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 98 of our electronic ATV magazine.

First the good news.

Peter VK3BFG is planning an ATV QSO party on Friday 27th and Saturday the 28th of August. These are a lot of fun and if you don't join in, they are worth just watching.
VK3RTV is now officially a DATV high-definition ATV repeater sporting DVB-S2 or standard definition DVB-S if you prefer it. All video links are done via HDMI except the Media Box.

The Netherlands has removed the minimum age for Amateur Licenses. The minimum age limit for a Novice license was previously 12.

The Broadcast Engineering Conservation Group (BECG) is now the proud owner of P5. This is a mobile generator that went into service in1953. It was retired in 1987 and yes it will need some restoration.

Now the bad news.

The Swiss authorities have decided to charge ATV operators £55 for special license required to use QO100. There is a lot of hard work gone into QO100 none of it from the Swiss authorities

John G3RFL has sent off the NOV to cancel GB3FY, it's been off the air for the last 2 years since a fire at its site, it's the right thing to do as the callsign can then be reused, but all the same a sad day in Lancashire

Moving swiftly to the magazine content:-

In Voyager Catchup Trevor has been answering emails after the last issue, this is a catch all to the questions.

In between Voyager questions Trevor has been looking at touch screen control. John G3RFL started the ball rolling in the last issue and Trevor has joined in with part one using an ESP32 micro as an alternative to the PIC used in the last issue. This should make the code a little more friendly to develop and customise, fingers crossed.

Jim Andrews KH6HTV has the story of the first BATVC microwave ATV event organised by Don N0YE, this took place on Thursday 17th June. Participating along with Don were Bill, ABOMY, Chris, K0CJG, and Jim, KH6HTV. Bill was anxious to try out his new home-brew transverter which he designed and built over the past winter.

CaribouLite is an affordable, open-source dual-channel SDR (Software Defined Radio) platform and Raspberry Pi extension (HAT). Not something we normally cover in CQ-DATV, but it's hard to pass on something as interesting as this. With CaribouLite, your Raspberry Pi computer becomes a self-contained dual-channel radio Tx/Rx spanning a wide frequency spectrum up to 6 GHz.

Jenny List has the story of the last few remaining NTSC transmitters in the USA, which now finally came off air, marking the end of over seven decades of continuous 525-line American analogue TV broadcasts.

Jim KH6ATV explains the Boulder ATV group scheme of loaning ATV equipment out to prospective hams who express an interest in getting into ATV. Brilliant idea Jim.

Finally, in 'From the Vault' we start looking back at the ground-breaking video modulation of a Y.I.G. John pioneered this and used it used for the ATV repeater GB3FY. This had never been done before or since and with the loss of the NOV we thought this should be in this issue's From the Vault.
With that lets hope you all enjoy CQ-DATV 98
CQ-DATV Production Team

Save The Date - DATV QSO Party 2021

Planning is underway for the annual DATV QSO Party and again it will be a global event!

Peter VK3BFG let VK7WI news know planning is underway for the annual Party that will be held Friday 27th August and Saturday 28th August, Eastern Australian Time.

Friday night will be a VK occasion with stations working through local repeaters as a priority to maximize the use of amateur radio.

Saturday here (will be Friday evening in the US) as usual we will start with stations more to the east and work our way over to the west coast.

Saturday evening here it is possible to work into the UK.

There will be Anchors who will be co-ordinating the various areas around VK, the US and the UK.

Zoom will be used as the Internet Backbone between countries and then put out on the various ATV networks around the world.

Source: WIA NEWS BROADCAST July 4 2021
https://tinyurl.com/ahpwvzb3

Swiss radio amateurs face fee to use QO-100

The Swiss communications regulator OFCOM charges £55 (CHF 70) to issue radio amateurs with special permits to use the QO-100 amateur satellite transponders.

A post on the USKA website indicates OFCOM wishes to protect license-exempt users in 2.4 GHz and OFCOM reserves the right to withdraw the special permit if there are problems.

The special permit entitles the holder to use a transmitter with a maximum output of 100 W PEP for a satellite uplink in 2400-2410 MHz. As part of their application radio amateurs must submit the following information:

Call sign and license number
Location (place name, address)
CH coordinates (new coordinates, e.g. 2,600,000 / 1,200,000, not Google degrees!)
Antenna gain (dBi)
Antenna height above ground (m)
Direction of the antenna (°)
Elevation of the antenna (°)
e-mail address
Telephone number at which the surgeon can be reached while the system is in operation

Switzerland's national amateur radio society USKA
https://tinyurl.com/IARU-Switzerland

Minimum Age Novice and Full License in The Netherlands abolished

Today is an important day regarding youth and amateur radio in The Netherlands. To gain more young active radio hams, it is a must that this age group actually has the ability to obtain an amateur radio license. Until today, the minimum age for a novice license was 12 years and for a full license 14 years. It has been published that the minimum age for both licenses will be abolished.

This all started a few years ago by the local VERON section of Breda, which made a proposal for the yearly general assembly of VERON. In this event in 2018 the proposal got accepted by the local departments.

VERON continued with this proposal and collaborated successfully with the national regulator (Agentschap Telecom), which lead to this great change.

This example is also showing that it's actual possible to make changes, volunteers are important in all levels to take amateur radio to the next step.

Source: *https://tinyurl.com/hz2ftx2p*

GB3FY RIP

It is with great sadness that today I sent off the NOV to cancel our ATV repeater license GB3FY. Can I thank everyone who helped with the construction and installation of this ATV repeater. The project started 8 years ago and was serialised in CQ-DATV (An ATV Repeater for Lancashire), starting in the very first issue. We looked at the choices and options at every stage and from the outset took the pioneering approach with a YIG transmitter (Yttrium Iron Garnet), I don't think anybody has modulated one of the devices with video before or indeed since, GB3FY was the first. It ran for 6 years and turned Cleveleys into the hub of an ATV hot spot with many of us seeing each other on ATV, something that due to geography of our respective locations was not possible via simplex and definitely not on 10GHz.

If you did not follow the story their was a fire at the site (Farmers Parrs Heritage Museum, which is a charity for children with AUTISM). This was nothing to do with GB3FY which escaped relatively unharmed, but it was decided in conjunction with the owner to remove the repeater. It ran for six years and is now just gathering dust in my shack, so by sending off the NOV I am releasing the callsign should anyone anywhere else want to use it.

I know this happened for GB3ET which used to stand for Emley Moor Television, and it now lives again as an Digital ATV repeater. The callsigns of silent keys are never reused except under exceptional circumstances for obvious reasons, it is a different case for repeaters and I hope GB3FY will one day will undergo the same Reincarnation and appear somewhere else sending out its call and ATV pictures.

Its with a sad heart I make this decision but ATV does not drive me as it one did and I will perhaps revisit CW on top band where this journey started for me over 50 years ago. Thanks for all the support from the team here in Lancashire and CQ-DATV for running the story.

(The construction of the repeater was covered in CQ-DATV issue 8 - ED)

