CQ-DATV

dotMOBI

Issue 97 July 2021

https://cq-datv.mobi

ISSN 2059-2191

In this issue

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

Production Team

Ian Pawson G8IQU — Trevor Brown G8CJS

Terry Mowles VK5TM — Jim Andrews KH6HTV

Contributing Authors

Roberto Abis IS0GRB — Jim Andrews KH6HTV

Trevor Brown G8CJS — Mike Collis WA6SVT

John Hudson G3RFL — Rick Peterson WA6NUT

Mike Stevens G7GTN

Editorial

Welcome to CQ-DATV 97. I hope the ATV contest participants have fully recovered and that the results will soon be available.

In this issue we have all the latest news, views, and articles. Roberto IS0G explains how to update the OBS software in order to provide H265 encoding. H265 will produce a much better quality than the H264 codec. If you did not know the OBS Studio program will not work with H265 without a dedicated video card. Roberto has the solution to producing H265 quality pictures without an external card.

John G3RFL looks at touch screen control. He started by purchasing 6 TFT touch screens (£11.68 each) from eBay (Other electronic auction sites are also available). These screens have appeared in many of John's projects, who can forget John's aerial rotator in CQ-DATV 38. These screens are becoming more popular with home constructors and easily lend themselves to micro controlled projects. John is a lover of using PIC Micro controllers and has produced the necessary source code to interface an XPT 2046 interface chip, that many of these screens use, to a PIC.

Jim Andrews KH6HTV recently received an inquiry about cable TV. He has Cox Cable in the Phoenix area. He wanted to know what system they use. Could it be DVBT? Can it be decoded with our ham DTV gear? rf channels, etc? For specifics on the Phoenix, Cox Cable, Jim decided it would be informative to other ATV hams to discuss digital CATV and to illustrate a typical system.

Sometimes in the middle of all these hi-tech explanations it's nice to take a break and look back at something a little less taxing or not as the case may be. We have all used the humble dipole, but how much thought have we given to its radiating properties.

Before we all got involved in digital encoding and the reduced bandwidth it requires, there was another solution called SATV. Rick Peterson, WA6NUT looks back at this analogue solution. It was first suggested by Heinz Guenter Venhaus, DC6MR, in a 1972. Heinz proposed using a 1 MHz low pass filter between the video source and ATV transmitter, reducing the bandwidth of the ATV signal from about 10 MHz to 2 MHz. The results were not what we now expect from such limited bandwidth, but it was 1972.

Mike Stevens G7GTN has been investigating introducing a range of short Eurocard PCBs to support many of the past projects we have all loved. Perhaps given the support of project cards we might all want to build them again. The full Eurocard is an expensive PCB format, but if we truncate it down to the same width, but with reduced length can be made for a very reasonable cost. He has experimented with various software design packages and started with DIPTRACE to produce the Grass Valley PCB for CQ-DATV. He is now looking at Kicad software which will enable cost savings and 4-layer PCB's.

What is he going to design these PCB's for? Well in the From the Vault he is looking at the design Colin Edwards produced back in 1983. A 625-line monochrome television test card, known as the Cropedy video testcard. This underwent many changes and modifications back in its day and Mike has tracked some of the early history in order to select the version he would like to support with his PCB design.

CQ-DATV Production team

DVB-T QSO Hrvatini - Korada

Some time ago, Graziano suggested that he make a connection in DVB-T at 23 cm between Hrvatini and Korada. At the time of the covid, I made a transmitter with a power of 1.5 W and wondered if that was enough power to connect at a distance of 54.4 km.

S57MSL & S52DS in action

On Tuesday, June 15, 2021, I started preparations in the morning. Batteries, power cables, antennas with their cables, transmitter, receiver, spectrum analyzer, adapters and other tools had to be collected. There is always something running out on the field… hi. It took about 4 hours for me to load into the car.

At the same time, I remembered the will and enthusiasm there was years ago, when some athletes made 300 km for the competition and then carried all the equipment to the hill for a few hours. For example: Dubi from Selnica near Maribor to Kredarica and Boč, Štefan from Ljutomer to Snežnik, Bohinj to Možic, Koprčani to Slavnik, Mijo to Rogla or Mrzlica, from Mozirje to Menina planina, from Rateče to Lisca, Goričani to Javornik, etc. But it is also true that we were 20 years younger at the time.

When I got to Korada, my space was occupied by cows. I had to retreat to another place from where I wasn't sure if I had direct visibility to the Hrvatini because there was no view of the horizon due to the fog. At 14.00 GMT I opened the receiver with certainty. Disappointment ensued despite the belief that the connection must go, as Graziano had had a connection to IW3RMR two days earlier. I started changing cables, antennas and receivers. There was also no signal on the spectrum analyzer. Then I moved a good 10 m higher and finally saw a signal on the spectrum at 1265 MHz. I think the error was in some connector. I connect a DVB-T receiver, there is a signal, but there is no picture. On the spectrum I see that at the output of the converter with LO at 455 MHz there is interference from LTE at 810 MHz as I was close to the base station. We moved to 1289 MHz. We moved away from the radar interference on Učka and LTE. The converter output at 834 MHz (66 CH) finally showed a great picture.

The results of measurements of the reception of different antennas are as follows:

backfire 50cm ..-72 dbm MER 19db
yagi 1meter .....-76 dbm MER 15 db
pot 15 cm ....-83 dbm MER 10 db

The Graziano S50J broadcast with 3 W and a 55 element yagi antenna.

Then I went to a 1.5 W show. There were no more problems. Graziano only had a commercial receiver that only shows signal strength and quality. I think they were both over 70 percent.

After 3 hours of perseverance, we were just happy with the result achieved. This was followed again by 2 hours of tidying up.

Report by Adolf Skarabot, S52DS

A Slovenian ATV contest

Decades have passed since the last Slovenian ATV contest, we have been participating in the IARU ATV contest and used to also take part in the Ancona ATV contest.

These two contests have undergone considerable changes, which I feel were a step backwards. I would like to suggest we reinstate the Slovenian ATV contest again.

Let's adopt the old IARU September dates and set the times to the same as all other IARU UKV contests from 2pm Saturday to 2pm Sunday UTC.

Contacts are valid regardless of the mode. (FM, DVB-T, DVB-S, DVB-T2, DVB-S2) only one contact on the same frequency. We exchange the report, serial number and QRA locator.

The logs should be collected by Dolfe S52DS because the old policy he wrote has not yet been revoked by anyone.

The participation by foreign hams would also be allowed.

In this term, the Ancona contest now takes place only with a different schedule.

I would like your opinion.

http://forum.hamradio.si/viewtopic.php?f=11&t=21943

Rudi Pavlic

73 s58ru

Slovenian ATV competition

The problem of the Slovenian ATV competition appeared after 2003. In 2003, the Slovenes had the last-eighth ATV competition. This year, our logs were also transferred to the IARU ATV competition for the last time.

In the following years, we tried to involve individuals - to participate in IARU ATV competitions. The problems with this were inconceivable.

We did not know which of the RA federations would be the organizer of the IARU ATV competition for the year in question; where can we send our ATV logs for IARU competition; where the results of the IARU ATV competition will be announced;

We spent more time and energy to obtain the above data than for the competition itself. We had the most obstacles from the IARU organization. After 2016, the organization of IARU ATV competitions has stabilized somewhat, but Slovenians are no longer on their lists.

What is the need for the "Slovenian ATV competition"?

I find this question very difficult to answer. In Slovenia today, according to my modest records, there are about 20 to 30 RAs that also deal with ATVs.These RAs have QTH in the south and north of Slovenia. There are very few or none in the central part of Slovenia.

As many competitors as possible are needed to run the competitions. RAs living in the north of Slovenia are associated with Austrian RAs, and "Southerners" with Italian RAs.

Only the Slovenian ATV competition without simultaneous ATV competitions in neighboring countries, perhaps, would not make sense. It does not make sense even if there are no Slovenian competitors. To date, we have had countless ideas about ATV racing. We also wrote a lot. We also asked for help at various institutions, RA, RK,… at home and abroad, but ……

For consideration! If Slovenian ATV stations appear at the IARU competition, these stations are at the top of the competition rankings or contribute to the excellent rankings of their correspondents.

73 s58ru

Remember, all our back issues and more are available in electronic format.

Check our website *https://cq-datv.mobi/*

How to use the OBS Studio program in H265 without having a dedicated card

Written by Roberto IS0GRB

As many of you know with the OBS Studio program it is not possible to use the H265 codec without having a dedicated video card that supports this codec.

Below I will explain how to update the OBS in order to have the H265 codec and then encode the video with a much higher quality than the H264 codec.

For the use of this mode, the use of a high-performance PC is recommended, at least with I5 8th Gen processor or higher, as in H265 mode the OBS program uses much more CPU than normal, because clearly most of the work is done by the software and no longer by the board.

1. Download the package with this name " ffmpeg-4.3.2-2021-02-27-full_build-shared.7z " from the following site: *https://tinyurl.com/58nn8u7j* If it is no longer available, you can find it in my google drive: *https://tinyurl.com/jh7wcd2w*

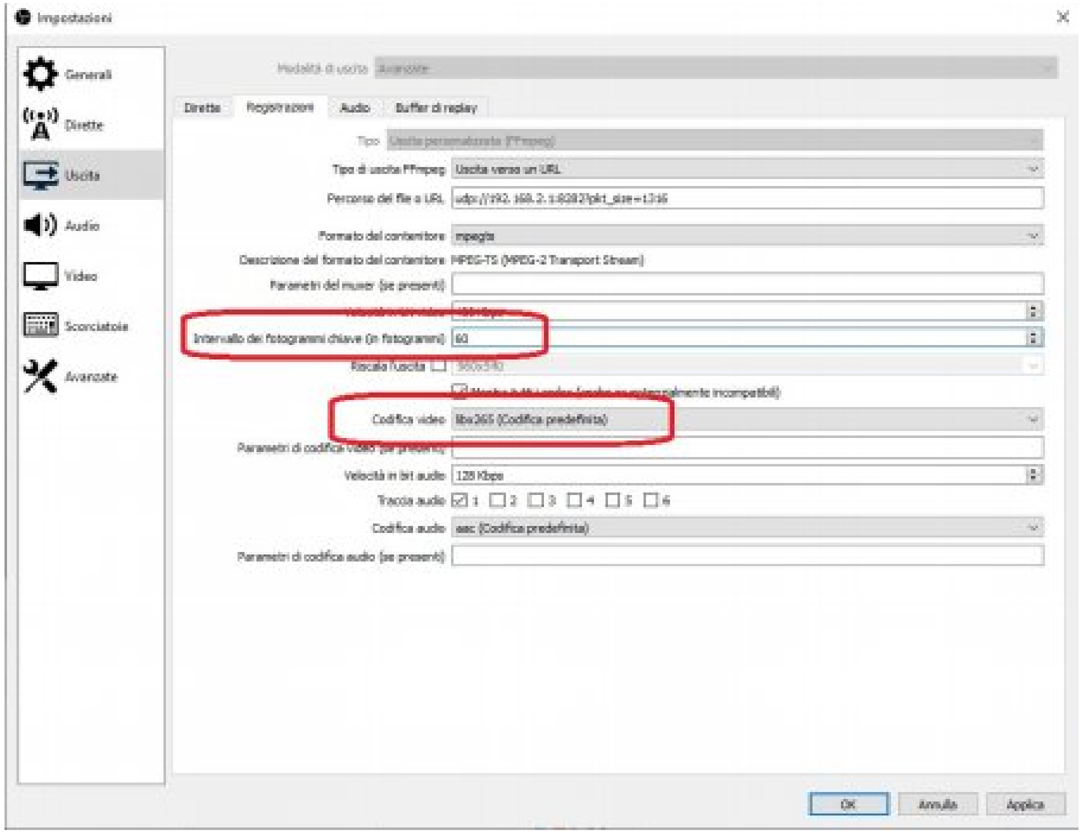
2. Close the OBS program if it was previously open

3. Unzip the package to a folder of your choice on the desktop, for example: "ffmpeg-shared"

4. Copy the contents of the BIN folder of the package into the BIN\xxbit folder of the OBS program, overwriting the original files: For OBS 32bit: c:\Program Files\obs-studio\bin\32bit For OBS 64bit: c:\Program Files\obs-studio\bin\64bit

5. Now open the OBS program and in recording in the available video codecs you will also find the libx265 codec.

I suggest to correctly set the key frame, necessary for the synchronization of the video on the receiver corresponding to 2 seconds, in this case, since I use 30fps on OBS the value will be = 60 (in Recording mode the value is: fps x 2, in Direct mode the value is in seconds = 2)



On the next page are 2 screenshots in H264 and H265 to see the differences. Test carried out locally.

If you update the OBS program, you need to copy again the contents of the BIN folder of the package, as the files are overwritten by the update.

Above H264

Below H265

Tips for improving OBS and Transport Stream performance with effective control of the bit rate and the reduction of CPU usage in H265

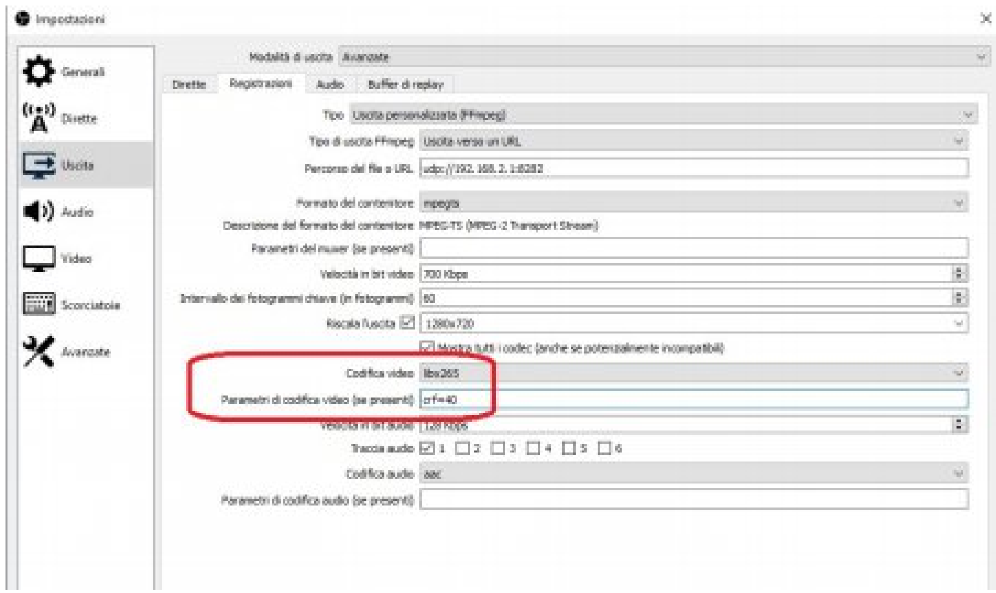
On OBS, in recording mode, there is no CBR control as in Streaming mode, which allows you to have a constant bit rate even in the presence of moving images.

