In this issue

The CQ-DATV editors gratefully acknowledge all those authors that have contributed articles for this free magazine.

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Editorial

Welcome to issue 92 of our electronic ATV magazine.

Firstly, there were some complaints about the cover of issue 91. It was meant to be humorous and show that a priceless magazine such as CQ-DATV had no borders when it came to distribution through-out Europe and the rest of the world. Obviously it didn't tickle the funny bone of some. Sorry if you were offended.

The BATC magazine is also available in electronic format, introduced by Ian some time ago and the idea of receiving an ATV magazine electronically just grew every year and by the time Trevor parted company they were well into the 90%+.

This month's cover is a photo by Luigi D'Arcangelo IZ7PDX. The cropped version does not do the sunset justice, so we have reproduced the full uncropped picture inside, our thanks Luigi.

We did trial the cover on a public forum (our Facebook) and everyone is happy with this cover as it attracted only positive comments, as did our magazine in general. Thanks for all the support.

The old adage of never judge a book by its cover may actually be true. If you are ever unhappy with CQ-DATV then please let the team know at editor@cq-datv.mobi unless you really are "disgusted of Tunbridge Wells" then the junk mail filters might be a problem.

In this issue, starting with the news and the fact that Adobe Flash is now no more, I think we all knew that was on the cards and an on-screen Spectrum analyser, which takes Trevor back to a video he filmed several years back, to view it on YouTube, follow the link in the news article.

John Gebuhr, WB0CMC, describes a cheap ATV amp for 420-450 MHz.

D'Arcangelo IZ7PDX explains how to make Pluto into an DATV repeater, proving he does not just take excellent pictures but is a dab hand with the coding.

There are two articles written by Jim Andrews, KH6HTV, one on measuring the RF power of DATV transmissions and another regarding testing of 5.8GHz antennas.

Lucien Serrano, F1TE is looking at the new Minitiouner which has had a makeover. This new version will still support the much-loved Jean-Pierre F6DZP software.

Daniel Romila, VE7LCG is looking at software drivers for RTL8232 based SDR dongles, how do they fit so much in such a small space? They have limitations as Daniel points out, they are only 8-bits, that's still a lot of TV picture even in the days of 4K TV.

Trevor has produced another version of the GVG panel, several PCB's are being beta tested by our readers, but it is too early for feedback so he has added some lines to the programmes to help with diagnosing any problems.

He has populated and tested the new MK2 PCB with his own mixer, but that's going to be next month's report.

Giorgio de Luca IU3IOU has spent a day in the mountains with what he describes as old mode ATV. Looks pretty smart kit to us Giorgio.

From the Vault is the story behind the ATV handbook. Yes there is a copy in the library and yes it goes back to 1980, but it is From the Vault and we are allowed to be time lords in this section.

Cover picture:
QO100 Under the Snow and left, the uncropped original

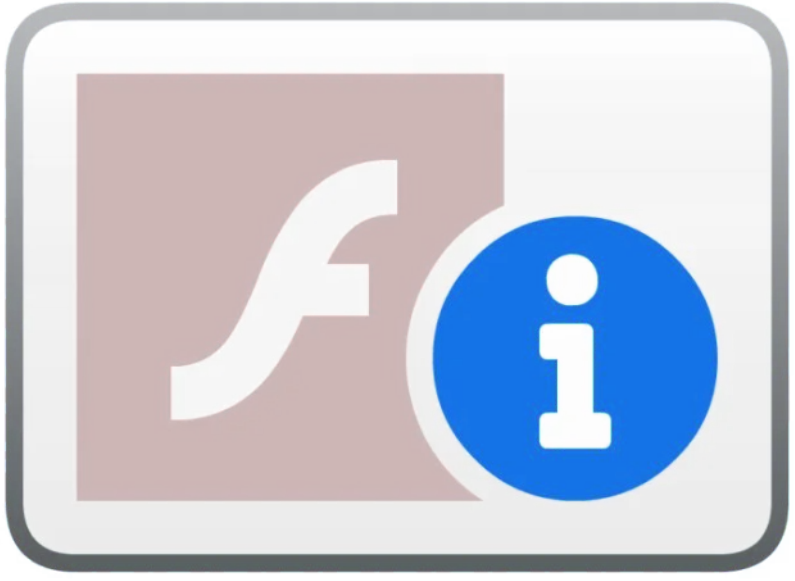
Photo by Luigi D'Arcangelo

We don't run a forum, but everyone is welcome to add comments to our Facebook page and Rudi, our Slovenian supporter, reminded us via email of the quote from President Kennedy "ask not what"….sorry it's too embarrassing to put any more. Thanks Rudi, we've never been compared with anyone like that before, the teams still blushing.

The CQ-DATV Production team

A flash in the pan?

Adobe has finally and formally killed Flash.
The Photoshop giant promised Flash would die on January 12, 2021. Thanks to the International Date Line, The Register's Asia-Pacific bureau, like other parts of the world, are already living in a sweet, sweet post-Flash future, and can report that if you try to access content in Adobe's Flash Player in this cyber-utopia, you'll see the following: Flash death notice



The Flash Death Notice

This link:

https://www.adobe.com/uk/products/flashplayer/end-of-life.html

leads to Adobe's Flash Player EOL General Information Page where netizens are advised to uninstall Flash and fire it into the heart of the Sun (we're paraphrasing Adobe, here.)

That page repeats Adobe's assertions that the likes of HTML5, WebGL, and WebAssembly "have continually matured over the years and serve as viable alternatives for Flash content." Throw in the fact that "major browser vendors are integrating these open standards into their browsers and deprecating most other plugins (like Flash Player)," and Adobe is content to let Flash become an ex-plugin.

Adobe's page also explains why you'll see the Flash Death Notice depicted above, rather than Flash content:

Since Adobe is no longer supporting Flash Player after the EOL Date, Adobe will block Flash content from running in Flash Player beginning January 12, 2021 to help secure users' systems. Flash Player may remain on the user's system unless the user uninstalls it.

More specifically, what's happened is that Adobe put a logic bomb into its Flash software some releases ago that activates on January 12 2021, and causes the code to refuse to render any more content from that date. Adobe has also removed previous versions from its site, and "strongly recommends all users immediately uninstall Flash Player to help protect their systems."

Thus ends Flash, which started life in 1993 as a vector drawing product named SmartSketch, from long-dead company FutureWave Software. FutureWave turned SmartSketch into an animation tool called FutureSplash Animator. FutureWave was acquired by Macromedia in 1996, occasioning a name change to Macromedia Flash 1.0.

Macromedia started to distribute the Flash plugin for the web browsers of the mid-1990s, and it took off as publishers and users alike looked for content that offered more interactivity than was possible with early versions of HTML. By the early 2000s, Flash was all-but-required to experience the modern web of the day.

In 2005, Adobe, which by then had well and truly figured out that online content was going to be rather bigger than desktop publishing, acquired Macromedia in part to get its hands on Flash.

Doing so helped Adobe to cement its role as the de facto standard for creative tools. But Adobe also got an increasing security burden because Flash was not well built. Hackers noticed the plugin was the Swiss cheese of computer security – full of holes – and exploited the software mercilessly to infect victims around the planet with malware.

After years of assaults, and the rise of alternatives, Adobe announced the demise of Flash in July 2017, saying support will be dropped on December 31, 2020.

Browser-makers agreed to expunge Flash, and from 2020 onward warned users that running Flash was a very bad idea and would not run it by default. Those users, by and large, cannot now access Flash content.

Farewell, Flash. You were mostly fun while you lasted.

Spectrum Analyser made easy.

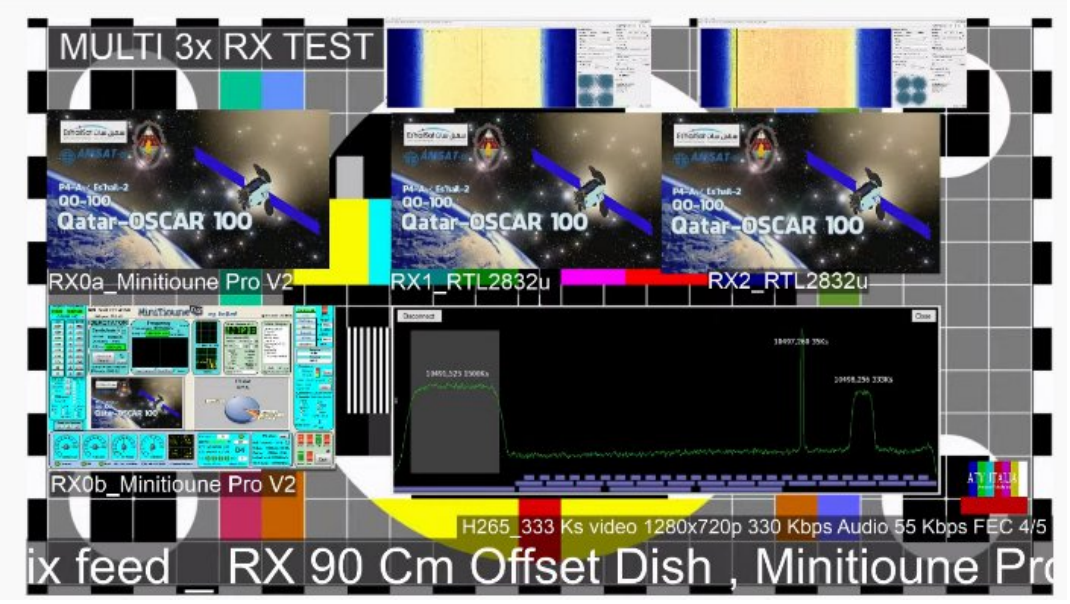
In 1982 Satellite TV enthusiast Steve Birkill demonstrated his C-Band and Ku-Band satellite TV equipment in, seven years after his pioneering reception of the Indian TV 'SITE' experimental broadcasts from the ATS-6 satellite. The video is still on the internet it was filmed by Trevor and edited by Mike Pearson. Sorry about the picture quality we used what we had at the time a Betamax home video camcorder. You can see the video at *https://tinyurl.com/y28s98a3*

1982 might not qualify for the news section of CQ-DATV but if you notice about the middle of the video Steve uses a monitor to produce a spectrum analyser display down the left-hand side of the screen.

This has been revisited by Valter Casagrande who has put together a similar unit this time with the display down the righthand side of the screen. It's always good to see old idea revisited and Valter has called his self-contained unit a Spettrosat. The unit uses a SF 1237B MK2 tuner.

Valter is hoping to make these units available for 40 euros excluding post and packaging depending on where you live this will probably be around 10 euros. The look extremely useful Valter perhaps some pots to expand the display and a character generator overlay to show calibration might be the icing on the cake but please keep all our readers informed.

Luigi D'Arcangelo Iz7pdx



Today I tried to simulate a scenario in which to simultaneously broadcast on the QO100 and at the same time 3 other signals received live from the QO100 transponder using, 3 separate physical receivers, RX0 Minitioune, Pro V2, RX1 RTL2 832u and RX2 RTL2 832u both controlled by DVB-S2 Demode GUI software.

From this test I was able to see what the operational difficulties and the merits of the configurations are. OBS (Open Broadcast Software) uses the plug in VLC video sources to embed the TS stream broadcast by DVB-S2 demod GUI directly into the screen. it's necessary to launch two instances of the GUI and configure the two UDP addresses differently, for example 127.0.0.1:8888 and 127.0.0.2:8888 separately selecting the two receivers.... At the beginning of the transmission. I deliberately left in '' program '' beyond the video", even the audio with the 3 signals I received it highlighted the latency, due to the processing of the CPU (intel i 7). Halfway through the video I started transmission on the QO100 of my so composed signal. To configure interfaces properly it's essential to have a lot of space on your desktop, minimum 2 HD monitors, recommended 3 4 K monitors... Thank you all I hope this tutorial will inspire into DATV testing. Please don't hesitate to contact me for more info or there is anything I have omitted. 73 de IZ 7PDX Luigi.
https://tinyurl.com/y4ja8vj9

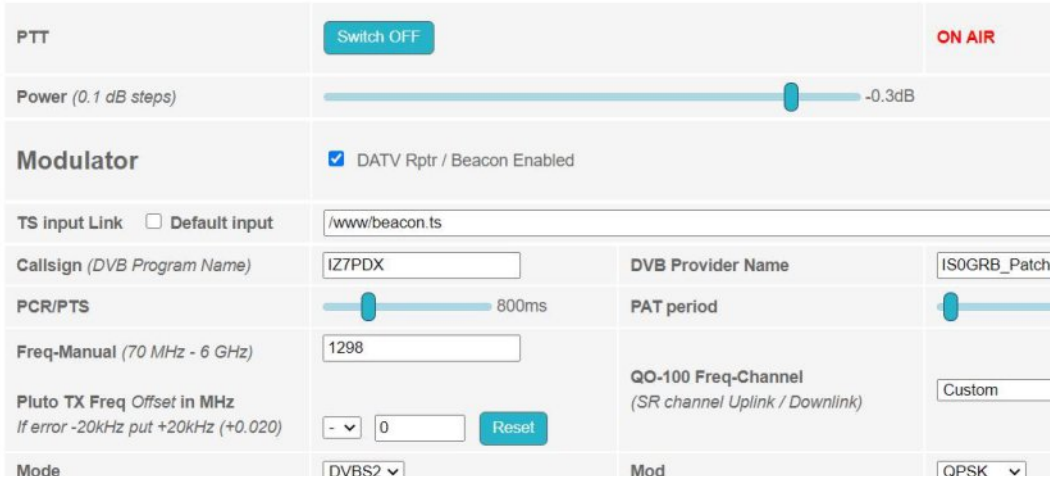
Pluto DATV IS0GRB Patch v1. 3 installation and verification

This new patch allows you to easily create a DATV repeater with the Octagon SF-8008 decoder (using 23 cm input frequency) and when there is no input signal, the Pluto automatically switches to a perpetual beacon (via audio video loop), reporting the presence of the repeater.

Those who aren't interested in making a repeater can use the Pluto as a DATV beacon, (follow the simple directions on the dashboard screen).

I recorded a beacon video with OBS Studio software (TS) using the following parameters: 1080 x1 920p 1000 KS and FEC 3/4 (respecting video encoding balances for this setup) The file must not exceed 25 MB (mine was 12.6 MB).

Next the TS video is uploaded to Pluto's '' Live Beacon '' and looped on the frequency set between (70 MHz to 6 GHz) in my case 1298 MHz (see the screen shot below)



After loading the data, the cable can be disconnected from the PC and the beacon will continue to transmit independently without the PC. By connecting an external power pack and possibly a 5 V power supply, we can guarantee continuity of service even in case of a power outage, using the battery as a buffer. Any amplification chain will have to be fed separately. The beacon has been on air since this morning and has never had any problems. great job Roberto, 73 de Luigi Iz 7pdx Ham Radio Station.

What is ruffle?

Ruffle is a Flash Player emulator written in Rust. Ruffle runs natively on all modern operating systems as a standalone application, and on all modern browsers through the use of WebAssembly. Leveraging the safety of the modern browser sandbox and the memory safety guarantees of Rust, we can confidently avoid all the security pitfalls that Flash had a reputation for.

Ruffle puts Flash back on the web, where it belongs - including iOS and Android!

Designed to be easy to use and install, users or website owners may install the web version of Ruffle and existing flash content will "just work", with no extra configuration required. Ruffle will detect all existing Flash content on a website and automatically "polyfill" it into a Ruffle player, allowing seamless and transparent upgrading of websites that still rely on Flash content.

Ruffle is an entirely open source project maintained by volunteers. We're all passionate about the preservation of internet history, and we were drawn to working on this project to help preserve the many websites and plethora of content that will no longer be accessible when users can no longer run the official Flash Player. If you would like to help support this project, we welcome all contributions of any kind - even if it's just playing some old games and seeing how well they run.

Releases

Ruffle is still in active development and we release nightly development builds every day, as long as some code changed. Whilst we try to keep nightly builds in working order, no guarantees can be made.
Installing the browser extension
If you visit websites that have Flash content but aren't using Ruffle, or you want to ensure you're using the latest and greatest version of Ruffle on every website, then our browser extension is the perfect thing for you!
Until our first release, we currently only ship unsigned browser extensions. To use these, first download the appropriate one for your browser from our releases, and then install it manually.

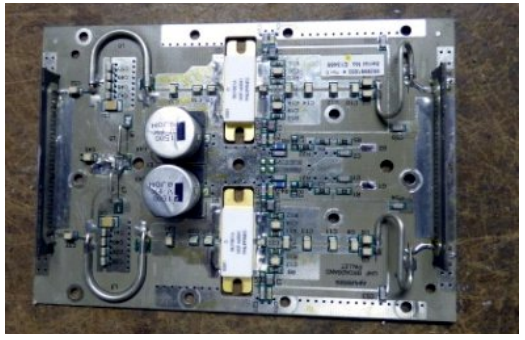
Source: *https://tinyurl.com/y2r4rmxz*

A cheap ATV amp for 420-450 MHz

Written by John Gebuhr, WB0CMC

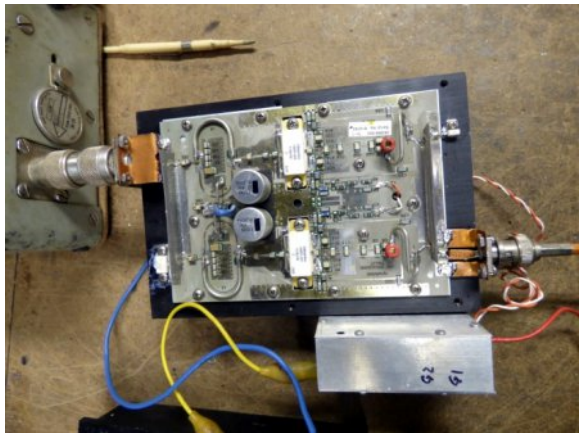
A few weeks ago I acquired a UHF module from a digital transmitter that is being retired. It contained 9 amplifier boards, each with a 300 watt capability. One drove the other 8 for a combined output of about 2400 watts. They were specced from 470-800 MHz. I wondered if they would work down in the Ham band. There were also 5 DC-DC power supplies to run them. The boards run on 32 VDC.

Power supply, 375VDC in, 32VDC out @ 18 A max.

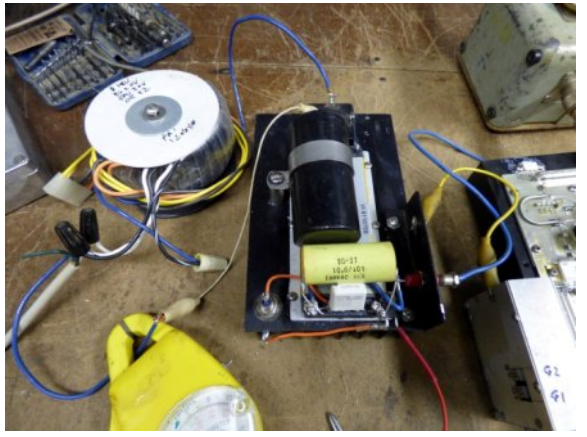


Original 300 watt board. It takes 15 watts of drive

With minor modifications they do work fine at 434MHz. Each board will operate either single ended or dual IO. They have a 13-14dB gain and run class AB. For ATV I found a static bias of ½ A per device is adequate for good linearity and gain. Efficiency is about 25-30%. A 300 watt board modified for 434 is shown below. This is connected for single ended operation. The unused in and out are terminated in 50 ohms mounted to the heat sink. The two trimmers (red) are 3-20 pF caps and optimize the input match. No other mods are necessary.