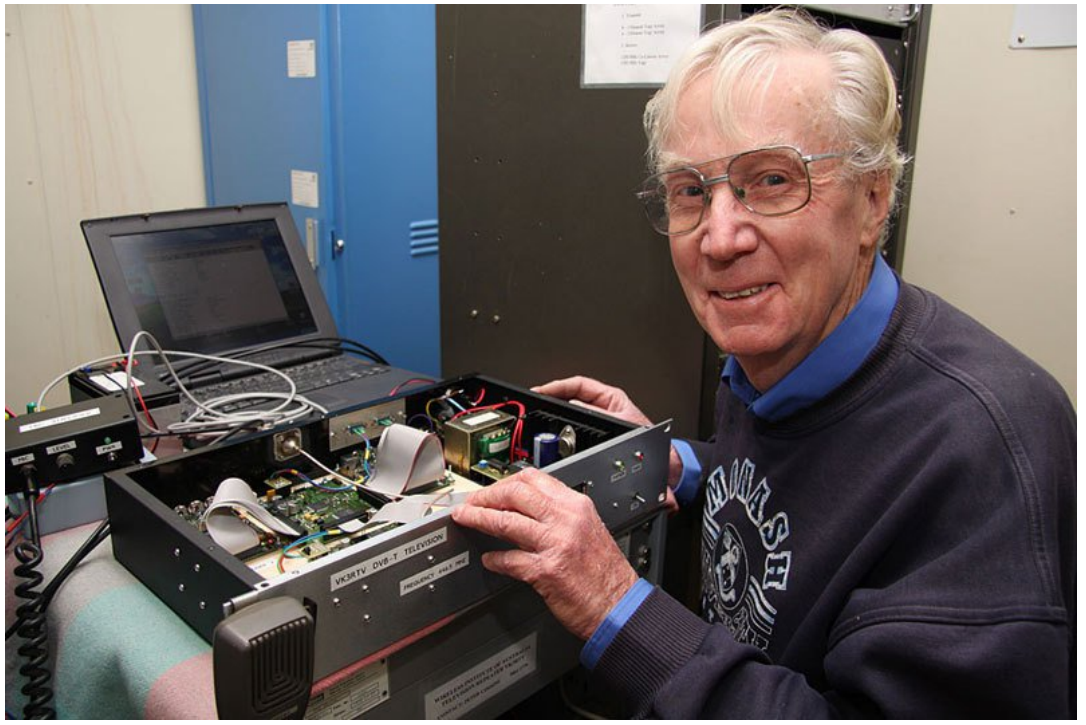
John G3RFL

DATV repeater, VK3RTV now on air

WIA News reports DATV Radio amateur Victoria, VK3RTV, began high-definition television transmissions on Thursday, July 15, 2021 with a two-channel multiplexed downward link using DVB-T2 protocol. We think this is a first in Australia. System mounting links are on 1246, 1255 and 1278 MHz using either high definition DVB-S2 or standard definition DVB-S. All video links are done via HDMI except the Media Box which generates local codes and information. This one will soon be converted to HD. DVB-T2 is a second generation protocol with many improvements over DVB-T. Stations report increased reception ease and a station, VK3GMZ, accesses and receives the system via the knife blade diffraction on Dandenong Mountain. High quality images are seen that can be viewed on bigger televisions. Fine print is read easily.

The two multiplexed channels, VK3RTV1 and VKRTV2 are also broadcast via the British Amateur Television Club. As this is a new protocol for Australia, only DVB-T2 compatible decoders can be used to receive VK3RTV. The conversion was funded by members of the Melbourne Amateur Television Group. The annual DATV QSO party is scheduled for Friday, August 27th and Saturday, August 28th and can now include additional repeaters in the US.

The principle is that DATV stations transmit to their local repeater and a local anchor transmit the signal internationally. More details about this event will follow in later streams.



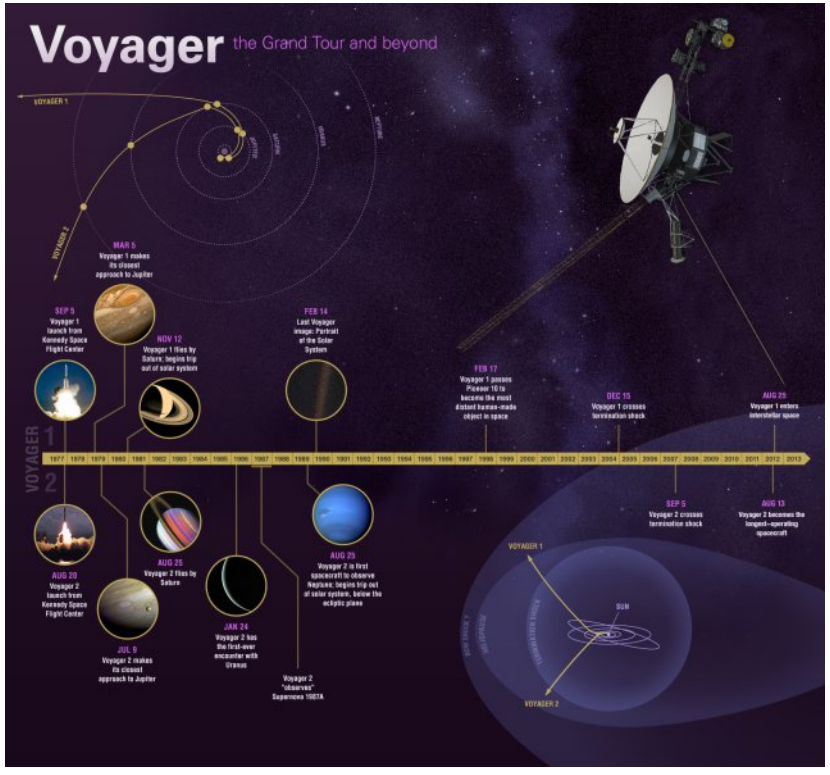
Welcome to Television, Digital Amateur Television VK3RTV, Author : Jim Linton - VK3PC

Voyager follow-up

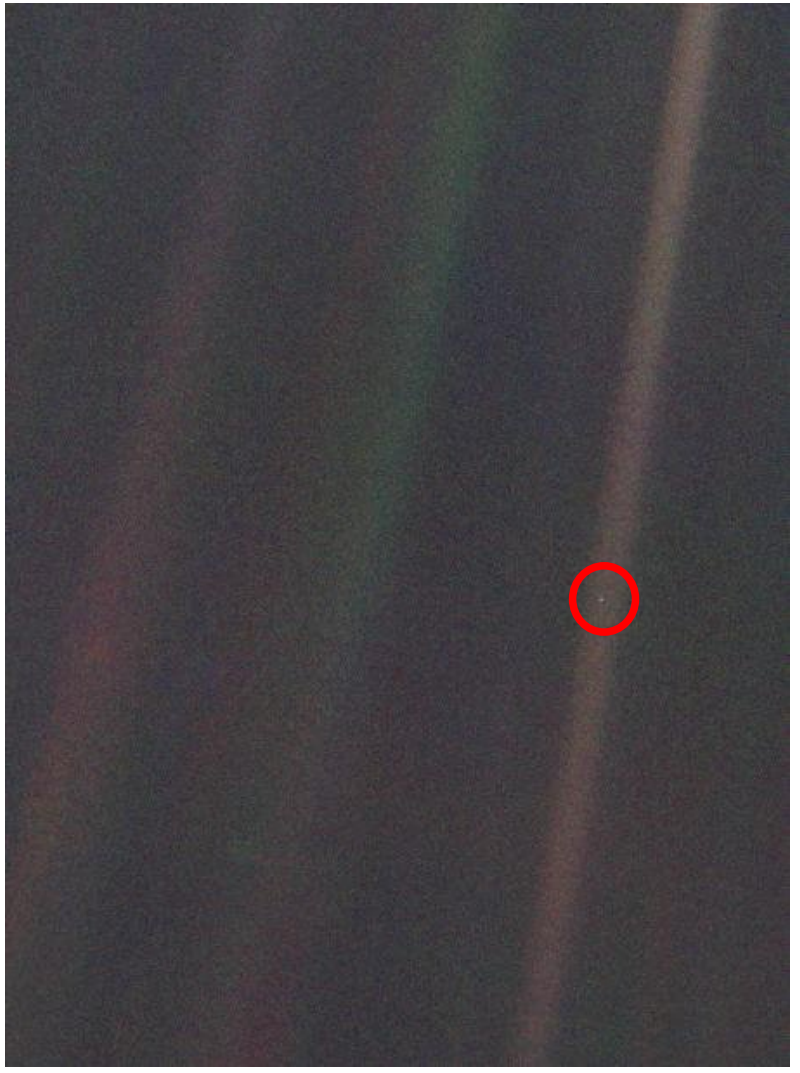
Written by Trevor Brown G8CJS

In CQ-DATV 96 we covered the story that hum had being reportedly been detected in outer space by Voyager 1, the space craft launched back in 1977. This was not really an ATV story but pictures from space using cameras we all understand coupled to microwave communications of images is the stuff our hobby is built of and is something we cannot ignore.

It's always good to read what others can do given a budget well beyond ATV circles. We did receive some emails at the CQ-DATV production office (yes, it's a virtual office) but it sounds better if we just call it the production office. Unfortunately, none of us has a direct line to NASA so we can only produce information available to you all via the internet.