This forces you to keep the video bit rate lower than what you could get, to avoid saturating the Transport Stream if you decide to transmit moving, accelerated or very colorful images.

Using the libx265 codec it is possible to insert the additional “Constant Rate Factor (CRF)” parameter:

crf=value

which allows you to control the bitrate of the transport stream quite well. From the numerous tests i carried out, the value 40 gave excellent results in terms of control and quality:



On this site you will find a well done explanation of the FFMPEG CRF parameter: *https://tinyurl.com/9mtczfy*

As previously mentioned, the libx265 codec uses a much higher CPU percentage than normal and it is advisable to use a processor of at least Intel I5 or higher category.

To overcome this inconvenience, instead of using the "libx265" codec, I suggest use the "hevc_qsv (libx265)".
It is necessary to specify the bitrate_limit=1 parameter in the “Video encoding parameters section (if any)”.

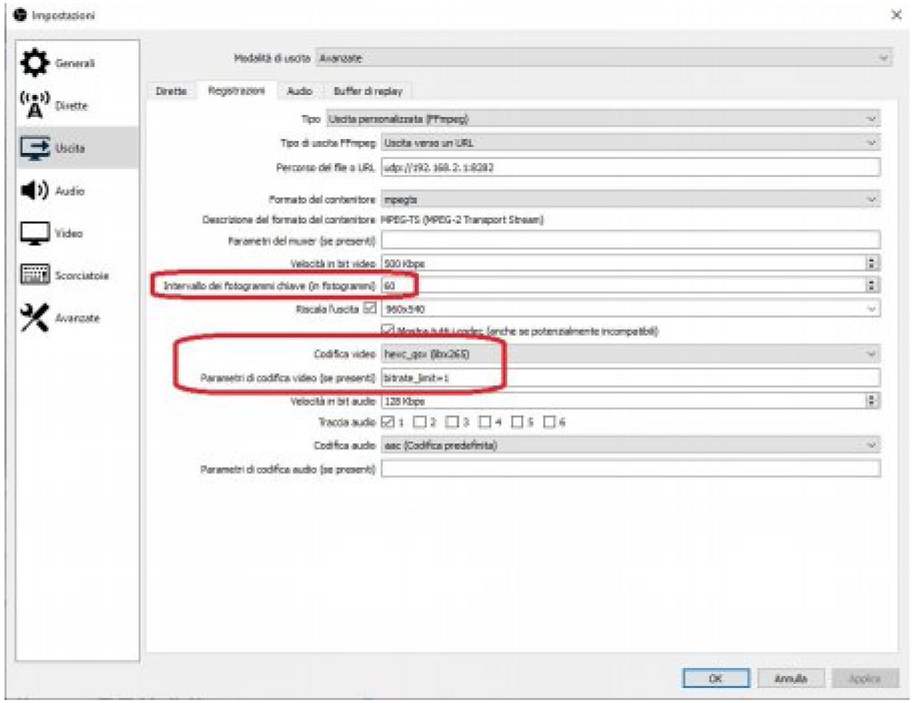
Hevc Quick Sync allows excellent control of the bit rate and uses much less the CPU, this permit to use even less performing PCs.

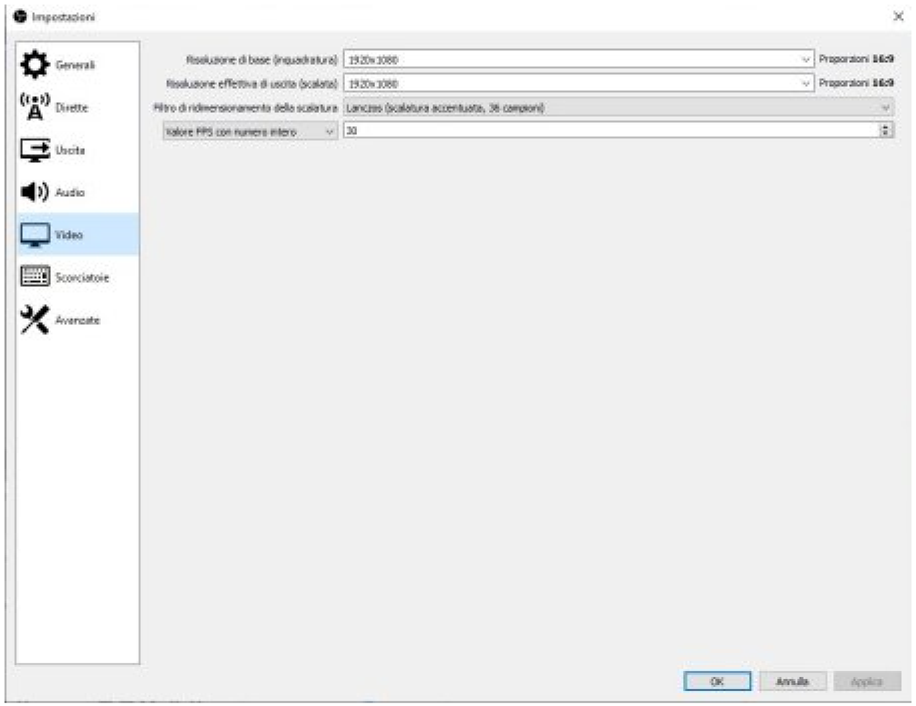
After many tests, the null packets remain practically stationary, confirming the excellent control it carries out, also detected by the OBS statistics. (Below are the screenshots of the tests carried out locally with SR333 8PSK.) Then adjust the video and audio bit rate to your Symbol Rate / Modulations.

For static transmissions, like those of normal QSOs, you can go to high resolutions such as 1920x1080 or even 1280x720, by enabling the box "rescaling the output" in recording, while with very animated images instead of reducing the bit rate too much I suggest rescaling the output to 960x540, which is a excellent compromise between quality and traffic generated.

If you want to play with the parameters of this encoder, here you will find all the necessary information: *https://tinyurl.com/pmz44y69* the parameters must be inserted without the - sign in front and with this syntax:

```
parameter=value
```





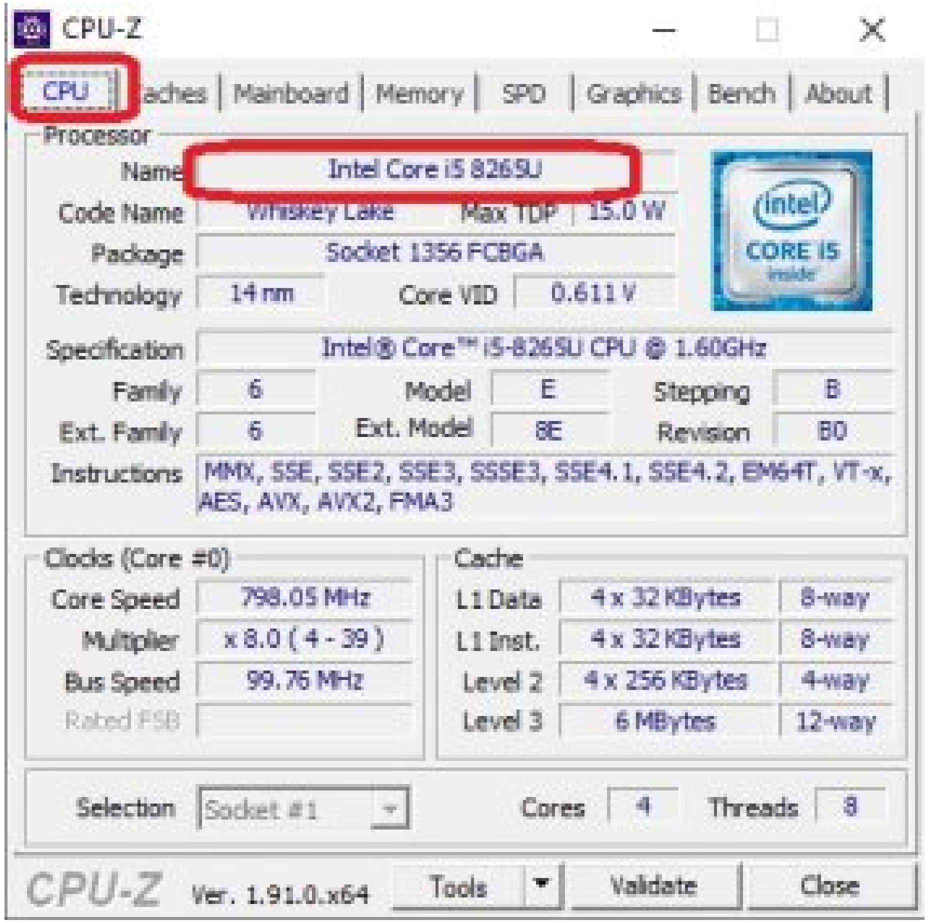
Encoder
hevc_qsv [HEVC
(Intel Quick
Sync Video
acceleration)]:
General capabilities: delay hybrid
Threading capabilities: none
Supported hardware devices: qsv qsv qsv
Supported pixel formats: nv12 p010le qsv
hevc_qsv encoder AVOptions:
-async_depth <int> E..V...... Maximum processing parallelism (from 1 to INT_MAX) (default 4) -avbr_accuracy <int> E..V...... Accuracy of the AVBR ratecontrol (from 0 to INT_MAX) (default 0) -avbr_convergence <int> E..V...... Convergence of the AVBR ratecontrol (from 0 to INT_MAX) (default 0) -preset <int> E..V...... (from 1 to 7) (default medium)
veryfast 7 E..V......
faster 6 E..V......
fast 5 E..V......
medium 4 E..V......
slow 3 E..V......
slower 2 E..V......
veryslow 1 E..V......
-rdo <int> E..V...... Enable rate distortion optimization (from -1 to 1) (default -1) -max_frame_size <int> E..V...... Maximum encoded frame size in bytes (from -1 to 65535) (default -1) -max_slice_size <int> E..V...... Maximum encoded slice size in bytes (from -1 to 65535) (default -1) -bitrate_limit <int> E..V...... Toggle bitrate limitations (from -1 to 1) (default -1)
-mbbrc <int> E..V...... MB level bitrate control (from -1 to 1) (default -1)
-extbrc <int> E..V...... Extended bitrate control (from -1 to 1) (default -1)
-adaptive_i <int> E..V...... Adaptive I-frame placement (from -1 to 1) (default -1)
-adaptive_b <int> E..V...... Adaptive B-frame placement (from -1 to 1) (default -1)
-b_strategy <int> E..V...... Strategy to choose between I/P/B-frames (from -1 to 1) (default -1) -forced_idr <boolean> E..V...... Forcing I frames as IDR frames (default false)
-low_power <boolean> E..V...... enable low power mode(experimental: many limitations by mfx version, BRC modes, etc.) (default false)
-idr_interval <int> E..V...... Distance (in I-frames) between IDR frames (from -1 to INT_MAX) (default 0)
begin_only -1 E..V...... Output an IDR-frame only at the beginning of the stream
-load_plugin <int> E..V...... A user plugin to load in an internal session (from 0 to 2) (default hevc_hw)
none 0 E..V......
hevc_sw 1 E..V......
hevc_hw 2 E..V......
-load_plugins <string> E..V...... A :-separate list of hexadecimal plugin UIDs to load in an internal session (default "")
-profile <int> E..V...... (from 0 to INT_MAX) (default unknown)
unknown 0 E..V......
main 1 E..V......
main10 2 E..V......
mainsp 3 E..V......
rext 4 E..V......
-gpb <boolean> E..V...... 1: GPB (generalized P/B frame); 0: regular P frame (default true) -tile_cols <int> E..V...... Number of columns for tiled encoding (from 0 to 65535) (default 0) -tile_rows <int> E..V...... Number of rows for tiled encoding (from 0 to 65535) (default 0)

How to check if the CPU supports Intel Quick Sync Video graphics functionality

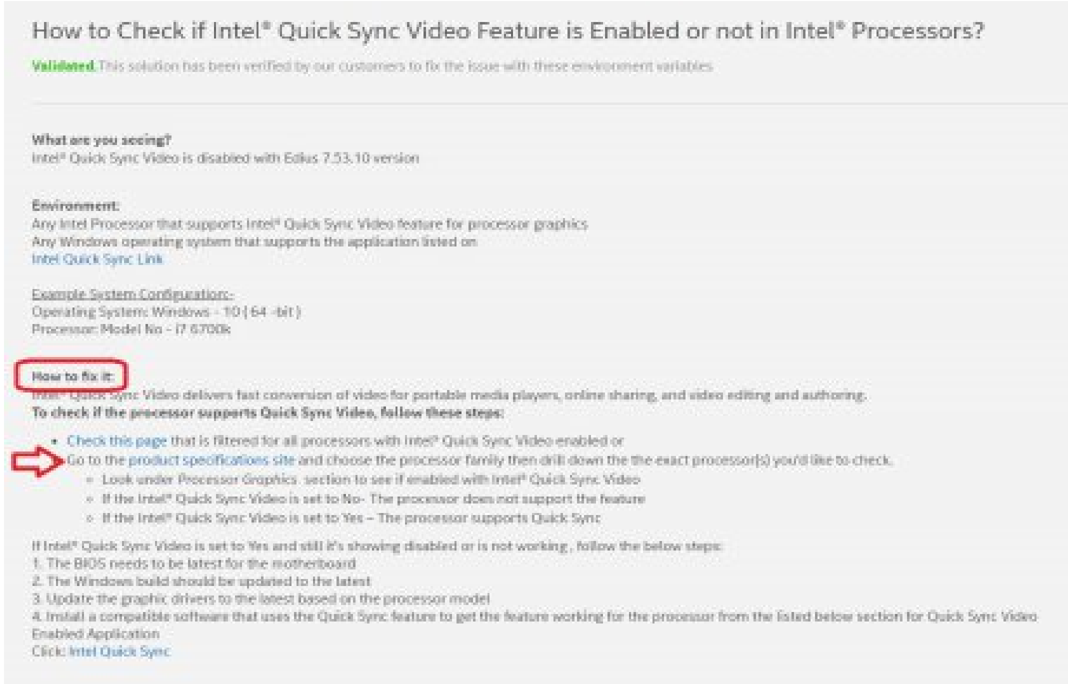
Below will be described the method to understand if the CPU installed in your PC supports the Intel Quick Sync Video feature in order to use the "hevc_qsv (libx265)" encoder on OBS

It is first necessary to understand which CPU model is installed on your PC . Install the CPU-Z program that you find at the following address: *https://tinyurl.com/ypzvh9ut*

After starting the program, the CPU name will be displayed in the CPU panel



Now go to this Intel site: *https://tinyurl.com/3mc6hwej*. In the section "How to solve the problem", click on "Product specifications site".