The box on the side is the gate bias control. The blue wire is the 32 Volt supply line.

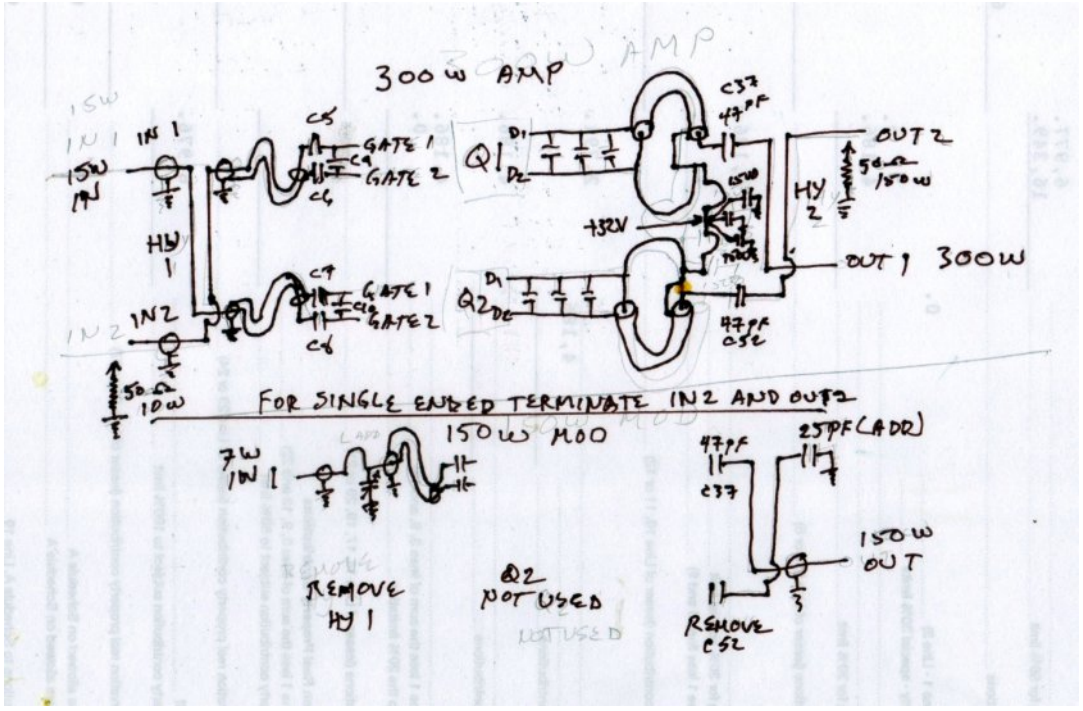


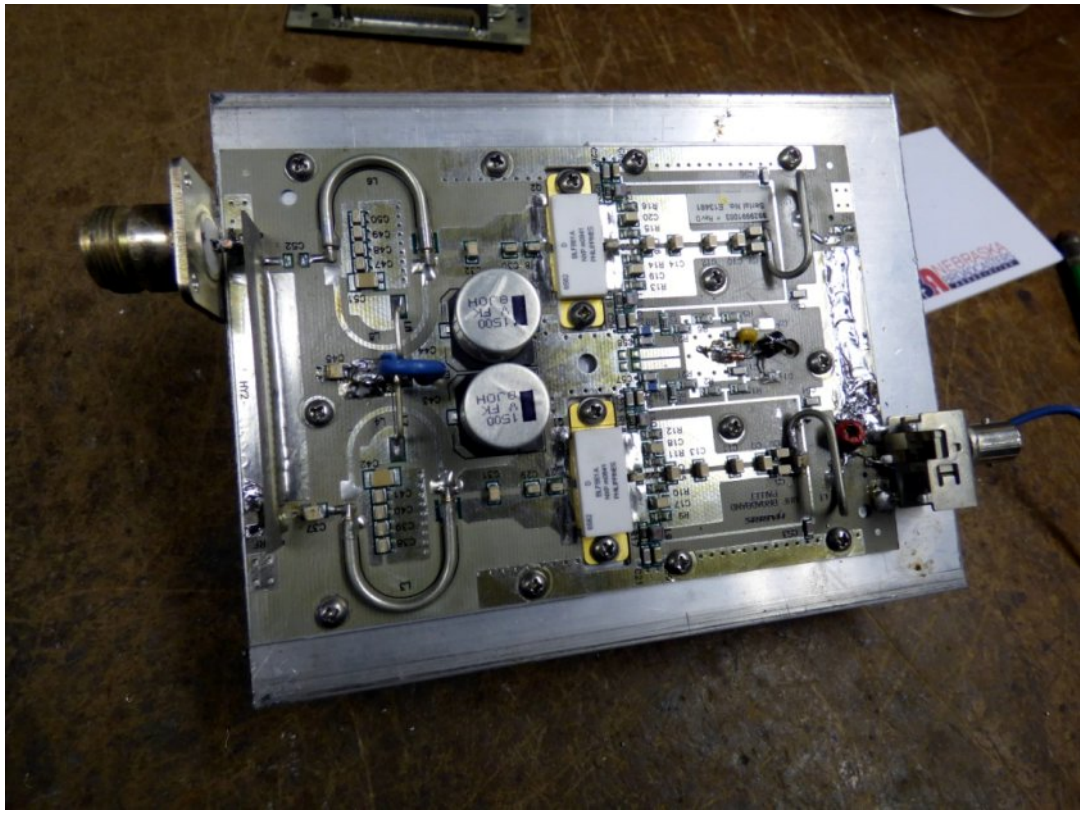
Power supply for the amp.

Primary power at 240 volts is about 2.5 A at 300 watts CW. I used a dual primary transformer to get 240 VAC to rectify. I also added the 20 volt winding in series to get 260 AC which gives about 355 DC filtered for the converter. A 15 watt PC electronics TX with colour bars gives 175 watts on the bird.

Killing the ped and video it goes to 300+ watts. I will have to add a fan to this for longer transmit times since it does get pretty warm. Following is briefly what the amp is.

For a single 150 watt amp and a lot less heat to dissipate, it only draws about 9 amps at 150 watts CW, remove the input hybrid (HY1)and put a small loop and trimmer shown as the 150 W mod. Remove C52, the output cap of the unused half and add a 25pF at the out 2 terminal.





The little circuit in the middle is a 78L05 for biasing the gates. It needed a diode to ground from the regulator to get the 5.7 volts needed to give about ½A static bias. The input cap is, again for matching and will have some effect on sync level but it is a set and forget adjustment. The unused side should have no gate bias.

The transmitter that these came out of was a Harris and ran on 480 VAC. The rectifier for the module used a "Y" connected bridge rectifier and cap to give the 375 volts DC for the inverter. The inverter will put out 32 volts with only 240 DC in but I doubt it would have much current capacity. At 350 it will run any of the configurations shown here.
I've got 3 of these 150 watt mods out there now with my 7 watt ATV transmitters and they do work well. 7 watts seems to be a perfect match for the 150 watt mod.

It's been fun.

A New Minitiouner - Single Channel - Minitiouner-S

Written by Lucien Serrano, F1TE

Introduction

The launch of the QO-100 satellite and its very efficient wideband transponder has made greatly popular the amateur digital television activity.

Figure 1 : The Box

Anticipating this, for four years now, the REF has been manufacturing and distributing semi-kits for digital television reception.

In collaboration with the initial designer of the hardware and software, Jean-Pierre F6DZP, we made available to the community a receiver called "MinitiounerPro", suffixed "Pro" to differentiate it from the first Minitiouner kits distributed by our English friends at the BATC.

The most complete "Pro" receiver offers the possibility to have simultaneous reception on two bands, between 144 and 2450 MHz

To date, about 700 Minitiouners have been distributed by REF, both in France and in Europe, viral marketing has done a great job.

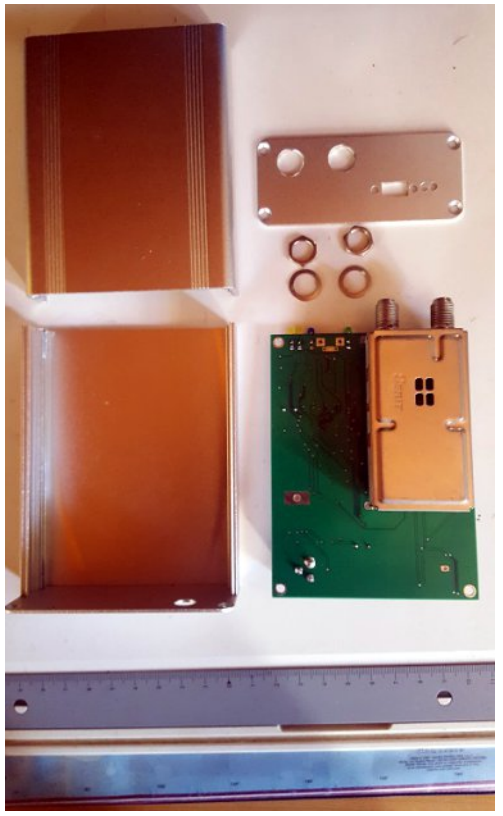


Figure 2 : The Kit

The MinitiounerPro is a semi-kit, that is to say that the SMD technology components, surface mounted, are already soldered and there are only a few through-hole components left to be mounted on the board, a few LEDs and a connector , this which remains within everyone's reach.

This kit was designed by the REF team which carried out the prototypes, the industrial production and its distribution via the REF association online store. We have often been asked to provide an enclosure, but the low added value of our online store on this item compared to availability on the NET has prevented us from doing so until now.

With the objective of providing everyone with the simplest possible receiver at the most reasonable price, we have adapted the design of the Minitiouner to offer a smaller, simpler receiver, with an enclosure, while keeping software compatibility with the MinitiounerPro.

Of course, some concessions had to be made on functions less often used, such as the possibility of external relay commands, the output of TS streams in parallel format or double reception.

This gives us a simpler schematic, a smaller PCB, and the possibility to use a standard case which will then be provided as part of the new kit.
USB Connection

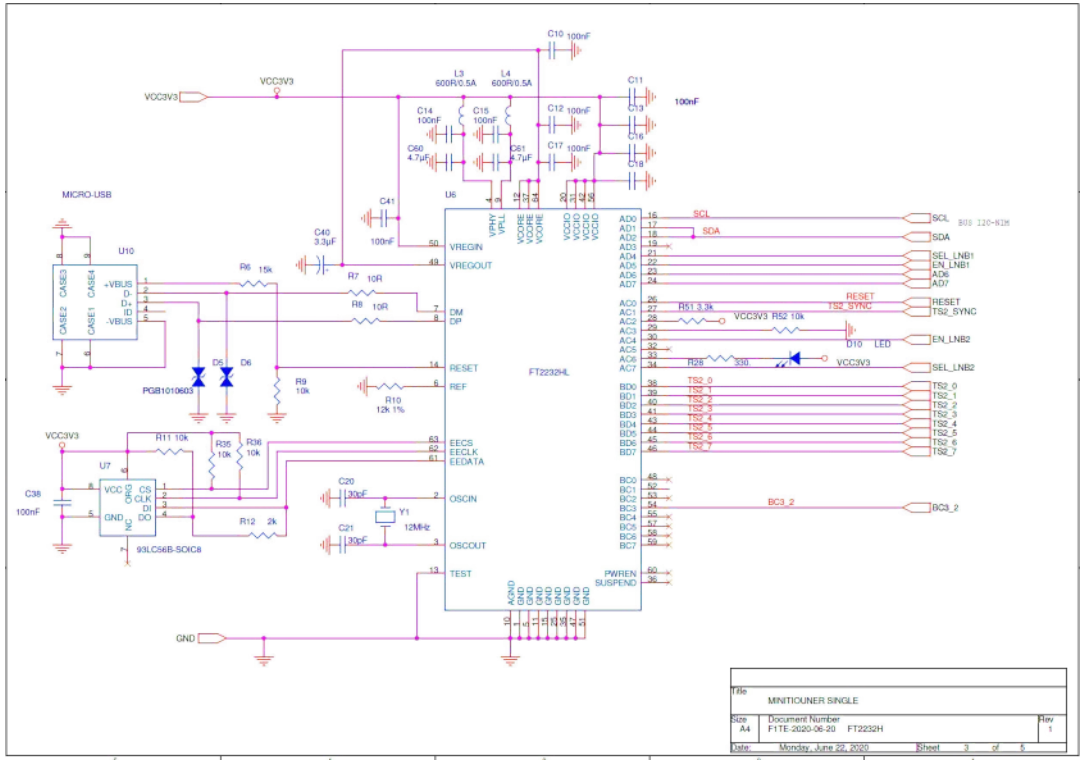


Figure 4 : USB

This function is performed by FTDI 2232H chip which provides the USB connection between the PC software, and the NIM tuner which delivers the "TS" transport stream : the digital stream received and decoded. All commands controlling the receiver are transmitted via this bidirectional channel.

The USB connector is a micro-USB model compatible with many cables used on smartphones and other USB equipments. This type of connector, is widely used and very convenient, despite a potential fragility. A similar connector is used on SDR Adalm-Pluto transceivers.

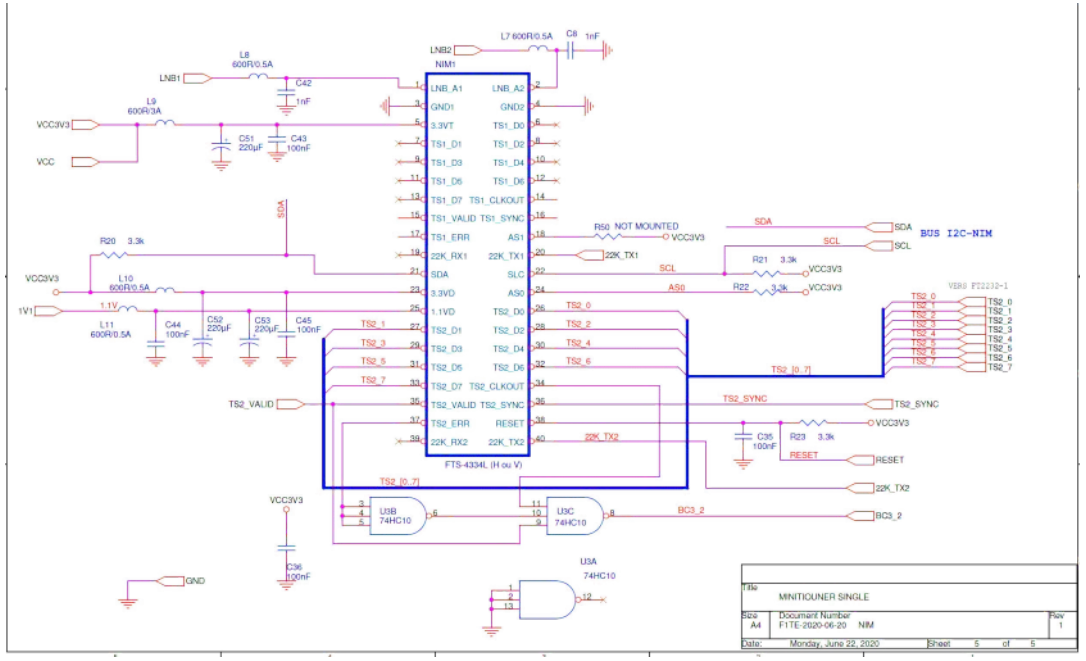


Figure 5 : NIM

There are two models, horizontally or vertically mounted, of this NIM. For this version, we have opted for horizontal mounting under the printed circuit, opposite side to the components.

100% compatible with F6DZP's “Minitioune” and “Scan & Tioune” software, this new receiver allows everyone to start quickly reception from the QO-100 satellite and, of course, also direct “terrestrial” reception of amateur DATV, which is now supplanting analogue television. Analog television technology is abandoned by commercial television, and so DATV could only gain usage in the amateur domain, thanks to its spectral efficiency.

A very high-quality fluid image can be broadcasted in DATV over a bandwidth at least twenty times lower than analog equivalent. We must salute the superb work of F6DZP in this field where for more than 10 years, Jean- Pierre has been promoting these technologies in the amateur world.
This new version is still a semi-kit solution that is offered to you. It comes in the form of a printed circuit board made of pre-assembled SMD components. The choice of this technology allows costs to be reduced by use of professional automatic assembly equipment at factory. The only remaining task for the user is to solder the LED diodes, to place the NIM and to assemble both in the enclosure provided.

Power Supplies

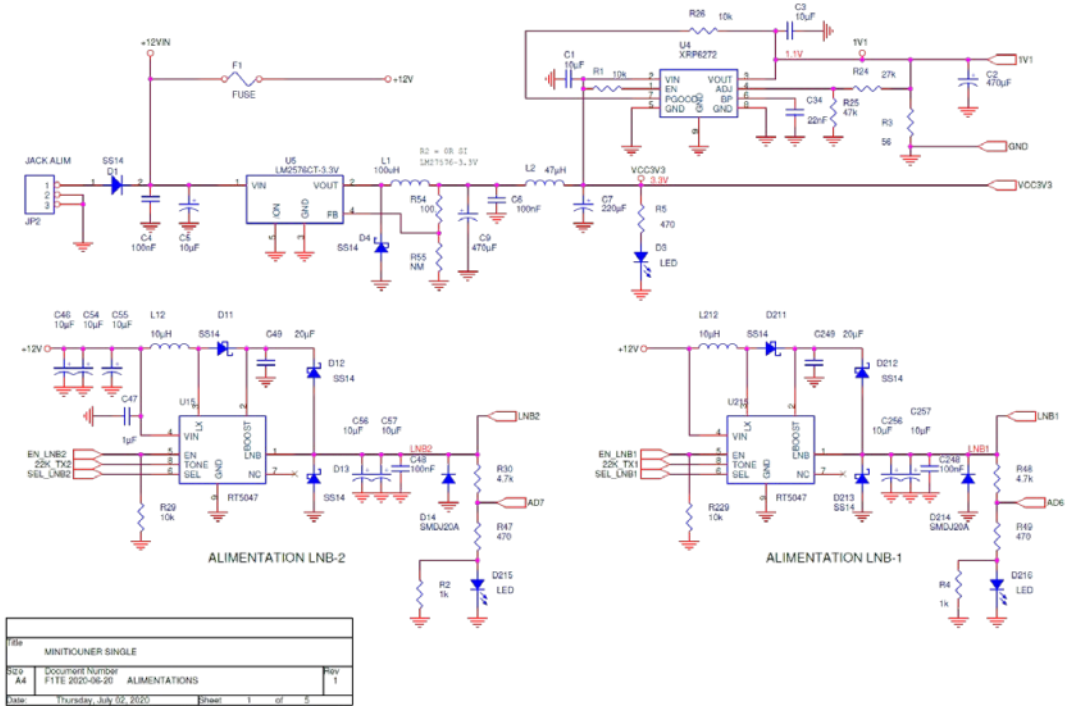


Figure 3 : Power supply

On diagram above, we identify the general power supply which will provide the 3.3V voltage necessary for the various components.

