signal with a power meter, one detector head is showing -3 dBm, another one -1,8 dBm??? Perfect

power metering is done with so called "channel power measuring", accounting the crest factor of brick wall shaped COFDM signals. This way the proper power value is -2,2 dBm.

Output power of this DVB-T TX is adjusted in software by changing an attenuation factor in dB, with -5 dB you are getting around 0 dBm or 1 mW. Using -15 dB results in a very clean signal with -60 dBc shoulders at the TX output. This high value means enough quality for more amplifying.

PA problem

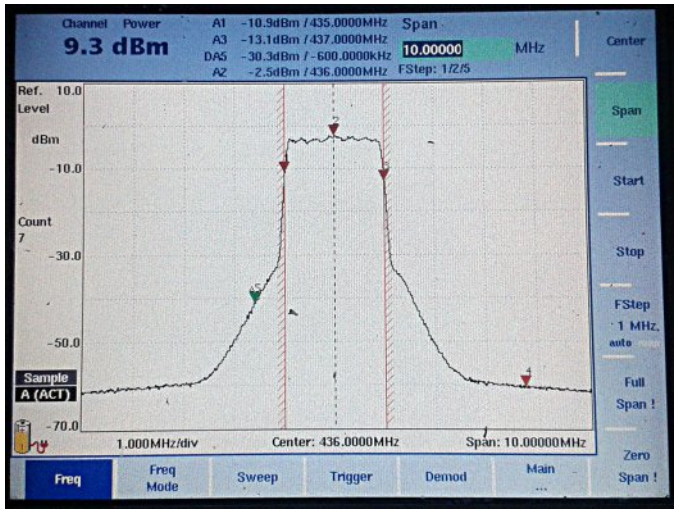
Preceding tests showed that with rising saturation degree the shoulders behind the power amplifier are rising too. At 35,7 dBm output power there are -30 dBc shoulders, but with good filtering the repeater control QRG on 70cm is usable anyhow.



On the bench a power splitter is put between meter and aerial along with a 20 dB attenuator, all in all 26,4 dB. Output power was 3,7 W, and I tried to achieve a better shoulder span by inserting a small 0,5 W amplifier and different filters before the PA - in vain. In the end I holded on with the narrow filter between PA and aerial and less than 4 W output.

By the way - I was wondering about the input problems of my Anritsu spectral analyzer. A bit too much power there gave a very odd shoulder reference...

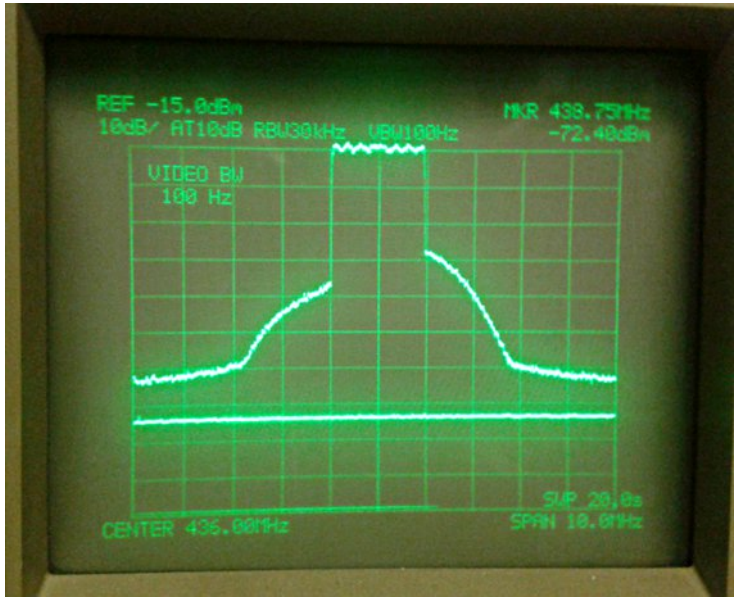
Future thoughts



I do not like the present configuration, this PA is saturated with 3 W output already. Perhaps other PAs are able to produce 5 W output with -60 dBc shoulders. The downside is - to get only 3 W out, it needs 4A at 12 V. 48 W input against 3 W output, the energy efficiency is not very bright...

Tomtoms homepage: www.dl1mfk.de

ATV repeater homepage: www.db0qi.de



Turn your Raspberry Pi into a live HDTV transmitter

Alexandru Csete OZ9AEC

Reproduced from the OZ9AEC web site

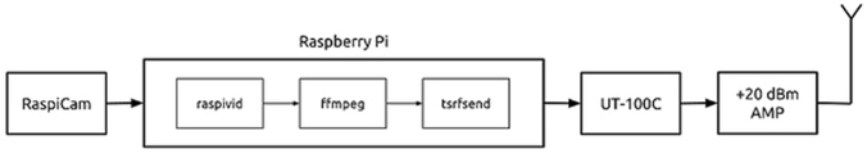
Note: *Clicking on the blue text will take you to the internet links, provided your device is connected to the internet.*

In a previous post I wrote about using the UT-100C DVB-T modulator on linux and I promised to follow up how to use the modulator with live video sources. In this post I am going to describe how to setup the modulator on a Raspiberry Pi equipped with a RaspiCam camera module, effectively turning the Pi into a live HDTV transmitter.

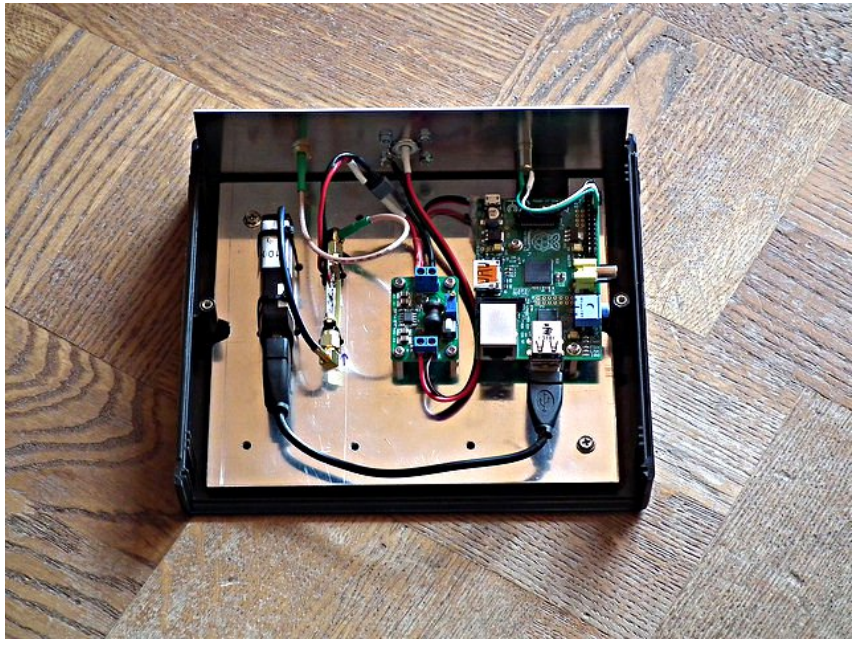
The setup can be made small enough to be carried by a medium size drone and the range can be increased using power amplifiers. If you do that be sure to comply with the radio regulations applicable in your country. In particular, transmitting with significant power in the UHF TV bands will most likely get you into trouble. Your best bet is to get a ham radio license and use the 23 cm band.

The setup I am using performs the following tasks:

- *Capture H.264-encoded video from the camera using the raspivid application.*
- *Convert the H.264 bitstream to constant bitrate and DVB compliant MPEG-TS stream using ffmpeg 2.2.2.*
- *Send the MPEG-TS stream to the UT-100C modulator using tsrfsend application.*
- *In my own setup I also use a 20 dBm power booster to increase the range.*



The idea for this setup, in particular for using the latest ffmpeg for MPEG-TS generation, comes from Evariste F5OEO who posted it on the Viva DATV forum.
In fact, he has made a complete Raspbian image available for download for those who want a quick and easy way to get started. While his image works well, it will limit you to the



software available at the time when he built the image.
To get an idea of the video quality you can expect from this setup check out these test recordings I have posted on Youtube. Be sure to check out the recording of the HEAT 2X rocket being fueled with liquid oxygen at -180 °C. They were all recorded over the air using the Rocketcam 1 prototype setup and an RTL2832-based DVB-T dongle with modified drivers to work in the 1.3 GHz band.

In the following sections I will describe each component of my setup.

Step 1: Raspberry Pi and camera

The first thing to do is to ensure that you have your Raspberry Pi up and running with an up to date Raspbian image and the RaspiCam. You can use this tutorial on the Raspberry Pi website. You should definitely get acquiantened with the raspivid application that is used to capture H.264 encoded video with the camera module. It is a great tool and you will also find it useful for other tasks.

I suggest you create a working directory, for example ~/dvb/, where you can put the scripts and binaries used for the DVB-T setup.

Step 2: The UT-100C driver

You can download my binary driver built for kernel linux-rpi-3.12.19+: usb-it950x.ko.

I have also posted instructions how to build the driver on the target (Raspberry Pi). You may have to do this if my driver is not compatible with your device.

In either case put the usb-it950x.ko file in the working directory, e.g. ~/dvb/. You can test the driver by plugging in the UT-100C dongle and loading the module:

```
$ cd ~/dvb
$ sudo insmod ./usb-it950x.ko
```

To remove the module:

```
$ sudo rmmod ./usb-it950x.ko
```

Step 3: Get ffmpeg 2.2 or later

At the time of writing ffmpeg seems to be the only open source application capable of muxing H.264 video into DVB compatible, constant bitrate MPEG-TS. The downside of the ffmpeg muxer is that it adds a 5 second latency to the transmission. We'll have to work on this.

My binary built with libc-2.13 is available here: ffmpeg. However, here you really have the opportunity to learn something by cross compiling your own ffmpeg. Just follow the instructions from the ffmpeg wiki which is what I did with the following choices / changes:

- *I didn't build any addon libraries as I only want to use ffmpeg for TS muxing.*
- *During menuconfig of the crosstoll-ng under C library select eglibc 2.13 or whatever version comes with your Raspberry Pi.*

You can find which version of libc you got on you pi by running the following command in the Raspberry Pi console:

```
$ ll /lib/arm-linux-gnueabihf/libc-*
-rwxr-xr-x 1 root root 1200240 Mar 20 23:00 /lib/arm-linux-
gnueabihf/libc-2.13.so*
```

As you can see I had version libc 2.13 installed at the time of writing this article.