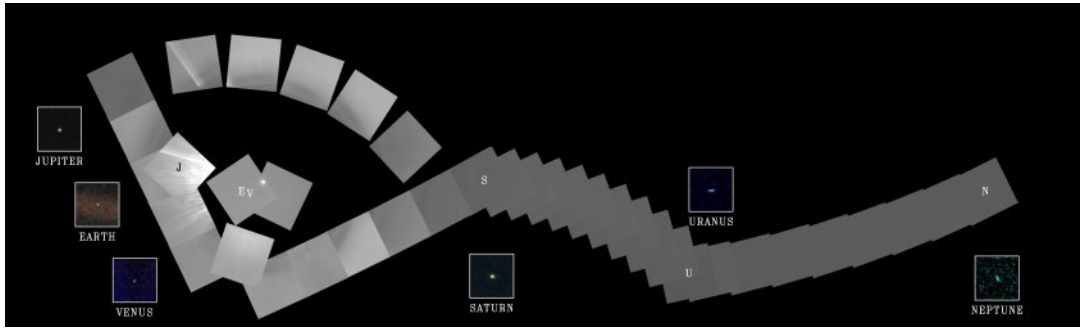
Voyager 1 is now 22 billion Km away from earth and about to run out of power, probably within this decade. The cameras have been switched off so we will never again see pictures from either of these craft. This power rationing is necessary to keep other experiments running. It would appear that even though its plutonium power supply boasting an 88-year half-life (perhaps estimates may have be revised) but 44 years on a single charge is something most smart phone users would die for, but being Plutonium based they probably would.



The 'pale blue dot'

Pale blue dot explained

The 'pale blue dot' (circled in previous picture) is probably the most famous image and is actually a picture of earth and now the title of a Carl Sagan book. The software on the craft has been removed to free up memory space and the equipment used back at earth for recovering the pictures has been dismantled. I think this really drives home that we will never see pictures from either of the two cameras on either craft again.

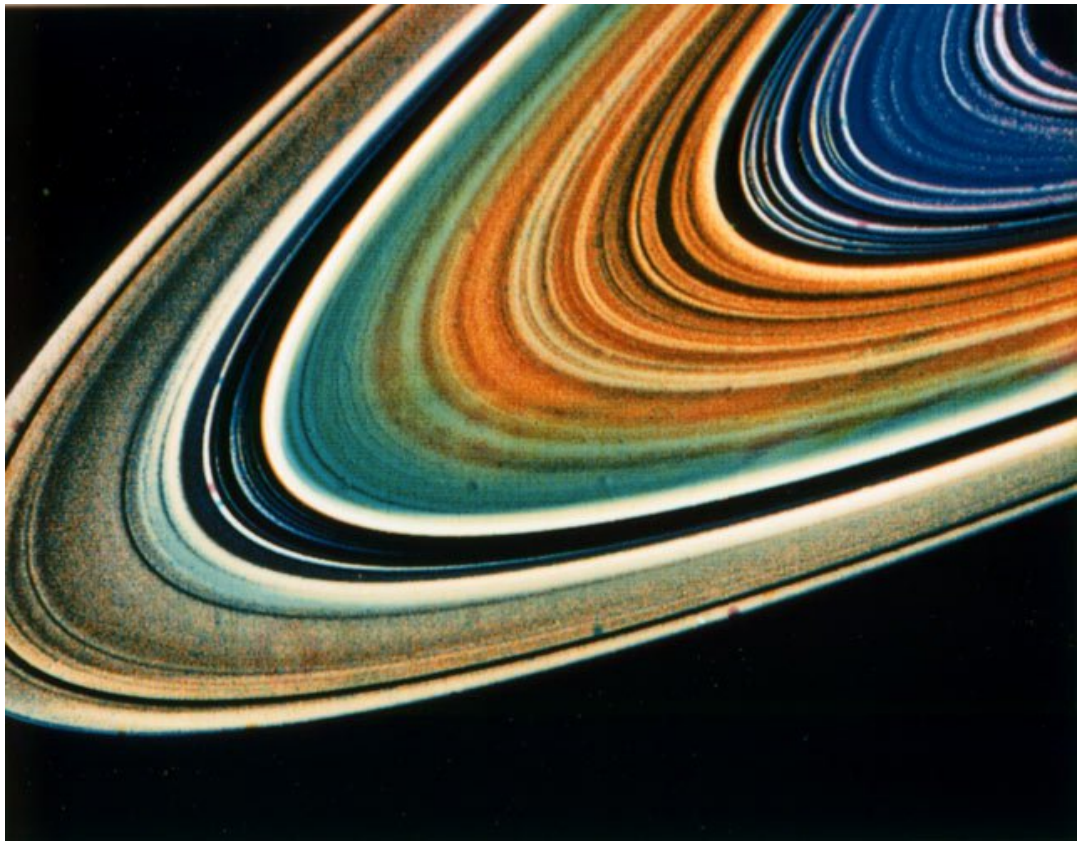


The ''family portrait'

Voyager 1 took its famous picture back in 1990 often referred to as "Solar System Family Portrait". Voyager 2 also sent back thousands of images and became the first space craft to observe Neptune.

The transmission bandwidth has been reduced and I cannot find any current figures but given the 1977 technology it's probably another reason to turn off the cameras as it will be so limited that there would be little chance of sending an SSTV image via the link, which is a 22.4-watt transmitter, something to think about when you set up a microwave link and hope for a DX record.

Whatever happens on either craft they will carry on their journey just we will lose contact with them, the current estimate for Voyager 1 will be around 2025 Plutonium power supplies are probably not what they once were.