Click on Processors

Select the type of processor detected by the CPU-Z program, in my case Intel Core

It is now necessary to select the generation of the processor. If you don't know this information first check this Intel site based on the processor code: *https://tinyurl.com/t3s5m58w*

How to Find the Generation of Intel® Core™ Processors

In Intel® Core™ Processors, the generation of the processor is the first number after i9, i7, i5, or i3.

Here are some examples:

11th Gen examples

- Intel® Core™ Processor i7-**11**65G7 because **11** number is listed after i7
- Intel® Core™ Processor i5-**11**30G7 because number **11** is listed after i5

10th Gen examples

- Intel® Core™ Processor i7-**10**65G7 because number **10** is listed after i7
- Intel® Core™ Processor i5-**10**210U because **10** number is listed after i5

9th Gen example

- Intel® Core™ Processor i9-**9**900K Processor is 9th generation because number **9** is listed after i9.

8th Gen examples

- Intel® Core™ Processor i7-**8**650U Processor is 8th generation because the number **8** is listed after i7.
- Intel® Core™ Processor i5-**8**600 Processor is 8th generation because the number **8** is listed after i5.

7th Gen examples

- Intel® Core™ Processor i7-**7**920HQ Processor is 7th generation because the number **7** is listed after i7.
- Intel® Core™ Processor i5-**7**200U Processor is 7th generation because the number **7** is listed after i5.
- Intel® Core™ Processor i3-**7**350K Processor is 7th generation because the number **7** is listed after i3.

6th Gen example

- Intel® Core™ Processor i5-**6**400T Processor is 6th generation because the number **6** is listed after i5.

5th Gen example

- Intel® Core™ Processor i7-**5**650U Processor is 5th generation because the number **5** is listed after i7.

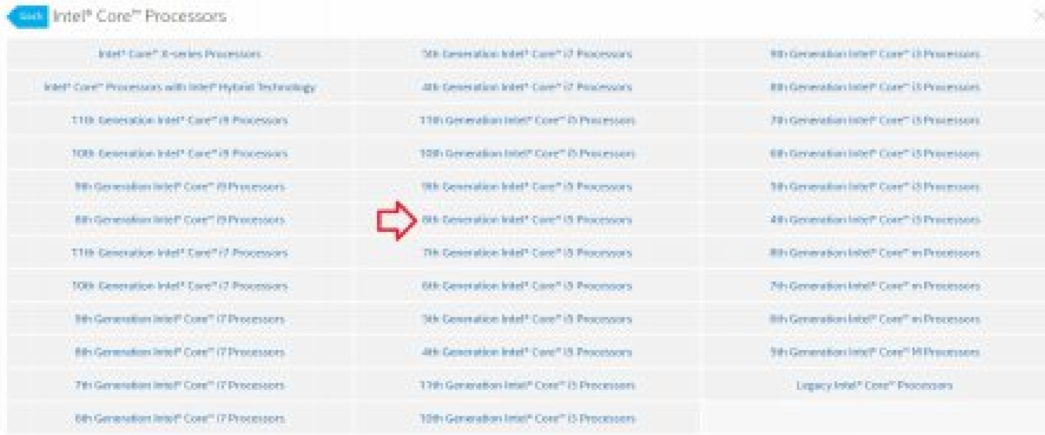
4th Gen example

- Intel® Core™ Processor i3-**4**350T Processor is 4th generation because the number **4** is listed after i3.

3rd Gen example

- Intel® Core™ Processor i7-**3**820QM Processor is 3rd generation because the number **3** is listed after i7.

Then continue selecting the generation of your processor on the Intel site in my case I5 8th generation



Now select the model of your processor from the list; in my case Intel Core I5-8265U

Below in the “Processor Graphics” section it will be indicated if your processor supports Quick Sync Video

Processor Graphics	
Processor Graphics ‡	Intel® UHD Graphics for 8th Generation Intel® Processors
Graphics Base Frequency	300 MHz
Graphics Max Dynamic Frequency	1.10 GHz
Graphics Video Max Memory	32 GB
Graphics Output	eDP/DP/HDMI/DVI
4K Support	Yes, at 60Hz
Max Resolution (HDMI)‡	4096x2304@24Hz
Max Resolution (DP)‡	4096x2304@60Hz
Max Resolution (eDP - Integrated Flat Panel)‡	4096x2304@60Hz
DirectX* Support	12
OpenGL* Support	4.5
Intel® Quick Sync Video	Yes
Intel® Clear Video HD Technology	Yes
Intel® Clear Video Technology	Yes
# of Displays Supported ‡	3
Device ID	3EA0, 3EA1

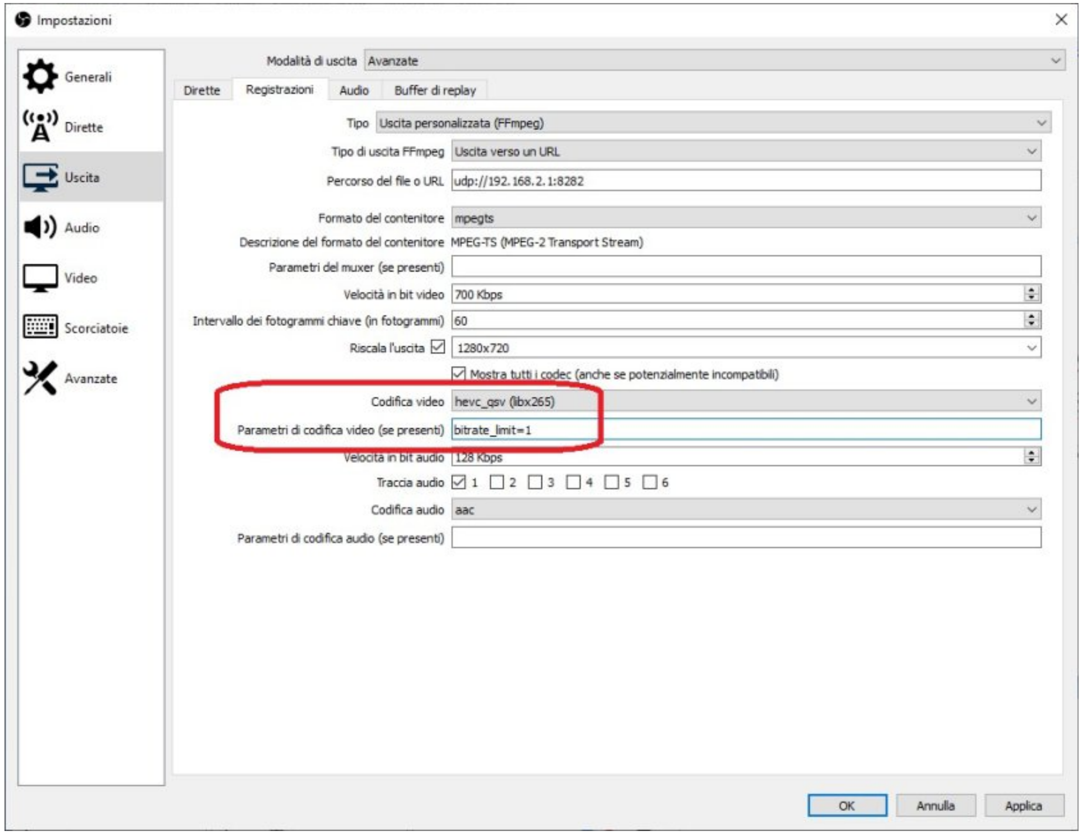
If YES is indicated but OBS still returns the error "Function not supported", in the Intel site indicated above you will find suggestions to enable Quick Sync Video.
https://tinyurl.com/3mc6hwej

If Intel® Quick Sync Video is set to Yes and still it's showing disabled or is not working , follow the below steps:
1. The BIOS needs to be latest for the motherboard
2. The Windows build should be updated to the latest
3. Update the graphic drivers to the latest based on the processor model
4. Install a compatible software that uses the Quick Sync feature to get the feature working for the processor from the listed below section for Quick Sync Video Enabled Application
Click: Intel Quick Sync

I also suggest to watch this video on Youtube which clearly explains how to enable the Quick Sync Encoder:
https://tinyurl.com/52eyxapz

More useful information on this OBS forum page:
https://tinyurl.com/w2usjwm4

If everything works, you are able to use the hevc_qsv (libx265) codec on OBS which allows excellent H265 coding at the same time as very low processor usage and effective Bit Rate control.



How to use the 3.5" LCD touch screen

Written by John Hudson G3RFL

Touch screens are now becoming a very affordable user interface. They look more elegant than push buttons and switches.

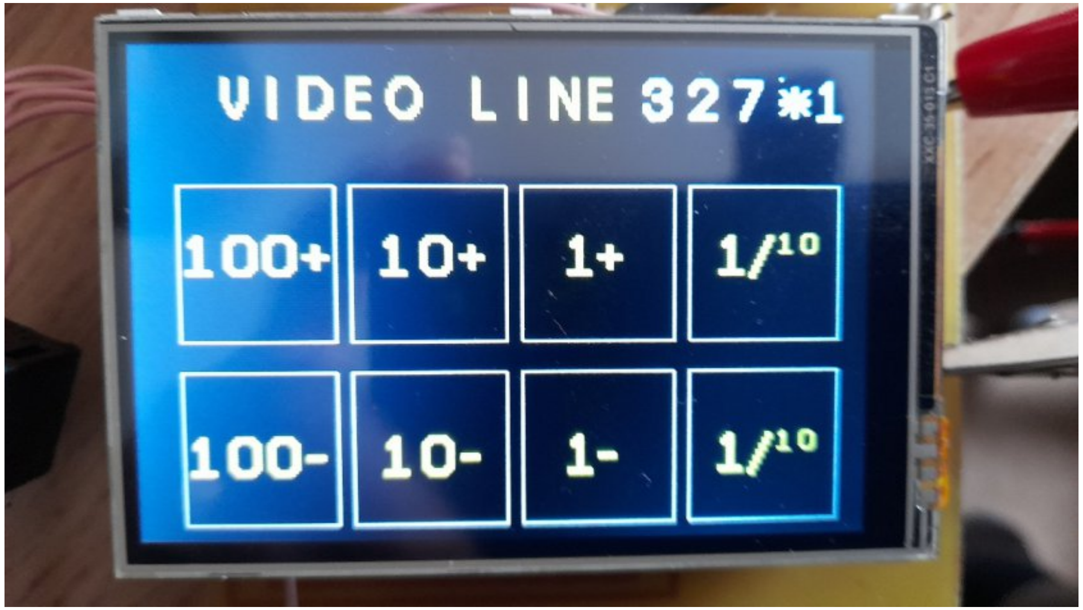


Figure 1 - Touch screen of my CQ-DATV 95 trigger unit (my thanks to Dave Woodhall for the pictures)

Most amateur built equipment using push buttons and switches never aspires to etched panels because the cost can be prohibitive, so we settle for Letraset or dymo tape for legends (other screen-printing systems are available). I have to also confess up front to avoiding metal work whenever possible, so touch screens are now becoming my interface of choice for controlling projects.

There is inevitably some coding as these screens are best suited to micro controlled projects, but I would prefer spending time in front of a computer writing code as opposed to the alternative option of metal work, where my limited skills of drilling front panels or creating square cut-outs, just does not deliver the professional look I originally envisaged and sometimes end in a liberal use of Band Aids (for me not the project (other sticking plasters are available).

I also do read other ATV magazines and realise I am not the first to tread this path, but in this article, I wanted to not just produce a connection diagram and some hex code to control it an approach I have been guilty of past articles. Now I am feeling more confident with several successes under my belt and want to open the door to help others develop projects of their own.

This has always been the driving force behind CQ-DATV articles and is why I have been supporting this magazine since the very first issue. This is an "how to do it article" rather than a "this is how to make it" article and is supported by a source code listing that can be used in MAPLX to compile the hex used to programme for the PIC.

This approach a enables it to be customised in order to develop projects of your own. Hex code will always be the required end product, but unless you have the source code to compile it from, it can never be customised. I have based the example on the scope trigger unit which appeared in CQ-DATV 95.

I started by buying 6 TFT touch screens (£11.68 each) on eBay who could refuse an offer like this. They have appeared in many of my projects in CQ-DATV 31 I started an explanation of their use. In CQ-DATV 38 I built an aerial rotator controlled by again a touch screen and finally the scope trigger unit in CQ DATV 95. There are numerous touch screens out there using various driver chips. All 6 of my bargain screens use the same driver chip the XPT 2046. In this article I want explain how I produced my working designs and provide a path for others to develop similar projects of their own.

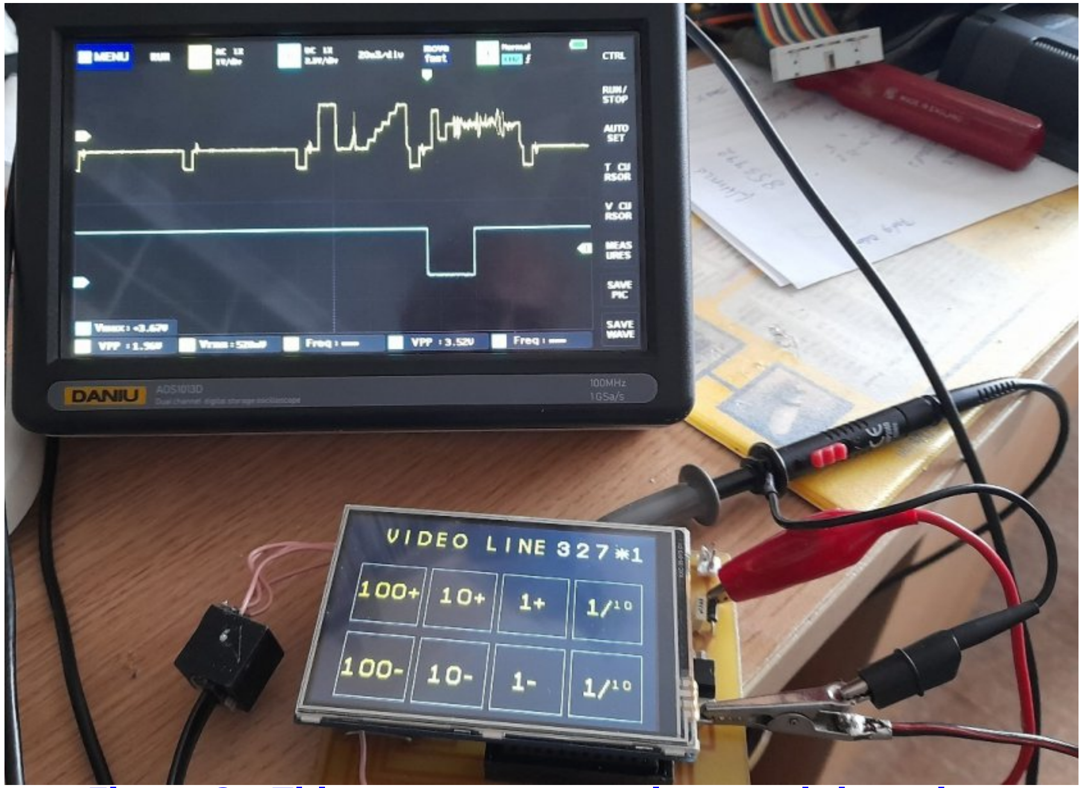


Figure 2 - This was my scope trigger unit in action, and it shows video waveforms expanded in a way that the original unit was not capable of delivering as a stand-alone unit

The code runs in a PIC micro controller which is my weapon of choice for tackling anything that requires a micro. There are advantages and disadvantages to this approach. You are working at machine level which delivers speed and is ideal for control. The downside is mathematics. An 8-bit register can be rotated to either double of half its value. Bits can be individually set to add or subtract say 1,2,4,8 etc if you are working in decimal, but it’s a little complex. The code needs recompiling in MAPLX after every change and then resultant hex needs programming into the PIC to find out if it still works and deliver the expected change. This is the downside, and perhaps why people use higher level languages, which perform slower and require more memory space.