Put the ffmpeg binary(ies) in the same working directory where you got the and check that it works:

```
$ cd ~/dvb
$ ./ffmpeg -v
ffmpeg version 2.2.2
built on May 29 2014 23:17:41 with gcc 4.8.2 (crosstool-NG
1.19.0) 20130603 (prerelease)
```

```
configuration: --enable-cross-compile --cross-
prefix=/home/alc/embedded/rpi/ffmpeg/ctng/
arm-unknown-linux-gnueabi/bin/arm-unknown-linux-
gnueabi- --arch=armel --target-os=linux
--prefix=/home/alc/embedded/rpi/ffmpeg/deploy
libavutil      52. 66.100 / 52. 66.100
libavcodec     55. 52.102 / 55. 52.102
libavformat    55. 33.100 / 55. 33.100
libavdevice    55. 10.100 / 55. 10.100
libavfilter     4.  2.100 /  4.  2.100
libswscale      2.  5.102 /  2.  5.102
libswresample   0. 18.100 /  0. 18.100
```

Step 4: tsrfsend

Finally, we need an application that can talk to the UT-100 modulator, configure it and send the MPEG-TS steam to it. You can write your own application based on the API docs that come with the driver package or use the tsrfsend application included in the UT-100C Opencaster Bundle.

There is no license included with the tsrfsend application so I can only assume full copyright; however, I hope I will not get into trouble for sharing my armhf binary with you: tsrfsend.

If you have the sources you can simply build it on the Raspberry Pi, or try the cross compiler you created for ffmpeg. In either case you should apply the patch that I have posted on the Avalpa forum.

Put the tsrfsend binary into the same working directory where you put the driver and the ffmpeg application.
A few hints how to test the tsrfsend application are available in my previous post.

Step 5: Connecting the pieces

We need a way to (1) send H.264 video from raspivid to ffmpeg and (2) send the MPEG-TS from ffmpeg to tsrfsend. Since all these applications can operate on files the easiest way to connect them is using named pipes (aka FIFOs). We can create two named pipes in the working directory:

```
pi@raspberrypi ~ $ cd ~/dvb
pi@raspberrypi ~/dvb $ mkfifo videoes
pi@raspberrypi ~/dvb $ mkfifo videots
pi@raspberrypi ~/dvb $ ll
total 0
prw-r--r-- 1 pi pi 0 Jun  4 22:37 videoes|
prw-r--r-- 1 pi pi 0 Jun  4 22:37 videots|
pi@raspberrypi ~/dvb $
```

The names videoes and videots refer to video elementary stream and transport stream respectively. Having the pipes in place we can now launch the raspivid, ffmpeg and tsrfsend applications sequentially using the pipes for input and output.

In the following example I use a 6 MHz channel, QPSK modulation with rate 1/2 FEC, 1/4 guard interval and 8k FFT. With these parameters the channel capacity is 3.732 Mbps which is what we set the ffmpeg muxrate to. THe video rate must be lower than that and leave sufficient margin for bitrate fluctuations. Therefore, I have set raspivid to capture 1280x720 pixel frames at 30 frames per second and 3.3 Mbps video bitrate.

The following lines should be copy & paste-able into a terminal or a script:

```
raspivid -n -w 960 -h 720 -b 3300000 -t 0 -fps 30 -g 90 -pf
high -ih -o videoes &
./ffmpeg -loglevel error \
 -framerate 30 -i videoes -minrate 3.1M -maxrate 3.5M
-vcodec copy \
 -f mpegts -mpegts_original_network_id 1
-mpegts_transport_stream_id 1 \
```

```
 -mpegts_service_id 1 -mpegts_pmt_start_pid 1000
-mpegts_start_pid 1001 \
 -metadata service_provider="YOUR CALL" \
 -metadata service_name="COOL TV CHANNEL" \
 -muxrate 3732k -y videots &
sudo ./tsrfsend videots 0 1280000 6000 4 1/2 1/4 8 0 0
```

Note that I am using "sudo tsrfsend" because I did not configure any udev rule for the modulator that would allow using it as regular user. If you want to run the application as regular user, create a udev rule as I showed it in my previous post.

In the example I am using 1.28 GHz carrier frequency which is in the DATV segment of the 23 cm amateur radio band. If you don't have a DVB-T receiver that works at that frequency you can change it to some UHF frequency and use your regular digital television to receive it provided that it can do DVB-T and you are only transmitting in your lab with very low power. Check the regulations in your country to know for sure what you may and what you may not do.

I have modified the RTL2832, R820T and E4000 drivers to allow tuning to L-band frequencies as supported by these tuners.

We can also use ffmpeg to read from a file instead of the camera. In that case we use "... -re -i videoes ..." to transmit in real time, otherwise ffmpeg will read and send the file as far as it can read it from the SD card. I haven't tested this option much as I am only interested in live transmissions for now.

I hope this guide was helpful and I am looking forward to see who will make the first handheld HDTV transmitter using a Raspberry Pi and a UT-100C modulator and in particular who will make it work from a flying drone.

TV Amateur is a German language magazine. It is published 4 times a year. If you would like to subscribe, go to http://www.agaf.de/

5W 3cm Digital Power Meter

By John Hudson G3RFL

After building the 100W POWER METER for 23cm published in CQ-DATV 11, a requirement arose for a lower power meter working in the 3cms band, 10,425MHz

I used the same PCB and LCD display that the 23 cm power meter used as it worked well on the 100 watt power meter and I could adapt the PIC code without a total re write. The very nice LCD display produced an attractive White characters on a Blue background. The display required an I2C interface, which was provided by the same PIC30F4012 that I used for the 100w power meter. Ebay proved also to be a very good source of SMA/SMA 10dB 2W attenuators at very reasonable prices

The PIC30F4012 is a very impressive PIC. It has its own internal XTAL and uses a X4 PLL to make an even faster clock. The display is two lines and the top line is programmed to show a BAR GRAPH in 80 steps. The second line has got some fixed things that never change such has the ”W” and “dBm” also the decimal points ….5.000W 37.0dBm…as an example.

With 5watts going through the SMA/SMA 10dB 2W attenuators, you get just 500mW out of the pad and into the Waveguide Detector. This should produce 7V so if we pad that down to 5V then bingo, the PIC A/D 10 bits can interface to this DC input.

At an A/D value 1024, the display power wants to read 5 watts. So we have 6 digits and 3 digits for the dBm scale. After a lot of head scratching my Son LEE M0LMH joined the plot and between us we sorted it all out without using log's. First we took the A/D value, squared it then divided by 65536 then divided the answer by 10465.
Now we have the whole watts, so we save that. Next we multiply by1000 and divide by 654. Now we have the milliwatts figure, so we save that.

Next, and this is the harder bit LEE, sorted out how to convert these two values into dBm (0 to 50) with a fraction left over. This took 48 bit maths, real genius how it works. Multiply the watts value by 1000 and add the milliwatts to it. This gives us a big number that is the total value, now in milliwatts. Now divide by the magic number of 1.258927714 (this is about 1dB). Answer is in dBm with a fraction left over. Convert all these 9 digits to ASCII and deliver to the LCD. Job done. No said LEE, I have to add leading Zero blanking on 3 digits. To correct the values from the 100W values to give 5W readings, we just DIV by 20

DETECTOR

The last building block is the Detector that will rectify the microwave RF and produce the DC required by the power meter. There is a lot of history to RF detectors. The first was a COHERER which was a glass tube full of sharp iron

filings between two probes. On the presence of RF they aligned themselves and created a short across the terminals. However on the RF being stopped they still shorted out until the tube was tapped by anything that vibrated, known as a de-coherer. Thus CW was born.

A more sensitive detector was required so then a VACUUM TUBE DETECTOR was born. The start of the VALVE (TUBE), before the days of semiconductors.

But today we do have semiconductors and it's in this field we find the detector used for our meter. The power is the square of the voltage measured times the termination, in our case 50 ohms.

The power is mainly terminated in a dummy load and the detector senses the voltage across it. 5W is a lot so it was best to dissipate much of the power by adding an attenuation pad in front of the detector, say 10dB, thus not blowing the socks off the detector diode.

After building several of these to try and see what was required, it finishes up I need a low capacitance diode with low volts drop. So I started out with a HSMS-2822 SCHOTTKY device with two diodes so we get full wave rectification of the RF. I soon found that I needed lots of values of decoupling caps with short leads. This then led on to using SMD components, as indeed the detector has as well.

Now on V5 of these and I do not want standing waves on the device so its correct over a wide frequency range. First I tried FR4 D/S PCB and lots and lots of links through the PCB, even at one time I tried nuts and bolts and its input was SMA. After lots of versions I finished up using a WAVEGUIDE Detector and SENDER head coupled together with the Full Power 5W going in to it and RAM (Radar Absorbent Material) up the middle of the Waveguide.

This caught fire with the RAM material now turning to graphite dust and epoxy. This was too messy and had other problems.

The answer was to buy a 10dB 2 watt attenuator on Ebay. A nice little brass unit, SMA in, SMA out, about 10mm dia. To heatsink it, a brass collar was used.

So we now have the power down by 90% and I fed this into a Microwave SMA Waveguide sender (actually an "N" connector with adapter), then coupled that into a waveguide detector. This will measure the peak voltage so it needs scaling down by 0.707 to get the mean value. As shown in the photo from the TX I now have 5W of RF and my detector needed to be loaded with a resistor to give 5V output which was equal to +37dBm or 5W.