This switching power supply the U5 chip has a double filtering to produce a voltage free from switching noise. From this voltage of 3.3 V, U4 generates 1.1V voltage necessary for the tuner "NIM". The two chips U15 and U215 are used to generate the voltages +14 V and +18 V necessary in case of use of an LNB on the satellite bands. This allows to select the polarization, horizontal or vertical, of the received signal.

These polarization voltages are controlled by the Minitioune software and you must make sure that the voltage is correctly programmed at 0 V by the software if you are using something else than an LNB connected to the inputs of the NIM tuner, and in particular a shorted conventional terrestrial antenna.

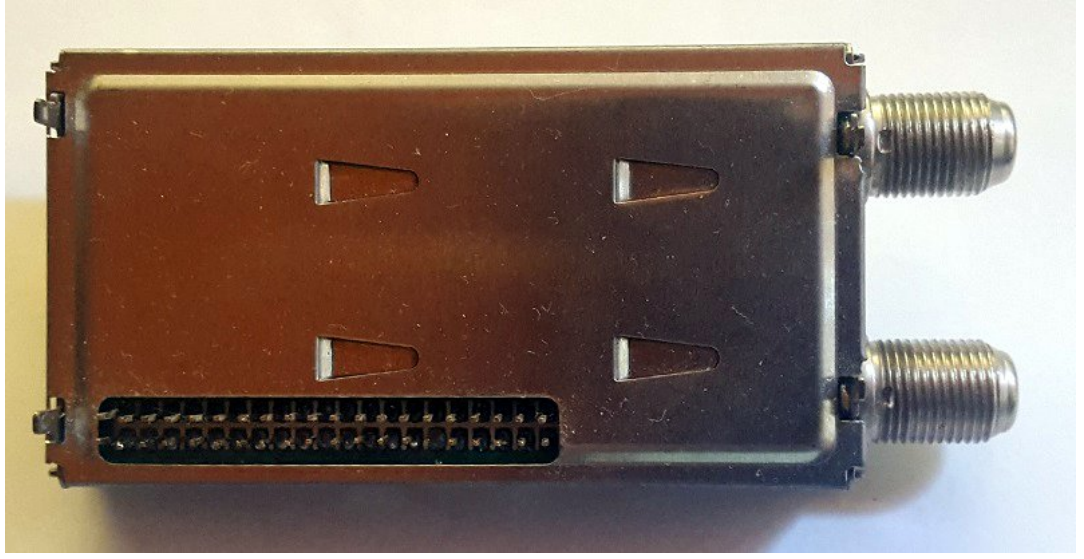


Figure 6 : NIM

The 2X20-pin female connector which receives the NIM is a SMD model soldered at factory this time on the printed circuit. The NIM is a special model which receives without gap from 144 MHz to 2450 MHz.

Continued next page...

Assembly

The enclosure dimension are: 88 x 38 x 110 mm. Front and back panels are supplied non drilled.

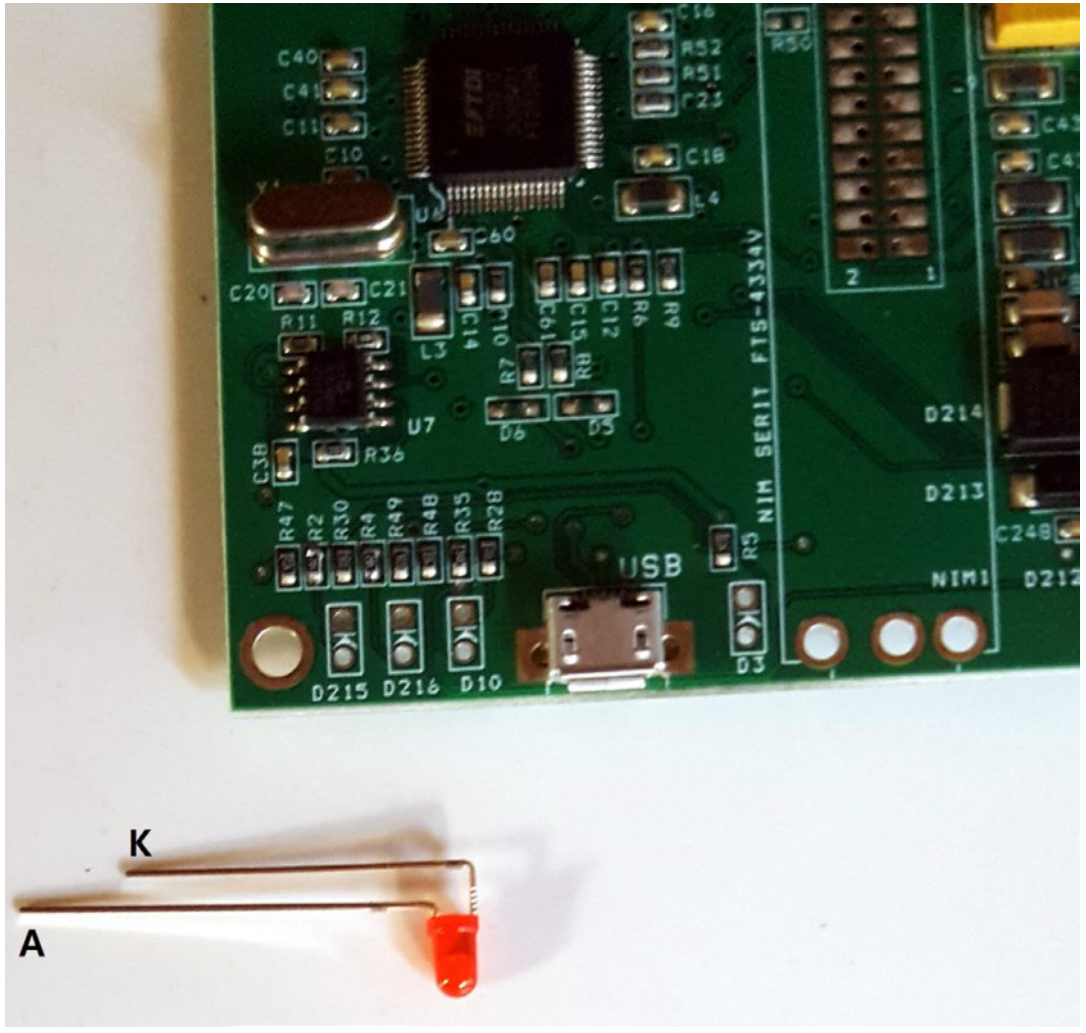


Figure 7 : LED assembly

Once the LED diodes are soldered, you must mount the NIM on its connector positioned on the face opposite the components and immobilize it to the GND pads by a few soldering points.

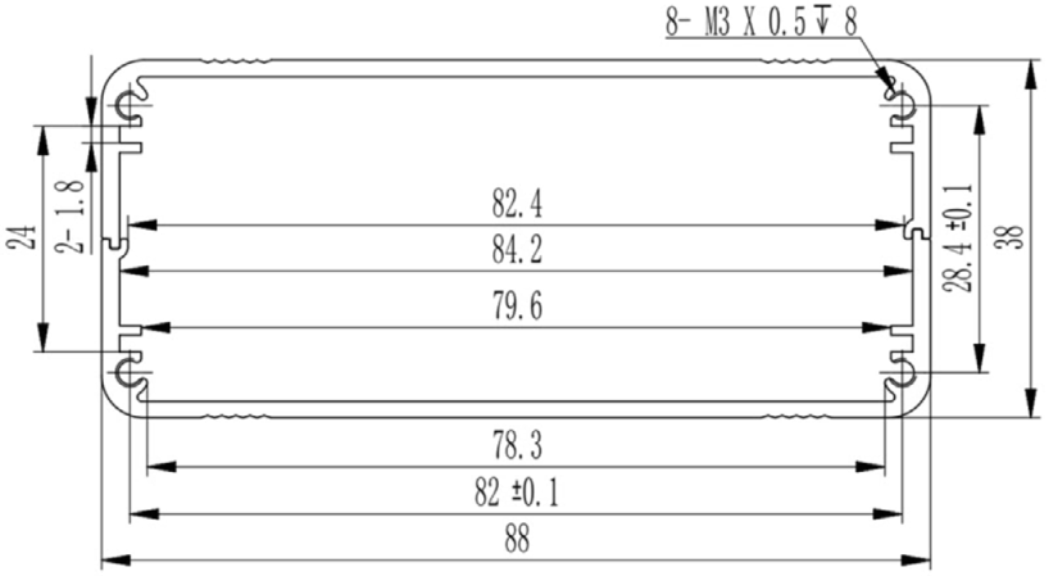


Figure 8 : Case profile

Then proceed with the drilling of the front and rear panels according to the drill plans below. Position the front and rear faces for pointing to visualize the countersunk fixing holes.

The holes for the LED diodes are 3mm in diameter, the holes for fixing the tuner F socket are 10mm and the power jack hole on the rear side is 8mm.

For the USB connector, drill two 5 mm diameter holes on each side of the center of the connector, 5/10 of a mm below the axis of the diode holes. The second tangent hole is always tricky to drill, start at 3mm first so you don't have to engage too much material when finishing at 5mm. Finish with a soft watchmaker's file to obtain an oblong hole.

Insert the NIM on its connector and immobilize it perfectly horizontal by soldering the 4 gnd points.

Fix the front face on the NIM, possibly placing the washers to ensure that it is perfectly squared.

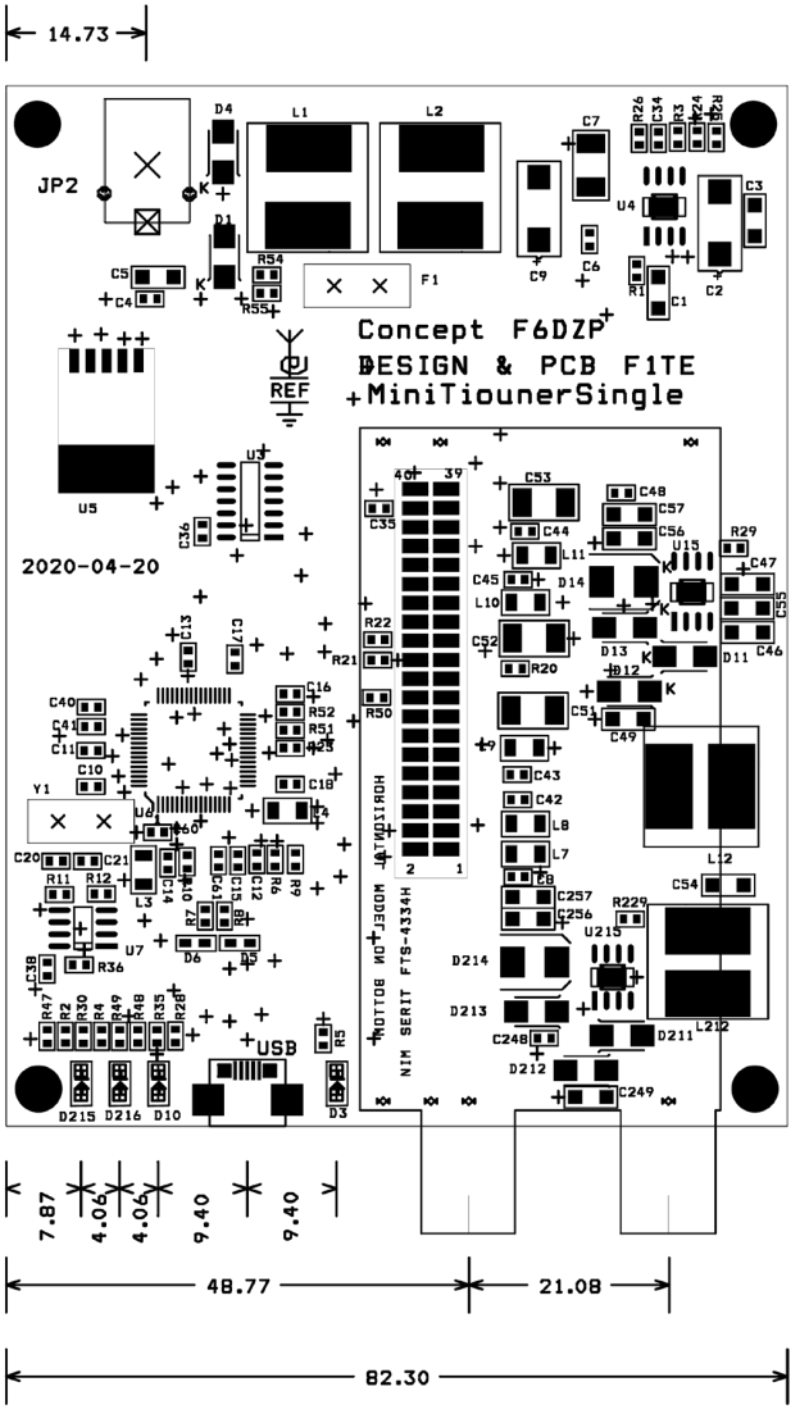


Figure 9 : CAD dimensions

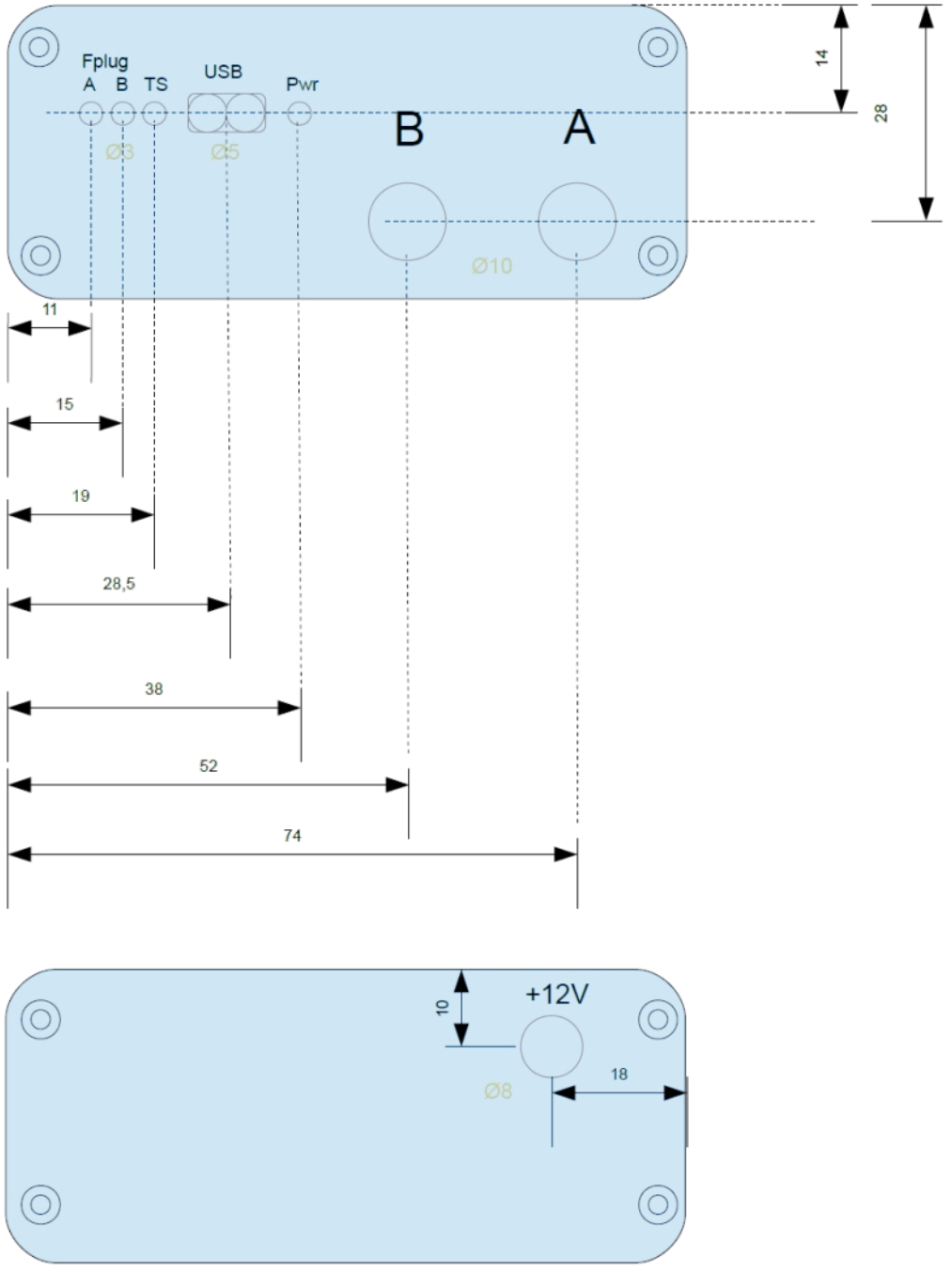


Figure 10 : Drilling plans

Commissioning

The Minitiouner Single is supplied with power via the 2.1 mm jack located at the rear of the box.

As with the MinitiounerPro, a voltage of 12 V 500 mA is required. Never exceed 15 V, this is the maximum that can withstand the RT5047 integrated circuits which generate the voltages 13 V and 18 V for the LNBs. The operation is checked with the test software TestMyMiniTiounerV25.exe, version V2_5 and later.

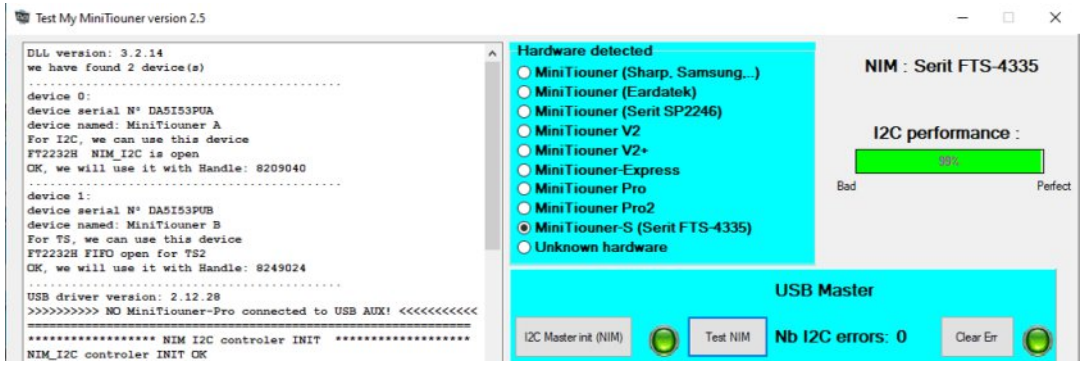


Figure 11 : Test software

The Minitiouner is recognized as a Minitiouner-S, compatible with the versions of this series of BATC, but compared to these kits, it has the advantage of natively managing the voltages of two LNBs connected to the two F plugs of the NIM.

There is therefore no need for any injector or “T-bias” to perform this function. Regarding the Minitioune software, you must use the versions from V0991i.