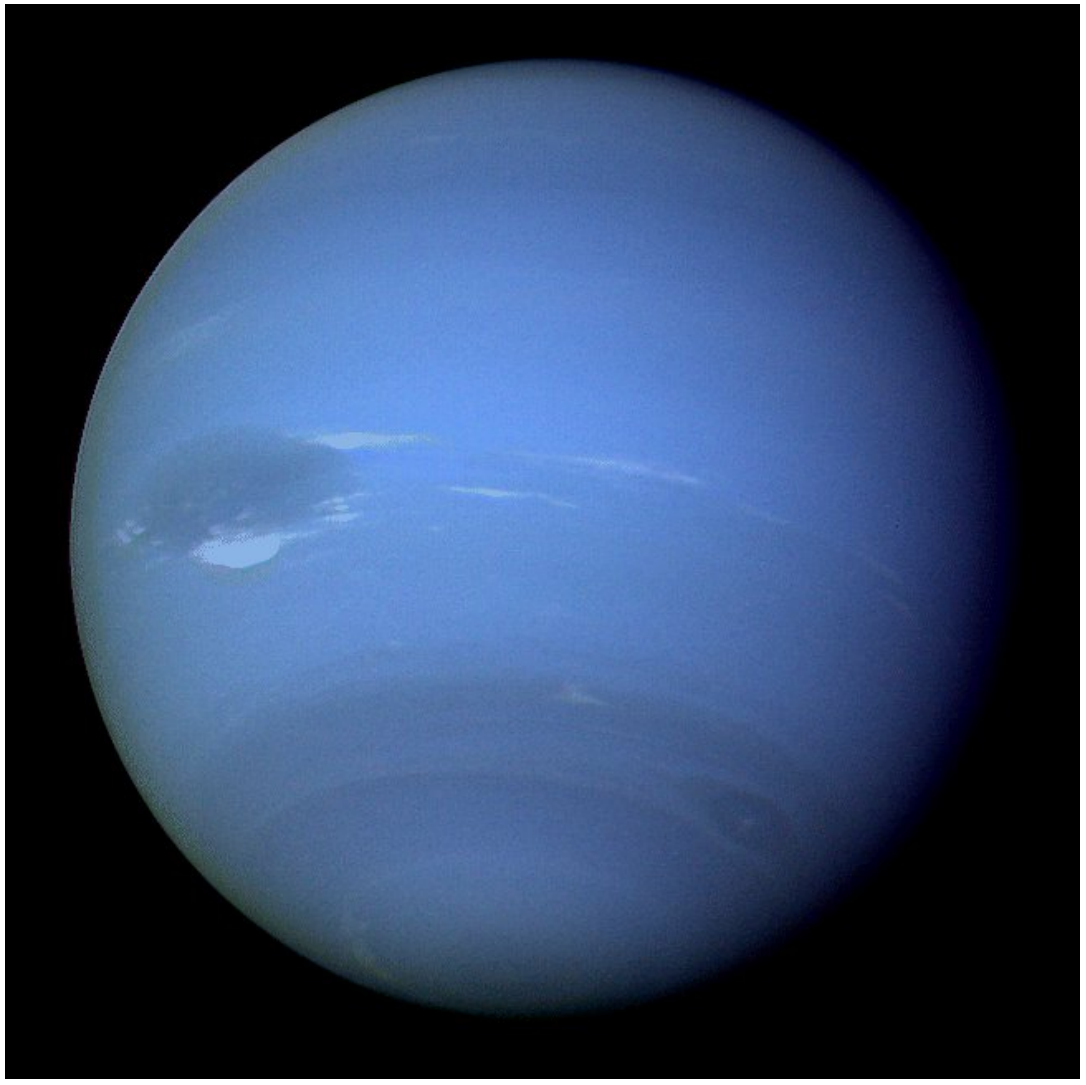
Saturns rings

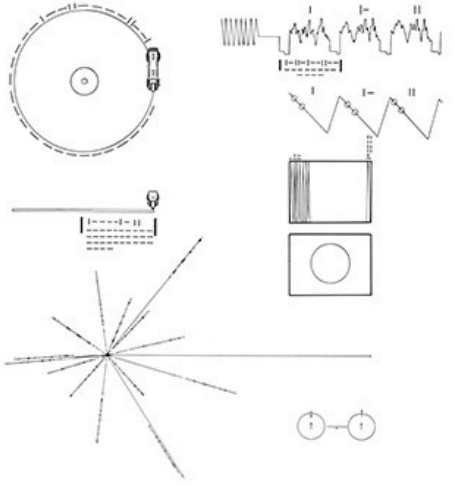
Will anyone get to play the Golden Record carried on Voyager 1 and 2. The discs have 155 images, some natural sounds such as surf and winds, spoken greetings from Earth-people in fifty-five languages along with printed messages from President Carter and U.N. Secretary General Waldheim. We may never know.

We hope this answers any questions from our overloaded in in-tray although we do answer all emails, unless you know otherwise.

https://tinyurl.com/hu9hbp2u

All Images: Courtesy NASA / JPL-Caltech





Above: Voyager2 image of Neptune

Top right: Voyager 1 digital recorder

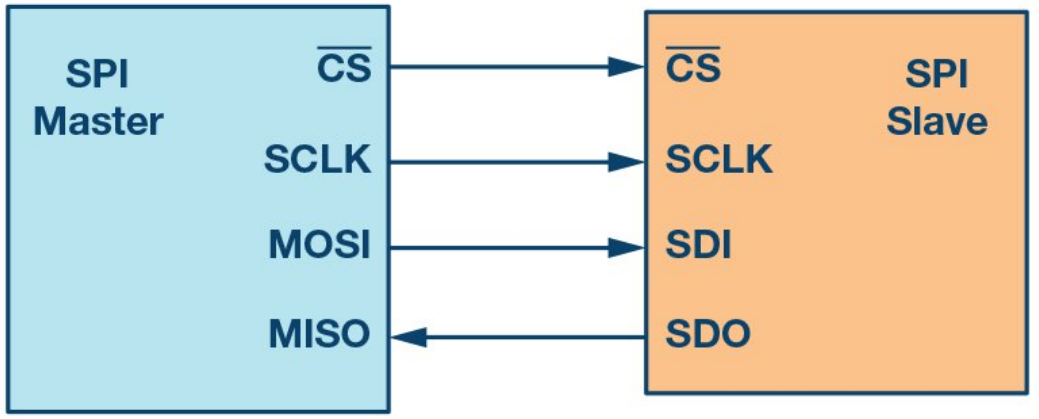
Bottom right: The 'Golden Record' diagram

Touchscreen Control using ANNEX BASIC

Written by Trevor Brown G8CJS

In CQ-DATV 97 John G3RFL investigated touch screens and together with his son Lee produced some PIC source code to drive one of these displays. They can be found on e-bay costing less than £12. This opened a door into this technology, I am always on the lookout for open doors and to explore where they lead to.

Following in John's footsteps, I started investigating these screens which communicate via a Serial Peripheral Interface (SPI). This is an interface bus commonly used to send data between microcontrollers and small peripherals such as shift registers, sensors, and SD cards. It uses a clock and two separate data lines for send and receive, along with a chip select line to choose the device that the master wishes to communicate with, making it a 4-wire interface.

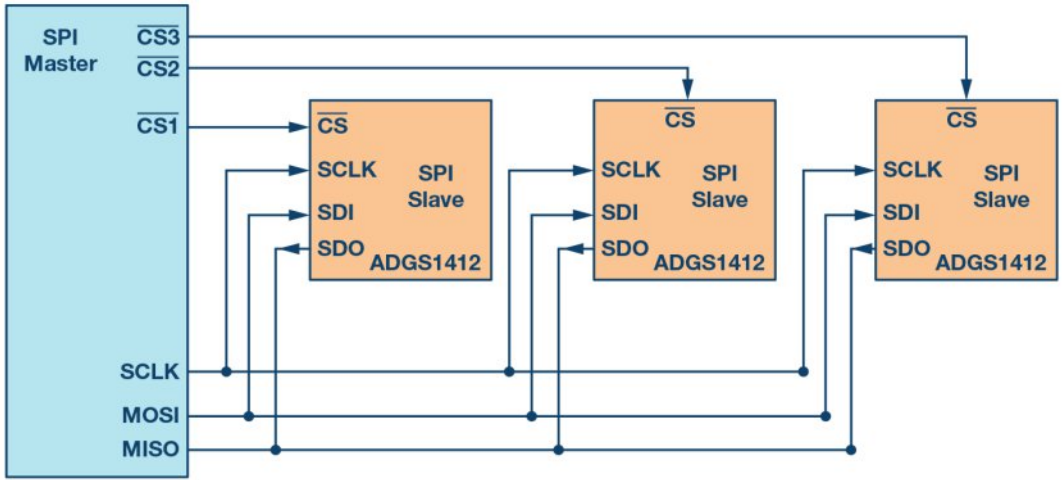


Basic SPI Interface

- *Clock (SPI CLK, SCLK)*
- *Chip select (CS)*
- *Master out, slave in (MOSI)*
- *Master in, slave out (MISO)*

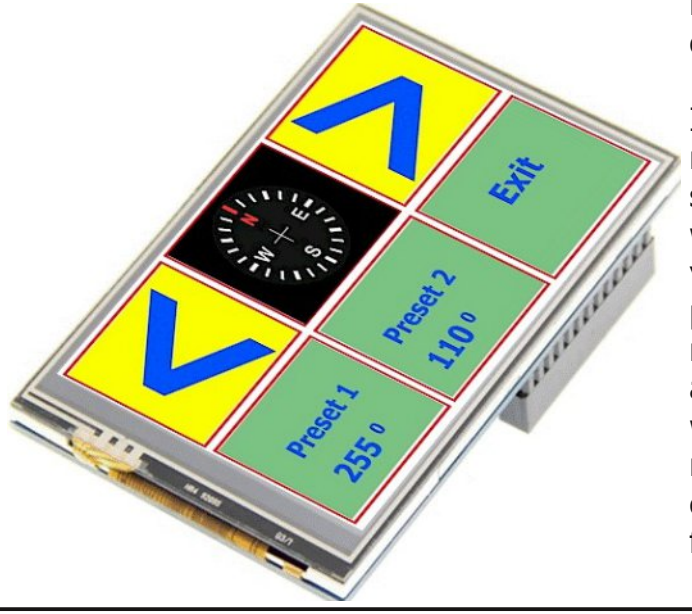
The device that generates the clock signal is called the master. Data transmitted between the master and a slave is synchronised to the clock, again generated by the master. SPI devices support much higher clock frequencies compared to I^2C interfaces. The downside is the increased number of connections. This at first glance is 2 more than I^2C, the data bus is not bidirectional, so we have a send data and a receive data connection, called MOSI and MISO. There is also a chip select and this is another downside. In I^2C you send the address information along the data bus and the addressed device responds. SPI requires a separate CS for every device. The two data and the clock connections can be daisy chained across numerous devices in a I^2C fashion, but if you have a lot of devices then you start to use up the micros I/O with separate chip selects.

At this point in time, I only envisaged one touch screen. SPI is necessary to support the faster data speeds and be able to interface to this more demanding technology.



Multiple device connections via SPI

I also wanted to take the technology to the next level and introduce the concept of soft keys. PC users are familiar with the F keys and different programs assign the F keys with different functions, but they rarely change the assigned functions within a programme. Touch screens can bring so much more to soft keys in that they can have their functions and legends changed in response to software commands. An example is a touch screen where a function called aerial rotator is one of the options.