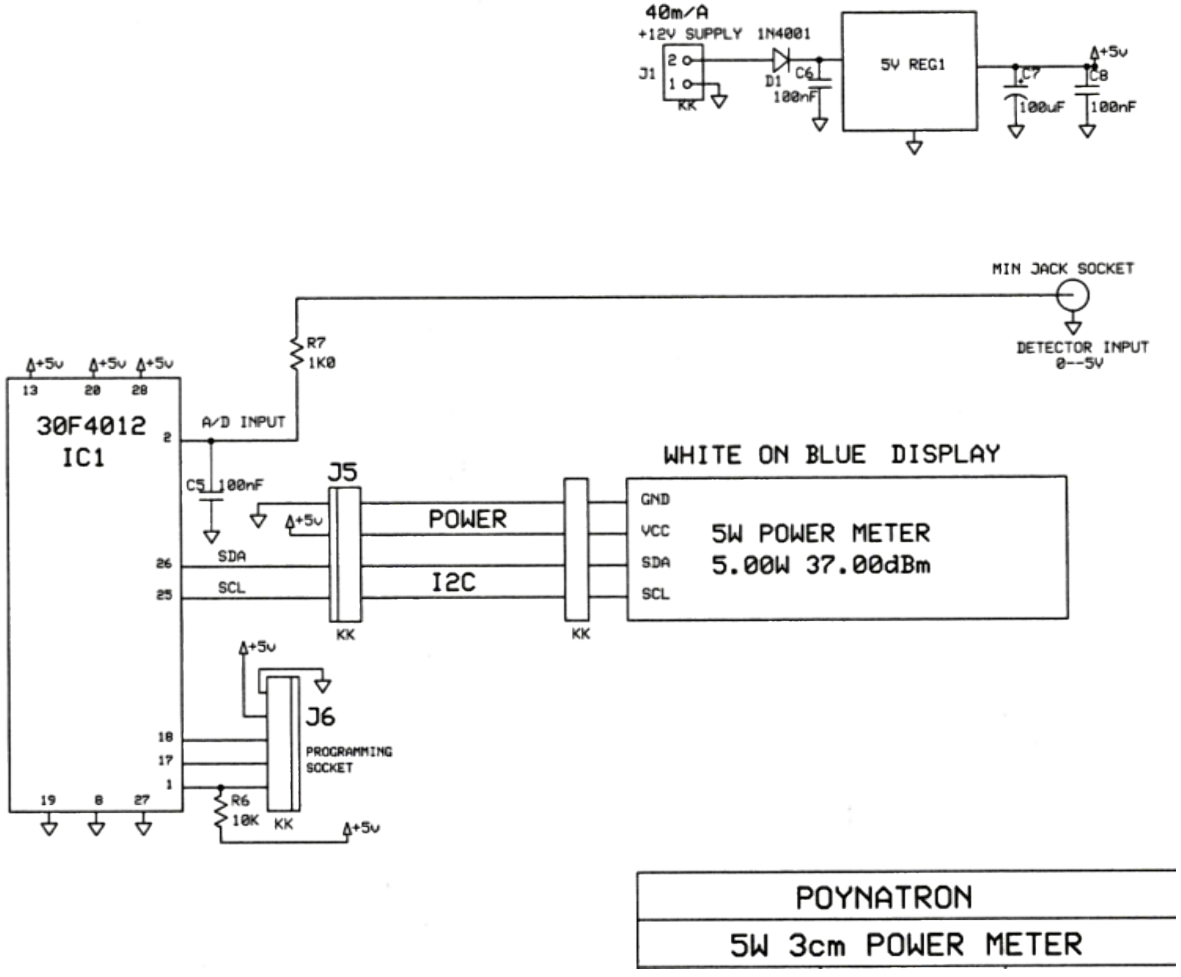
NOTE:- at 5W input you will have to restrict the time its on for otherwise the attenuator will over heat, but you can get 1dB,2dB,3dB attenuators to get rid of the heat. If you look at the photo, I made a BRASS heat sink to slide over the 2W attenuator and it does get warm after 30 mins (about 30 Deg C). Oh, I had to turn the detector diode around to give a positive voltage output. Not sure about this being 100% linear but it does give a constant level to tune things up to as a reference. You can correct for the bottom end error by adding a resistor of 20K or so from the detector to +5V.

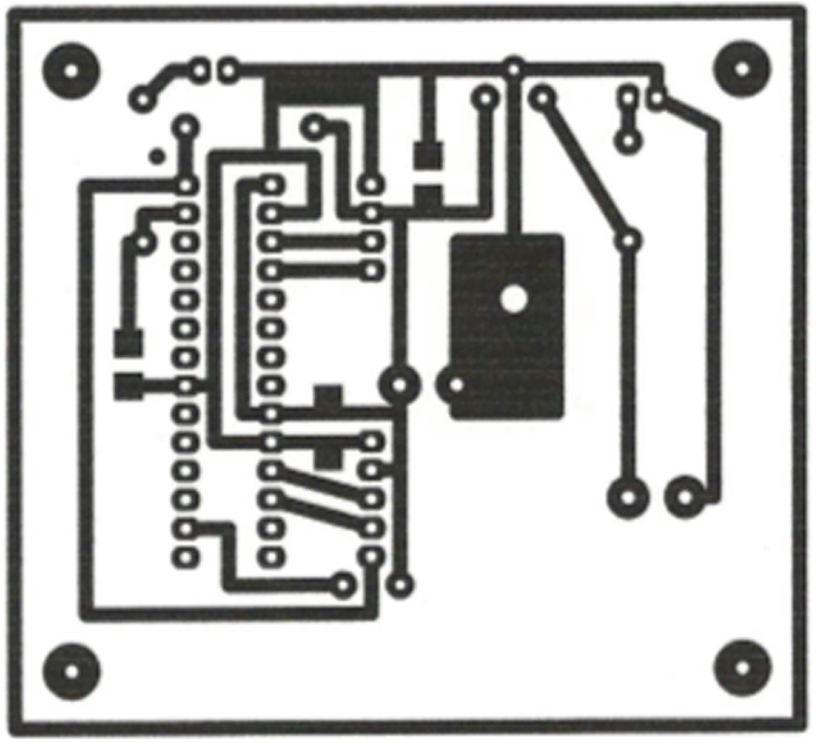
Once I had solved all the problems, the unit started to evolve and take shape. The single sided PCB was drilled and populated and the PCF30F4012 was programmed with the revised code. (This is available for download on the CQ-DATV site).

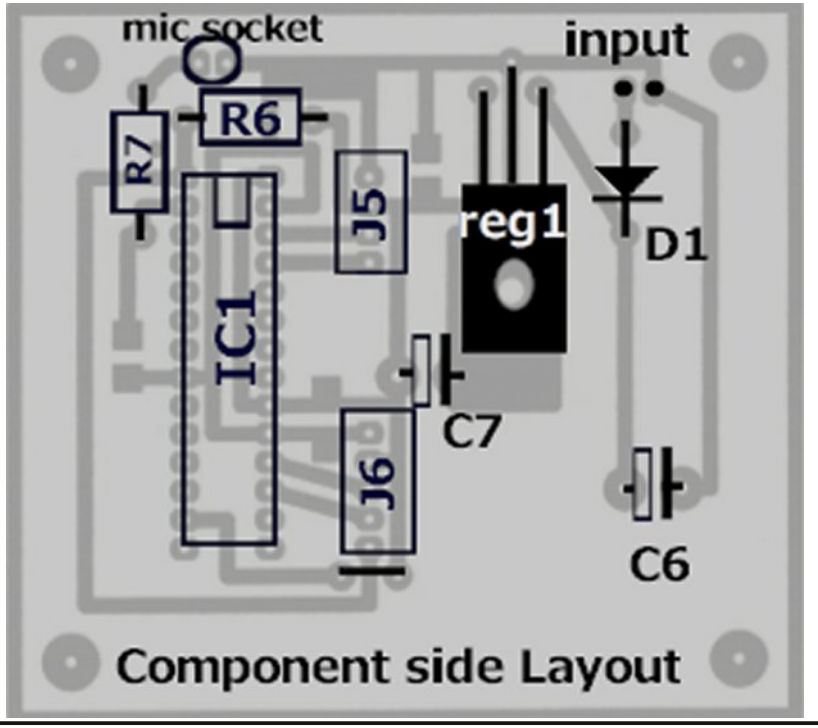
The case was from MAPLINS (N77AL), just gone up in price (about £15), but could be easily adapted to take the LCD display, which was sourced from Ebay.The 2watt 10dB attenuator from Ebay was mounted externally to the case.

NOTE: the PCB artwork is the same as the 100W version
On request from a CQ-DATV reader a BAR GRAPH was added to line one with 80 steps (see results on BOTH power meters 100W and 5W)

ATV the Best Learning Hobby in the World, John G3RFL







Above - Schematic of the Power Meter
Top right - PCB layout
Bottom right - Component layout

3cm 5W Power Meter Bar Graph

16 full blocks each with 5 steps total of 80 steps range is 0.001 to 5Watts

FULL block	POWER m/W	dBm
1	20	13.0
2	80	19.0
3	200	23.0
4	325	25.0
5	500	27.0
6	700	28.7
7	1,000	30.0
8	1,300	31.2
9	1,600	32.1
10	2,000	33.0
11	2,400	33.8
12	2,850	34.6
13	3,400	35.4
14	3,850	35.9
15	4,400	36.5
16	5,000	37.0

23cm 100W Power Meter Bar Graph

16 full blocks each with 5 steps total of 80 steps range is 0.5W to 100Watts

FULL block	POWER m/W	dBm
1	500	27.0
2	1,800	32.6
3	4,000	36.0
4	6,500	38.2
5	10,000	40.0
6	14,500	41.6
7	20,000	43.0
8	25,000	44.0
9	32,000	45.1
10	40,000	46.0
11	48,500	46.9
12	57,500	47.6
13	67,250	48.3
14	77,000	48.9
15	88,000	49.5
16	100,000	50.0

Fireworks

Dave Woodhall G3ZGZ

In Dave's' article back in CQ-DATV11 he described his quadrocopter drone fitted with a camera and downlink. The article included a couple of aerial pictures taken during a test flight.

Well Dave tried flying the quad on Wednesday night to see what Cleveleys looks like at night and try to find fireworks!

The video is, as expected, noisy, but at least I got a reasonable picture. Saw fireworks all the way to Fleetwood

and past the Norbreck. There were some really big ones let off that must have cost quite a packet.

DATV-Express Project - October update report

During the first half of October, the team worked to "production release" version 2.03 software for PC. The features or fixes include:

...* V2.02 had timing problems with old STB receivers with small buffers, where the DATV-Express PCR timing-processing overflows the buffer (after a several minutes) resulting in video screen freezes or screen going blank and/or audio popping.

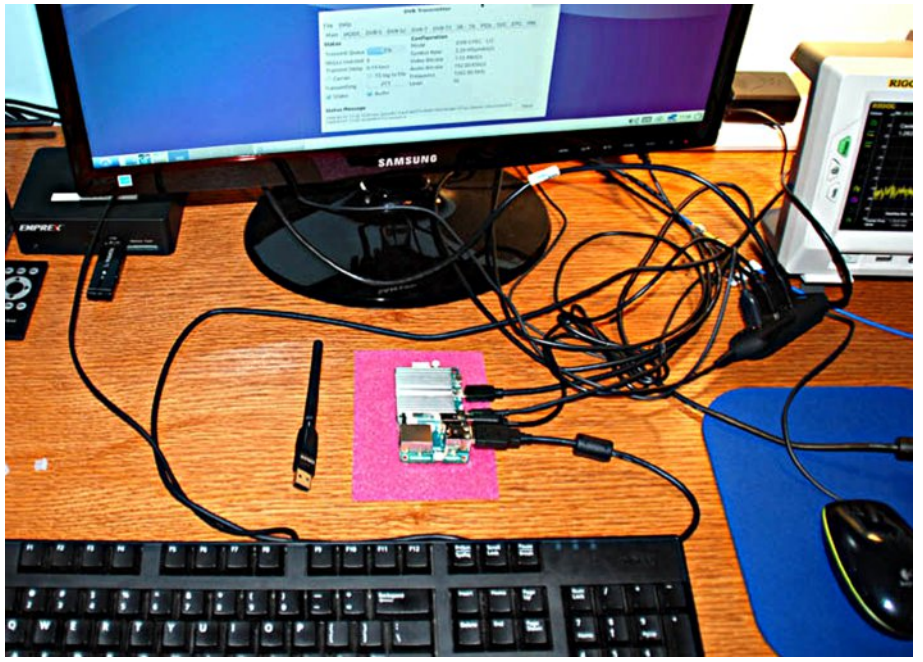
...* In V2.02 there was still a lingering problem with some older models of PVR-150 units where DATV-Express could not properly grab the composite video.