Conclusion

This new model in the Minitiouner range is intended to offer as many people as possible the opportunity to start in DATV, an activity that the REF is pleased to promote.

Figure 12 : Mintiouner-S in service

Software can be downloaded on web site *www.vivadatv.org* section Téléchargement/download

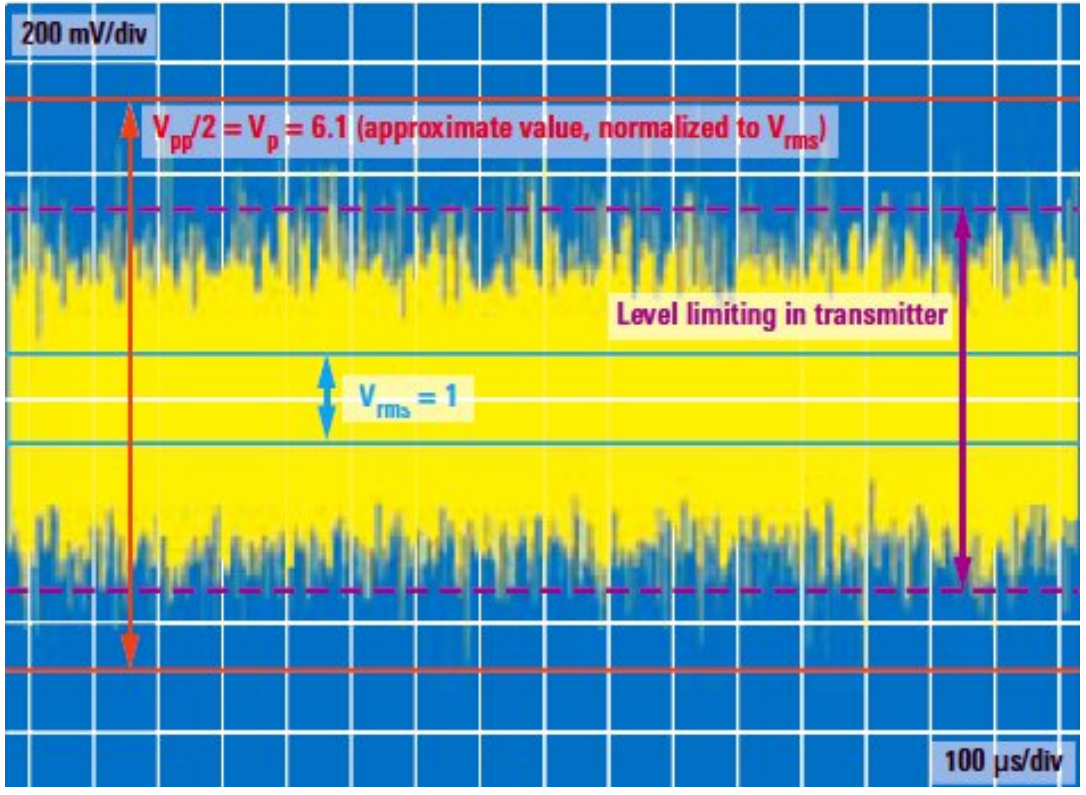
RF Power Measurement of Digital Signals

Written by Jim Andrews, KH6HTV
Reprinted from Boulder Amateur Television Club TV Repeater's REPEATER January, 2021

There is a lot of controversy among hams about RF power specs. and claims when it comes to non-sinusoidal rf signals, such as digital TV, D-Star, DMR, etc. The most common rf power meter in ham shacks is one such as a Bird or similar meter. These power meters use a semiconductor diode as the basic detector element. The diode detects the peak value of the rf input signal. Then depending upon the R-C filtering after the diode, the resultant DC voltage can represent either the rf peak or average power. These diode detector meters are all calibrated using CW sine waves. These types of power meters do not accurately measure noise-like digital signals.

Bird RF Power Meter

Now for measuring a digital signal, it is not a simple matter because it's time domain waveform looks just like random, white noise and is no longer a simple sine wave. There are many peaks and valleys to the signal. It is only really meaningful to characterize it by it's RMS power. A very good document discussing this is found in the newsletter from Rohde & Schwarz, called "News from Rohde & Schwarz. See issue #172, pages 44-48, "Measurements on MPEG2 and DVB-T Signals".



Oscilloscope display of DVB-T signal - R&S

The Crest Factor is an important concern for digital signals. It is the ratio of the peak to the rms value. It tells you the max amount of drive to which an rf amplifier can be used in a DVB-T transmitter and still remain in the linear range without signal limiting. While theoretically the crest factor could be very high, R&S says "Investigations have shown that for a

crest factor of approximately 13dB there is no appreciable impairment of the bit error rate (BER)." R&S also says -- "For economical reasons, the crest factor in DVB-T transmitters is usually limited to 10 or 11dB." Thus for a transmitter capable of putting out 100 Watts (PEP), allowing for a crest factor of 10dB, it's DVB-T, rms power would be 10 Watts (rms).

R&S goes on further to state --- "Thermal power sensors supply the most accurate results for measuring the power of a DVB-T transmitter. Plus, they can easily be calibrated by performing a highly accurate DC voltage measurement." The classic Hewlett-Packard model 432A is such a power meter. It uses thermistor power sensor heads. The meter has a self-balancing bridge which compares DC power to the unknown RF power.

Power Meter Tests

I have run some test bench experiments to see what answers we might expect to get with different RF power meters. I first started out with low, milli-watt signals to do a comparison of several test instruments of mine to verify accuracy. They were an HP-8656A signal generator, an HP-432A power meter with an HP-8478B thermistor power sensor head, and a Rigol DSA-815 spectrum analyzer. I generated a 441 MHz, CW, pure sine wave with my HP-8656A signal generator and adjusted it's rf level to read exactly +5.0dBm on the HP-432A. The interconnecting cable had 0.2dB of loss and the HP signal generator was set to +5.2dBm. Thus the two agreed exactly. Then using the same cable and generator setting, I measured the CW signal on the Rigol. It's marker read +5.16dBm, i.e. 0.16dB high, but still excellent agreement. I tested the Rigol on two bandwidths of 300kHz and 30kHz and got the same result.

The next test was at high power of 3 Watts (34.77dBm) at 441 MHz with both a pure CW sine wave and also DVB-T signal. The DVB-T signal source was a Hi-Des model HV-320E modulator set to 441MHz with 6 MHz bandwidth and QPSK modulation. A KH6HTV model 70-7B, 70cm amplifier was used to amplify either the CW sine wave or the DVB-T signal to the 3 Watts (rms) power level. The power level was set and measured using the HP-432A thermistor power meter, plus a calibrated 30dB, 50 Watt, Narda 776B attenuator.
I then inserted between the amplifier and the 30dB attenuator two conventional rf power meters which use semiconductor diode detectors. The first one was an M.C. Jones, Micro-Match, 70-500MHz, in-line power meter. I also borrowed from Bill, K0RZ, a Bird model 4300-400 with both average and peak reading capability. I used a Bird, 10 Watt, 200-500MHz power sensor in the Bird meter.

Both the Micro-Match and the Bird were quite accurate measuring the 3 Watt, CW sine wave.

The Micro-Match was -0.3dB low. The Bird was only -0.1dB low. But when they were used to measure the 3 Watt DVB-T signal, both meters read too high. The Micro-Match reading was +1.3dB too high. The Bird's reading was +2.1dB too high in CW mode and +2.3dB too high in peak mode. Thus either of these meters would give erroneous, optimistic, readings of DVB-T rf power. They were obviously responding to more of the peaks in the DVB-T signal than the rms value.

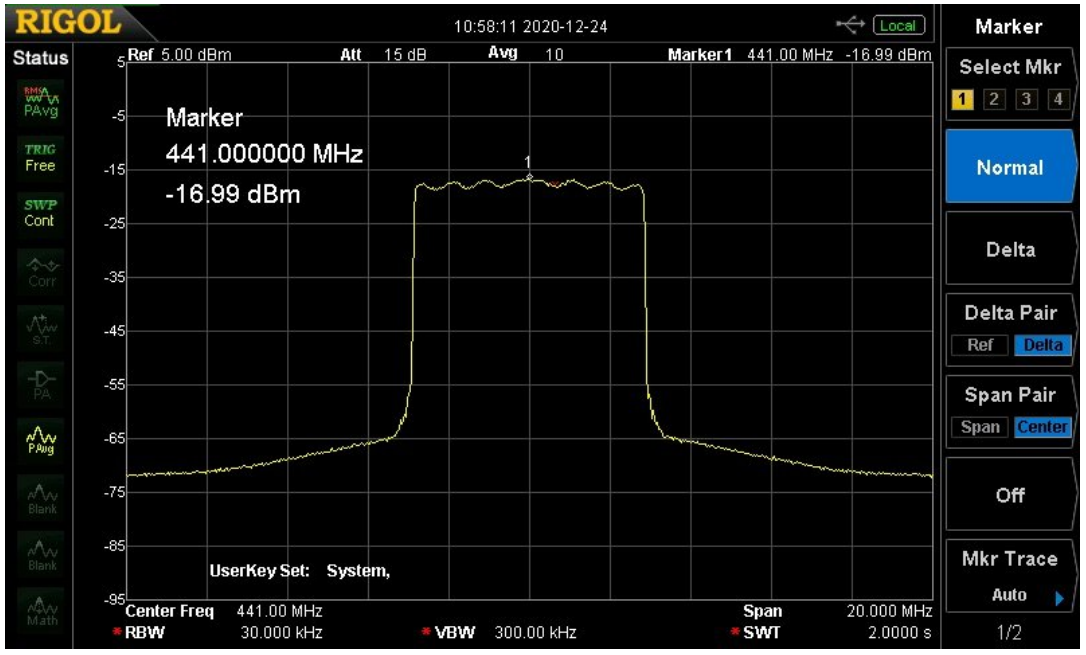
Spectrum Analyzer Measurement of DVB-T Power

Another technique to measure the power in a DVB-T signal is to use a calibrated spectrum analyzer. The analyzer should first be set-up exactly as specified by the ITU. A good reference book is "Digital Video and Audio Broadcasting Technology" by W.Fischer (an engineer for Rhode & Schwartz). I refer you in particular to chapter 21.2, "Measuring DVB-T Signals Using a Spectrum Analyzer", pages 425-428. The analyzer settings must be as follows:

- *Center Frequency: center of the DVB-T channel*
- *Span: 20 MHz*
- *Resolution Bandwidth: 30 kHz*
- *Video Bandwidth: 300 kHz*
- *Detector: RMS*
- *Sweep: slow, 2 seconds*
- *I also recommend using signal averaging of at least 10 averages*

The photo upper right shows the proper setup for measuring a DVB-T signal. The signal was direct from a Hi-Des HV-320E modulator set for 441 MHz, 6 MHz bandwidth and QPSK. The RMS power of this signal was +5.3dBm as measured with the HP-432A power meter.

Use the analyzer's marker to measure the power at the center frequency. In this example, the value measured was -17dBm. Thus the correction factor to be used is +5dBm - (-17dBm) ≈ +22dB

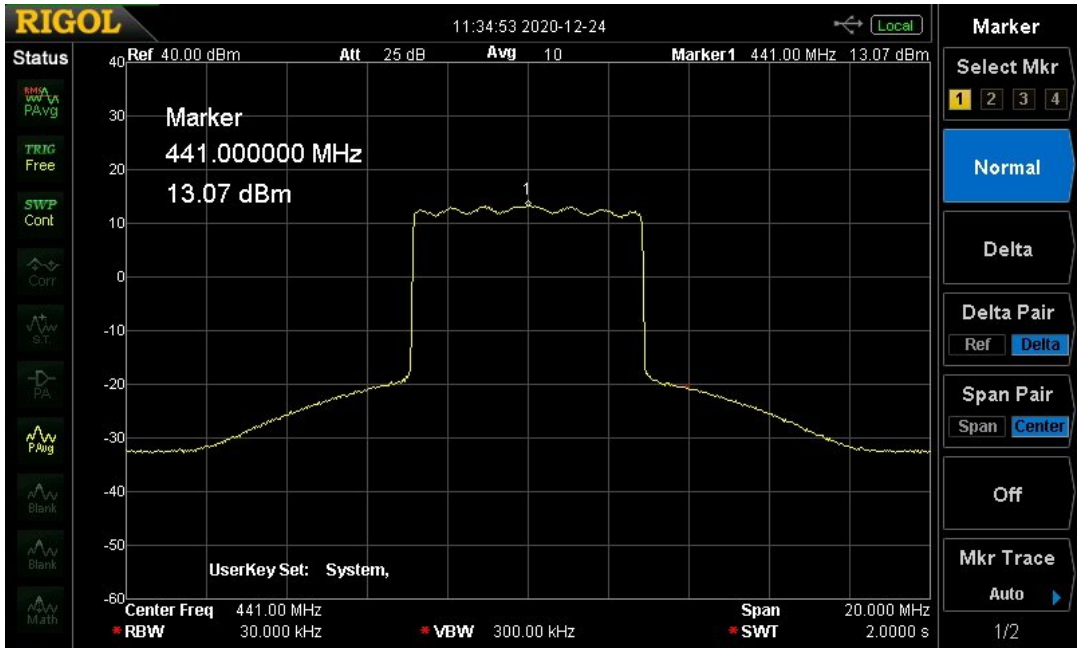


There is some uncertainty in where to make this measurement, due to the ripple in the in-channel power, plus there are some fluctuations in the observed value.

So why doesn't the analyzer measure the true +5dBm power? The reason is the analyzer is only measuring the power in a narrow 30kHz bandwidth, while the thermistor power meter is measuring the total power spread over a 6 MHz bandwidth. An extra cost optional measurement firmware can be purchased for the analyzer which will in fact integrate the power over the entire displayed span.

The +22dB correction factor is only good for measuring 6 MHz bandwidth signals. If you are using other bandwidth signals, then you need to determine a different correction factor value.

The photo on the next page now shows doing the measurement on the 3 Watt output from the 70-7B amplifier. This was the same signal used to evaluate the Bird and Micro-Match power meters.



Applying the +22dB correction factor to the above measured +13dBm, we can estimate the rf power to be about +35dBm (3.2 Watts). This technique is not as accurate as using a thermistor rf power meter, but will give close correlation.

It should be noted that another critical measurement of DVB-T transmitter is the out of channel, spectrum skirts. This is done with the same setup as shown in the above photos. The ITU spec. is to measure the skirt, shoulder, break-points ±200 kHz outside of the channel edges. For a 6 MHz bandwidth, this is ± 3.2MHz from the center frequency. On the photos above, the shoulders from the modulator are seen to be about -45dB down and for the amplifier's 3 Watt output, they are -33dB down.

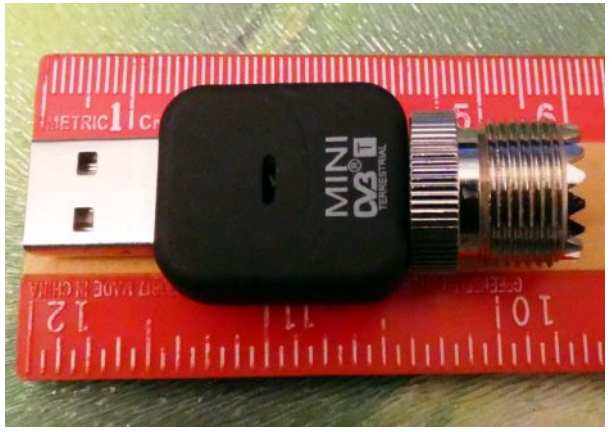
Software drivers for RTL8232 based SDR dongles

Written by Daniel Romila, VE7LCG

One of the cheap things to buy and to play with for ham radio activity (and not limited to that) are the SDR dongles based on the Realtek chip RTL8232 (several versions) and the Rafael Micro 820T chip (several versions). They work together. Rafael Micro declared already in 2018 it stops the production of RF820T chips, and it will produce only for mass quantity orders, if any.

It seams the orders kept coming, because we are in 2021 and we still can buy this kind of SDR dongles. They can be in various packages, smaller or bigger:

I personally remained with only one (after trying several of them, just for fun, and seeing that they are practically the same, no matter what version are the chips inside). It is a knock-off Noolec:



It has an MCX antenna connector, which is fragile, so I use it with an antenna connector adapter, as you see in the above picture of my SDR dongle. There are dedicated forums on the Internet where users swear a certain SDR dongle, based on a certain version of RTL8232 chip and its "associate(s)" is better than the other models.

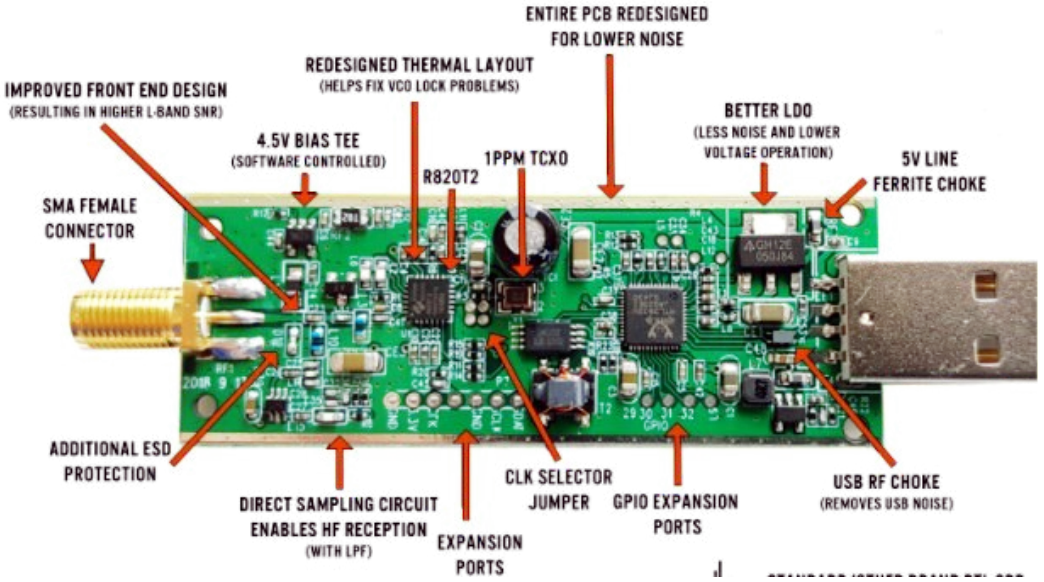
Based on those forums maybe I am right, that the differences among them are so small that they do not matter, at all, since they all keep the specifications declared on Realtek website: *https://tinyurl.com/hs2df3p*

In plain English, it is a radio kind of device "a high-performance DVB-T COFDM demodulator that supports a USB 2.0 interface." The original purpose was to use it as commercial FM receiver and also to receive TV stations in some parts of the world (not North America ATSC and NTSC television standards).

That part with receiving TV stations it is very debatable, for any system in the world, especially now in 2021 when almost all systems are digital, but it is not the purpose of this article.

It is still the best for this purpose – FM receiver - and works for receiving signals between 25 MHz and 1750 MHz. Users successfully tuned it outside those limits, especially above 1750 MHz. Mine does not work under 23 MHz.