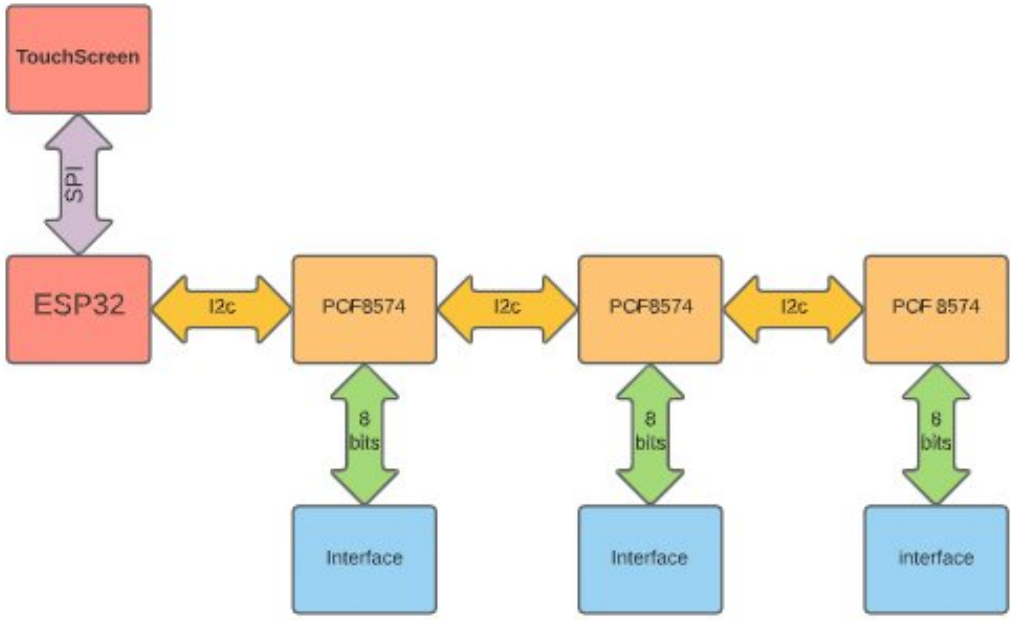
If you press the aerial rotator part of the screen the display would be cleared, and you would be presented with the rotator control screen and the touch screen would be reprogrammed to control the rotator functions.

This could display the aerial heading, perhaps even a graphic representation of the current beam heading, providing the screen resolution will allow it. There would now be touch screen controls to rotate the aerial both clockwise and anti-clockwise along with pre-set screen buttons for frequently worked stations. A short push could bring the beam to one of these pre-set headings and a long push would reprogramme the function to the current setting of the beam. A home key would take you back to the main menu ready for the next operation.

Another screen selection could be the robot camera from the Grass Valley article in CQ-DATV 91. Here we would be presented with tilt up and down keys, pan left and right keys, a speed selector and again some pre-sets that could be long push reprogrammed. Exit would take us back to the home screen. This enables the software to interact with the user in a level beyond the standard F keys we are currently familiar with.

This would require developing a lot of PIC code and each source code change requiring a hex compilation of the code followed by a reprogramme of the PIC in order to test the software.

Would it be possible to put something together that would require less instructions and be more friendly to test? John's 3.5" screen uses the XPT 2046 controller. There are smaller screens using the ILI 9341. The largest being 2.8". The resolution of the display is 320 x 240 pixels with 65K colours.

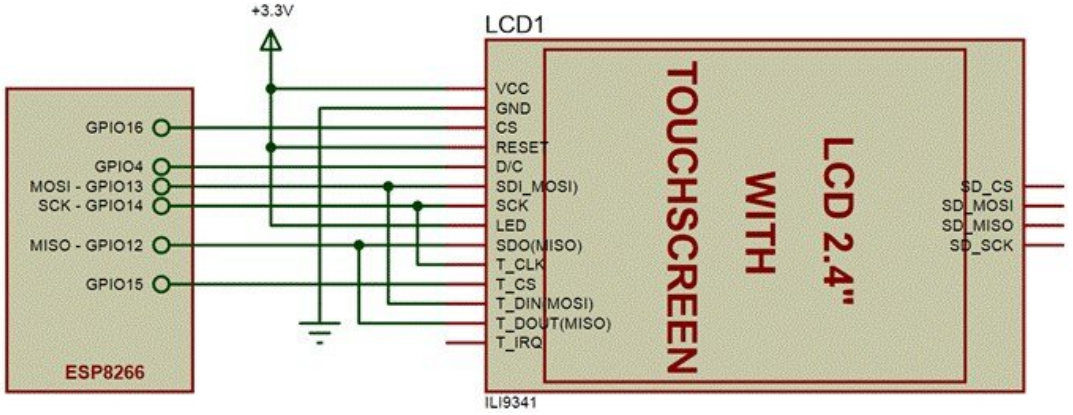


Flow Chart of how to control the devices in the shack from the Touch Screen

I think it might be a compromise too far, I prefer John's larger screen as I have big fingers and hate typing on iPhone screens, but the smaller screens come with a stylus and the prices start at just under £7, if you are happy to wait for a delivery from China. The prices jump to just under £15 for a UK supplier. Sounds like there is a good business to be had in being the UK reservoir for Chinese products.

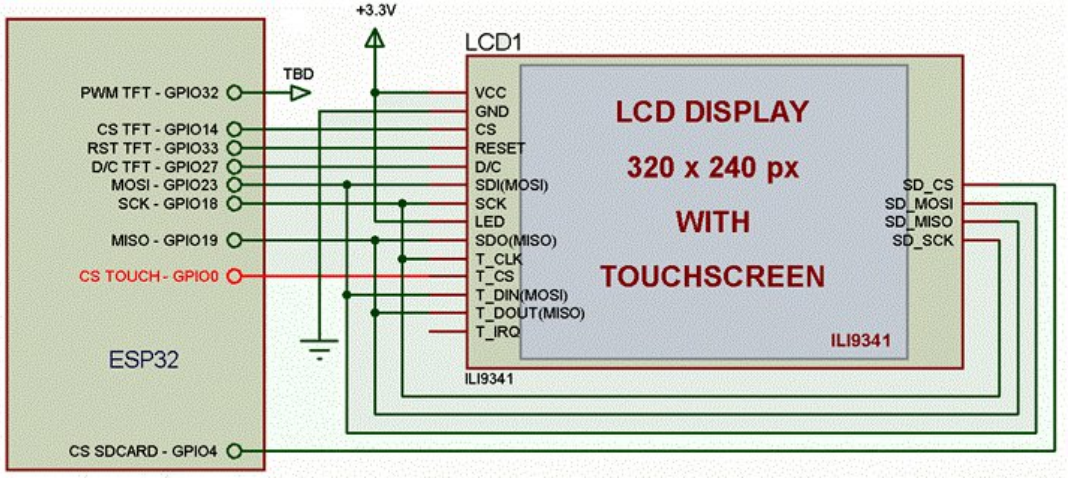
I also like the idea of using a ready built micro controller, as my home etching days are long gone, and I am happier with working in a higher-level language as the instructions will be more powerful and fewer will be required, particularly if I am going to expand into soft keys. The code could be added as separate call routines as screens are added.

The screens use the faster SPI interface for a reason (speed) and high-level languages will run slower than John's machine level code. Could I run one of these smaller screens from an ESP8266 and programme it in Annex BASIC? It worked for the Grass Valley project, and I still have some Micro's in my spares box and a little understanding of the code gained after this previous project. Looking in the ANNEX BASIC help file there are application notes and source code for a smaller screen using the ILI 9341. The resolution of the display is 320 x 240 pixels with 65K colours, which is similar to John's but lower in resolution.



ESP 8266 connections, from the ANNEX BASIC Help

There is also an interconnect in the larger faster ESP32.



ESP32 connections from the ANNEX BASIC help file

John's 3.5"displays are now £16 but look a lot smarter and might be worth splashing the cash on, the displays are available on eBay.