...* V2.03 adds a new feature of a DVB-T 1 MHz bandwidth selection.

...* V2.03 can now be installed on Ubuntu V14.04 LTS operating system (as well as the older Ubuntu V12.04 LTS)

Updated README details, new .DEB download files, and User Guide (Draft36) are all available on the DOWNLOADS page on the DATV-Express.com web site.

As soon as that task was completed, attention turned back to releasing v2.03 for the ODROID-U3 "micro-PC". Charles G4GUO was still handicapped in that the eMMc memory on his ODROID does not allow him to swap out between his development set-up (development is on the ODROID) and a fresh test image. So a new plan became to "cross train" Ken W6HHC to build and test the ODROID software from the github site of Charles. Ken will tell you that THIS IS NOT EASY! The Lubuntu 14.04 LTS OS on the ODROID is not quite the same as working on a PC installation of Ubuntu 14.04. It took more than a week to just successfully install QtCreator on the ODROID development image.
Then Ken learned that installing and using debreate (the tool

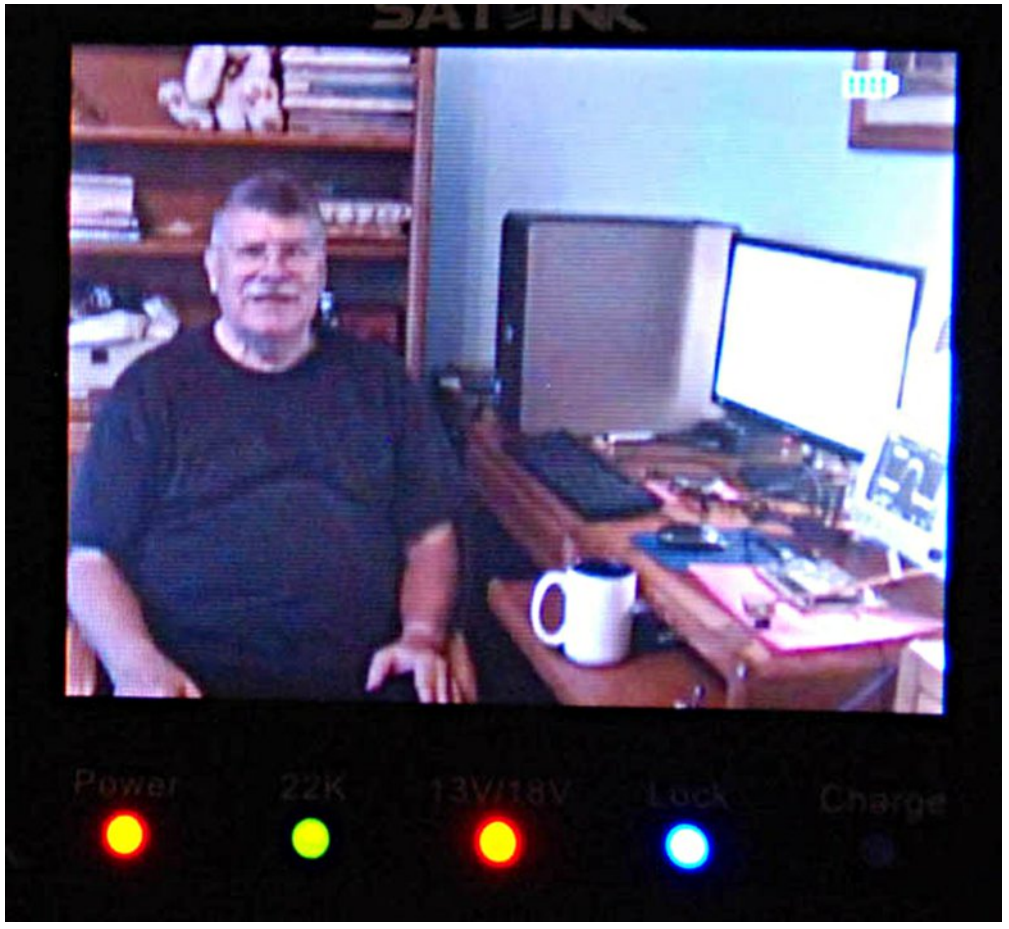


Set-up to build ODROID .deb file at QTH of W6HHC

to build a .deb file) is quite an adventure. But good progress has been made by Ken with about 30 e-mails and three Skype-work-sessions with Charles G4GUO for assistance. But persistence does payoff and a successful deb file build for the ODROID ARM "micro-PC" was finally achieved. Ken has now successfully tested the .deb package at his QTH and sent the video below (snapshot next page).

There are three main goals left to complete in order to release the ODROID-U3 deb installation file for DATV-Express.

1) Ken needs to work out the debreate build details so that the deb file installs DATV-Express software without errors or "missing dependencies" on a fresh OS image.



First video transmission received from ODROID at W6HHC "software lab"

2) Ken needs to test the resulting v2.03 installation on ODROID-U3 to make sure that all features work well.

3) An ODROID-version of the USER GUIDE needs to be prepared (many Lubuntu screens look different)
But the long awaited release of DATV-Express for ODROID-U3 appears to be much closer now.

"full speed ahead"....de Ken W6HHC

Converting CCTV lens from video auto iris to DC auto iris

by Dr Andrew (Drew) Wollin, VK4ZXI

Summary

It seems relatively easy to convert a video auto iris CCTV lens to DC auto iris and for a modern camera to control the lens correctly. I was able to convert a sophisticated expensive CCTV lens to DC auto iris, which otherwise was unusable.

However, I give no guarantee that it will work with any other lens, although I think the principle is the same.

If camera control is not possible or desired, it is possible to at least open the lens's iris with a voltage through a series resistor applied to the drive motor with the correct polarity. The problem I had bought a Pentax motorised zoom and focus lens for use in my amateur TV studio with the idea of using it on a remote-controlled tripod as part of a one person operation. Motorised lens are not cheap ($600), but I bought a new, but old stock, lens cheap (<$100).

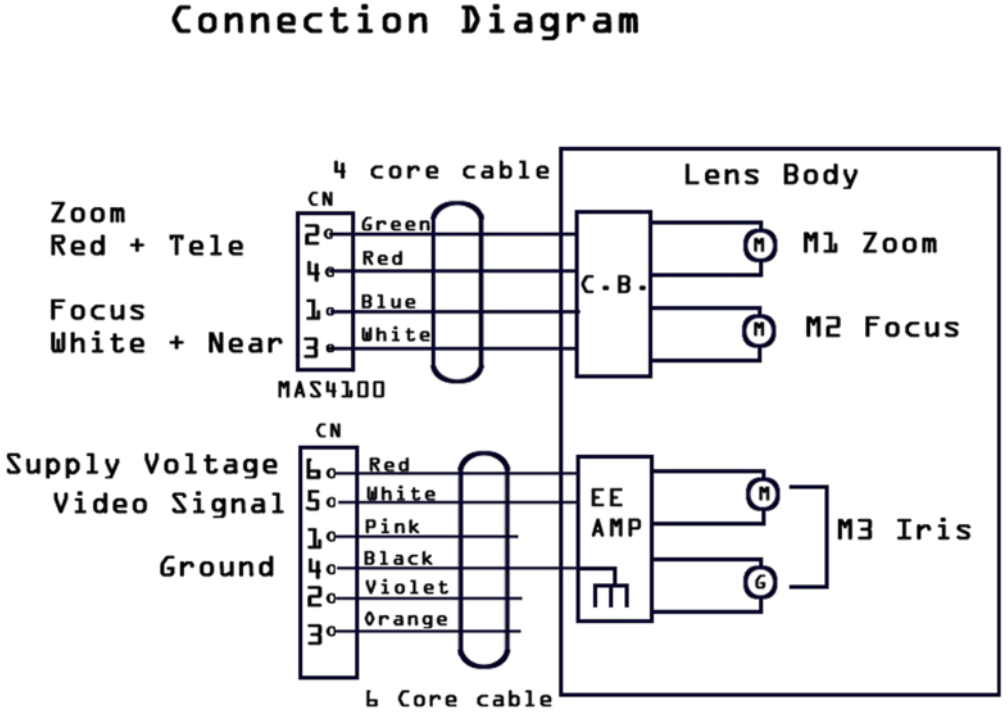
The main problem was that the lens used video auto iris, rather than DC auto iris, that is the standard on digital CCTV cameras. If not used, the video auto iris closes the lens, so at a minimum I needed to open the iris to use the lens. DV CCTV cameras can use lenses with an open iris or no iris or a manual iris.

I am a complete novice with CCTV, just learning as I go (and over-whelmingly impressed with what is possible with digital CCTV now). However, I am a radio amateur, VK4ZXI, and a graduated engineer with some knowledge of electronics.

How auto iris works

Lens can use video auto iris (common with old analogue lenses), DC auto iris (common for most modern lenses) or no iris (cheap lenses).

The connection diagram for my lens shows the video auto iris and the two control coils for the auto iris, a motor drive and a "galvanic" coil. The motor drive proportionally opens and closes the lens. The galvanic coil measures the rate of change and is used as feedback for the control system for the lens.



For video auto iris, a video signal from the image sensor (I don't know what format) is feed to the lens and some control circuitry (EE AMP) generates the required signals for the motor and galvanic coils.

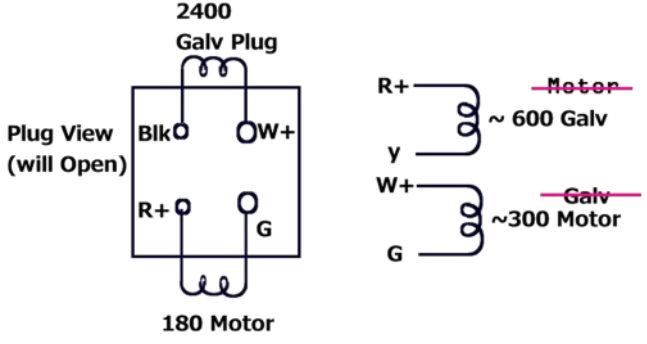
For DC auto iris, there are just the four wires for the motor and galvanic coils. The camera does the iris control instead of it being in the lens.

With some trepidation, I removed the lens cover and removed the EE AMP circuit board, leaving just the four wires for the two windings. Fortunately I had a cheap DC auto iris lens that I could dismantle and to salvage the auto iris connector that suited my HD CCTV camera.