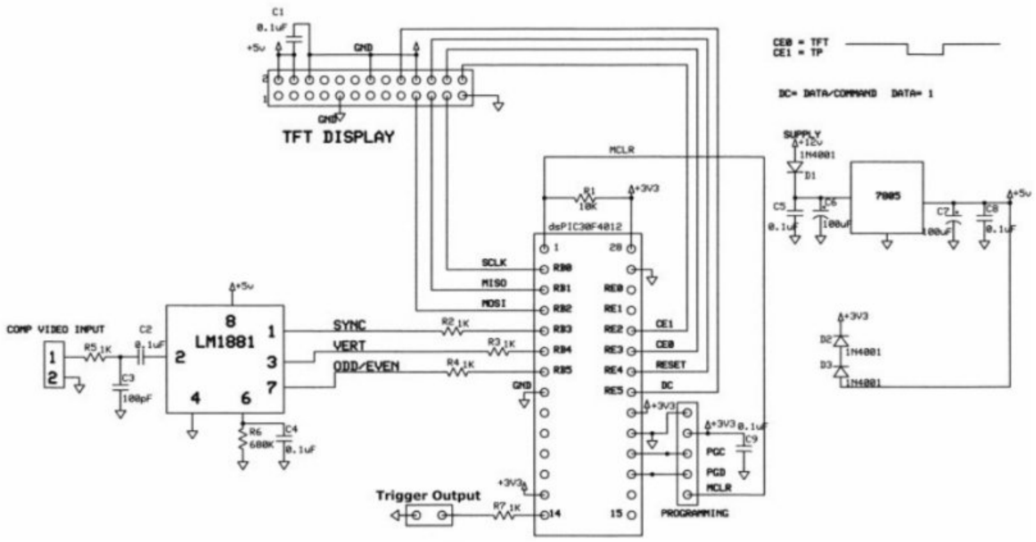


Figure 3 - The scope trigger unit see the full article in CQ-DATV 95 in the download library

I have reproduced the circuit here of the scope trigger unit as that is my most recent Touch screen venture. The hex dump for the PIC is on the CQ-DATV download site.

Within my touch screen are two custom chips the XPT2046 Touch Panel Controller Driver. This is a 4-wire resistive touch screen controller that incorporates a 12-bit 125 kHz sampling SAR type A/D converter and the LI9486L which is a 262,144-color single-chip SoC driver for a-Si TFT liquid crystal display with resolution of 320RGBx480 dots, comprising a 960-channel source driver, a 480-channel gate driver, 345,600bytes GRAM for graphic data of 320RGBx480 dots, and power supply circuit.

The ILI9486L supports parallel CPU 8-/9-/16-/18-bit data bus interface and 3-/4-line serial peripheral interfaces (SPI). There is also ILI9486L which is used with RGB (16-/18-bit) data bus for video image display. In this article I will limit myself to the XPT 2046.

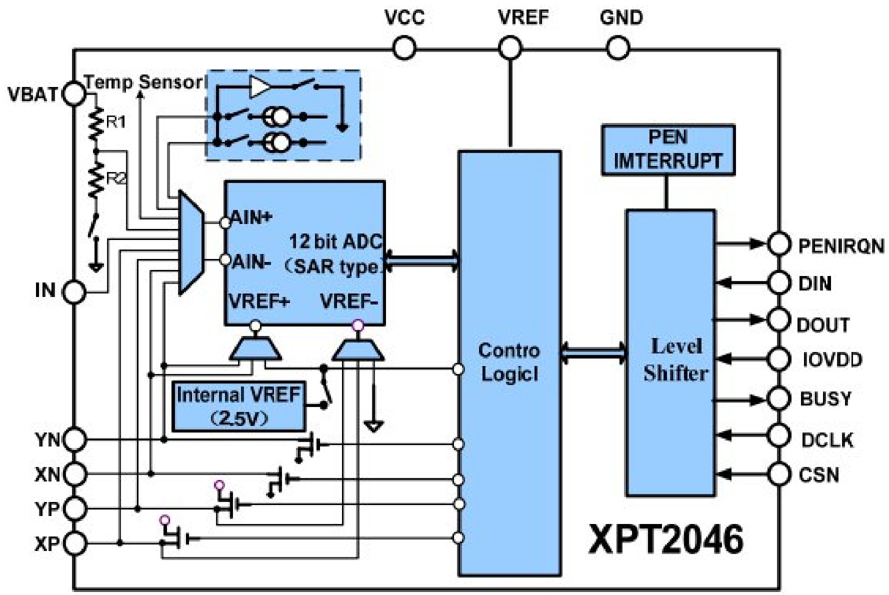


Figure 4 - The basic operation of the XPT2046 is shown in this simplified diagram

The XPT2046 operates down to 2.2V supply voltage and supports digital I/O interface voltage from 1.5V to Vcc in order to connect low voltage Up. The XPT2046 can detect the pressed screen location by performing two A/D conversions. In addition to location, the XPT2046 also measures touch screen pressure. On-chip VREF can be utilised for analogue auxiliary input, temperature measurement and battery monitoring with the ability to measure voltage from 0V to 5V. The XPT2046 also has an on-chip temperature sensor and is available in 16pin QFN thin package(0.75mm in height) and has the operating temperature range. of -40°C to +85°C.

The basic operation of the XPT2046 is shown in the simplified diagram. The device features an internal 2.5V reference and uses an external clock. Operation is maintained from a single supply of 2.7V to 5.25V. The internal reference can be overdriven with an external, low-impedance source between 1V and +VCC.

The value of the reference voltage directly sets the input range of the converter. The analogue input (X-, Y-, and Z-Position coordinates, auxiliary input, battery voltage, and chip temperature) to the converter is provided via a multiplexer. A unique configuration of low on-resistance touch panel driver switches allows an unselected ADC input channel to provide power and the accompanying pin to provide ground for an external device, such as a touch screen. By maintaining a differential input to the converter and a differential reference architecture, it is possible to negate the error from each touch panel driver switch's on-resistance (if this is a source of error for the particular measurement).

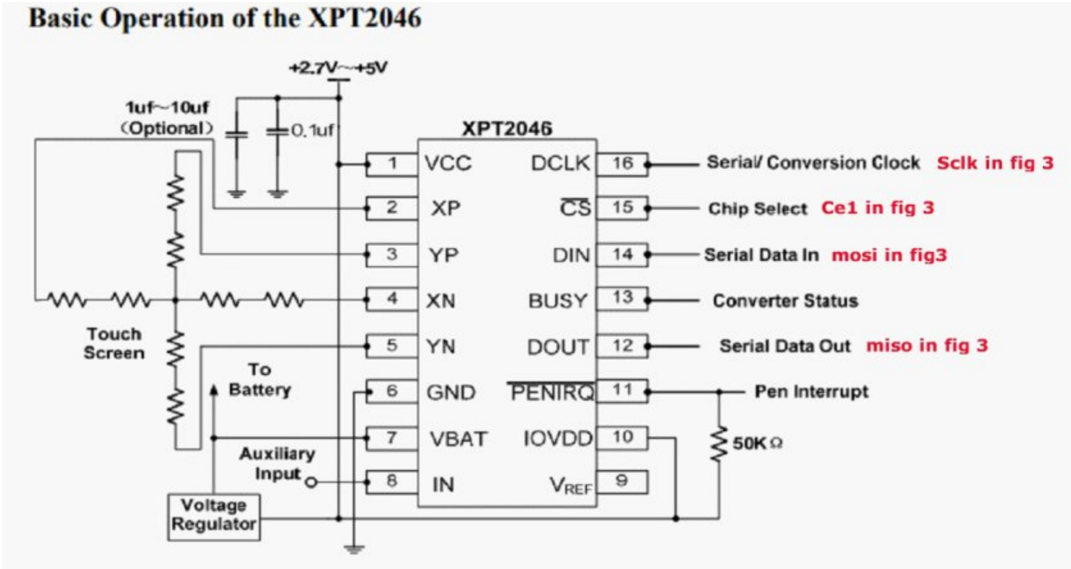


Figure 5

The 6 connections XPT pins 11 to 16 connect to the PIC (fig 5) and control the display and read the touch screen presses. The display can deliver 64,000 colours per pixel.

I want to concentrate on reading the Key presses which come back as serial data and needs decoding in the PIC. This data produces an X-Y position on the screen indicating where it has been touched and also how hard it has been pressed.

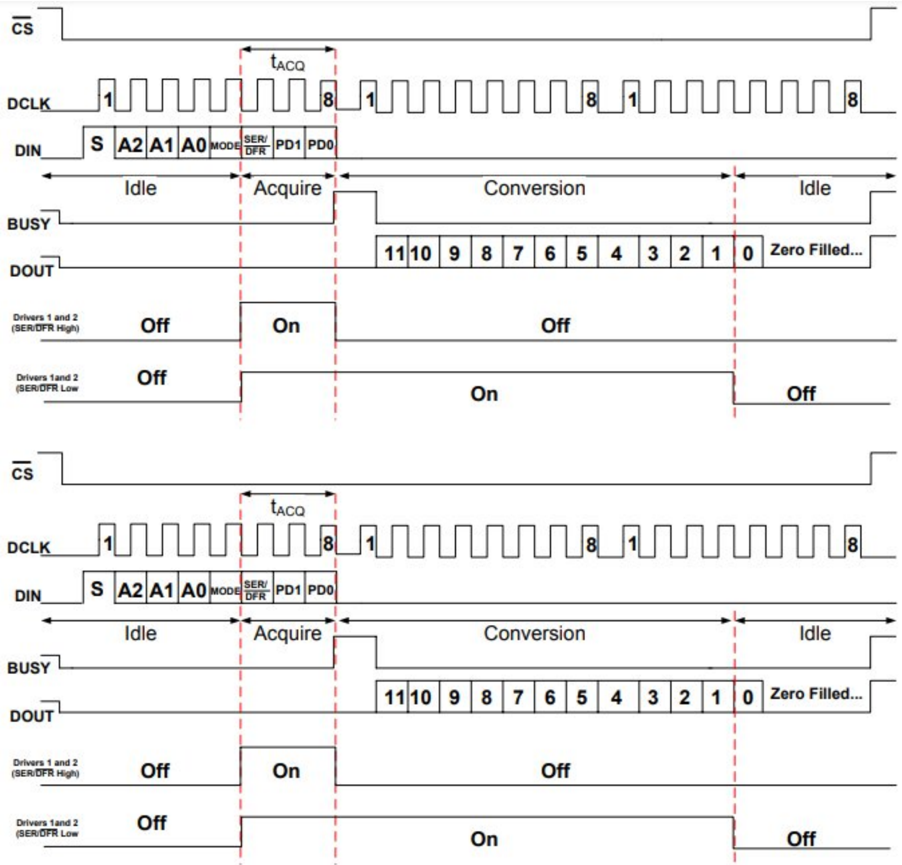


Figure 6 - This is the protocol between the XPT 2046 and this PIC, as you can see there is lot happening

W0 = X Position 0-479 (-1 if no pressure)
W1 = Y Position 0-319 (-1 if no pressure)
The Displays are 480 X 320 pixels.

I am at present polling the busy pin in software and ignoring the IRQ, its pulled high so is not active and the busy flag lets me know if the touch pad is happy to talk to me.

I also used different notation on FIG 3 for the CLK, data in, data out and chip enable. Fig 5 show the notation I used for my scope trigger in red.

The hardware interconnect and the pulse diagram in Fig 6 provide some degree of how the hardware is functioning and should help with any trouble shooting, but you won't need it (famous last words). The source code to drive the Touch screen should help you prove the hardware and develop your own functions and designs. As always get it working and then change it bit by bit so you can always return should you go down a wrong road.

The source code will need re-compiling after each change and then the PIC will need re-programming with the resultant hex data in order to test changes. There is no short cut around this but nevertheless if this helps you develop your own touch screen interface running then I have been of some use.

All of life is a learning curve and they can at times be a little discouraging particularly when you are low down on a steep part of the curve (we have all been there).

My thanks to my son Lee for the source code, he always takes the difficult parts on board and comes up trumps. Lee has provided lots of comments in his source code listing, which I hope will help you understand the programme. The comments are preceded by (;) they are not part of the programme and are purely there to aid human understanding.

Any problems you can always contact me via the CQ-DATV editor email and I will be happy to help.