Because it knows to receive such a wide band of frequencies, hobbyists adapted it for other purposes, like ham radio receiver and amateur TV receiver.
I have a kind of block real drawing from RTLSDRBlog Store:



As any device, it has its limitations. It works on 8 bit (not 12, not 16). So no matter what a genius software developer would do, it will remain an 8 bit device, and it will not sound so good as a dedicated FM receiver one can buy today. It will never work for the North American TV standard, which now is all digital. There are many articles on the Internet explaining why. You might see various bandwidths declared for this chip, bigger than 3 MHz. They are not the bandwidth that counts. That 3 MHz is the limitation. A good article, written in 2016 by R. X. Seger, a self-declared 12 minutes read, explains with some pictures and measurements:
https://tinyurl.com/hs2df3p

You can skip the article, and here I copied only one paragraph: "This SDR mode only supports a bandwidth of 3 MHz, at best, not nearly enough for receiving DVB-T, nor ATSC (6 MHz) for that matter." (Jim, KH6HTV note: "I dispute this statement as I have definitely proven that these dongles do in fact work for 6 MHz bandwidth DVB-T. The photo shown on page 1 of the Jan. 2021 issue (#66) of the BATVC newsletter was a screen grab of an actual 6MHz, DVB-T transmission which played flawlessly with live video and audio.") Both of them are right, because KH6HTV demonstrated it works, with video and sound; R. X. Seger wants more than that, not only to work, and imposed higher quality requirements that RTL2832 SDR dongles cannot meet.

The SDR dongles mentioned in this article are USB pluggable. That means one cannot use them as they are, because they do not have buttons, no audio outputs, no display. They require a computer and an operating system to become usable. It can be Windows, Linux, Android and so on – if you can find the driver/software for it.

My experience with SDR dongles on Android was not great. It did not work for me and I did not insist to make it work, since I have a big 23 inches Windows 10 tablet. Whatever operating system one might use, one needs first a driver – a piece of software telling the computer if the dongle is there or not, and how to communicate with it. On top of that will be the actual receiver software.

There are only 3 categories of drivers out there for RTL SDR dongles, for Windows operating system:

1) The driver made by the manufacturer Realtek. The most recent version is from 2012, with the official code number 86.001.0521.2012. This is the best driver to use for FM commercial radios and amateur TV (apart some programs for radio amateur ATV/SSTV which specifically mention they want the next presented here driver).

The manufacturer does not make available the download of this driver.

Some links where one can find it:

https://tinyurl.com/y5ekkek7

https://tinyurl.com/ya5l3a8z

(Use Treiber 2 – declared as being from 2013 – from this German website.)

It works for me, in January 2021, in Windows 10, and the operating system (at least in its version, today) does not try to change it – on my computer, with my settings. The 2011 version of the driver (for Windows XP, Vista and 7) can be downloaded – for example – from:

https://tinyurl.com/yxcpbc8x

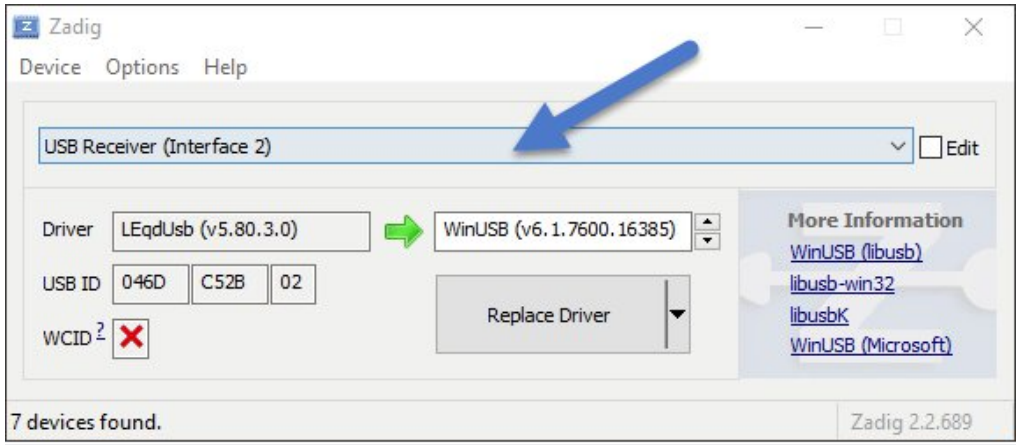
This kind of driver is old and did not have any development in the last 8 years. One can find it on some German sites with a last date of 2013, but all the files inside are from 2009 up.

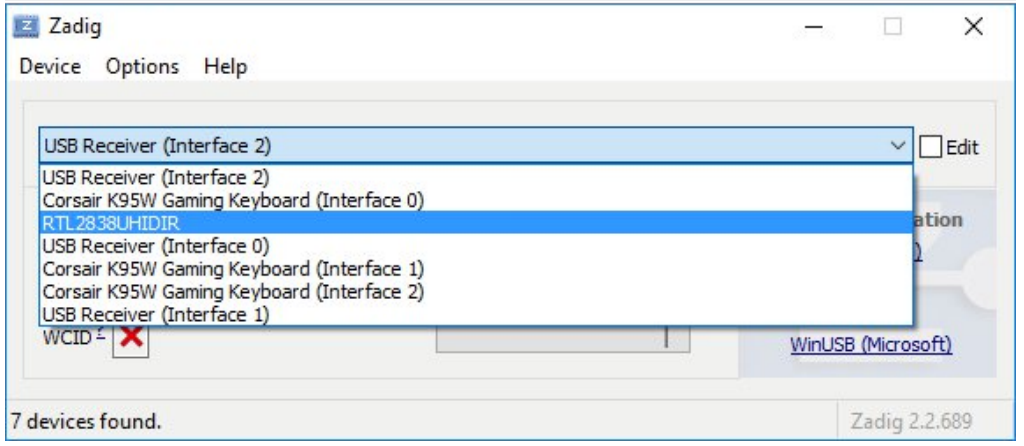
2) The second category of driver(s) is the most used today, and continues to have various developments in 2021. It is the driver that one needs in order to use SDR sharp, HDSDR and similar receiver software.

This kind of driver(s) is continuously menaced by Windows 10 operating system.

There are utilities with graphic user interface, like Zadig 5, which "convince" Windows 10 to use the wanted driver for the SDR dongle.

One of the DSR dongle manufacturers have a quick and simple tutorial at: *https://tinyurl.com/y2vtde29*



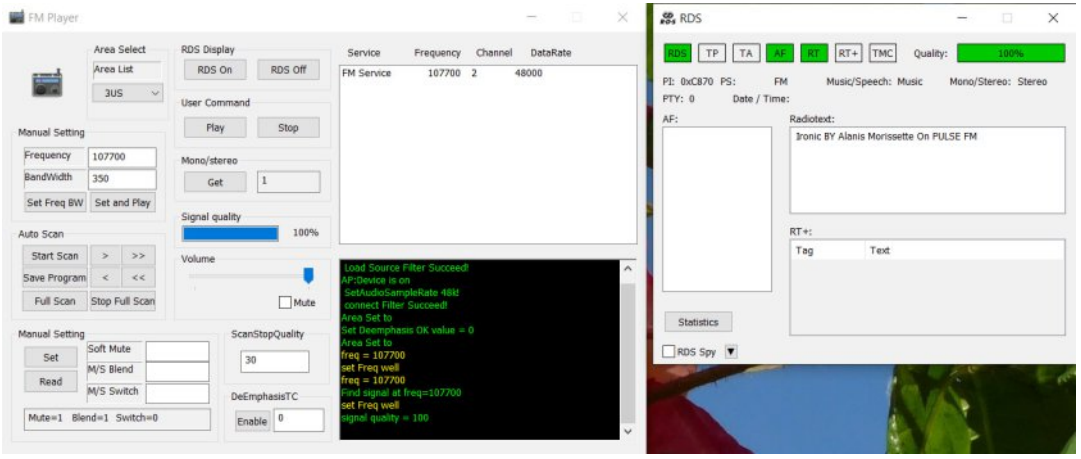


Once this driver is installed all programs meant to work with the original Realtek driver no longer work. The reception of commercial FM stations sounds better with the original manufacturer's driver.

3) The third category of driver(s) is what Microsoft Windows wants to install. It mistakes the SDR dongle for something else, and it is not usable for anything. Worse, it tries to replace at least the drivers from the second category (not the first category of manufacturer Realtek driver, at least not now, in January 2021, and not on my computer, with my settings, which might change anytime; I just had the unpleasant surprise a harddisk computer backup program that worked many years suddenly does not work anymore, after the last Windows 10 update).

So, after buying an SDR dongle based on RTL2832 chip one has to decide what he/she wants to do with it. If you are like me and want to experiment all kind of programs, most probably you would switch between the Realtek original manufacturer's driver and the "community" drivers. I could not find a work around switching or installing and uninstalling the drivers. For example I found a simple FM player, with scanning and RDS, described at:
https://tinyurl.com/yypks3j4

And downloadable from: *https://tinyurl.com/yypks3j4*



People complain in the page describing the software that they have to switch between drivers, back and forth: Realtek original driver for this simple FM player and the "community" driver for SDR Sharp.

An exhausting article, with screenshots and links (that worked for me in January 2021, either the provided direct link, either the provided mirror link) was written in 14th March 2017 by Dalvik and posted at:
https://tinyurl.com/y6b2zz49

Dalvik gives there plenty of explanation, with screenshots, how to handle the drivers, and links towards free and paid receiver software applications, with some useful comments.

Between others, he mentions his experience with Windows 10 regarding the SDR drivers, which I confirm is also mine:

- "Windows 10 build 10586 (Threshold 2) allows to install latest Realtek drivers.

- Windows 10 build 14393 (Anniversary update) DOES NOT allow proper Realtek drivers.

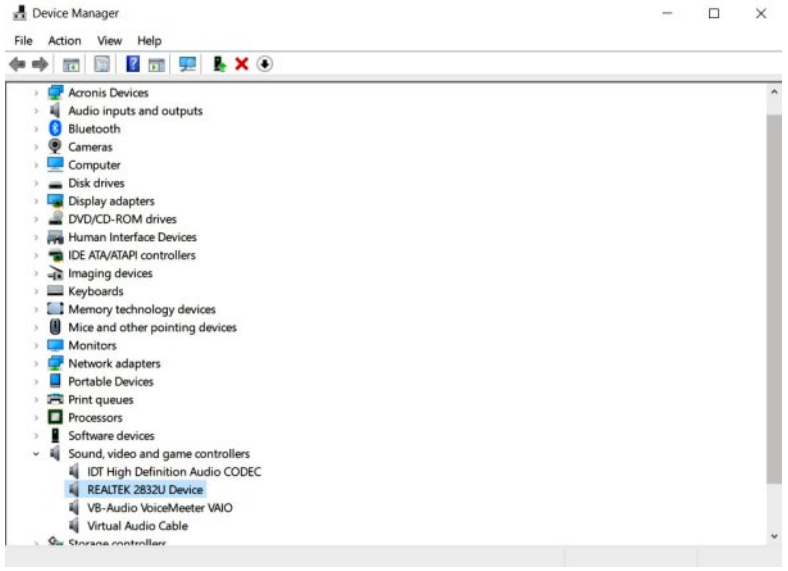
- Windows 10 build 15063 (Creators Update) allows it again."

Davlink wrote his article in 2017, and in 2021 some software developers do not exist anymore, and the given software program is no longer developed. That was the polite for saying some programs might crash your computer, as ProgDVB x64 7 did it for me.

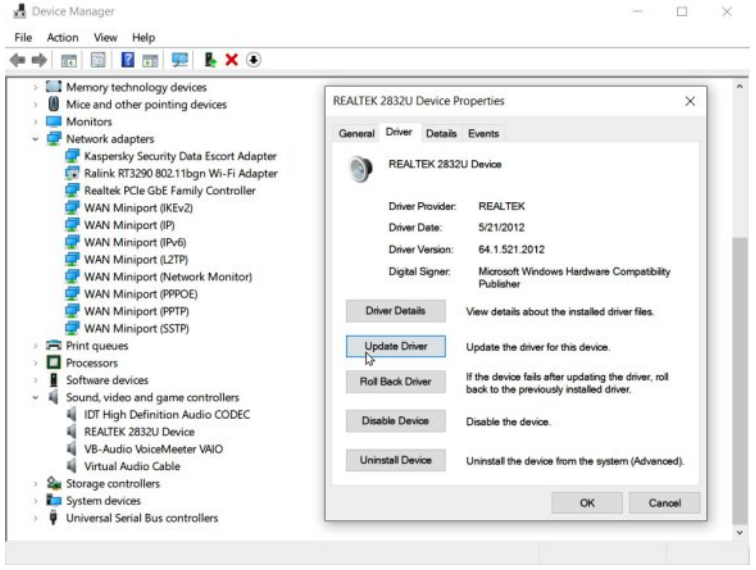
While writing this article I installed the Realtek driver from 2012, to take a screenshot for the simple FM player I was writing about. Obviously, now SDR Sharp no longer works in this computer (it says there is no SDR dongle connected, although it is):

One can ask "what does it mean switching between the drivers"? Well, that means you have already installed on your Windows computer the Realtek manufacturer's driver (I installed 2 versions of it – see next screenshots) and also the "community" driver.

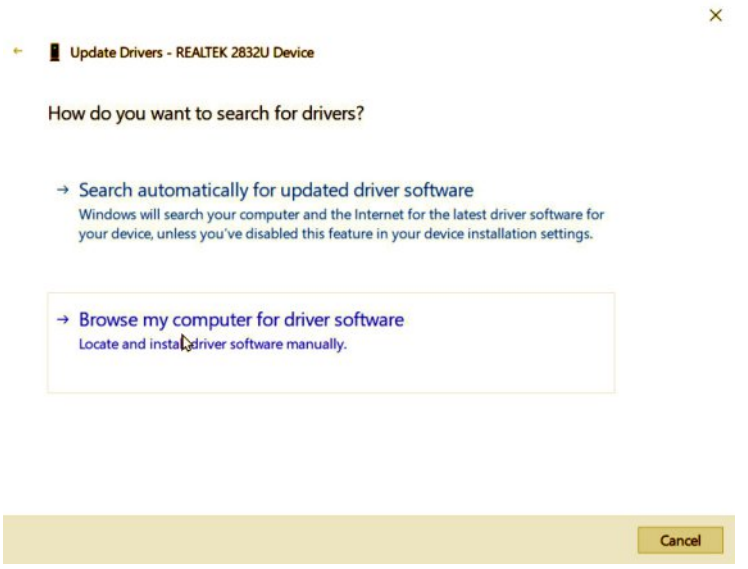
You already have them both on your computer and because some programs work with one of them, but not with the other you have to select which one to use. You need to go into Control Panel > Hardware and Sound> Device Manager. From there you have to right click REALTEK 2832U device:



After right click you will have on the screen

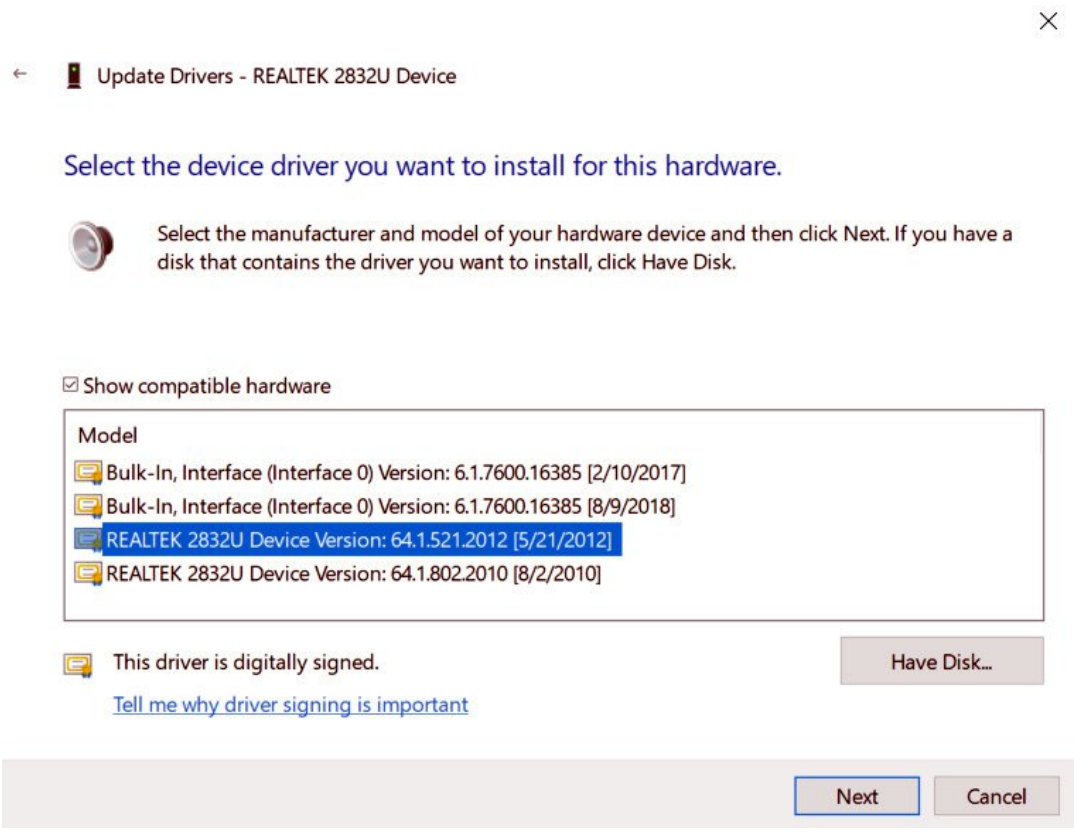


Click “Update Driver” and next select the option “Browse my computer for driver software”:



Next choose the bottom option, as you see below:

This is finally the place where to select the driver. If I want to use SDR Sharp I will select the first one, "Bulk-in Interface…".

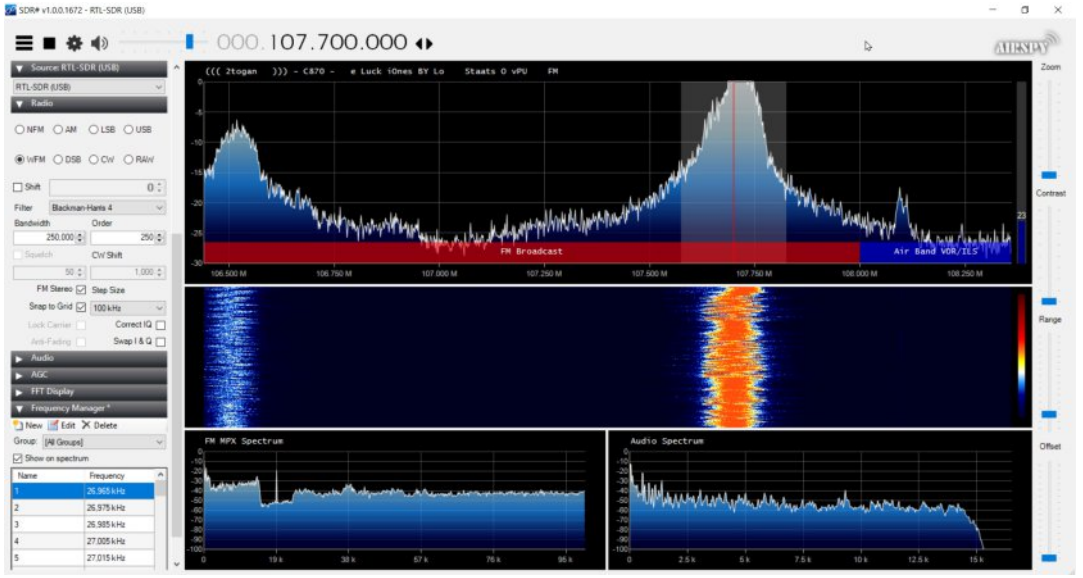


Believe it or not, you need to click "Next", and it shows that it does the installation, each time.