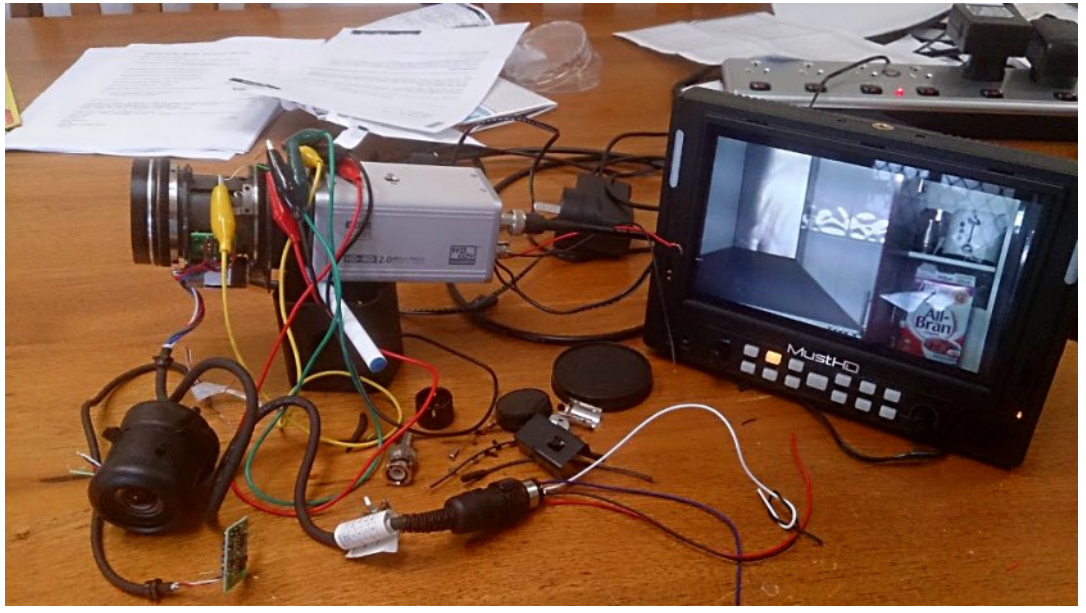
I measured the resistance of the coils on both lens. The lower resistance I presumed was the motor coil and the higher one, the galvanic coil.

I then applied a variable voltage from a power supply, though a series resistor to limit current (1000 Ohm I think). It was possible to open the lenses with either coil, but polarity was important on both (I discovered, but not surprising). The iris would open with about 5 V DC at less than 10 mA. Eventually I had identified the polarity of the coils and which was the drive motor and which was the galvanic coil, per my diagram below. The left diagram is measured at the connector for the cheap lens, the right is for the Pentax lens.

Measuring on the connector gave me the connections to the camera, some vital information. As can be seen, I originally misinterpreted which was the drive motor and which was the galvanic coil.



The next step was to see if the camera could control the lens. I cut off the connector from the cheap lens and connected it to the lens with jumper leads per my connections above. With some trepidation of blowing up both, I turned it on and it worked perfectly!



The Pentax lens is attached to a HD CCTV camera. The composite output is fed to a 7" focus screen (HDMI input not SDI). The cheap lens is at bottom left and not connected to anything. The EE AMP green circuit board is to the bottom right of the cheap lens and not connected. The black connector, centre bottom, is for the motorised focus/zoom and has wires to control them (5 - 12 V DC), which works. The image is of the kitchen range hood and a box of "ALL-Bran" in the cupboard next to the range hood. The camera is not easy to move with all the jumper leads connected! The minimum focus distance of the lens is about 2 m, with the range hood about 5 m distant. There is glare on the monitor from a screen door.

Continued on page 40

Amateur Television Status Display - Pt.1

Richard Carden VK4XRL and Mike Stevens G7GTN

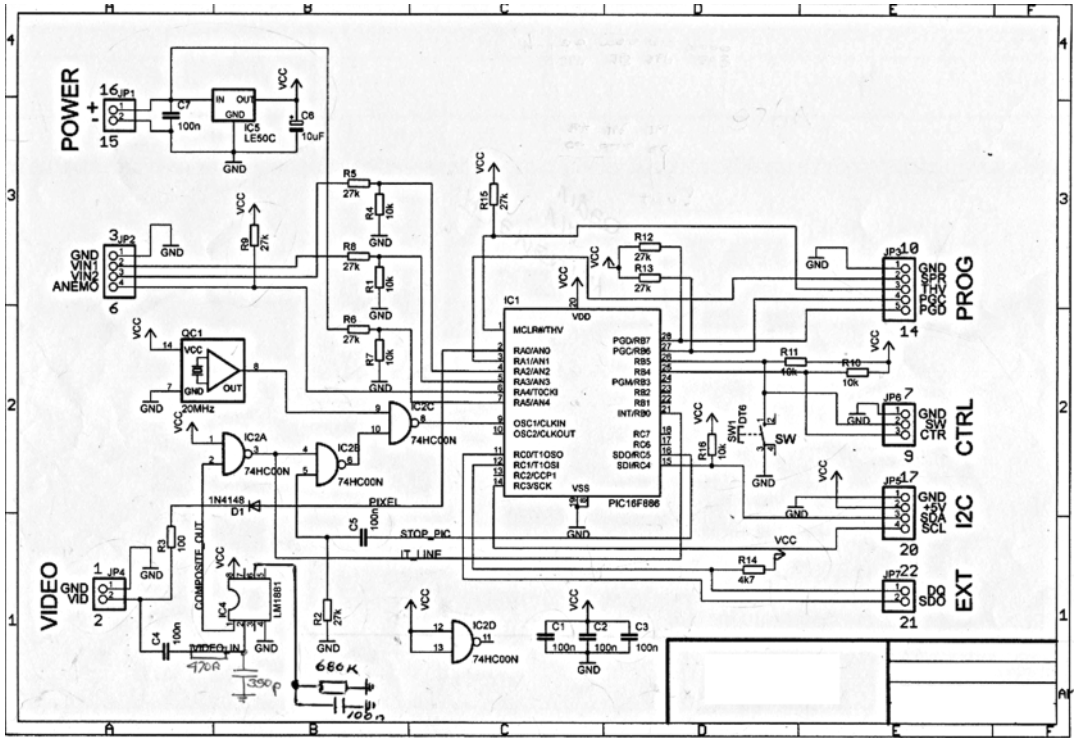
Introduction:

Following on from the excellent series on the OSD modules by Mike G7GTN we have now moved on to more useful circuits that can be adapted to a number of different uses.

My own interest in OSD goes back for some time however my expertise is not in the area of programming micros. During this time I was given a PCB, a programmed PIC and circuit for an OSD. However while the PIC was programmed I didn't receive the hardcopy of the programme so that changes could be made. Since most repeaters are some distance away any problems could take days to find and fix, hoping you had the gear with you to carry out the required repairs. What was needed was an OSD that contained at least some information as how the repeater was going plus some static information.

I had also run into a problem where some people were getting into the repeater and others were not. This could be easily overcome by providing a signal strength indicator with some sort of reference so that if we had antenna or pre-amp problems at the repeater site we would likely know beforehand where the problem was. Knowing where your input level should be, if it indicates low then it maybe time to look into it with those entrusted with those responsibilities. There have been a number of circuits and information regarding OSD's using the STV5730A, have a look at http://www.qsl.net/zl1wtt/page6.html.

While talking to Mike on the OSD subject we decided to continue on using the OSD modules as used in his previous articles and derive suitable software to drive it. I'll leave Mike to discuss the software dilemma.



OSD Module Software

Following on from Richards's introduction to the project, we had to consider the best way to interface the little MAX7456 On screen display generator modules and then further combine this with the repeater logic control system.

Since we only have two accessible pins available without needing modifications, a Serial Communications method was the only viable option open to us. The first challenge was the reliability of this link, after trying a couple of different approaches finally we settled on a pre-written library which had enough expansion options to take the project forward as additional ideas came along.

The library in question is called cmdMessenger and may be downloaded along with comprehensive documentation and example projects from the link supplied.

https://github.com/thijse/Arduino-Libraries/tree/master/CmdMessenger
With this installed we started to work on laying out what the required status screens would need We settled for three status screens as shown. One being the repeater Status screen, two and three the RX receiver Status screens. These last two screens could also be used for QTH use as well. We also have eight individual preset caption screens which are not implemented in this application. All these screens are able to be switched between and see how the whole system would function by using a PC Terminal and numeric commands along with additional parameters sent directly to the OSD Module. This removed having to write and debug code for two systems while still developing ideas, and proved a workable first attempt.

Command	Bar Value
9,1;<CR>	1 Bar displayed
9,10;<CR>	10 Bars displayed

As way of a more practical example, the level bars that we required can be tested at this point in the serial terminal by entering the commands as shown in the table. The final logic interface will of course make use of an ADC and convert the voltage levels from a receiver to bar segment values that make sense in this particular setup.

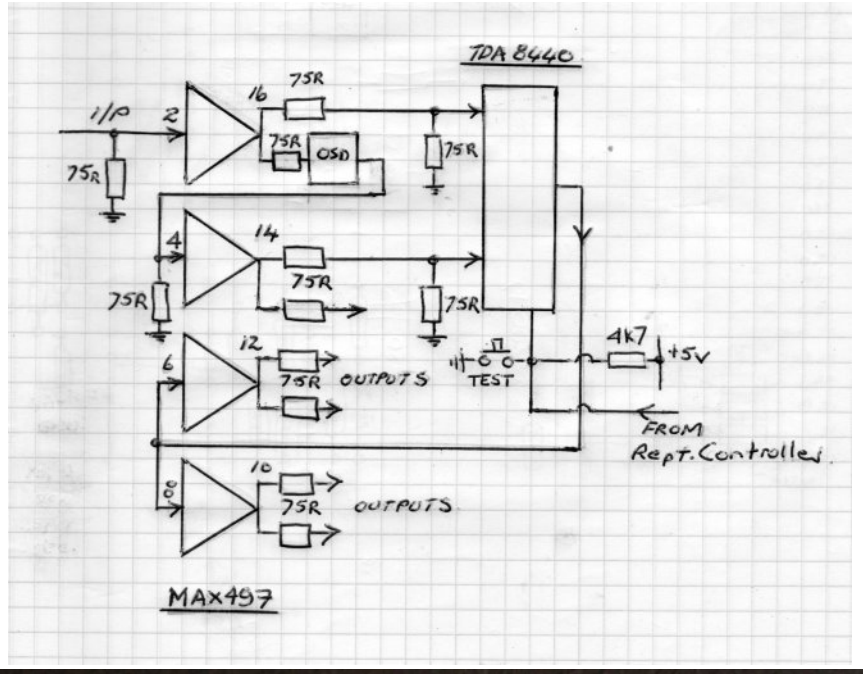
Background:

What we wanted was a way of providing a repeater data display with both static and up to date information. This could also flow over to QTH use providing IDENT from your own DATV or FM transmitter looking at the repeater data display (see below) we see the static information as to the transmission characteristics as well as the ongoing updates such as supply voltage, current, power output, room temperature, amplifier heatsink temperature. Also included for good measure is the date and time.