WELL READ THE WORLD OVER
CQ-DATV

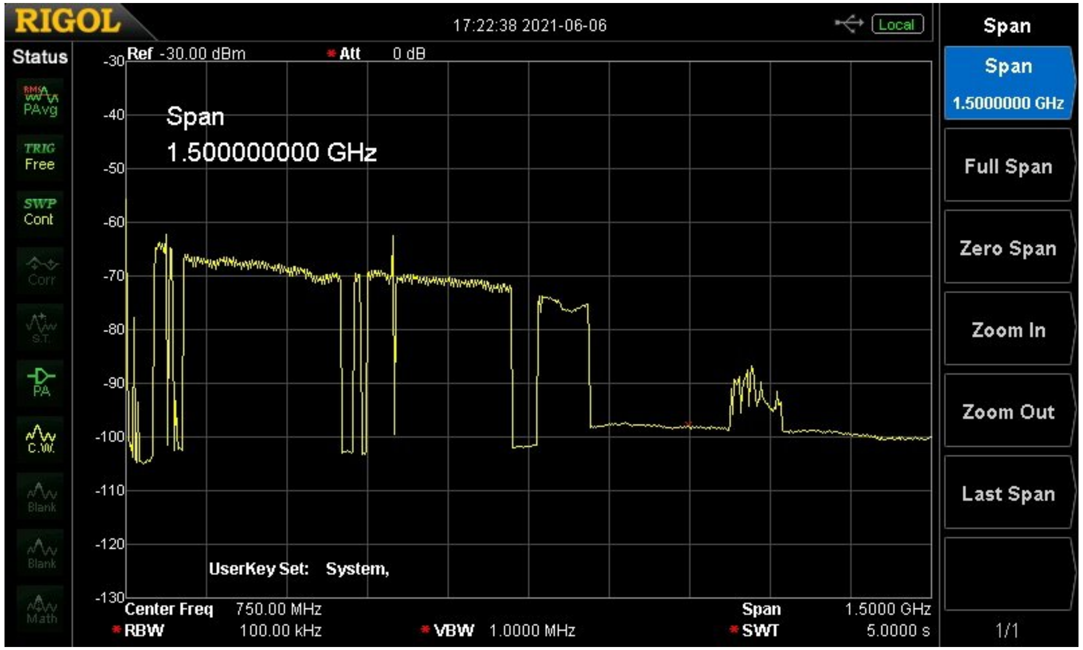
What is in the Cable TV Spectrum?

Written by Jim Andrews KH6HTV

Reproduced from Boulder Amateur Television Club TV Repeater's REPEATER June, 2021

I recently received an inquiry from Bil, K1ATV, in Mesa, Arizona about cable TV. He has Cox Cable in the Phoenix area. He wanted to know what system they use? Could it be DVB-T? Can it be decoded with our ham DTV gear?, rf channels, etc? For specifics on the Phoenix, Cox Cable, I referred Bil to the other Arizona ATV hams.

Because Bil asked these questions, I decided it would be informative to other ATV hams to discuss digital CATV. To illustrate a typical system, I connected my own cable TV signal to my Rigol spectrum analyzer to provide some visuals. Here in Boulder, Colorado, we receive our cable service from Comcast.

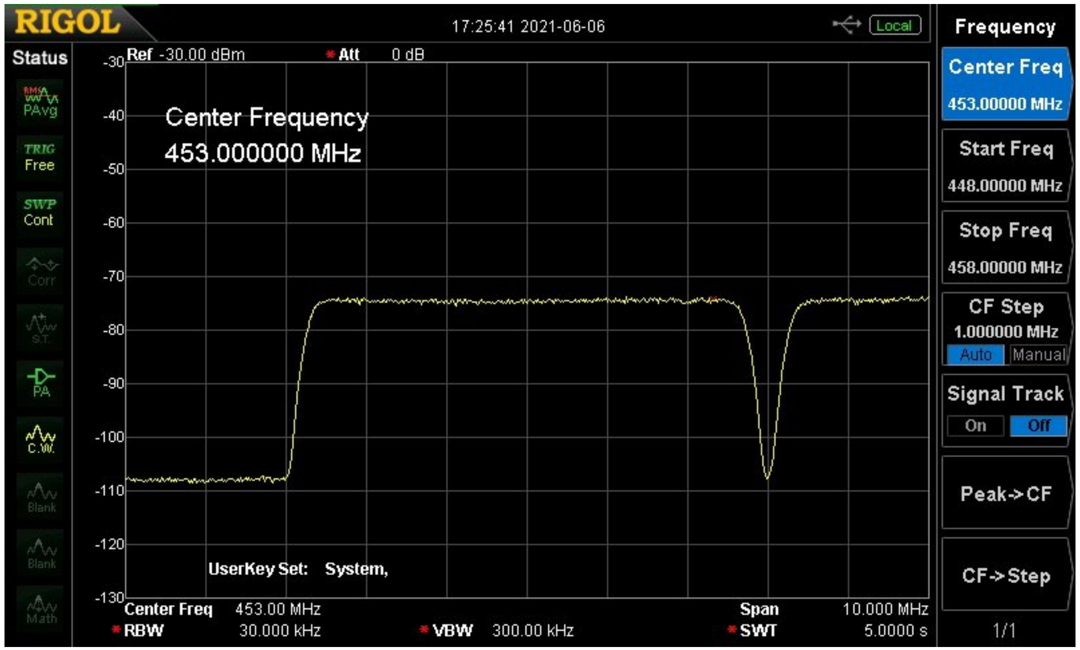


This photo is a full sweep of the Comcast cable from 0 to 1.5 GHz

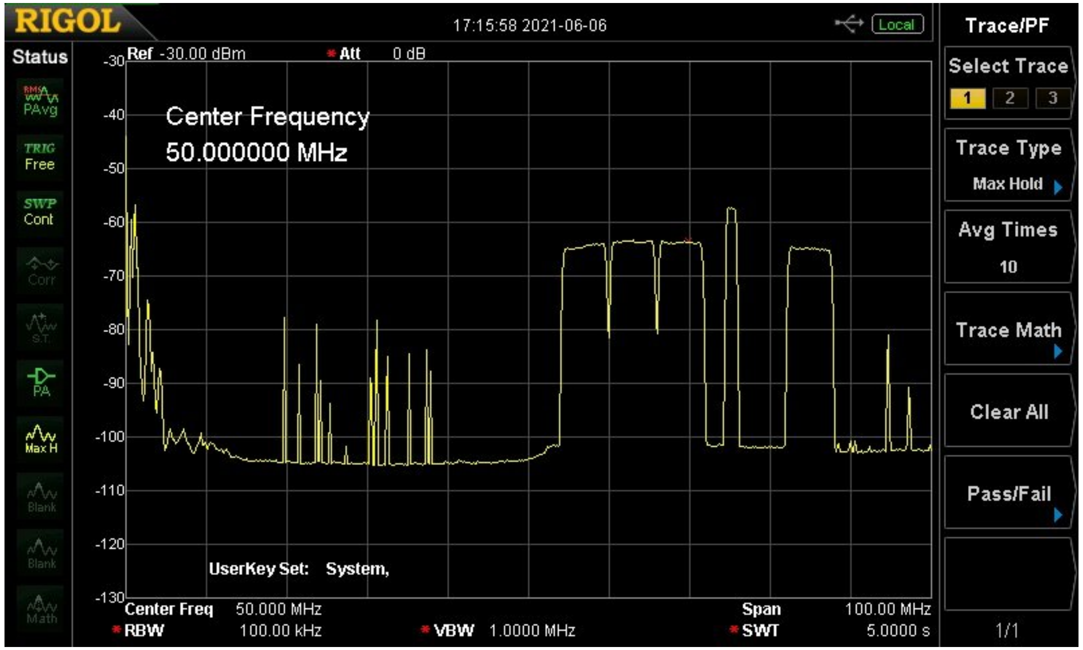
The "Bible" for all technical questions relating to digital TV is a book I found by Walter Fischer, an engineer with Rhode & Schwartz in Germany. The book is entitled "Digital Video and Audio Broadcasting Technology". It is published by Springer and is available in both German and English. For any DATV ham who really wants to know the real guts of DTV, I highly recommend this book. It covers DVB-S, DVB-T, DVB-C, ATSC/8VSB, plus several other systems.

Here in the USA, the cable companies use a form of DVB-C, called ITU-T J83B. The international standard is called J83A. For the USA, J83B, the RF channel bandwidth used is 6 MHz. The modulation methods used are either 64-QAM or 256-QAM. J83B uses a different, complex, scheme of error protection (FEC), than J83A. For 64-QAM, the gross data rate is 30.34 Mbit/s. For 256-QAM, the gross data rate is 42.88 Mbits/s. The spectrum is carefully controlled with smooth roll-off filters on the channel edges.

So, lets now look more carefully at what we see in the CATV spectrum.



This (previous picture) shows the typical spectrum of a single TV channel. It is cable channel 62 (453MHz). 10dB/div & 1MHz/div. Resolution band-width was set to 30kHz. Note: there was no signal on Ch 61, but there is another signal present on Ch 63. Note the deep notch at the channel edge. The channel filter roll-off is thus preventing cross-talk into the adjacent channels. The noise floor of the measurement was about -109dBm

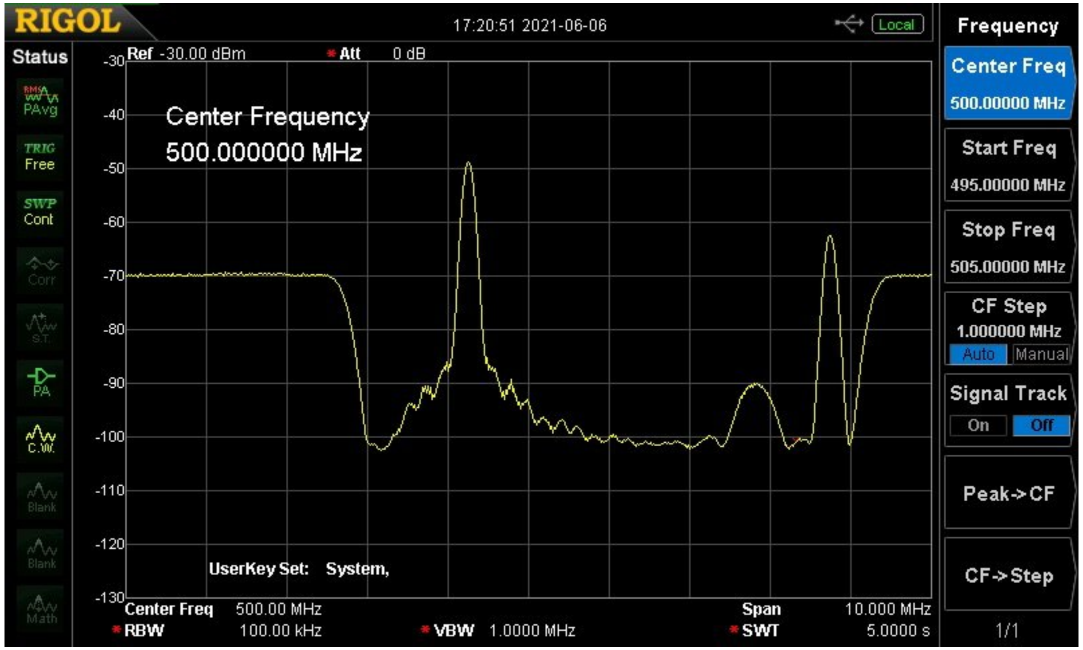


This is what we find at the bottom end of the band

The frequency sweep is from 0 to 100 MHz. The key thing we find here is the "Up-Stream" data flow. This is where we the users send our data out to the internet. The region between 5 and 42 MHz is used for this purpose. While watching this on my spectrum analyzer, the spikes seen occurred randomly. The cable company uses bi-directional amplifiers to accommodate the up-stream vs. the down-stream data flows. The cross-over region around 50MHz is thus empty. Above 50 MHz, we now see appearing starting at 54MHz, Ch 2, 3 & 4. There next appears a narrower (1.3MHz) digital signal.

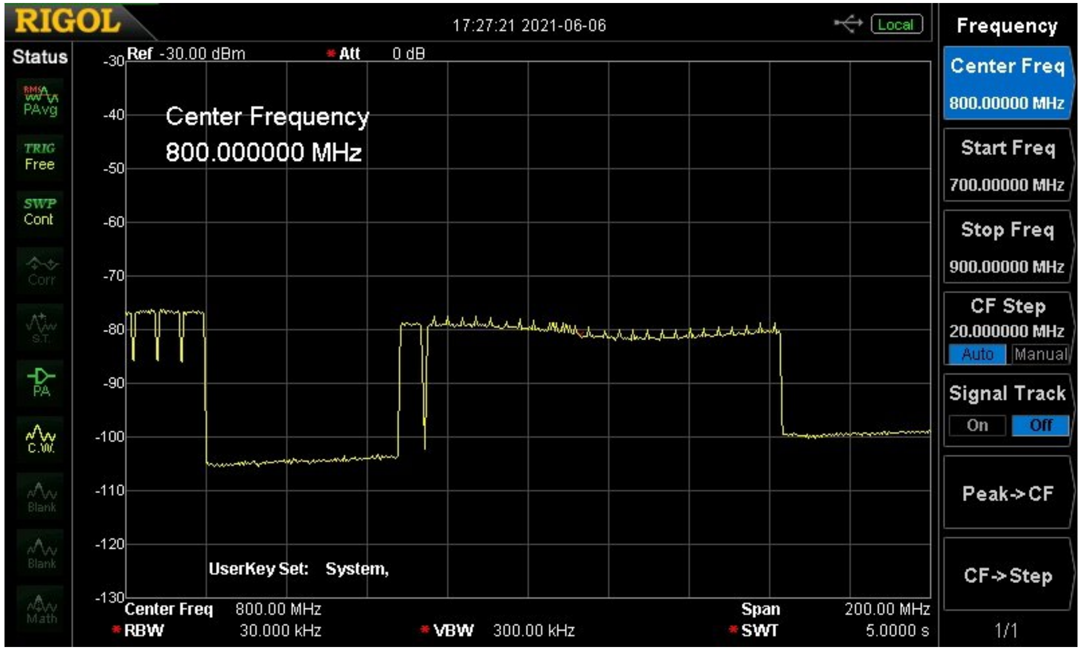
I don't know what it is used for. It then appears that the cable company leaves the FM broadcast band (88-108MHz) empty for fear of RFI. I did find local RFI there from two nearby, strong FM broadcast stations. In years past, the cable companies included a single carrier at about 110MHz which was used by service trucks to locate leaks from the cable system. I did not find that, nor any other similar signal to be present anymore.