The Realtek driver is very stubborn, and remains in the system until an uninstall procedure is done with its original Realtek package. I had previously installed the "community" driver, and after uninstalling the Realtek driver my computer comes back to the community driver and I do not need to use again Zadig 5, as you saw in the previous screenshots.

This might be or not the behavior of your computer, too, but very close to 100% you will have the same.

SDR Sharp works again:



Grass Valley Mixer Conversions - Part 25

Written by Trevor Brown, G8CJS and Mike Stevens, G7GTN

Let's start with a summary of this project so far.

We started with an old Grass Valley mixer control panel. The original panel was designed to connect to a large rack unit and perform production switching, mixes, wipes, and keys between ten synchronous video sources. Monitoring was done with a stack of picture monitors dedicated to PGM PST and one for each video source.

Production switching has moved on since the 80's and now we all have expectations of production switchers being able to work with non-synchronous sources and provide picture in picture monitoring of PST, PGM and all the video sources, on a single screen. An example is the popular software Vmix. If we could interface this Grass Valley panel to the Vmix software we could produce digital effects, streaming, multivision views of the operation on a single PC screen and so much more.

We started this project by discarding the rack unit altogether in favour of making the panel self-powered and only USB connected to a PC. Inside the control panel we removed the micro and replaced it with three PCF8574's port chips to enable an I2C bus to connect to the panel. In this way we could emulate the processor we had removed, down an I2C bus.

I2C is not new, it's a two-wire interface (data and clock) and is a useful interface between hardware and micro. If you have a micro you are familiar with and it supports a programming language that you are happy to use to develop your own software, then I hope this series of articles, along with the diagrams of the panel in the GVG 17 download, will allow you to explore the panel on your own.

Grass Valley 100 and 110 panels do still turn up on eBay, but not as often as they once did. I2C has been around for several years and it's not the first time it has been used to create video projects. There is the I2C book in the CQ-DATV library from when Chris Smith G1FEF engineered a range of TV modules, using a Z80. I still have some of the PCB's for that original project, if anyone is interested, but some of the chips are getting scarce.

By contrast I have used the ESP8266 and Annex BASIC to drive the I2C bus. Annex is a modern version of BASIC, it is not a new language and its roots go back to John G. Kemeny and Thomas E. Kurtz who released a version back at Dartmouth College in 1964. The version I have used is a modern variant and it is a recent development, as is the ESP8266 micro. There is a full explanation of how to load Annex BASIC onto the ESP 8266 in the GVG 17 zip file on the download site.

I have also added devices to the GVG panel including an OLED display and a suite of inexpensive robot cameras based on the SG90 servo modules which use a ready built controller module (PCA 9685). This enables the GVG panel positioner to control Pan and Tilt of these devices remotely. The PCA 9685 connects these servos via the I2C bus, modules can be found ready built on eBay and they are not expensive.

Mike G7GTN has added a second Arduino Pro processor and written a C+ program to enable it to communicate, again via the I2C bus, to Vmix. It uses MIDI commands to communicate with the Vmix short cut menus. Mike also designed a MK1 PCB and later a MK2 PCB which has mounting pads for the second processor and adds more I2C connections and on-board power regulators.

The MK2 beta PCB's have now been produced and distributed to our beta test group. One in New Zealand, four in Greece, at the time of writing they have not appeared from the postal system. I still have three PCB's one I intend to populate myself and replace the MK 1 PCB I am currently using, which does not have the outboard regulators and has the Arduino Pro piggybacked with floating leads. I would prefer to delay fitting a MK2 PCB until I get some feedback from the beta testers. The current set up is working and is OK for de-bugging any software problems or tracking other reported bugs.

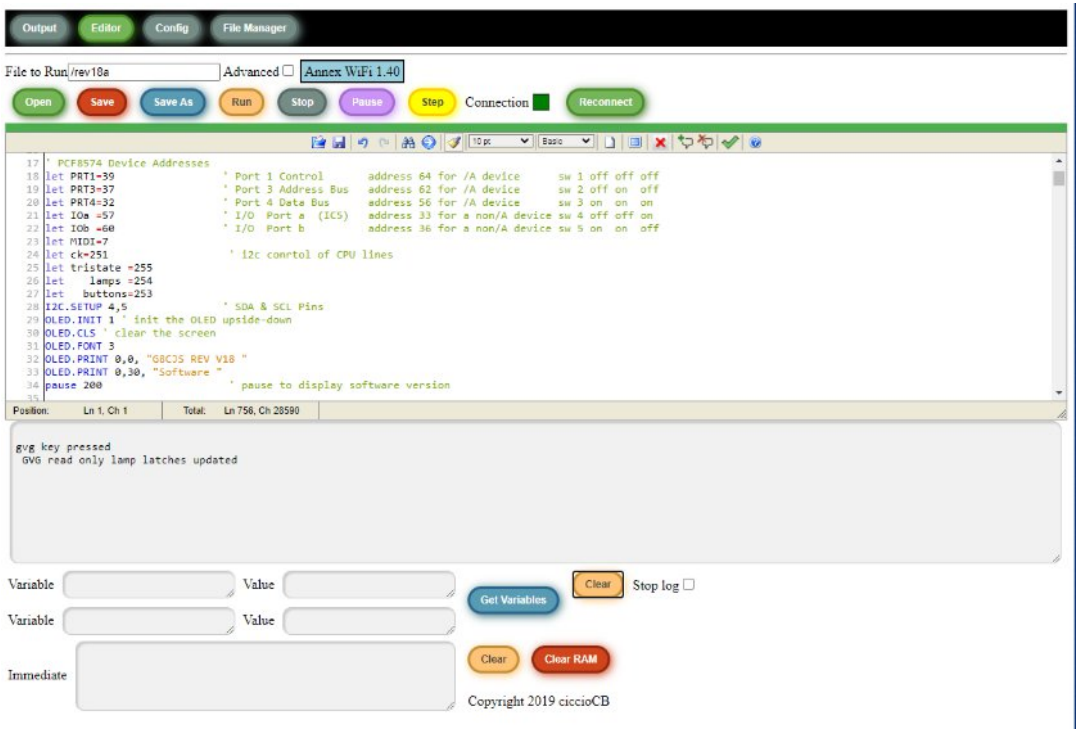
I only have access to the free version of Vmix which is limiting this project as I cannot implement key functions which have been excluded from this version of the software. I started with a time limited option of the full software, it ran for 6 months which is plenty of time to evaluate this clever software, but not long enough to get this project off the ground.

I am happy to try adding control of the features that I no longer have, but I would need someone with a fully working Vmix software to supply some testing and feedback.

Since last month I have been spinning my wheels a little tidying up the software and removing redundant routines that were commented out as they were replaced. I am also trying to add some simple diagnostics that can be turned on in the editor. These diagnostics revolve around the wlog command which is the ANNEX BASIC command to print to the control screen of the editor. You can follow wlog with any text you want and add this to any subroutine or part of the program you think is not being reached. The word you add needs inverted commas e.g. " Word ". Remember to save the program whenever you edit it in this way. This is a huge advantage of interpreted languages and makes them easy to trouble shoot.

I have added to several of the lines and prefaced them with (`). This in Annex BASIC denotes a comment and once the editor sees it the rest of the line is ignored and it is only there to benefit the human trying to understand the program.

I have added numerous comments to the program this way as an aid to providing understanding of how it works. It's a simple matter of removing the (`) saving and running the program to run the extra code.



Let's start with Line 135 `wlog "gvg key pressed" and Line 136 `pause 100 ' commented out only needed for diagnostics. Remove the (`) from both lines and save the program, this will then report if a key press is detected by the software. This information indicates that the 3 PCF 8574's are working. Line 136 is a pause to wait for the key bounce to stop so multiple reports are not generated.

If the keys are not working and this message does not appear then load and run the I2C address scanner software. This should return addresses that match the addresses in lines 18, 19 and 20 of the software. If the addresses returned by the I2C scanner program are different, one of two things has happened. Either the rocker switches have been set incorrectly or the suffix on the chips is different to the ones I used to develop the software.

If its just the rocker switches this is easy to correct. If it's that the chips have a different suffix, then the programme will need to be edited to suit. Remove all the PCF8574's and reinsert them one at a time taking note which chip is at which address in the scanner program and then edit the GVG BASIC program (lines 18, 19, and 20) so the addresses match your chips. Once you have finished with the diagnostics add the (') and resave the program.

Line 636 'wlog" GVG read only lamp latches updated" again remove the (') The lamp latches updated message will appear after each key press. This is the process of illuminating a GVG button lamp. Button presses will be recorded as a change in the soft memory lamp map held by the PC and will then update the read only latches on the panel, and if the (') is removed and the program saved it will print this message on the edit part of the screen and keep doing it for every button or T-bar end stop lights being reached.

The initialization will bring up the message as the lamp defaults are set. The clear button in the edit panel will clear these messages. This can be used at the same time as line 135 and 136 messages to show a button has been pressed and the lamp latches updated. The lamps on the GVG panel should be working by now unless you have a hardware problem in the panel.

Line 681 is the monitoring line used to see what the Annex Basic is feeding down the I2C bus to the Arduino.

These numbers are translated in the Arduino to MIDI commands to work in conjunction with the Vmix short cut menu. Remove the (') again so it becomes an active command and will display the data to the Arduino just like the comment explains. Again, remember to save and run the program once you edit it. It will not show commands going elsewhere on the I2C bus E.G., to the LCD display or the Robot cameras.

At run the program will now show 10 20 49 60
These are the position of the keys at initialisation of the programme and set the PGM and PST to source 0, Key to source 9 and the DVE selector to zoom as per lines 89 to 95 of the program, as other keys are pressed, they will add numbers to the bottom of the list. The list will scroll, but you can manually clear it with the Clear button in the ANNEX editor control panel. You can stop this function by reinstating the (') and saving and running the programme. This routine is useful if the mixer appears to work but not communicate with the Vmix short cut menu.

Line 696 'wlog xx ; "Robot Camera Selected" is part of a subroutine for the positioner control of the Robot cameras, again edit out the (') and the line is active save and run. Now if you select a Robot camera it will keep scrolling with a number and Robot Camera Selected. The numbers are the code for which camera is selected:- 12 is camera 4, 8 is camera 3, 4 is camera 2 and 0 is camera 1

Again, useful if you have a Robot camera not behaving as expected, they are controlled by a PCA9685 module so if we can verify it is receiving commands it is helpful to isolate any problems.

These are simple diagnostics and revolve around the wlog command. This is a huge advantage in interpreted languages and makes them easy to trouble shoot.

Line numbers change as test is inserted or removed, so the line number and the diagnostics only apply to GVG 18 (copy on the CQ-DATV download site).

I hope in the next issue to have some feedback from the beta testers. I still have two PCB's available if you would like to join this group. It goes without saying you need a panel, and it is unfair to buy a beta PCB and then go looking for a panel.

Once we know the PCB's are ok, we will then get some made, and you can buy as many as you want and leisurely search for a panel.

This is your free ATV magazine.
Please consider contributing an article!

Radio contest day: Old Mode and IARU Reg. 1 ATV

Written by Giorgio de Luca IU3IOU

Today was a day spent in the mountains for two radio contests: the Old Mode 10-24 GHz 2020 Contest and the IARU Reg. 1 ATV Contest.

This morning we went up to Monte Tomba - Malga Doch , landlord JN55WV me (Giorgio IU3IOU), Davide IU3CLX and Mario I3EME .

Together we worked to prepare the station paying particular attention to the ATV Contest in the 23 cm band in TX / RX.

After the installation we dedicated ourselves to the participation of the Old Mode 10-24 GHz 2020 Contest and we set out to carry out connection tests with 24 GHz equipment with 4 mW and 5 mW guun diodes and horn antennas with gain of 30 db. The tests led us to create between the three operators IU3IOU , IU3CLX and IQ3QR / P , activated by I3EME while it was returning home, valid radio links for the Old Mode Contest , covering a distance of about 8 km.

I (Giorgio IU3IOU) and Davide IU3CLX remained, we refreshed ourselves with some sandwiches and after lunch we dedicated ourselves to the second contest of the day dedicated to ATV , using the IQ3QR name. Initially we were not very optimistic being the first time in transmission in ATV and mostly in an international contest.

We were unable to complete the first connection as we received the signal from the correspondent but he did not receive ours, and this did not help the spirits. But over time and sharpening the weapons a little the connections arrived, giving us the opportunity to experience the transmission in ATV, the difficulties of the 23 cm band, the need for precision in pointing the antennas.

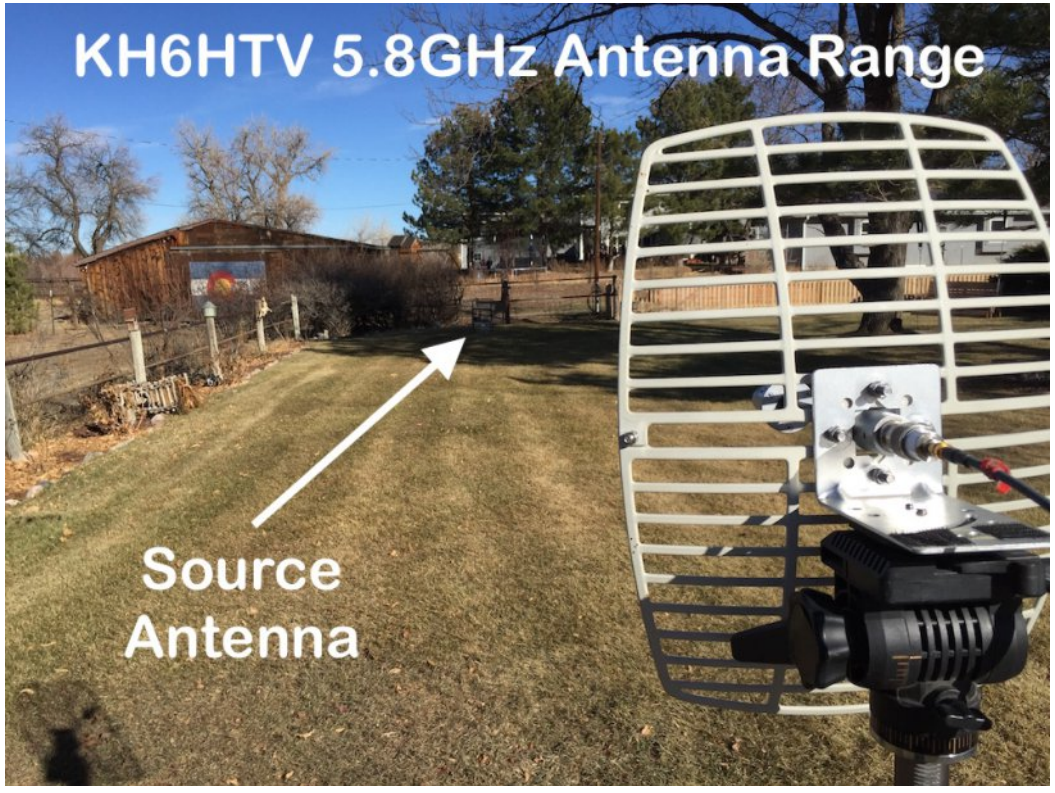
A beautiful day dedicated to radio and experimentation.
73 de Giorgio IU3IOU

Source: *https://tinyurl.com/y6tll8lq*

Antenna Range Tests of 5cm Antennas

Written by Jim Andrews, KH6HTV
Reproduced from Boulder Amateur Television Club TV Repeater's REPEATER January, 2021 2nd Ed.

Following Don, N0YE's example of testing microwave antennas, I decided to try my hand at doing it for a collection of 5.8 GHz antennas. I set up my range in my backyard where I had a clear, unobstructed path. Being winter time, I had to wait a long time before the weather cooperated with a warm day and no wind.



I laid out the range using W1GHZ, Paul Wade's microwave design program. HDL_ANT32 (version 4.1) *https://tinyurl.com/yx8mvwat*. One inputs the test frequency, the largest diameter antenna to be tested, and the range separation distance.

It then tells you the Rayleigh distance, the height of the source antenna and the height of the antenna to be tested. I made my measurements at the same frequency we have been using for DVB-T on 5cm band, i.e. 5.678 GHz. The separation between my source and measurement antennas was about 70 ft. across a very flat portion of my backyard, which was covered with dried bluegrass. Paul's program thus said to place my source antenna at a height of 7 1/2" and the antenna under test at 4 3/4 ft. Also following Ed, K0JOY's, advice I used a high gain dish antenna as the source, rather than a low gain dipole. Prof. Ed is our local resident antenna expert.

Source Antenna

The CW signal source was an Analog Devices ADF-5355 frequency synthesizer set to 5.678 GHz. It's output power was -3dBm. This was then boosted to +20dBm using two Avantek AMT-8052, C-band amplifiers. The source antenna was a horizontally polarized, L-Com HF5822EG, BBQ grill, dish antenna.

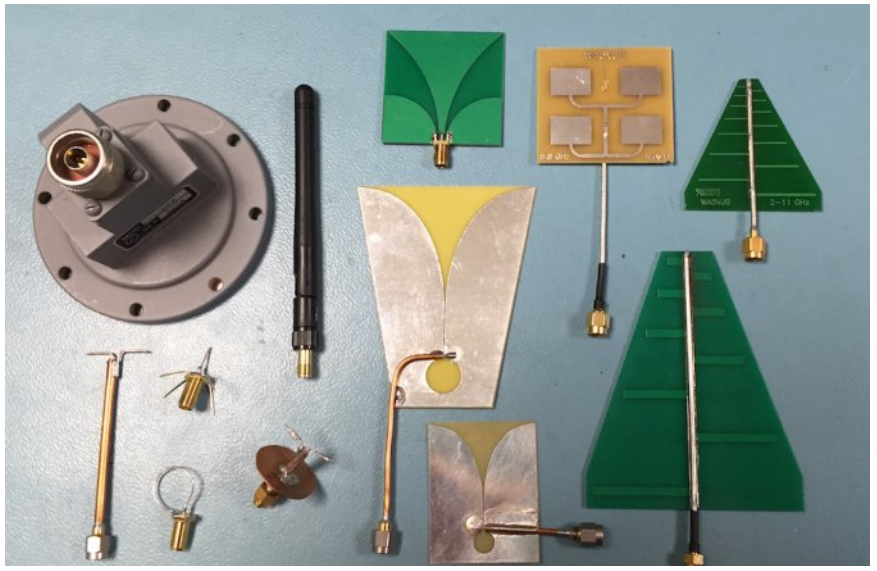
Receive Antenna under test + supervisor

For my receiver, I used my 5 GHz transverter. The 414.4 MHz IF output was viewed on a Rigol DSA-815 spectrum analyzer. The analyzer was set up to display two traces. The yellow trace was the "live" signal while the magenta trace was put in the peak hold mode. The antenna under test was placed at a nominal height of 4 3/4 ft. and then scanned in all x, y, & z planes to optimize the received signal. The peak hold trace then captured the highest level.