The QTH version may indicate static information relating to call sign, digital or FM technical information. Audio levels could also be shown plus the signal strength at the repeater site, however the final configuration will be left up to the individuals to work on if required.

There is a number of ways that the OSD could be incorporated into the overall system. For what I would see as to my system requirements the repeater data would be switched into the video via the repeaters microcontroller. Also the OSD unit could be bypassed via relays mounted on the backplane allowing it to be removed from service if so required.

(See block diagram) This is one way of many that could be used where the OSD board provides for the incoming video to be split two ways. One input goes to the video switcher IC using a TDA8440 (Audio selection not used), or another



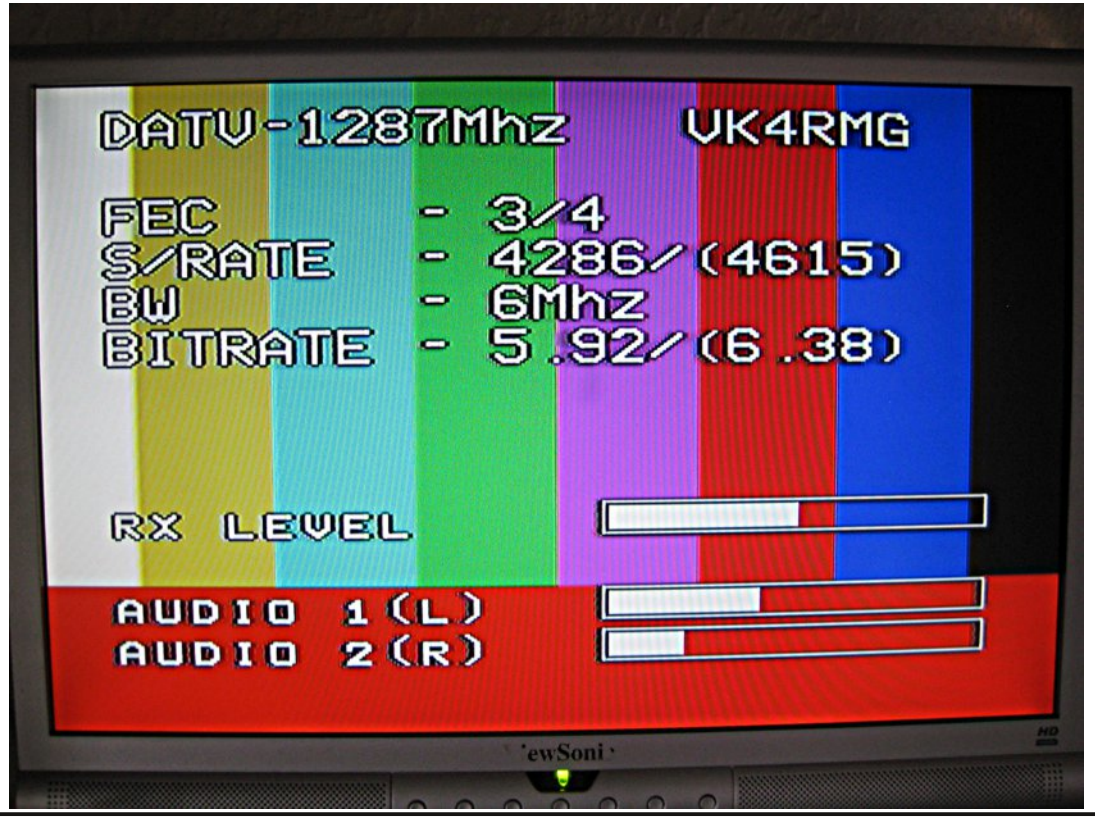
device, maybe relays? The second output goes via the OSD module, thus it enables the video to by-pass the OSD when not required. Other methods could also be used and again it would be left up to individual construction requirements, also there maybe some minor software requirements to initiate it into your system.

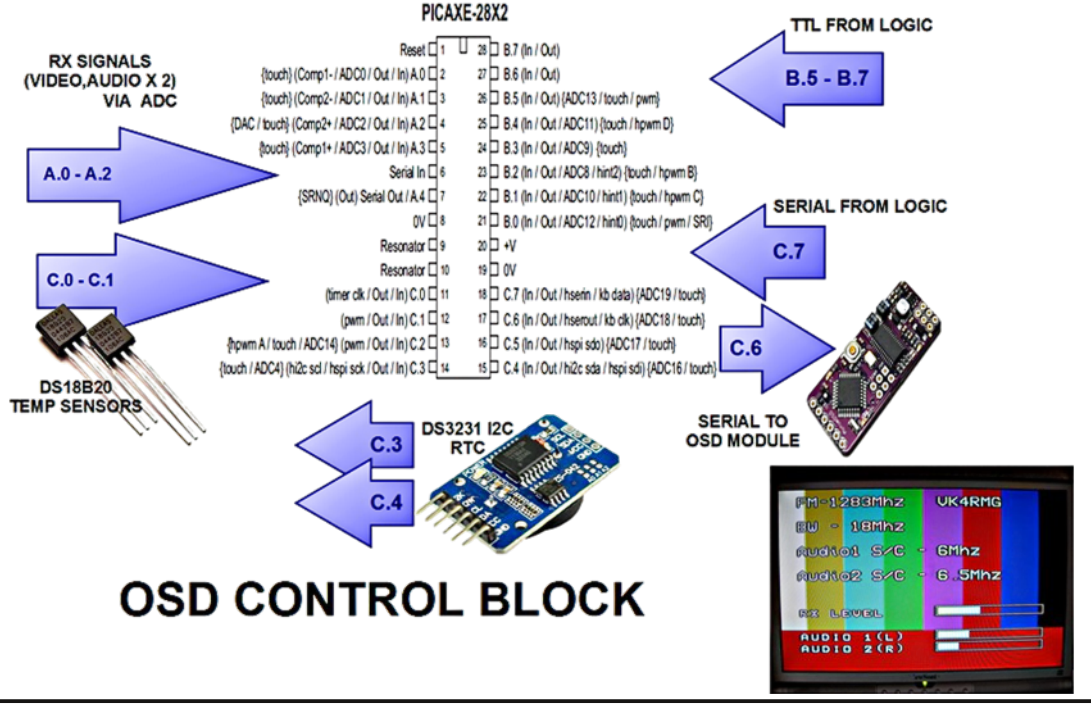
Relays could also be used instead of the switcher IC or the OSD could be used as is and be switched on/off from the repeater controller, completely your choice.

However in the interests of exchange of information please drop a line indicating with drawings and photos to the editor so that these can be added into future articles.

To be continued.

In part 2 we will set up the library and test using the Com Port.



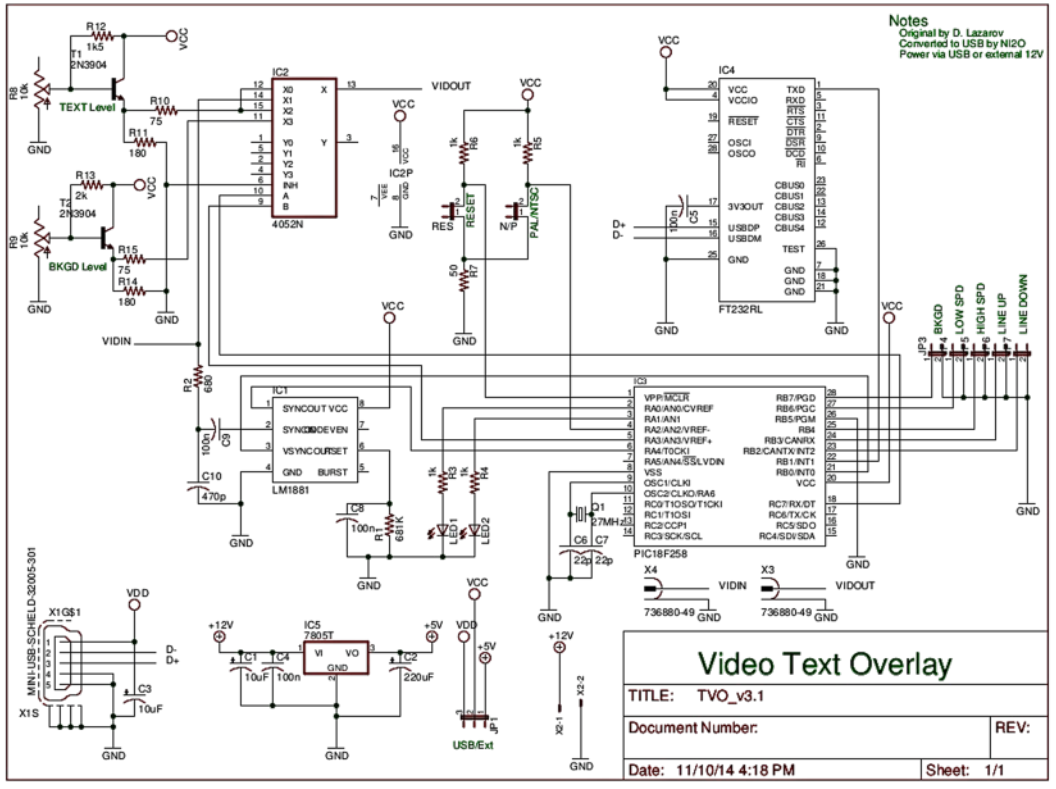


Video Text Overlay update

Mark Phillips

I built the Video Text Overlay device per the article in CQ-DATV issue 9. Additionally I have converted it to USB.

A side effect of the conversion to USB is that one can now power theboard directly from the USB port as there is up to half an amp of current available from the computer.

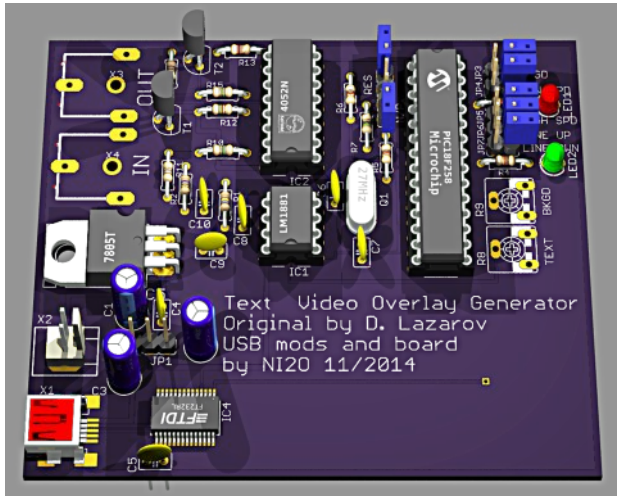


The USB chip used is the FTDI FT232RL. This replaces the MAX232 TTL converter as well as serve to cut down the component count slightly. Whilst this chip is a SMD device (as is the USB connector) it is very simple to solder by the "normal" iron method. I used a reflow hot air gun but a trick I have learned with an iron is to simply flood the pins with solder (thus causing many bridges) and then clean up with Solder Wick.