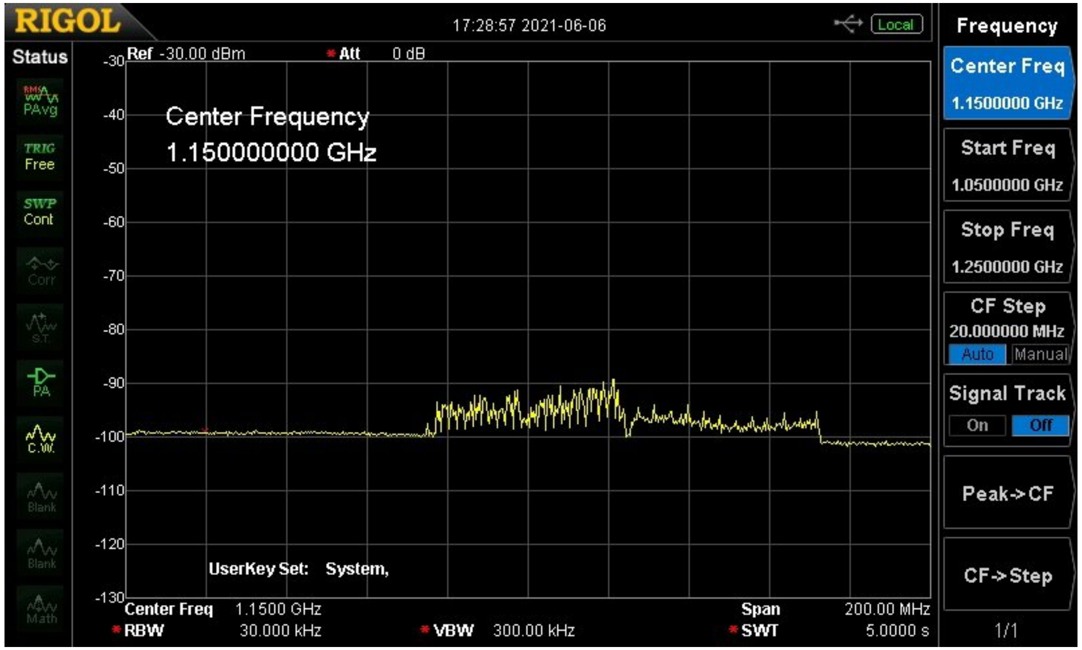
The region from 110 to 400MHz was totally filled with 6MHz, DTV channels. Then again from 450 to 720MHz was again filled up with more DTV channels. With one exception.



The exception was at 500MHz, where I found a single analog TV signal on channel 70

Here we see the video carrier at 499.25MHz. Also visible is the 3.58MHz color sub-carrier and the 4.5MHz sound sub-carrier. When I connected an analog TV receiver to the cable and tuned it to Ch 70 I found this to be just a black screen with no audio.





This is the region above 720MHz.Here we find one single DTV channel, but then a spectrum totally different from DVB-C. This appears to be a very wide, about 90MHz band-width digital signal with a bunch of pilot tones. This is for internet use. It is the "Down-Link" of data from the internet, plus whatever signaling the cable company needs to use.

It is a new concept for me. When the Comcast service tech installed our service when we moved in, he explained that they now install a "master" set-top receiver in the living room. Then for all other TV sets in the house, they install "slave" set-top boxes. The slave in our bedroom is actually a much smaller unit than the master. The tech explained that the master and slave talk to each other on a frequency above 1 GHz. Thus, the signal seen here between 1125 and 1220MHz must be for the master/slave communication. It is seen to be two distinct signals of about 50MHz width.

This it the last region found on our sweep up to 1.5GHz

So, back to K1ATV's questions. He asked "Can we use our ham DTV gear, such as the Hi-Des receivers to watch cable TV?" NO, Bil, sorry --- We are using DVB-T (or some hams DVB-S). Not DVB-C, J83B. Plus, Comcast, and probably most other cable companies today encrypt (scramble) their transmissions. While the TV receivers we buy at Wal-Mart, etc. come equipped with a digital cable tuner for both broadcast ATSC and cable J83B, they still will not work. I tried doing an auto-scan on my Comcast cable with two different brand receivers and neither one would receive nor decode any of the Comcast channels. Thus they were all encrypted.

I might add a note. The modulators and receivers from Hi-Des do come equipped with the capability of encrypting and unscrambling their DVB-T transmission. However, we as FCC licensed radio amateurs are strictly forbidden by FCC rules from encrypting our transmissions. Thus we should never use this feature.

Another note: Back in 2010, I and several other Boulder hams experimented using digital cable TV, J83B, for over the air amateur transmissions. We found it quite unsatisfactory.

While it sometimes worked, it often did not, even for line-of-sight paths. The issue was multi-path. With much multi-path present, the CATV digital receiver simply could not decode the signal.

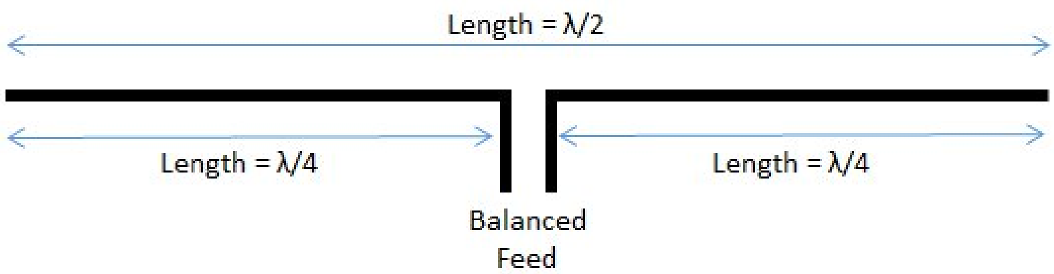
So by 2014, when we discovered DVB-T and Hi-Des, we abandoned digital cable, J83B, for DVB-T. We are very happy we did so. DVB-T tolerates severe multi-path and we have had great success with it.

The Dipole Antenna

Antenna A-Z

Typical Characteristics					
Bandwidth	Gain	Size	Impedance	Pattern	Polarization
10.00%	2.15dBi	$\leq \frac{\lambda}{2}$	73Ω	Omnidirectional (Normal to Dipole)	Linear

The dipole antenna is the basis of many different antennas. The standard dipole antenna measures 1/2 wavelength total, with each side of the dipole maintaining a length of 1/4 of a wavelength. Each side of the antenna is fed 180° out of phase from the other side of the antenna.

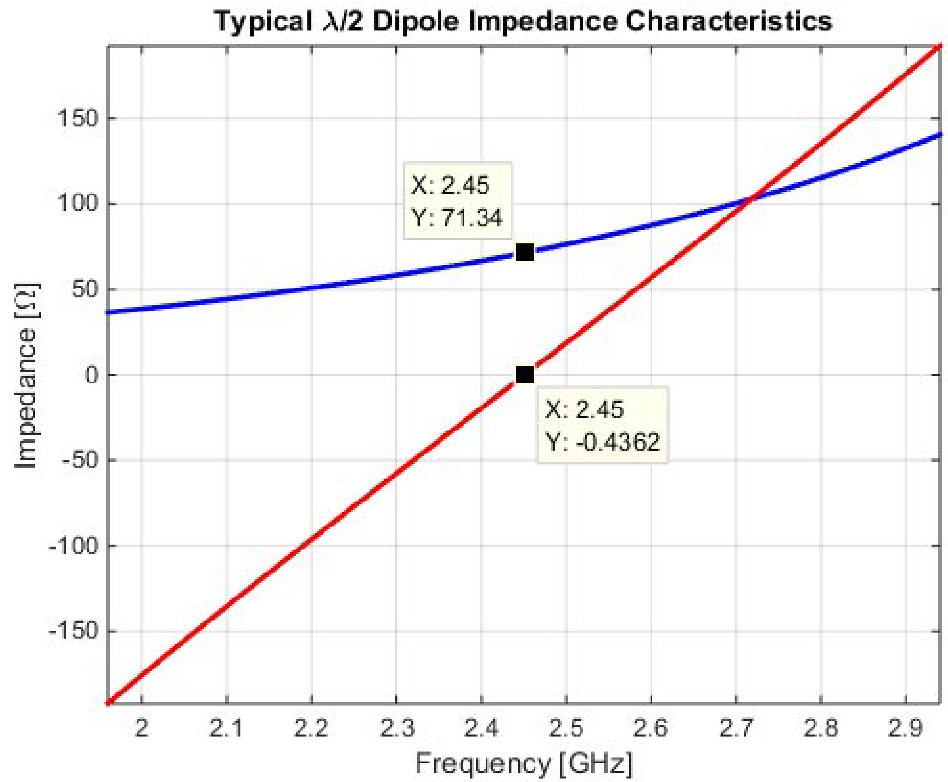


Dimensions of a traditional dipole antenna

The standard dipole hasa "doughnut" shaped pattern which is linearly polarized along the length of the antenna.The peak gain of this antenna is 2dB more than that of an isotropic antenna (2dBi).

In order to obtain this pattern shape a balun shouldbe used when feeding this antenna with an unbalanced feed line. Often this type of antenna is fed usinga coax attached to a balun. If a balun is not used the pattern will "tilt" towards one side of the dipole.

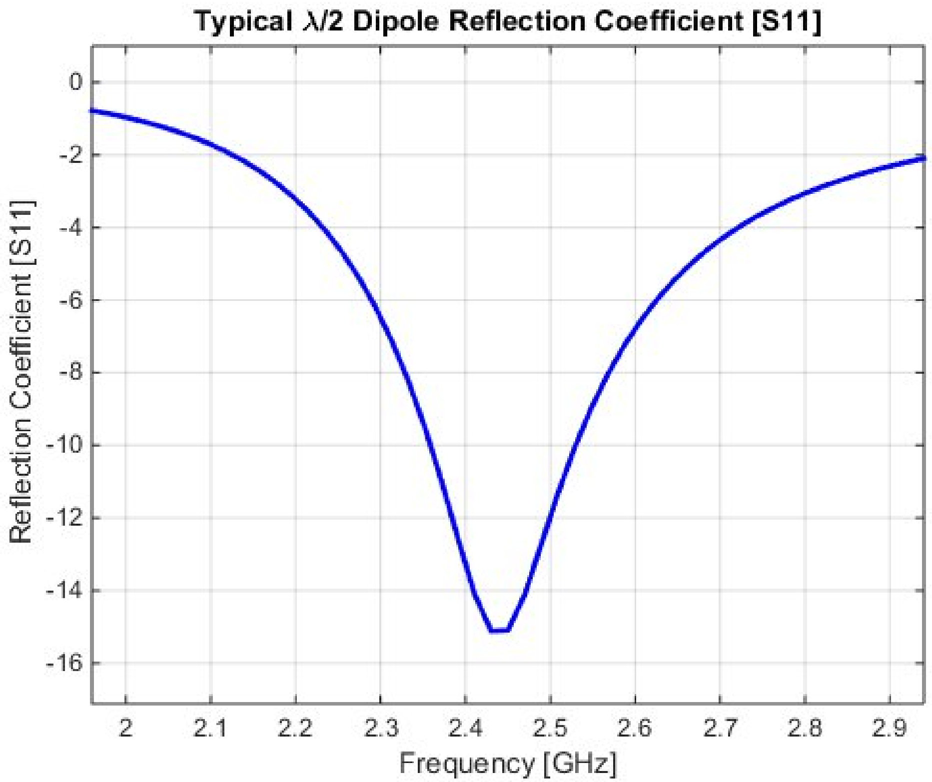
The natural input impedance of a dipole antenna is 73Ω, which is double that of a monopole antenna. Below is the standard input impedance of a thin dipole antenna centered at 2.45GHz.



Typical impedance of a thin dipole antenna

A general rule is the thickness of the dipole antenna determines the bandwidth of the antenna. For a very thin antenna the bandwidth will usually be around 5% and as the thickness increases bandwidths above 20% are obtainable. For a standard dipole the thickness should be much much less than the length of the antenna. The bandwidth changes because as the dipole increases in width the slope of the imaginary impedance decreases.

The 50Ω bandwidth this 2.45GHz thin dipole antenna is shown below. Slightly more bandwidth is obtainable when a 73Ω coax is used, this is why TV coax cable is designed to have an impedance of 75Ω.



Typical Thin Dipole Reflection Coefficient

General Facts:

- *Length of λ/2*
- *Omni directional pattern normal to the antenna*
- *Linear Polarization*
- *2.15dBi Gain*
- *Impedance 73Ω (can be fed with 50Ω with a decrease in bandwidth)*
- *Balun is needed to avoid pattern degridation*

Design Guidelines:

- *Decrease dipole length to increase the resonant frequency*

Source: *https://tinyurl.com/y6hk4mvp*

"Smalband" ATV (SATV)

Written by Rick Peterson, WA6NUT
Reproduced from Boulder Amateur Television Club TV Repeater's REPEATER April, 2021

Introduction

This article describes "Smalband" ATV (SATV), an ATV mode popular in the Netherlands. In Dutch, "Smalband" means "narrow-band" ("Schmalband" in German). Although this technique has been applied to PAL and SECAM analog ATV in Europe, it can also be used with NTSC analog ATV.

What is SATV?

SATV was first suggested by Heinz-Guenter Venhaus, DC6MR, in a 1972 article in TV-Amateur, the publication of AGAF, the German ATV club. DC6MR proposed using a 1 MHz low pass filter between the video source and ATV transmitter, reducing the bandwidth of the ATV signal from about 10 MHz to 2 MHz. The narrow band signal lacks color and the FM sound subcarrier, but a voice signal can be added by FM modulation of the video carrier **[1]**.

Interestingly, the Aptron Labs AX-10B ATV transmitter allows the operator to select either the usual 4.5 MHz FM sound subcarrier or FM voice modulation of the video carrier. Alternatively, voice communication can accompany the SATV image signal by means of a 2-meter FM link.

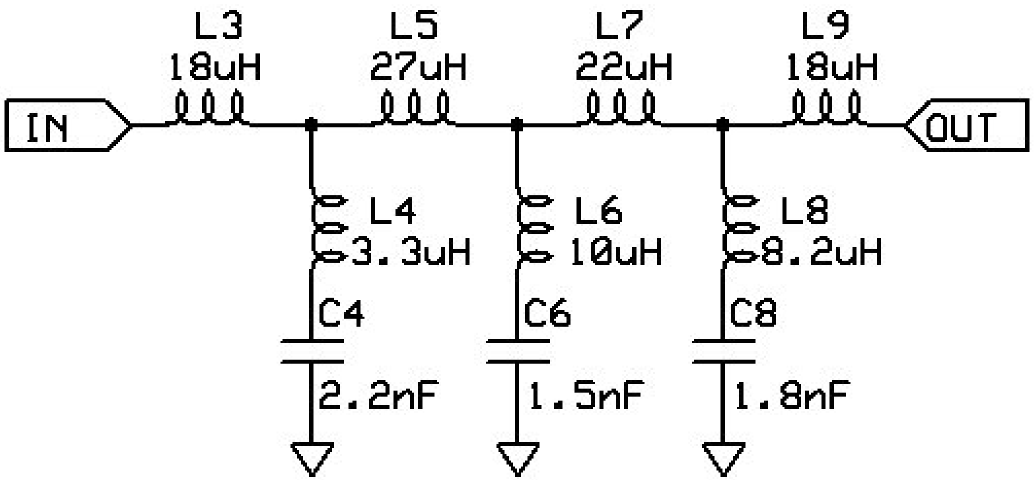
Why SATV?

SATV has been popular in Europe, especially in the 70 cm band, since that band is only 10 MHz wide. A single 10 MHz wide double sideband AM analog ATV signal would occupy the entire band! So SATV allows the band to be shared with other users.