The Rigol's marker then found the peak of the held trace and gave a readout in dBm which was recorded in a notebook. The reference antenna used was a 1/2 λ dipole (2.15 dBi gain). The IF output, received level on the dipole was -26.6dBm. The gain in dBd of all of the other antennas tested were then computed as the difference in the max. signal strength readings compared to the dipole. Here are the results.

ANTENNA	Return Loss measured	Gain Mfgr's Spec.	Received Signal Level dBm	GAIN (dBd)
1/2 λ Dipole (KH6HTV's reference antenna)	-40 dB	2.2 dBi	-26.6dBm	0 dBd REF
L-Com model HG5822EG, BBQ grill style dish, 12" x 16" (KH6HTV's)	-21dB	23 dBi	-8.6dBm	18dBd
Radio Wave model FP1-2-5NS, 12" dish	-13 dB	23 dBi	-8.9dBm	17.7dBd
ValuLine VHLP1-220-W01, 12" dish with carbon foam side-lobe suppression. Modified by NO YE to use a WA5VJB, 2-11 GHz log-periodic antenna as the feed	-7 dB		-13.3dBm	13.3dBd
WR-187 open flange waveguide -MicroLab/FXR model 601-D98, N coax to waveguide adapter	-10dB		-23.0dBm	3.6dBd
1/4 λ monopole with 4 dropping radials - SMA	-18 dB		-27.0dBm	-0.4dBd
Pro 5.8G, 4 1/4" rubber duck, RP-SMA	-20 dB	??	-26.2dBm	0.4dBd
NOYE 1/2 λ dipole with disc reflector	-9 dB		-25.3dBm	1.3dBd
1 turn loop antenna on SMA			-29.9dBm	-3.3dBd
WA5VJB, 2-11 GHz, Log-Periodic	-11 dB		-24.6dBm	2.0dBd
WA5VJB, 5.8 GHz, Quad Patch	-15 dB	11-12 dBi	-23.4dBm	3.2dBd
WA5VJB, 5-18 GHz, Vivaldi Gain	-11 dB	8- 10 dBi	-21.2dBm	5.4dBd
WA5VJB, 9 - 25 GHZ, Vivaldi Gain	-6 dB		-27.5dBm	-0.9dBd
Chinese 1.4 - 9.5 GHz, Log-Periodic	-2.6 dB	??	-30dBm	-3.4dBd
Chinese 3-20 GHz, omni-directional Vivaldi	-15 dB	3 - 5 dBi	-27.5dBm	-0.9dBd

Following the publication of the above article, Jim has received several comments and this is his reply:-
Reply to Ed & Paul's comments about using a dipole as a reference antenna.



Assortment of small, 5.8GHz Antennas tested

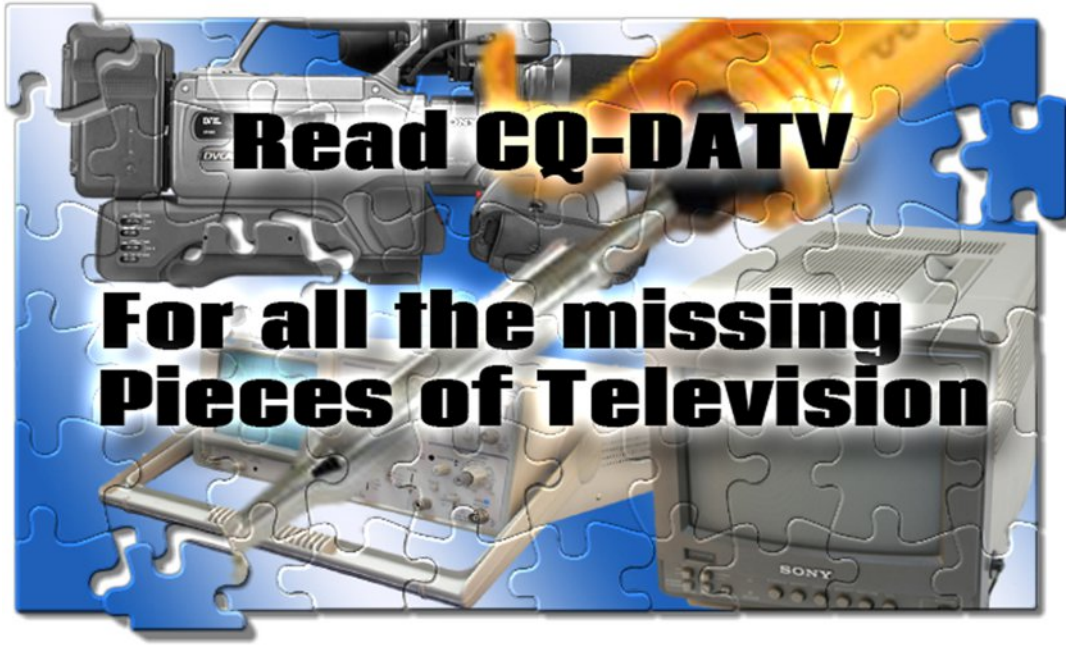
I used the dipole because I did not have any other real reference antenna, such as a standard gain horn as Ed suggests should be used. Thus, I reported my results referencing my own dipole as dBd, where the "d" was my own dipole's received power. So, let's try again, but this time assume that the L-Com, BBQ grill, dish antenna is the reference with it's manufacturer's gain specification of +23dBi. I will express all results now in dBi, thus adding 2.2dB to my previous table's dBd values. We would then have the following table, all in dBi. Now, where is the real truth ?

The uncertainty between the choice of reference antennas was of the order of 3dB. The gains of both the dipole and 1/4 λ ground plane antennas were about 3dB too high using the L-Com reference. But the gains of both the L-Com and Radio Wave dish antennas were 3dB too low using the dipole as reference. The only real truth for me was the relative differences I saw on my own range among the various antennas. Some were poor antennas and others were great.

Exact values ? ? ?

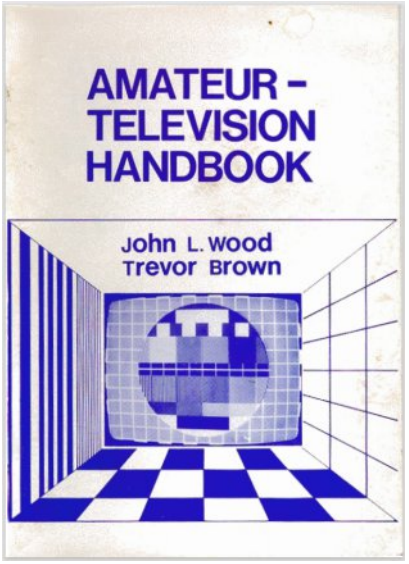
ANTENNA	Gain Mfgr's Spec.	GAIN dipole Reference	GAIN L-Com BBQ Reference
L-Com model HG5822EG, BBQ grill style dish, 12" x 16" (alternate reference antenna)	23 dBi	20.2dBm	23 dBi
Radio Wave model FP1-2-5NS, 12" dish	23 dBi	19.9dBi	22.7dBi
ValuLine VHLP1-220-W01, 12" dish with carbon foam side-lobe suppression. Modified by NOYE to use a WA5VJB, 2-11 GHz log-periodic antenna as the feed		15.5dBi	18.7dBi
WR-187 open flange waveguide – MicroLab/FXR model 601-D98, N coax to waveguide adapter		5.8dBi	8.6dBi
1/2 λ Dipole (KH6HTV's reference antenna)		2.2 dBi	2.2 dBi
1/4 λ ground plane, monopole with 4 dropping radials - SMA	2.2 dBi	1.8dBi	4.6dBi
Pro 5.8G, 4 1/4" rubber duck, RP-SMA		2.6dBi	5.4dBi
NOYE 1/2 λ dipole with disc reflector		3.5dBi	6.3dBi
1 turn loop antenna on SMA		-1.1dBi	1.7dBi
WA5VJB, 2-11 GHz, Log-Periodic		4.2dBi	7dBi
WA5VJB, 5.8 GHz, Quad Patch	11-12 dBi	5.4dBi	8.2dBi
WA5VJB, 5-18 GHz, Vivaldi Gain	8 - 10 dBi	7.6dBi	10.4dBi
WA5VJB, 9 - 25 GHZ, Vivaldi Gain		1.3dBi	4.1dBi
Chinese 1.4 - 9.5 GHz, Log-Periodic		-1.2dBi	1.6dBi
Chinese 3-20 GHz, omni-directional Vivaldi	3 - 5 dBi	1.3dBi	4.1dBi

Jim, KH6HTV



From the vault - Character Generator

Written by Trevor Brown G8CJS



In 1980 John Wood and myself put together an ATV Handbook and it is still available in the CQ-DATV library as a free PDF download.

I am not going to repeat any of the projects, but I would like to explain the background to the book and at least one of the first projects "The Electronic Character Generator".

The PDF version of the Handbook in the library is a rare first edition, if you can say that about a PDF file. It is not valuable but has one or two errors that if it were a postage stamp would make it valuable.

The book idea was my first contribution to the BATC. I had recently joined the committee and was yet to make a substantial contribution, then it happened, I had a light bulb moment there was a discussion to reprint an old out of print yellow/buff ATV handbook which had sold out.

What was under consideration was for it to be reprinted as it stood, at a suggested print run of 200. I thought we could do better and pushed to not reprint the book and to use the budget for a new book focused on actual ATV projects that could be constructed.

The time scale was short as we had sold out the last book, but the orders were not piling up, hence the modest print run. The snag was the yellow book was written by the then committee.

Each had contributed a chapter, and there was support for just a simple re-print of more copies.

None of the sections of the yellow book had anything to build or anything that remotely resembled an ATV project and, to be honest, the book was not a huge page turner. I outlined the idea of a new book but kept my other idea of Printed Circuit Board support for the projects to myself until later in the process.

What I did have was the Electronic Character Generator it was running, but on Veroboard. If I could get it onto a home-made PCB, which would mount in a Eurocard frame, I thought I might be able show them the future.

I struggled (more later) but by the next committee meeting I produced it as part of my update on the book. It was a Eurocard PCB and mounted in a card frame, I even took along an extender card to explain the system. There were two members of the committee familiar with card frames and they both worked for the BBC.

They wanted the Eurocard idea dropping and a standard called ISEP adopting. This was a slightly larger, much older imperial format with a particularly nasty edge connector, that had long since become obsolete. Both members had large junk boxes full of both scrap ISEP modules and connectors.

Why because the BBC had put together a rack of modules based on these cards and connectors, referred to as white modules after the colour of the front panels. These could be found at most of the radio rallies amongst the many junk piles.

I was unsure if the BBC had pulled out of white modules and that was why they were at the surplus sales or if they were just old modules that had been superseded or prototypes that may have never worked.

Why the BBC had adopted this format was something I never understood, it's not that I was anti BBC, I just wanted something that would fly in the outside world.

I went out and bought a white module (off-air receiver) to become familiar, it did not work, but then I think the price reflected that. I spent several hours on it and concluded it probably never had worked and was a prototype. I could understand the format support because it would enable the new modules to be integrated into an existing white module rack at an exceptionally low cost.

I assumed these modules only reached the UK rallies and I wanted a longer lasting legacy that the BATC could expand and build on and not something had inbuilt obsolescence that would be short lived and may not have support outside the UK.

The club had started a foray into an ISEP module with an SPG which could be integrated if it could be re-engineered to Eurocard. This was a TTL based module and although it performed well it was a difficult build, in that the PCB was single sided and had a lot of surface wiring to augment the single sided PCB. I did build one and get it working, but it was not a build for the faint hearted.

Shrinking it from ISEP to Eurocard was just not going to be possible. Eurocard was the future, all the parts for a card frame were available, just not at surplus prices and the SPG well perhaps I could come up with a Eurocard replacement, I had to find a way to diffuse that argument.

What was needed was a colour SPG without the topside wiring harness, which was rather a messy solution, but it kept the cost of the PCB's down. Everything was about cost and being new to the committee and coming from an ITV background I tended to look at things differently.

Eurocard 19” mine was only half rack and is on loan supporting a local ATV repeater

I think the BBC contingency viewed me with suspicion or perhaps just as someone who was a little extravagant with my solutions . I remember one of them turned up in a checked suit, I referred to it as a BBC suit, small check (Cheque), it was a Morecambe and Wise joke, he never came in it again, but did keep raising support for ISEP, fortunately he was not a contributor to the book or any of the project work involved.

I was supported throughout by John Wood G3YQC at every stage who was a believer from day one. John took on the drawing and artwork design of this new book and I did the video engineering side trying to ensure the modules were all compatible at their edge connectors.

My character generator had been designed with its own downstream keyer, so it just took video in keyed the characters onto the output and made it a simple interface. The electronic test card was a different story. It needed an SPG and a PAL Code. John Lawrence and David Ellis Jones put the PAL coder together.

Richard G4BAU the Test Card designer was happy it would be integrated into a rack and supplied with pulses and a PAL coder particularly as the coder was not going to use a cheap games chip and the SPG would be subcarrier locked to minimise subcarrier patterning that was prominent in early ATV colour projects.

It also used a link prom to generate the circle, once you blew a link, it stayed blown. I needed to set up a jig to programme these and make them available as pre-programmed items in the shop. There is now a modification to use an EPROM in the addendum, thanks to Mike Cox but at the time EPROMS were too slow.

I may have been digging an engineering hole for myself at this point. Like an aircraft taking off you come to the rotate point where there is insufficient runway left to do anything but take off called rotate, we were past that point, the ATV handbook and Eurocard support was going to fly.

We still did not have an SPG, the existing ISEP SPG had now moved from a single PCB to two PCB’s and had gained the much-needed subcarrier lock, but it was never going to fit a Eurocard or even two, it was low scale integration, mostly TTL gates.

I had started to design an SPG and rather than use discrete TTL chips I went for the Custom SPG chip ZNA134J. This might sound extravagant (note to self don’t come in a BBC suit) as they were an expensive chip. It would however keep the part count down, but it was also a mono SPG chip and needed a lot of surrounding circuitry to supply the colour pulses and to add subcarrier lock.

This was not going to be finished in time for the book, so I think I became reconciled to a second book volume 2 but neither John nor I spoke about that, other than in private. John was busy adding other projects to the book and it was not only looking good but was in danger of all the pages not fitting in the staple binder, so putting the missing SPG onto the back burner we published.

The first book sold 5000 copies and ran to several print runs, the original budget was to print 200 of the yellow books which fortunately nobody ever mentioned again or the ISEP modules which relied on scavenging connectors from old modules.

All of the contributors are all listed and without their help there would never have been an ATV Handbook or series of books. The module construction of the cards required a mother board to connect them all together but ended up as a "wire wrap your own project", as per a master interconnect diagram, not everybody built every module, so it made sense.

Then disaster struck! The first print run of the book had some missing pages, nobody knows how this happened and John and I were devastated. The first print run was low in that the several boxes of books all fitted into my car boot. The reason the print run was low was the only experience that the then club committee who financed the project had was based on the low selling yellow handbook which was without any constructional projects.

I was allowed the budget which was going to be spent on a small reprint of the old book to finance this new book. Throwing out a car boot full of books and sorting the problem was not possible and the major problem was the Electronic Character Generator, which had all the diagrams for populating the PCB and the analogue keyer, just the TTL Logic page was missing.

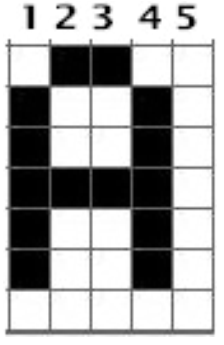
I was pleased it was my project that had been struck down and that everybody else's was unscathed. The small print run went in a few weeks and such was the demand that a larger print run of the corrected copy was possible. Nobody ever spoke of the yellow book again I think we had turned a corner and realised what our members wanted.

This is the story of the character generator, how it works, the problems and learning curve I was on, set against the background of the politics and problems of putting the Handbook together. I designed the circuit back in the late 70's and it was my first attempt, so don't be too hard on me. I did learn a lot along the way.

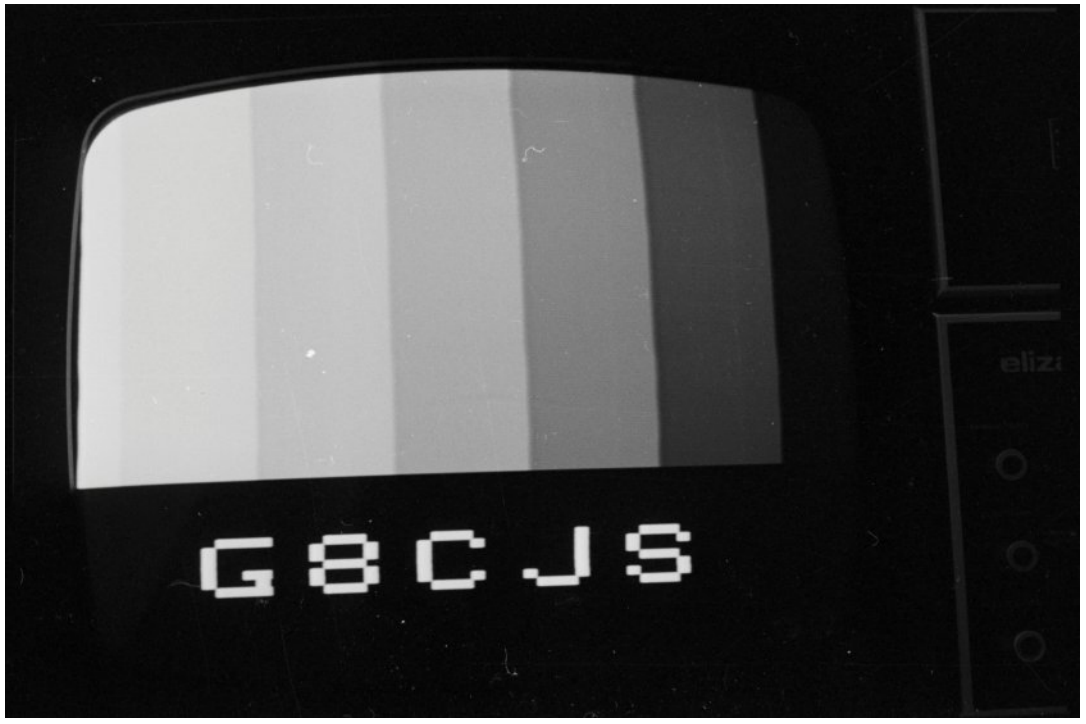
The logic revolved around a custom ROM (RO-2513). This was the heart of a complex computer terminal, which is where this custom ROM was extracted from, let me explain.