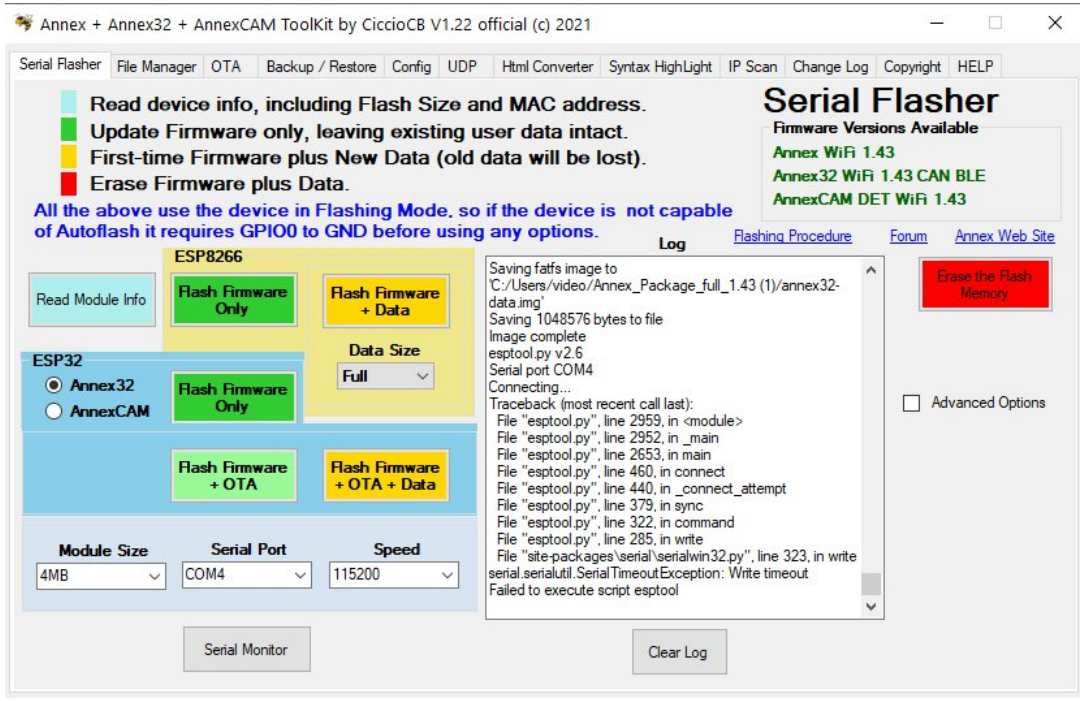
The resolution of the larger displays is 480 x 320 pixels with 65K colours, based on chipset ILI9486. The interface is SPI plus some extra control connections. The larger display might be a better option compared to the small screens using the ILI9341 as the higher resolution enables the creation of better GUI (Graphics User Interface) pages with an improved touchscreen interaction. These displays have a connector adapter for the Raspberry Pi but can easily be used with the ESP modules. They are built on the Waveshare design and use a 16-bit serial interface based on the 74HC04, 74HC4040 and 2 x 74HC4094 logic chips.

The trap door starts to open when you consider all these touch screen choices, the micro also needs to be communicating with the kit it is controlling.

This could be via an I^2C bus from the same ESP micro passing commands along to several PCF 8574 devices on a one per device basis. We can then have 8 pins to toggle for each unit, but we could have more than one PCF 8574 should the target unit require it. I think we should start with the ESP32 processor as per the diagram.

I have not used one but too much speed is never a problem, and it would be good to get my feet wet on this improved processor. The source code using ANNEX BASIC is considerably shorter than the PIC code and has the advantage of just save and run to test each step. When I develop software there are always lots of steps, I am of the creep up on problems in small bites school of thought, perhaps that's small bytes, but I am getting better! John programmed at machine level so the code will run faster than the higher-level text files of Annex BASIC, but the processors have different speeds.

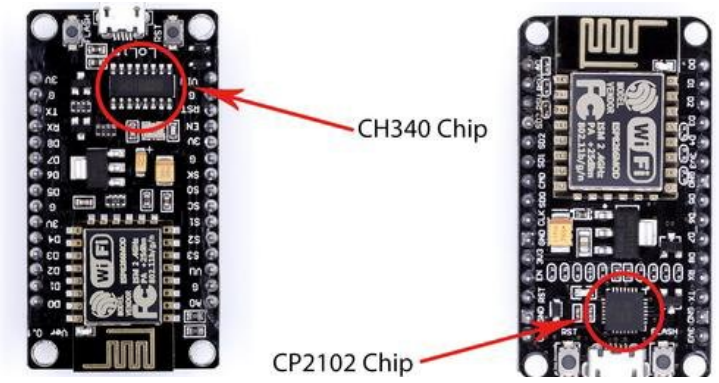
I ordered an ESP 32 and started to explore it in conjunction with ANNEX BASIC, after the GVG project I felt reasonably confident. The first stage is to download the new ANNEX zip file, unzip it and run the ANNEX tool kit which produces a screen that looks like this.



The latest ANNEX Tool Kit Control Panel, note the flashing procedure link for help instructions. It shows the old control panel in the example

Select the serial monitor, click the comport and press the right button on the last row. It will warn you its about to wipe all the data, but as you have not stored any this won't be a problem.

The next pop-up screen asks for your Wi-Fi details password and router IP. I won't show the screen then I won't find you outside my house using my Wi-Fi. The program flashing should follow. When this flashing is complete it will display the IP address of the module in the serial monitor.



I had a problem with several error messages. This is down to the UART chip. All my previous micros used a CH340, the new ESP32 module has a CP1202 UART, and this requires additional drivers under Windows 10 (other operating systems my not require this, I don't know).

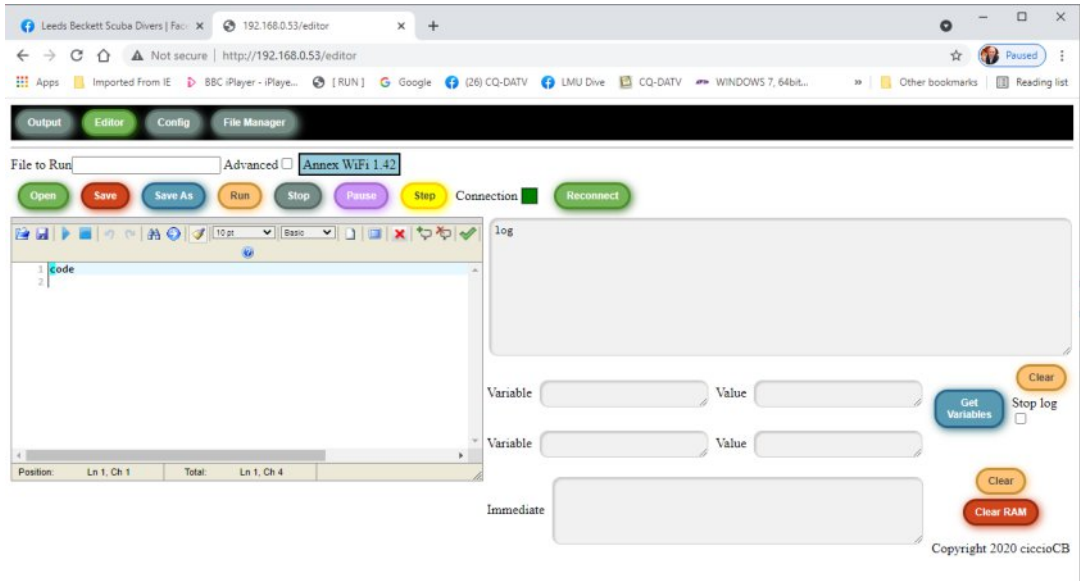
The writing on the chip is too small for my eyes, but the chips are different shapes. Opening device manager in Windows should indicate the missing driver and they are free on the internet, just use a Silicon Labs site, other sites add junk mail to sell you driver update software. I fell for that one, but they are now deleted, and I am not getting ads for things I don't want.

If you then open your browser and put the IP number in the search bar, mine was 192.168.0.95 you should see the editor and you can type in a program to test the system.Give it a name, followed by save and run. It should print CQ-DATV 5 times in the left-hand display.