In the U.S., the 70 cm band is wider, but really not wide enough for ATV signals with 10 MHz bandwidth, especially in populated areas. So the considerate ATV'er will transmit with bandwidths of 2 MHz or less, using SATV or digital TV (or at least transmit analog TV with suppression of the lower sideband).

Implementing SATV

Implementations of SATV are found in the BATC publication CQ-TV in articles by G8CHK, G8MNY and PA3CRX **[2, 3 , 4]** and on PE1ITR's website **[5]**.



PE1ITR, 75 Ohm, 1 MHz Low Pass Filter

The author constructed the 1 MHz low pass video filter described by PA3CRX and PE1ITR. Above is the schematic diagram for the filter.

The author's filter is identical to their filter, except that the 27 μH inductor (L5) is replaced by separate 4.7 μH (L5A) and 22 μH (L5B) inductors in series (the separate inductors have higher resonant frequencies than available 27 μH inductors).

Fig. 1 shows the author's filter.

Figure 1: The assembled 1 MHz lowpass video filter (housed in a Hammond 1590B enclosure)

Parts List for SATV Filter
All components available from Newark Electronics

Ref Desig	Value	Newark #	Ref Desig	Value	Newark #
L3 L9	18μH	63K2928	C4	2200pF	81K0666
L4	3.3μH	63K2936	C6	1500pF	81K0849
L5A*	4.7μH	63K2943	C8	1800pF	81K0858
L5B* L7	22μH	63K2932	**Note** -- C4 C6 & C8 are silver micas		
L6	10μH	42AH0135			
L8	8.2μH	86K8305			

Note -- L5A and L5B are connected in series to form L5 = 27 μH

A video camera NTSC signal was applied to the filter, with its output monitored with a tinySA® spectrum analyzer. The spectrum, shown in Figure 2, provides an approximate indication of the filter's performance: - 3 dB cutoff = 1 MHz (approx) & Stop band attenuation = - 50 dB (approx)
This is the same as measured by PA3CRX and PE1ITR.

Figure 3 shows the received 439.25 MHz TV image before and after adding the low pass filter. The transmitter is an Aptron Labs AX-10B.

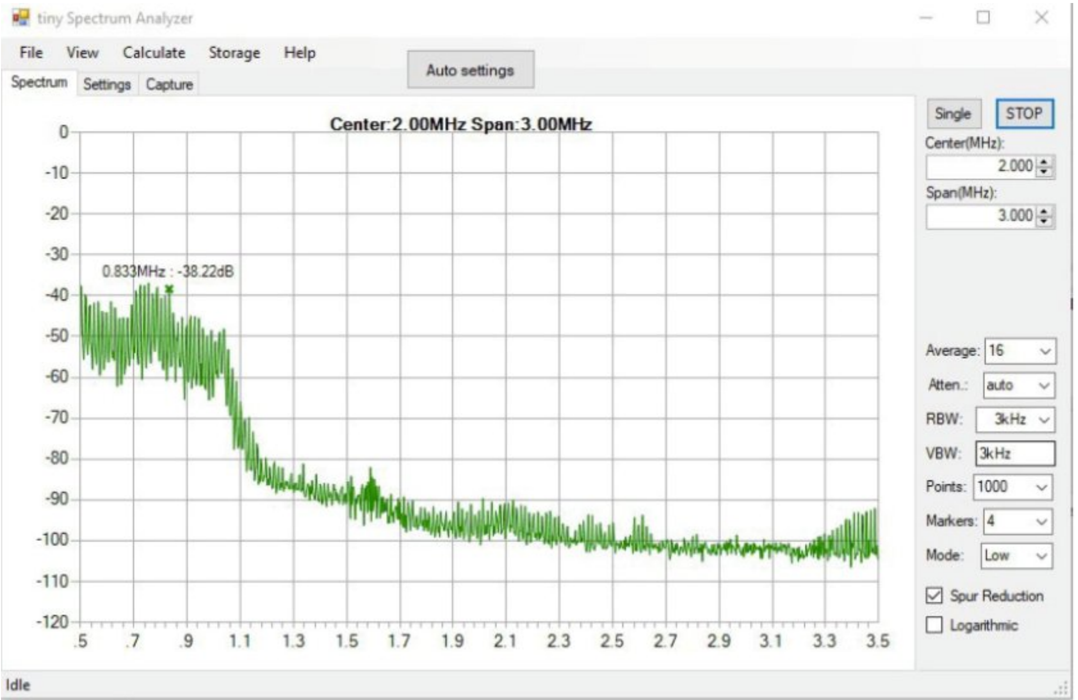


Figure 2: The spectrum at the output of the 1 MHz low pass video filter, with its input fed from an NTSC video camera (measured with a tinySA® spectrum analyzer)

The receiver is a Sony Bravia receiver tuned to cable channel 60 and connected to an antenna. It shows how the filter removes color and reduces resolution.

The voice signal from the Aptron transmitter, produced by FM modulation of the video carrier, was monitored on the author's B-Tech UV-25X2 VHF/UHF transceiver tuned to 439.240 MHz.

The -10 kHz offset is probably due to the varactor circuit used for FM modulation of the Aptron's crystal oscillator. Audio quality was good.

The SATV signal is compatible with any analog TV receiver. However, improved signal-to-noise reception is possible using receivers with lower bandwidth.

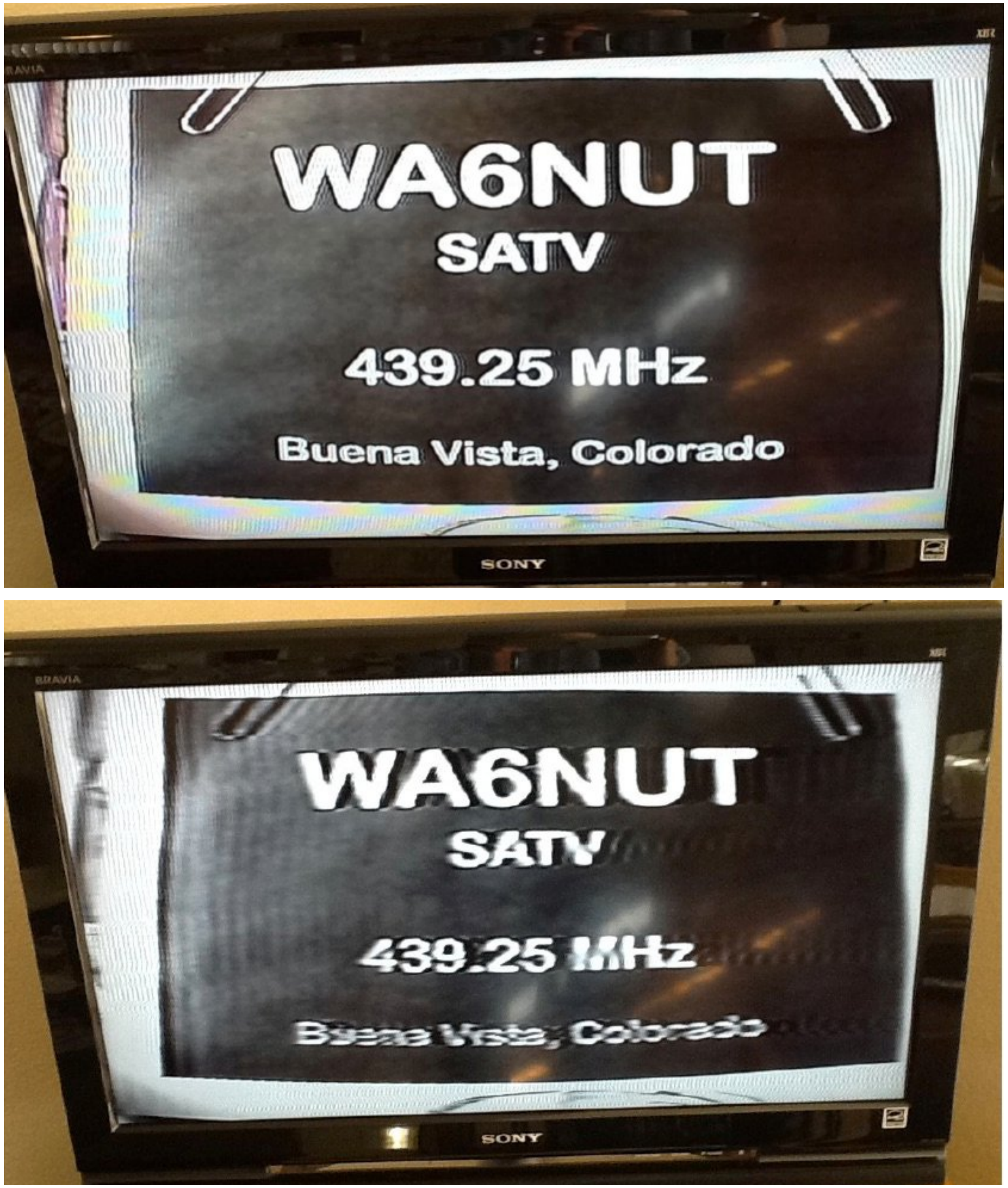


Figure 3: The received ATV image, without the low pass video filter (on the top) and with the 1 MHz low pass (on the bottom). Note the distortion in the QTH ID and lack of color in the received SATV image

Dongle-type SDR receivers offer lower bandwidth suitable for receiving SATV. In his CQ-TV article, PA3CRX describes using an RTL-SDR dongle receiver with SDRSharp software to receive SATV. He used the PAL/SECAM/NTSC TV plugin, part of the "Community Plugin Package" released in 2019.

References:

1. VHF Managers Handbook, 2016, IARU Region 1. A description of SATV is found on p.119.

https://tinyurl.com/jyv3dusu

2. King, R., G8CHK "Video Filter for 70 Cm," CQ-TV, No. 153, February 1991, p. 20

https://tinyurl.com/3kwwa6zj

3. Stockley, J., G8MNY "Narrow Video TX Filter," CQ-TV, No. 166, May 1994, pp. 79-80

https://tinyurl.com/79kpzuks

4. van den Berg, C., PA3CRX "Reduced bandwidth analogue ATV, the easy (lazy?) way," CQ-TV, No. 269, Autumn 2020, pp. 38-41

https://tinyurl.com/8kmcw3uj (available only to BATC members)

5. Hardenberg, R., PE1ITR. web page. Use Goggle Translate for a version in English.

https://tinyurl.com/3hn6sn6s

From the vault - Cropedy Video Testcard Regenerated

Written by Mike Stevens G7GTN

Design Background

If we go back to July 1983, a testcard generator circuit was published in a magazine called Radio & Electronics World, shortened to R&EW. The design by Colin Edwards generated a 625 line monochrome television signal using standard TTL devices. The required testcard display is stored in a 2732 EPROM. This also contains the video sync map.

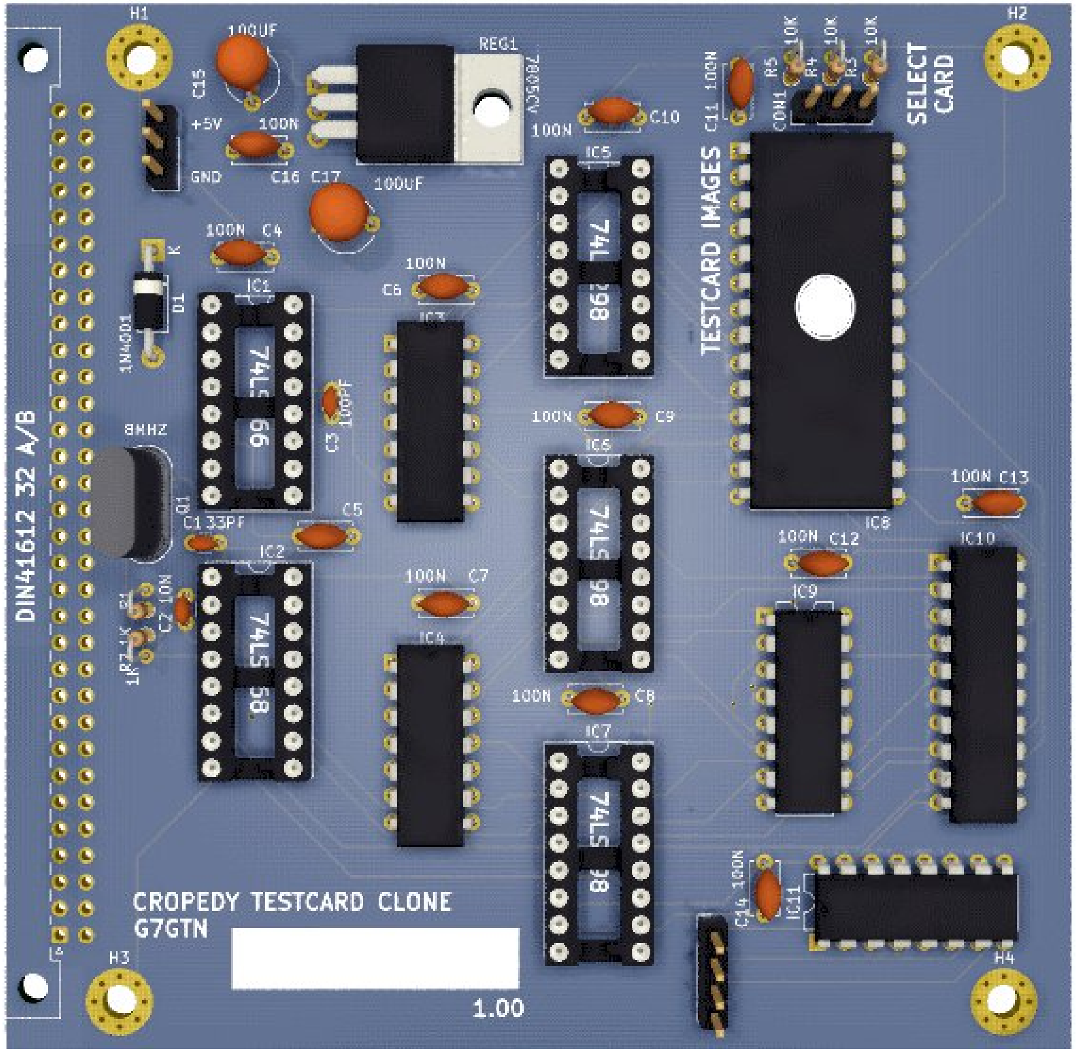
Various solutions were proposed to turn the original output into RGB to allow an external video encoder to be attached. Two such designs were presented in the BATC publication CQ-TV edition 139 which you may wish to reference.

The Worthing & District Video Repeater Group produced an add-on EPROM board allowing up to 8 individual chips to used and selected between.