In Leeds we had an exceptionally large computer company called Systime, alas it crashed rather spectacularly, but that is another story. The basement turned into a bargain basement surplus shop, where they sold off computer scrap boards. Along with many of my colleagues we bought all sorts of modules in the hope of finding out how they worked and how to repurpose them into something of our own.

One of these PCB's yielded the RO-2513, rather a late one as it turned out. It was single rail device (more on that later). This was a steep learning curve on this sort of technology and the PCB's were without any documentation. To create a character generator, you need a column counter, that in our case runs about 40 times line rate and was line locked (IC3).



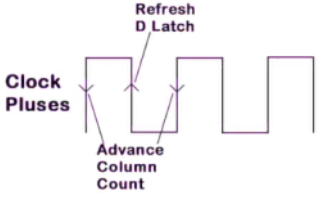
This was needed to clock a counter to produce a three-bit address to serial convert the five columns of data coming in out of the ROM and then to advance a repeat for the next character.



The Electronic Character Generator in Action

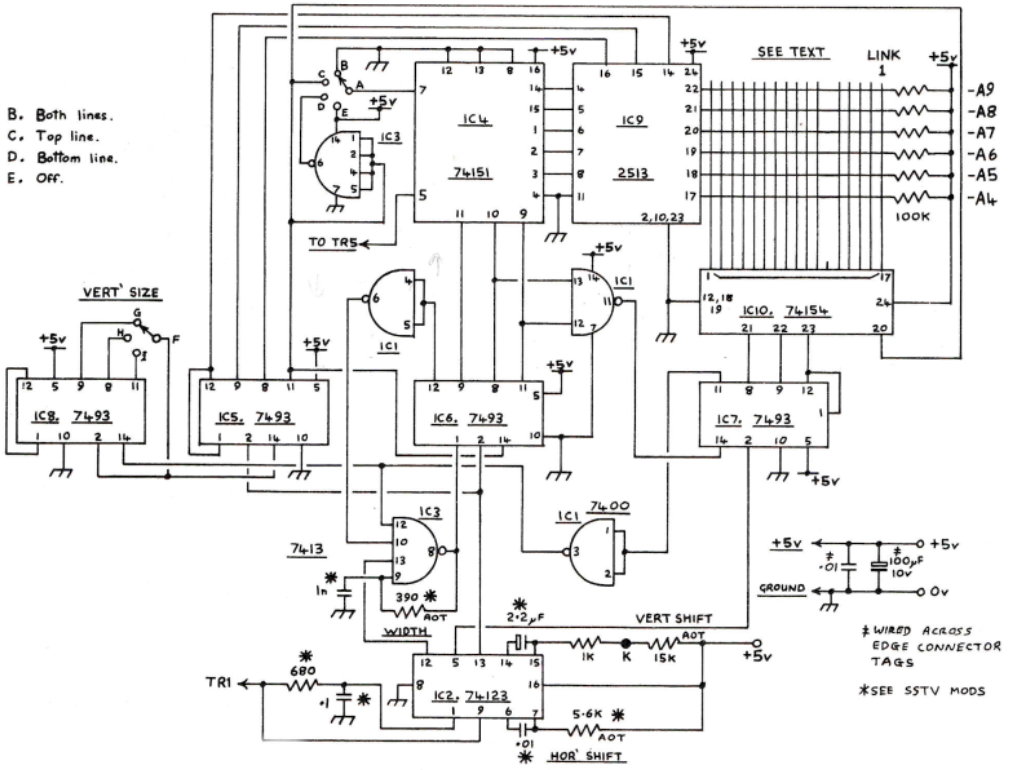
The counters were all 7493 which are ripple counters, this means all the address lines do not change in unison and can cause short duration false addresses after the counter is clocked. These false addresses can show up as glitches in the picture.

There is a solution other than to use synchronous counters and that's to clock all the data into a D latch and then clock them out with the same clock but on a different edge. This design had neither of these solutions, but the glitches were tolerable.



Avoiding Glitches caused by Ripple counters

This first counter drives a 74151 to serial convert the parallel column data that is the top of the characters and then it advances the 74154 that steps along the diode matrix to select the chosen character (more later).



This is the missing circuit. It can be found in the rear of the PDF but not in the first paper edition of the book

This is then repeated for the next character. When all the characters have their top row displayed, you need the next row.

To get the next row surprisingly you need a row clock to advance the row counter which steps down to the next row in the generator. This is a line counter assigning several TV lines to each row, to set the character size.

The block diagram says it all a lot of lunch times were spent huddled over a hot scrabble board, but enough to say one day 16 question marks appeared on the screen. The diode matrix was where we programmed the characters. The 74154 switched in a different array for each character.

The array could be anything up to 6 diodes if you wanted the @ character. Fortunately email address were not around and it was therefore not a character in high demand.

Diodes were messy and not flexible. It took a time to pre-wire in contest numbers and a callsign, but it worked, and everything must start somewhere.

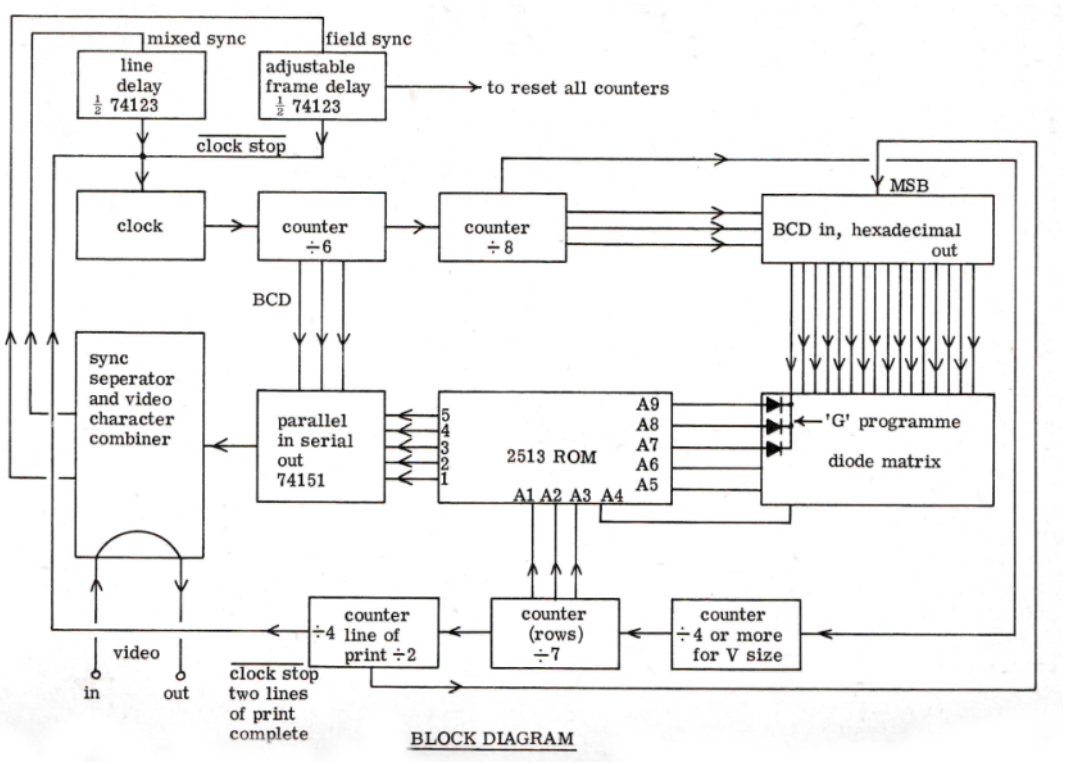
The 74154 did the heavy lifting and stepped through the diode arrays, which selected the characters (programming at its base level). It was all a little Heath Robinson, but this was just 1980.

The analogue section strips sync from the video and keys the output of the generator on the picture, this did make it into the first edition Handbook. The prototype was built on Veroboard and was a difficult build.

I had not made a PCB back then but if the Handbook was going to be modular, I had to grasp the nettle and the pressure was on to get this card frame module system adopted.

First problem was I bought times 2 transfers for the chips and laid out twice sized artwork, this was a rookie mistake as it prevented contact photo etching to test the design. This needed reducing and a friendly TV photographic department were brilliant at reducing it and producing a high contrast neg using lithograph film which could be used with a suitable UV light source to home etch a PCB.

With a little patience this PCB could be hand drilled to produce a prototype for testing and presenting at the committee meeting. They held the purse strings to fund the PCB's and to get support for Eurocard which used connectors that could be bought new (DIN 41612) along with card frames and front panels and all the associated parts.



BLOCK DIAGRAM

Eurocard became the standard for many more Handbook PCB modules, sometimes you are pleased when you stick to your guns and this was just one of those occasions, but then hindsight is a wonderful thing.

Flushed with success I put together a piggyback memory unit to replace the diode array. ASCII keyboards were a little thin on the ground, so it was programmed by switches, (set the toggles and press enter). Fortunately, this diagram also made it to the book, but I have also included it here.

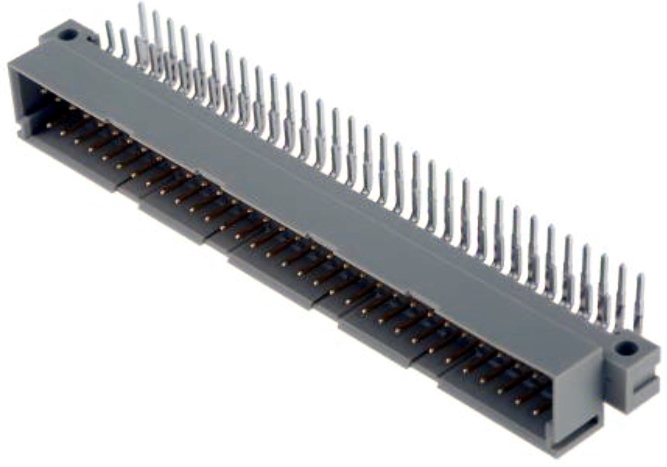
Staying with the 80's theme I added a poor man's keyboard. This was built into a small box with the legend on the top and required you to find the character and press the two buttons one above it and one to the left of the selected character.

There was a push button to ground to emulate a strobe, it's a good job there were only two rows of eight characters, but you have to think back to the 80's we were not or perhaps had just begun to be the keyboard users we are today. There was a separate non-destructive advance.

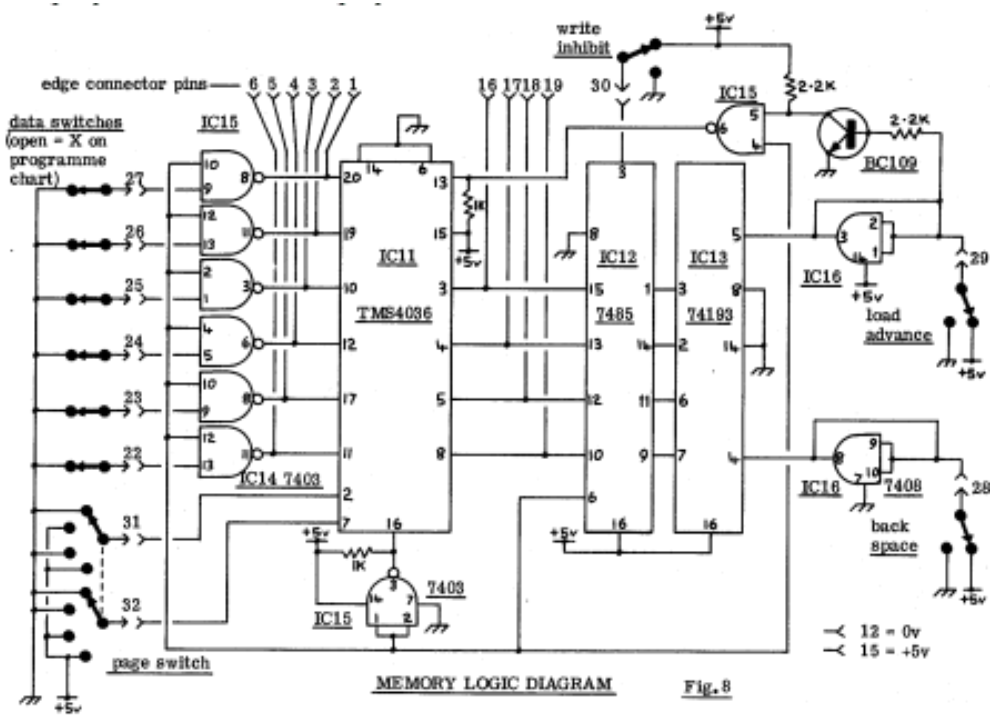
The Handbook became Handbooks plural and the missing SPG was finished and worked well. These early books started on a manual typewriter, no spell check or easy text correction.

The drawings were just that, pen, and ink drawings, but CAD programmes soon appeared. The projects in the books were supported by PCB's that were still created from sticky tape and transfers. The scale of the PCB artwork was not a problem because we found the most helpful PCB manufacturer in Alan Smith, who ran a PCB manufacturing company called WASCO in Lancashire.

He spent many hours showing me the errors of my ways in PCB layout. This was not just an academic process I remember being hands on making a punch tape that instructed the drilling machine where to drill one of the PCB's, I had come to collect and was not quite ready. 2:1 or 1:1



DIN 41612 Edge Connector



artwork was no problem and if we needed a prototype to test, again no problem and it came tinned and drilled.

Without Alan the PCB support would have not happened. Bob Robson G8AGI joined the team and brought along CAD software and the ability to use it for the later PCB's.

We sold around 5000 thousand books and along with PCB's and a limited stock of components to support many of the projects from the colour test card to the I2C modules. These were ordered from around the world, so we must have got something right.

I suspect some of the places would have had difficulty with ISEP edge connectors or their imperial sized card frame requirements.

There were problems, one was the RO-2513, the one I salvaged from a Systime PCB was a late single rail device

that only required a +5 supply some of the earlier ones needed multiple rails and without these rails the circuit just produced solid blocks rather like cue dots, like all bugs we realised they were not faulty chips just multi rail devices. It's one of the problems of using surplus equipment to develop projects.

There were not many of these early ROM's circulating and once the problem was found it could be fed out to constructors through the quarterly magazine.

Sorry the diagram is missing from the scanned PDF library copy of the Handbook. It and all the errata's I know of are scanned into the rear of the PDF. I have a later printing of the book, with the corrections in place, but am a little reluctant to pull the staples and scan it again given its age, the fact that some chips are obsolete.

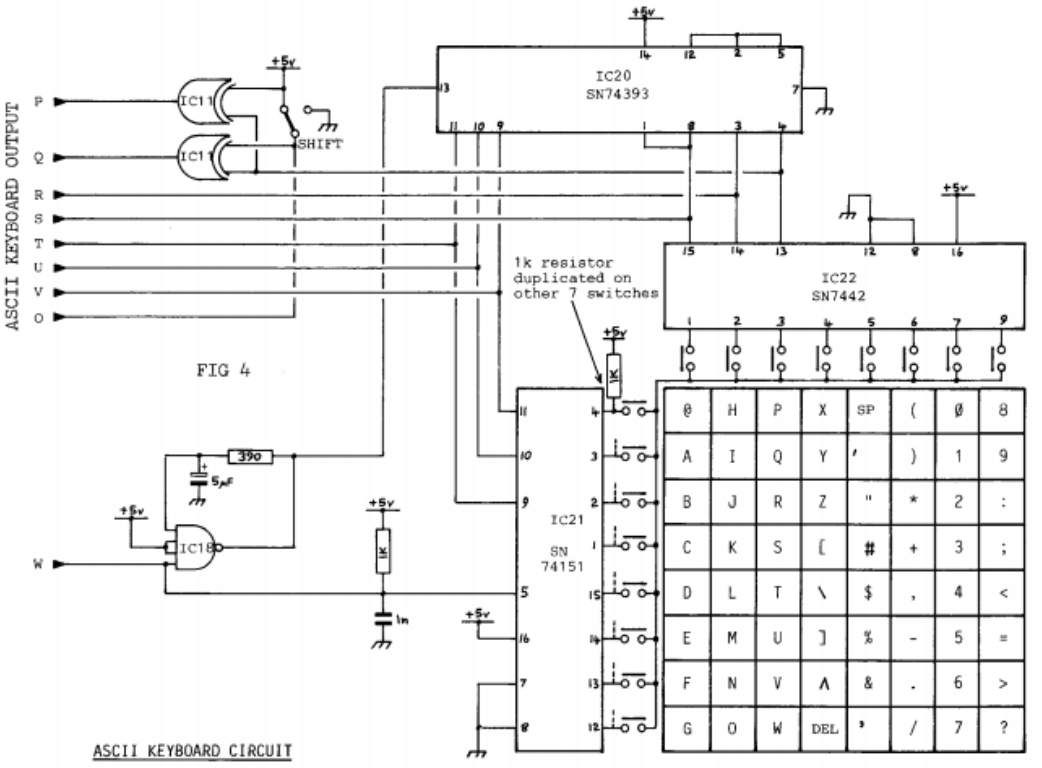
The PCB's were sold out many years ago and my copy is all I have to show for a lot of hard work. I will take this onboard under consideration as the politicians always say.

Yes, we kickstarted ATV by providing 80's solutions to 80's problems, we moved along with the I2C book, which came out of the clubs first micro board Teletron, this was aimed at supporting ATV repeaters and was the technology behind GB3ET the Emley Moor repeater and it was used on several other repeaters.

Chris Smith G1FEF joined the committee improved the Teletron hardware into I2C and added an operating system. The hardware grew a Teletext VDU and Vision Switcher. There was no room in CQ-TV so we added loose leaf pages to each issue that could be collected and made into an I2C book and again these are in the CQ-DATV library.

It's all history now but then this section of the magazine is called "From the Vault" and is where we look back?

This is not wrong today's solutions often come from things we did in the past. The next generation need to look at how we got where we are today and perhaps some of the thinking that worked back then might just possibly be the answer to today's problems.



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CQ-DATV welcomes contributions from our readers. It does not necessarily have to be on ATV, as long as it is of interest to our readers.

Although a formatted article showing the layout can be sent, we prefer an unformatted text file of the script, along with annotations of where important images should be placed. All images should be identified as Fig 1 etc and sent seperately.

Images should be in PNG format if possible and the best quality available. Do not resize or compress images, we will do all the rework necessary to publish them.

If you are sending a construction project, please include the dimensions of any pcb's and make the pcb image black and white, not greyscale.

CQ-DATV reserves the right to redraw any schematics and pcb layouts to meet our standards.

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Some artists of the 50's are revising their hits with new lyrics to accomodate baby boomers. Here's a few:

1. Herman's Hermits- Mrs. Brown you've got a lovely walker.
2. The Bee Gees- How can you mend a broken hip.
3. Bobby Darin- Splish Splash I was Having a flash.
4. Ringo Starr- I'll get by with the help from depends.
5. The Commodores- Once, twice, three times to the bathroom.
6. Marvin Gaye- Heard it from the Grape Nuts
7. Leo Sayer- You make me feel like napping.
8. Willie Nelson- On the commode again.
9. Procol Harem- A whiter shade of hair.
10. Johnny Nash- I can't see clearly now.
11. Helen Reddy- I am woman hear me snore.
12. Abba- Denture Queen.