In the next issue I will connect up a Touch screen and start adding some simple expandable code to control it.
https://tinyurl.com/vfkpchu8 - **Annex Basic for ESP32**

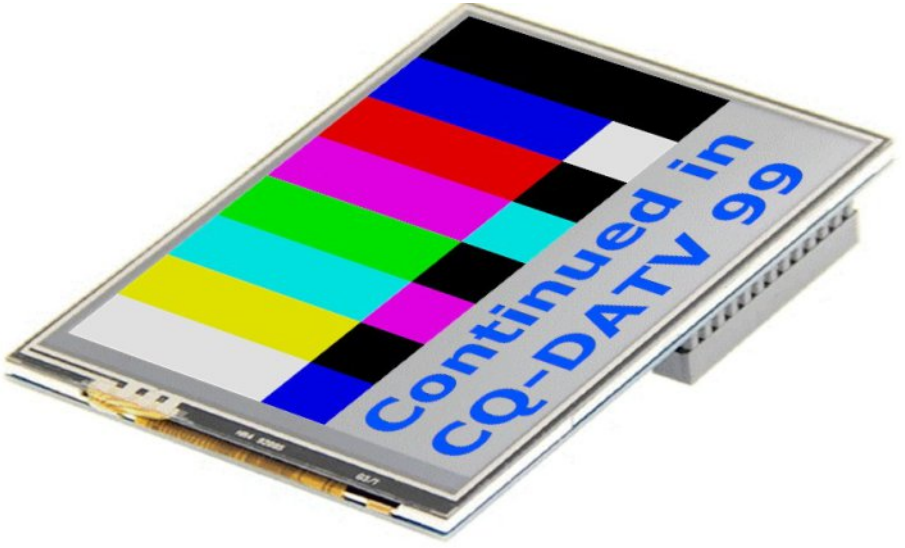
https://tinyurl.com/3fjpk6rt - **Annex Basic Forum**

https://tinyurl.com/bbea9u9n - **Annex Basic Download**
(The password for the zip file is annex)



ANNEX BASIC Editor control panel

```
` Simple BASIC test programme
for a=1 to 5
   wlog "CQ-DATV MAGAZINE" ` other magazines are available
next a
end
```



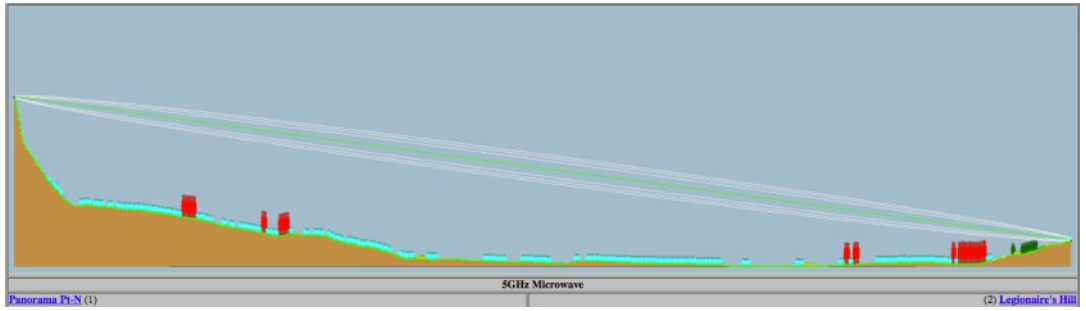
1st Microwave Outing of 2021

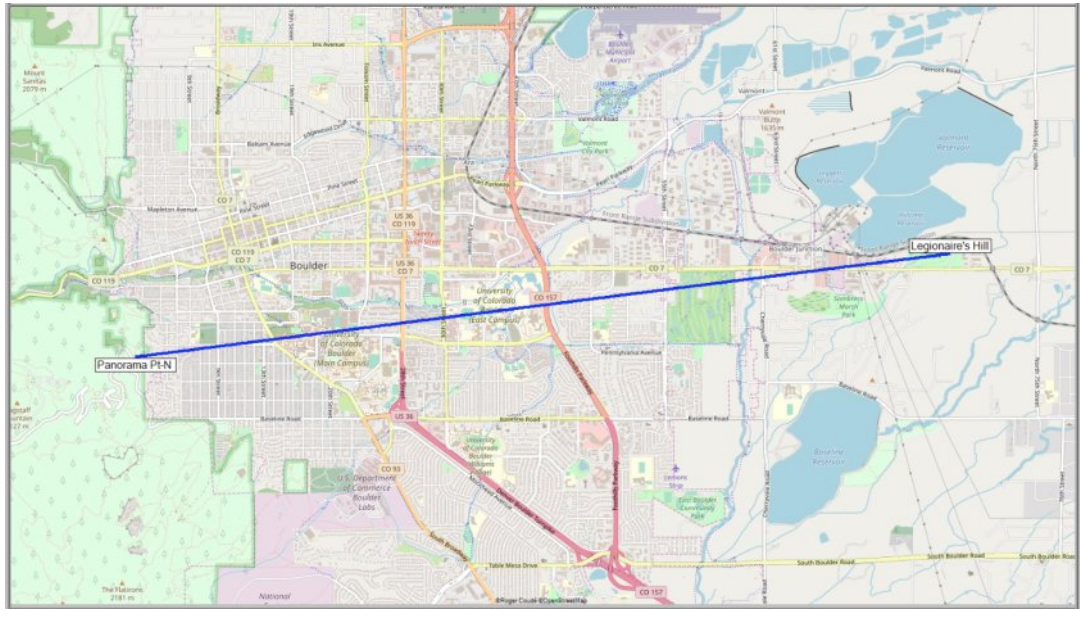
Written by Jim Andrews KH6HTV
Reprinted from Boulder Amateur Television Club TV Repeater's REPEATER June, 2021

Don N0YE organized our first BATVC microwave event of 2021 for Thursday, June 17th. This one was with Hi-Def, digital TV (DVB-T) on the 5 cm band. Participating along with Don were Bill ABOMY, Chris K0CJG, and Jim KH6HTV. This was Chris's first taste of playing with ham microwaves. He used one of Don's home-brew transverters. Bill was anxious to try out his new home-brew transverter which he designed and built over the past winter.

Our previous 5.8GHz outing was last September and documented in our ATV newsletter issue #58. On that outing we were shooting for some long distance records. We thus went to several remote locations. Our 2020 distance record was 51km (≈ 32 miles). This time, because it was the first time for Chris and Bill wanted to test out a totally new rig,

Don selected two excellent sites with only 8.9 km (5.5 miles) separation. Don and Chris set up on Legionaire's Hill on the east side of Boulder, off of Arapahoe Ave. Bill and Jim set up on Flagstaff mountain at Panorama Point on the west side of Boulder. The above photo is the view from KH6HTV's dish antenna on Flagstaff looking at Legionaire's Hill. The red arrow tip is on N0YE & K0CJG's location.





8.9 km RF Path for our 5.7 GHz, DVB-T signals

We operated on 5.678 GHz which is below the un-licensed Wi-Fi band. We were using DVB-T modulation with 6 MHz band-width. Most of us were using the L-Com model HG5822EG, BBQ grill dish antenna with 23dBi gain.

It is seen in the above photo. We used horizontal polarization. We used the BCARES 146.76 MHz, 2m, FM voice repeater for our intercom coordination.

Don's & Chris's 5GHz Transverters were built by Don and the key component was a cross-over, transfer coax relay which allowed Don to use a single mixer and amplifier for both receive and transmit. For technical details on Don's rig, see past issue #56. Jim's Transverter has been discussed in several previous issues of this newsletter. See issues # 37, 56 & 57. We hope to have a report soon from Bill on the design and construction of his new 5G Transverter.

We were able to successfully exchange two way contacts across the 8.9km path. Don and Chris's signals were the weakest and occasionally suffered freeze framing. Don and Chris were both able to copy quite well Bill and Jim's stronger signals. Our DVB-T receivers all include DVR (i.e. Digital Video Recorder) capability. Both Chris and Jim had memory cards in their receivers and were able to record portions of the received signals. A collection of photos from the recorded videos and still camera shots from the outing are included on the following pages.

I forgot to mention, we again had an un-invited guest. Dr. Murphy made his appearance. This time he attacked Chris's Canon camcorder. Chris and Don wasted a lot of time trying to de-bug the issue. The conclusion was the HDMI output failed on Chris's camcorder. The other issue we are constantly battling when out in the open -- too bright sunlight. Our cameras work ok in the bright sun, but we have one heck of a time seeing our video monitors. Even putting them deep inside a cardboard carton, it is still difficult. Also, I found the bright sun over-whelmed the IR input on my HV-120 receiver. It was extremely difficult to get it to respond to the remote control commands.

Don made absolute signal strength measurements of Bill and Jim's signals. He was using a Hi-Des HV-110 as his IF receiver, which has a very accurate S meter. For Bill, AB0MY, he reported from the On Screen Display (OSD) -66dBm and 15dB s/n. For Jim, KH6HTV, he reported -45dBm and 23dB s/n (i.e. perfect for QPSK). Don later reported that his transverter gain was 17dB and his antenna coax loss was -3.5dB. Thus the signal strength of Jim's signal at the antenna input to his transverter was -62dBm.