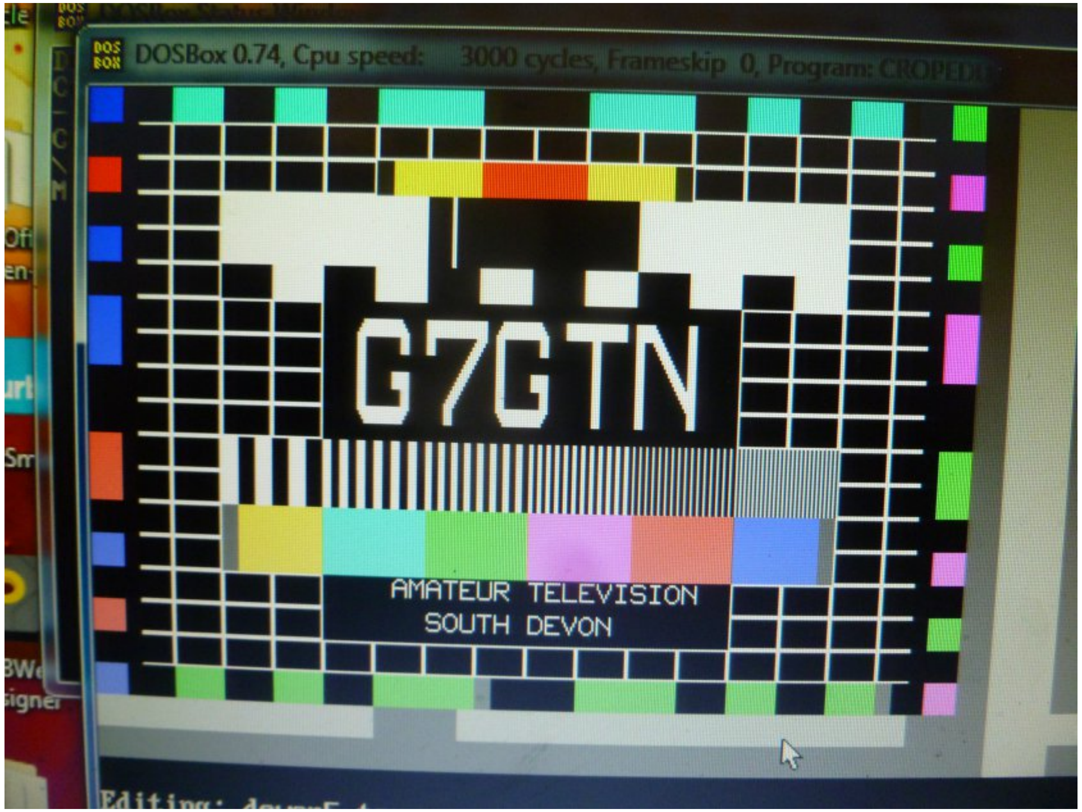
Designing the required Test cards would be very tedious and possibly error prone until the appearance of Cropedit a DOS based application written by Brian GW6BWX. This allowed a click and select type interface including the ability to redefine unused characters to build new custom elements to build up the desired result. The application can still be run using DOSBOX if you have the requirement to design your own cards.

Short Eurocards

I wanted to create a series of custom printed circuit boards to create my own card based video system. The obvious inter connect is a DIN41612 allowing a wire wrapped backplane type system to be easily employed. I have five cards already designed which will be featured. For cost reasons I selected a board size of (100X100mm) since these are all being manufactured by commercial suppliers instead of any home etching ideas.



Proposed (100X100mm) Eurocard board layout



A card design in Cropedit by Brian GW6BWX

Layout Design Software

Having tried several design packages I felt that Diptrace was a good fit for what I was trying to achieve, from circuit diagram to final PCB layout ready for manufacture. As designs start to become more dense VS the space available then moving to a four layer design became an obvious step. That of course allows more flexibility for routing by utilising two internal layers to be dedicated to power only (in this case +5V and Ground) Without a reasonably serious investment to gain extra pins and more importantly additional layers it became time to look at other design software options.

Kicad Design Suite

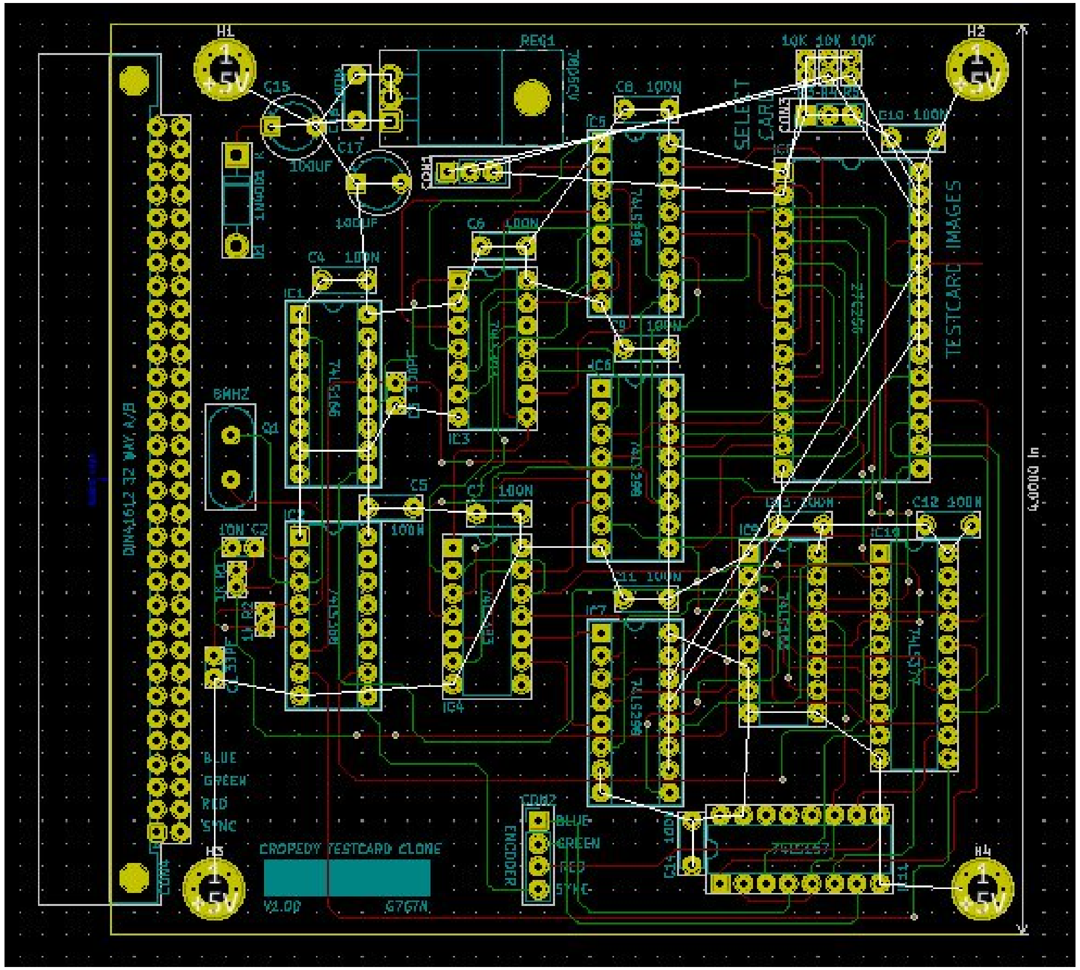
This is a freeware package available for all major operating systems and had all the facilities I was looking for to scale up some designs. As with all packages the first step is to layout your schematic and check this for errors using the Electrical Rules Check function (known as ERC for short) next you would generate a NET connection file that describes how the parts are interconnected. Then we can select the actual physical footprint for all the parts we are going to use in the actual layout stage. This allows flexible customisation between for example through hole and surface mount parts if so required.

Layout

Having done some basic parts placement several issues became apparent, one of which I created and the other is a slightly stranger issue. I thought that using an external Auto routing application called FreeRouting might assist with some mundane layout. It lost the concept of having different layers (internal) and created what might be called a total mess.

Even if some power traces did not collide the actual outcome was not usable at all. The next problem is far stranger in that the Ground has been totally lost and is now combined with the +5V connection. The way to resolve this I believe is to create a simple test project and examine the NET file that is generated to discover the differences specifically on the power connections.

Continued next page...



Back to fully manual routing - VIAS are free to help me

```
(libparts
  (libpart (lib 74xx) (part 74LS157)
    (description "Quad 2 to 1 line Multiplexer")
    (docs http://www.ti.com/lit/gpn/sn74LS157)
    (footprints
      (fp DIP?16*))
    (fields
      (field (name Reference) U)
      (field (name Value) 74LS157))
    (pins
      (pin (num 1) (name S) (type input))
      (pin (num 2) (name I0a) (type input))
      (pin (num 3) (name I1a) (type input))
      (pin (num 4) (name Za) (type output))
      (pin (num 5) (name I0b) (type input))
      (pin (num 6) (name I1b) (type input))
      (pin (num 7) (name Zb) (type output))
      (pin (num 8) (name GND) (type power_in))
      (pin (num 9) (name Zc) (type output))
      (pin (num 10) (name I1c) (type input))
      (pin (num 11) (name I0c) (type input))
      (pin (num 12) (name Zd) (type output))
      (pin (num 13) (name I1d) (type input))
      (pin (num 14) (name I0d) (type input))
      (pin (num 15) (name E) (type input))
      (pin (num 16) (name VCC) (type power_in))))
```

Part of the generated NET File for further investigation

References

https://www.kicad.org/

https://freerouting.org/freerouting/using-with-kicad

https://diptrace.com/

https://batc.org.uk/cq-tv/cq-tv-archive/

https://en.wikipedia.org/wiki/Eurocard

Information

External links

If you have an eBook reader that does not have WiFi then you will not be able to use the hyper-links in this publication. If you have an eBook reader that has WiFi then you will be able to providing you are in a WiFi zone.

But if you have a Kindle 3G then yes, but only to Amazon, and there is not a lot of ATV material on their site.
Smart phone reading apps are ok providing that you have a 3G data connection.

Note: These links will fire up your devices browser and if you are using 3G/4G then you will incur data usages charges.

Legal Niceties (the small print)

Copyright

Notice to Contributors

Authors are alone responsible for the content of their articles, including factual and legal accuracy, and opinions expressed by them may not reflect the editorial stance of the publication. Material submitted to dotMOBI should not infringe the copyright of other writers or bodies.
Contributions are accepted for publication on this basis alone.
dotMOBI publications - *https://cq-datv.mobi*

Author Guidelines

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.

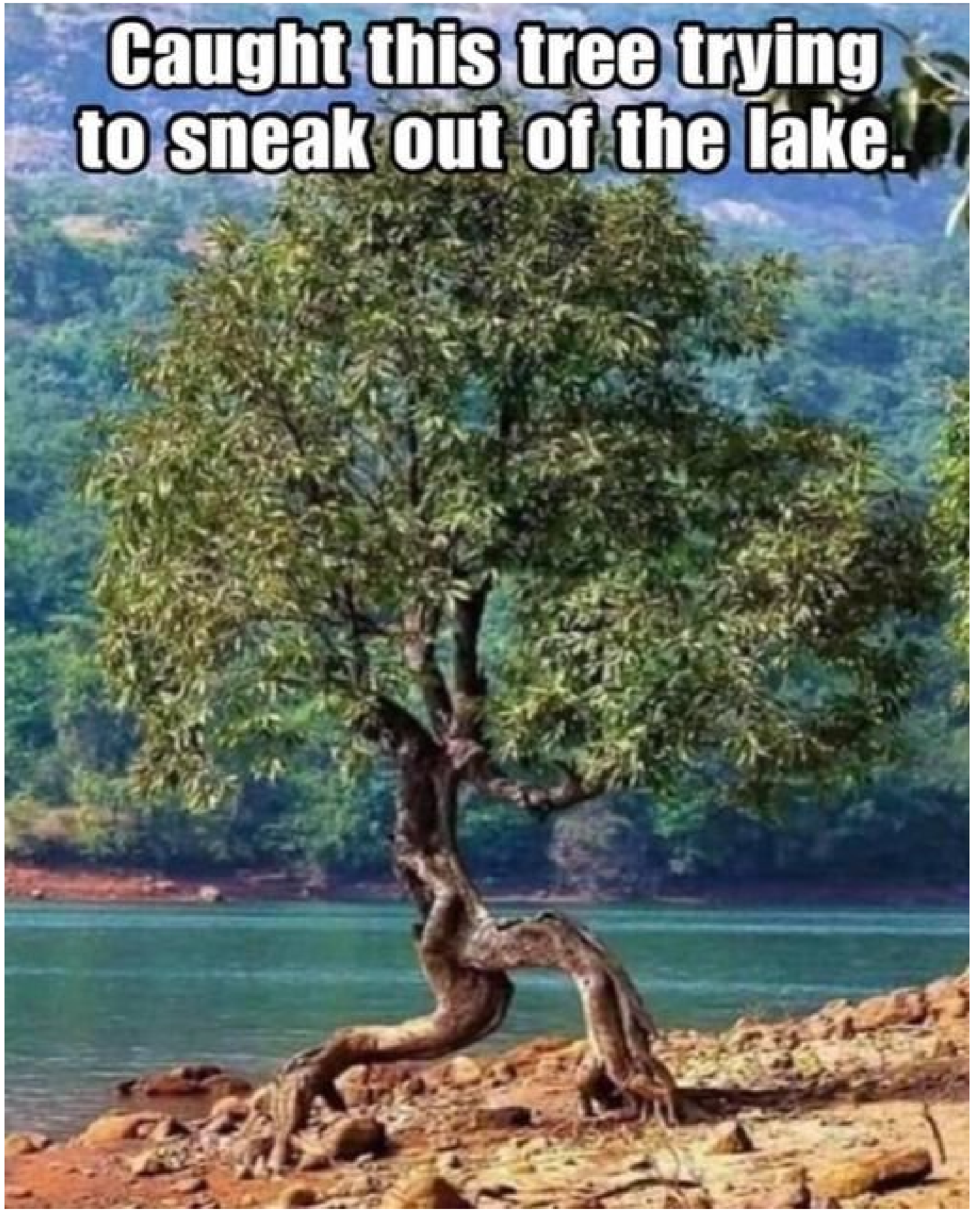
Images should be in PNG format if possible and the best quality available. Do not resize or compress images, we will do all the rework necessary to publish them.

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.

Is this the latest issue of CQ-DATV? *Click here* to go to our web site to check to see if there is a later edition available.

CQ-DATV is published on the last day of the month. The cut-off day for submissions/corrections/alterations is 5 days before the day of publication.



Please note that this mailing list is only used to advise interested people about the availability of new issues of CQ-DATV magazine. The list is not, and never will be, shared with any other organisations.

Want to be notified when issues of CQ-DATV are published? Join our *mailing list*.