It should be noted that there are some significant supply chain issues with FTDI and constructors should be aware that counterfeit devices are available from reputable sources. These sources may be unaware of the issues with their stock. The upshot is that the FTDI chip may be rendered unusable after a Windows software update thanks to a recent FTDI move to combat the counterfeiting.

An "undocumented feature" was discovered in the software supplied on Lazarov's web site. The application was only able to select COM's 1 through 5. It is common for USB devices to enumerate at much higher COM addresses. This can be "fixed" by reassigning the port number in the device manager in Windows. Linux/Mac users will be familiar with /dev/ttyUSBx. In most cases no driver files are needed for either platforms as they are downloaded by their relevant update routines.

Some CAD files in Eagle format as well as a PDF of the schematic and a BMP file of the 3D realisation are available for download, in a single zip file, from the CQ-DATV web site.



If there is enough interest I can make the board available through Oshpark.com.

Mark G7LTT/NI2O

ATV image generator using the Raspberry PI

By Ernest Neijenhuis, PA3HCM

This article was first published in the August 2014 edition of the DKARS magazine www.dkars.nl

I've had a Raspberry PI for a while already, but it hasn't been very useful until today. I recently started setting up my own ATV (Amateur TeleVision) station. I needed a simple solution to generate a test pattern, something to broadcast when testing my ATV transmitter. Since the Raspberry PI has a composite video output, there must be a way to let the PI do the job.

I found several projects on the internet. However, they produce only HDMI output, no composite video. After browsing the web, I found a very easy solution using the Linux fbi command. This command allows you to load a picture in the frame buffer of the graphics adaptor.

10 Steps

Since the Raspberry PI will run Linux, some basic skills at the Linux command line will be helpful to get the thing running:

Step 1: Get yourself a Raspberry PI (www.raspberrypi.org) and a 4GB SD-card. You will also need a 5V power supply with a Micro-USB connector. Also consider buying a corresponding case (I don't know how your shack is looking, but mine is always cluttered with solder drops, cut wires, metal tools, and all kind of other things that could create a short circuit at my Raspberry PI).

Step 2: While waiting for the Raspberry PI to arrive, you can create your favourite test pattern or whatever you like. Save it in JPEG format, name it test-pattern.jpg (all lowercase). Note that PAL 4:3 has a resolution of 768 x 576 pixels.

Step 3: Install RaspBian (www.raspberrypi.org/downloads) on your Raspberry PI.

Step 4: Connect display, keyboard and network. Then login at the console using the default username 'pi' and the password 'raspberry'.

Step 5: Get root:

```
pi@raspberrypi ~ $ sudo su -
root@raspberrypi:~#
```

Step 6: Install fbi:

```
root@raspberrypi:~# apt-get install fbi
```

Step 7: Create a small script called /root/atv-generator.sh using nano:

```
# nano /root/atv-generator.sh
```

Enter this text EXACTLY, then use Ctrl-X to save and exit:

```
#!/bin/bash
/usr/bin/fbi -d /dev/fb0 -a /root/test-pattern.jpg
```

Step 8: Use nano to edit /etc/inittab. Find the line for tty1 and replace it as shown below. This will start the atv-generator.sh script automatically when booting the Raspberry PI.

```
...
#1:2345:respawn:/sbin/getty -noclear 38400 tty1
1:2345:respawn:/bin/bash /root/atv-generator.sh
2:23:respawn:/sbin/getty â€“noclear 38400 tty2
3:23:respawn:/sbin/getty â€“noclear 38400 tty3
...
```

Step 9: Put the image in the directory /root, be sure it's named test-pattern.jpg. You may use SCP or SFTP to copy it over the network, or transfer it by USB-stick.

Step 10: Reboot your Raspberry PI and enjoy your test pattern!

All necessary links in this article are clickable , they are colored Blue.

www.pa3hcm.nl

73 de Ernest, PA3HCM

Blade RF transverter with SDR# on Windows

by Dr Andrew (Drew) Wollin, VK4ZXI

BladeRF XB-200 transverter working with SDR# on Windows

Software to support the BladeRF XB-200 transverter is beginning to emerge, however, the information is spread across a number of sources. In this post I have amalgamated the various bits of information to get the devices working on Windows 8.1.

Connecting the cables

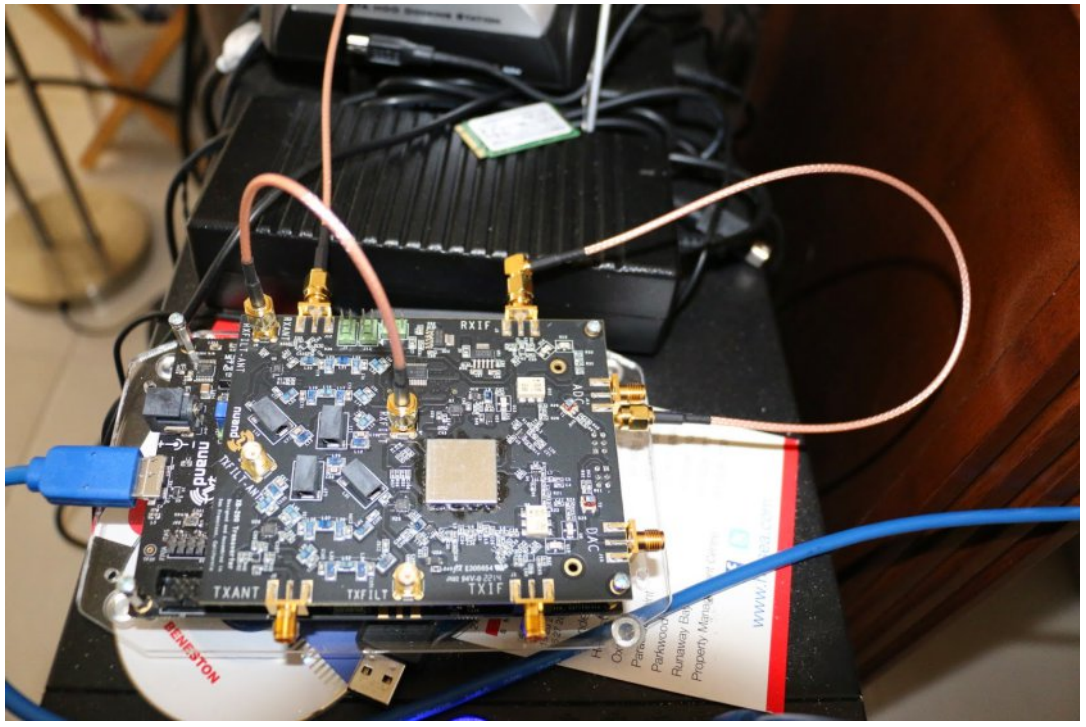
It is not entirely obvious how the various connectors are used. The information is provided in the BladeRF GitHub: https://github.com/Nuand/bladeRF/wiki/Getting-Started:-XB200-Transverter-Board

For RX only:

- *RXFILT-ANT to RXFILT to bridge "custom" filter.*
- *RXIF on transverter to BladeRF RX to connect transverter to BladeRF.*
- *Connect antenna to transverter RXANT for use with VHF and above.*
- *Connect HF antenna to ADC (be careful, see earlier post- http://vk4zxi.blogspot.com.au/2014/03/bladerf-transverter-and-hf-trx-its-been.html).*

Windows SDR# software for BladeRF

SDR# software to support the BladeRF and Transverter is available at the time of writing at: http://www.scan-

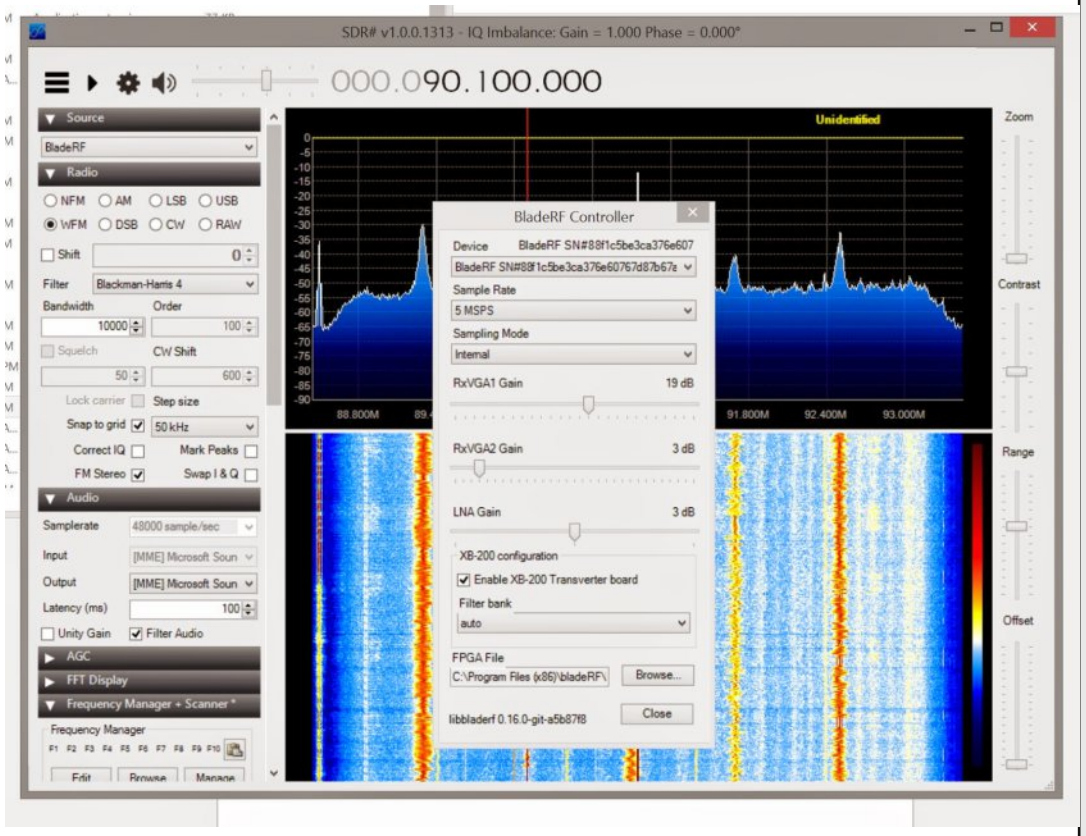


ne.net/bladerf/sdrsharp.zip, per http://nuand.com/forums/viewtopic.php?f=6&t=3600. However to create the latest version of SDR# and the BladeRF plugin from Jean-Michel at https://github.com/jmichelp/sdrsharp-bladerf and install as described. Download the latest version of SDR# at http://sdrsharp.com/ It is worth following the discussion at https://uk.groups.yahoo.com/neo/groups/SDRSharp/conversations/topics/14986 .

The software currently only supports USB2. It is ok to use the blue USB3 connector for USB2. Plug in BladeRF, with transverter, and run NUAND installer: http://nuand.com/downloads/bladerf_win_installer.exe.

Start SDR#, there should be no error messages and BladeRF should be the selected SDR. The setup allows the loading of the FPGA. The sampling rate needs to be restricted due to USB2; it stutters otherwise. 5 MSPS seems to work ok. The

transverter filters can be used, although "auto" seems to use the appropriate filter for the set frequency. The transverter can be bypassed to allow the BladeRF to access its native frequency range.



The setup panel in front of SDR# and BladeRF on a portion of the local FM band.

The future

Very good to see the BladeRF working with its transverter on SDR#. It is early days for SDR software to support the full capabilities. Simon Brown, the author of SDR-Console, anticipates a beta for RX in the coming weeks; and TX a little further. It is worth following the NUAND forum, the Yahoo SDRSharp group and the BladeRF GitHub.

Converting CCTV lens from video auto iris to DC auto iris - continued

The photo was taken during the day with the lights on. At night, with the kitchen lights off, the monitor image was better than visual, indicating that the auto iris was working well.

As a side note, the iris settings can be changed with the camera menu, allowing creative control over depth of field etc, if used as a cheap full HD SDI cinema camera with remote recording or live.

Conclusion

The bottom line is that it is relatively easy to convert a video auto iris lens to DC auto iris and for a modern camera to control the lens correctly. (the opposite is difficult) I was able to convert a sophisticated expensive CCTV lens to DC auto iris, which otherwise was unusable.

However, I give no guarantee that it will work with any other lens, although I think the principle is the same.

If camera control is not possible or desired, it is possible to at least open the lens's iris with a voltage through a series resistor applied to the drive motor with the correct polarity.

All down the Bar, except the VT Editor

(It's a line from a BBC Christmas tape), Trevor Brown explains

Its now almost 10 years since I worked in a VT department, but I still get asked about Christmas tapes. If you have never seen one, let me explain.

I think they evolved in different ways, before video tape, they were the domain of the film department, who collected out takes (the more embarrassing the better) and they would assemble this film for viewing at the annual Christmas party hence the Christmas part of the title. The material was similar to what you see on main stream out take shows, but that material can only be shown with the permission of the artist; I suspect those rules did not apply to these private showings.

The tradition expanded when video tape arrived, the outtakes would be collected by VT and again assembled into a single programme for viewing at Christmas, (the tape part), but the tradition changed by the inclusion of material often shot for the occasion (see the Hot Gossip Link). The tapes also got a much wider audience, in that they were networked around all the ITV companies and this grew into a contest to see who could produce the best tape, with its own judging panel. There was even an award which was a large inscribed rubidium disc from an HS 100 slow motion machine. It looked a little like a DVD only larger and much heavier. Each year it would be inscribed with the winning companys' name and it would reside in their VT department for the next 12 months. It must still exist somewhere and I would love to know where. (Yorkshire Television did win it and I had the pleasure of seeing it every day for 12 months, mounted on our department wall.

The tradition gathered momentum and the productions got more and more elaborate and attracted wider involvement of staff, it was getting competitive, and there is nothing like a competition to up the stakes. The artistes began to get involved, they had always been involved in the outtakes and when they screwed up a take they would often end up with Merry Christmas VT, a phrase I think originally coined by Noel Edmonds, but now the artistes were turning up in the club bar asking for someone from the VT department and coming up with an idea for the Christmas tape. This got to the level at Yorkshire Television where the then MD turned up to record a spoof announcement for one year's offering.

The ITV tapes were generally about 10 to 20 mins long although there was no time limit on productions in the contest rules. The next change was when we saw a BBC Christmas tape, officially there were two made by the BBC the first one was called White Powder Christmas, White Powder was a tape backing problem with Memorex video tape which clogged up the VT machines and put many productions

at risk, Memorex did produce some of the best performing video tape at a time of analogue technology where generations were lost in editing and duplication. As such their Chroma 90 tape became the industry standard until this problem. I think naming the production after a VT problem showed that Christmas tapes had now firmly become the domain of VTR.

White Powder Christmas was much longer than any of the ITV tapes and showed the production muscle that the BBC could put together. This tape was produced in the year the BBC had its strikes and much of the specially shot footage reflects this era. This was followed by Good King Memorex and was the last Christmas tape officially made by the BBC and included spoof material featuring a prominent royal, which attracted press attention and a clamp down on all Christmas tape production at the BBC, in a world where all controversial material is screened by lawyers and often has to be signed off at a very high level in the company, it was inevitable these flourishing underground productions would face the axe. There was one final BBC tape called an Easter Tape which was presumably to get around a poorly worded BBC memo of not producing Christmas tapes.

The BBC tapes had a different content to ITV tapes and often had a higher music content, with songs specially adapted for the production and performed by leading artist such as Suzy Quattro (see the link) singing Sports PA. The rumour goes this was written by a member of the VT department (My lips are sealed on the name) department and performed on rehearsal. The words written on the back of a roll of wallpaper purchased during the lunch break and pulled over scaffold poles as an improvised autocue. The artist did have a much higher involvement and Legs and co, (for those of you that have been around as long as I have) did have a dance routine performed in the VT area and again featured an adapted song to VT engineering. The faculties booking department performed what has now become a classic known as 4050 from Good King Memorex. My own personal favourite is "Rip Scratch", which was a send up of using RCA machines in a linear edit suite and is again part of Good King Memorex. At Yorkshire Television when that production was made, all the editing was done on RCA machines and many of the jibes struck home, I still have the scars.

ITV was not going to be outdone and Thames took Hot Gossip who were working on the Kenny Everett show at the time, up into their VT area and produced a raunchy version of the BBC legs and co production.

The adapted music still lives with me every time I hear a track on the radio that was adapted to a Christmas tape,

from Pink Floyd's "Another Brick In The Wall" to "Run Around Sue". There was no doubt that planning and a great deal of production effort went into these productions at every level.

By the time I left YTV in 1998 Christmas productions had disappeared and the Rubidium disc had long since vacated the VT wall. Most of the tapes were produced as a team effort although there was often a single motivating person at each company I won't name names and embarrass anyone, most of the tapes have been lost but the good news is there are clips available on the net for you to view just follow the links.

The technical quality of some of the material that can be reached by the links does not reflect that of the original productions which were all produced to full broadcast specification, none of us would compromise on a Christmas tape, they always got the latest and most up to date technology used on them.

If nothing else it proves that the engineers were not boring, least not in the VT department

Trevor Brown, Ex VT Editor Yorkshire Television

Please be warned some of the programmes contain Bad language and sorry for any missing links, these keep changing, but Google Christmas Tapes for more

The BBC story
http://www.vtoldboys.com/

Hot Gossip at Thames
https://www.youtube.com/watch?v=fattrSxsras

HS100 info
http://www.vtoldboys.com/slo70_3.htm

Suzie Quatro
https://www.youtube.com/watch?v=Gi0WsOBwRBI

Good King Memorex
http://www.dailymotion.com/video/x19bfw9_good-king-memorex-bbc-vt-1979_fun

Instant Replay (legs and Co) Part of White Powder Christmas
https://www.youtube.com/watch?v=AurAjnvnDF0

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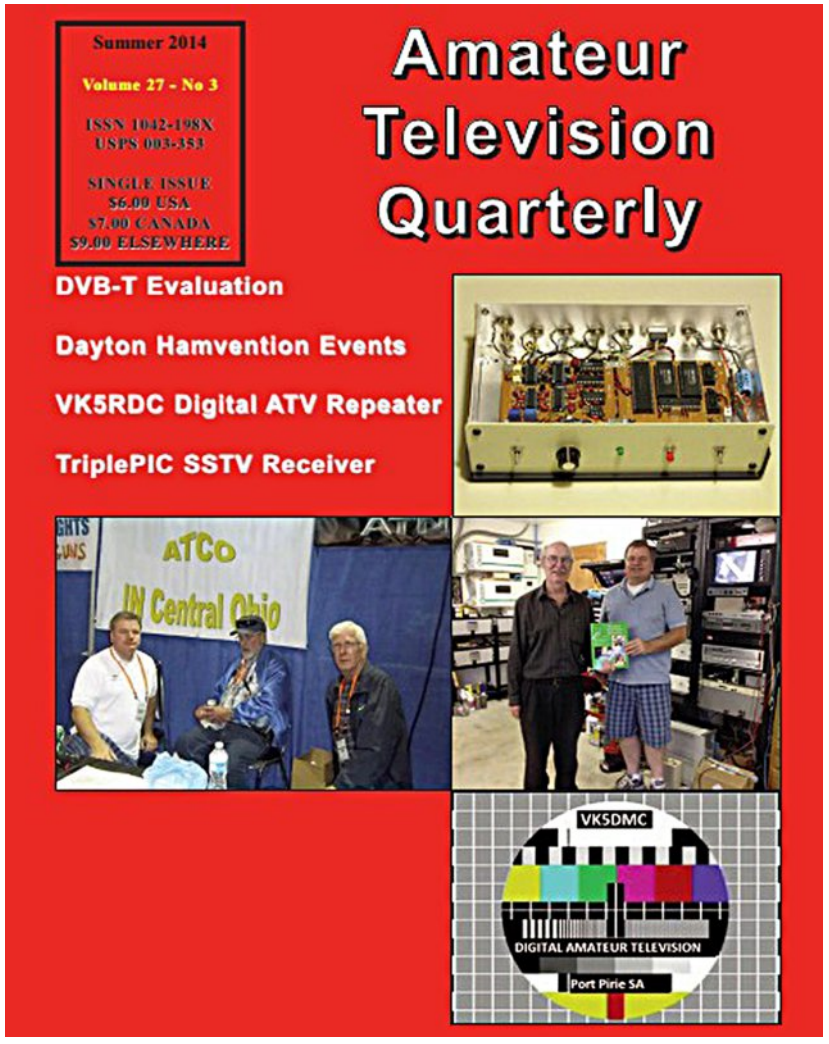

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Published by ATV Quarterly tel (909) 338-6887 email: wa6svt@atvquarterly.com

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