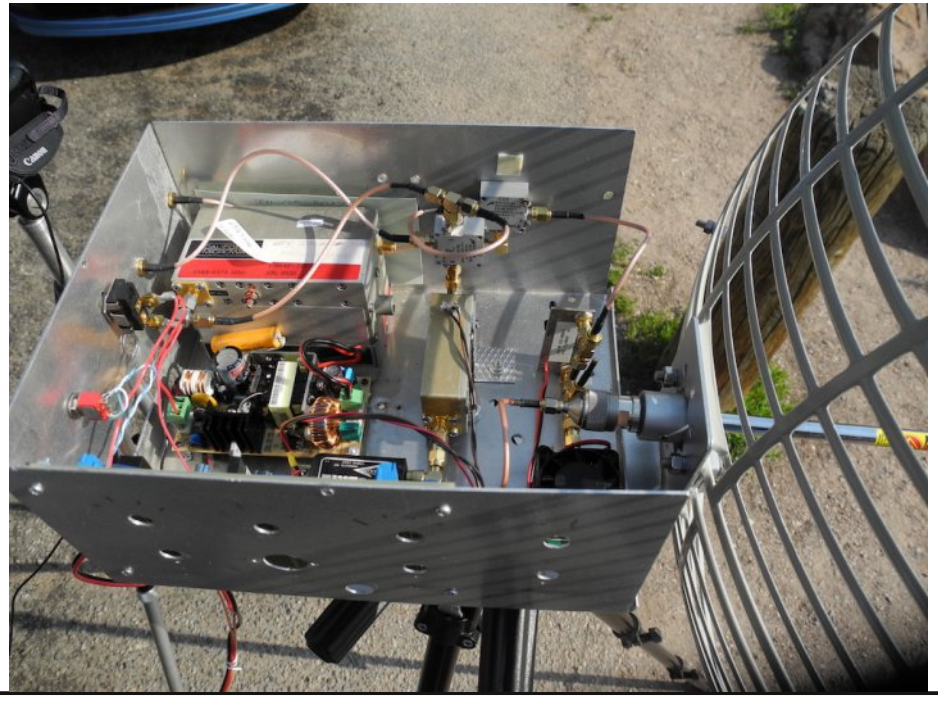
Using the known system parameters, a Radio Mobile rf path prediction was run. The KH6HTV system parameters were: transmitter power = +23dBm, both antenna gains = +23dBi, transmit coax loss = 0.4dB, receive coax loss = -3.5dB

Radio Mobile predicted -65.3dBm. However, Radio Mobile includes several fudge factors above the Free Space Loss of 126.7dB. It included Obstruction Loss of -3.86db, Forest Loss of 0.0dB, Urban Loss of 1.0dB, and Statistical Loss of 6.61dB for a total path loss of 130.4dB, or a net difference of 3.7dB over free space. If we take this away from the predicted -65.3dBm, we end up with the free space prediction of -61.6dBm. This result is quite amazing in that Don measured -62dBm, essentially the same. Plus the resolution on the Hi-Des S meter is only to the nearest 1dB. Thus on this particular path we were experiencing true free space propagation. Plus, we had almost a 40dB margin. Jim, KH6HTV, Boulder, Colorado

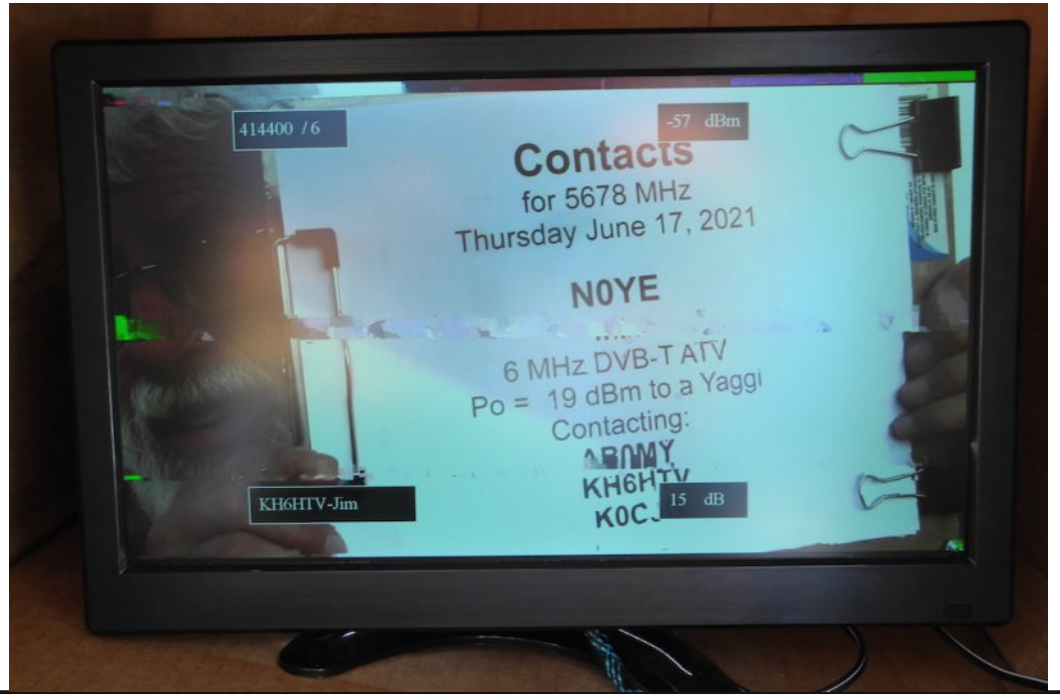
The first six photos (starting next page) were taken by still camera and the next six photos were screen grabs off of video received and DVR recorded.

Above: Bill's 5.8GHz Transverter & Antenna
Below: Inside view of Bill's Transverter

Above: Jim (foreground) & Bill's DATV set-ups
Below: View from Legionaire's Hill - from N0YE



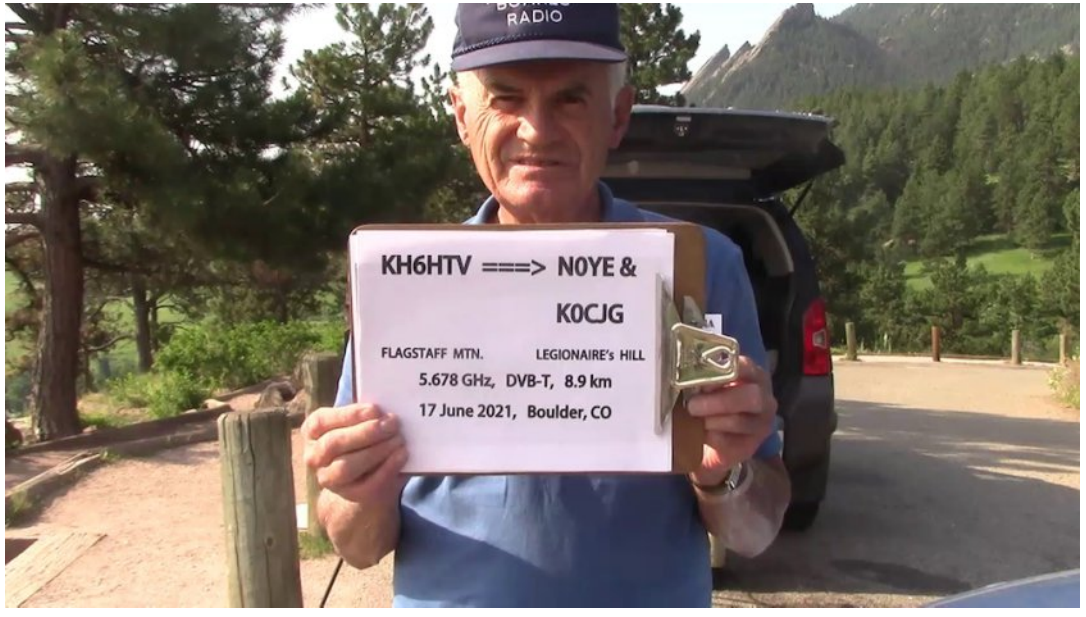
Images on KH6HTV's monitor: K0CJG's QSL & N0YE ID card. . note some break-up



Above: Bill, AB0MY's rig & SUV
Below: and Bill's Hero Brag Card

Above: Jim, KH6HTV's rig and convertible
Below: and -- his Hero Brag Card

Above and below:
Video received by KH6HTV from Chris, K0CJG



P5 – The power of television

Written by Richard Harris & Jeffrey Borinsky

What do you do at a television outside broadcast (OB) when you're miles from the nearest mains supply? Or you have mains but nowhere near enough current for the heavy demands of an OB? The answer is a mobile generator.
From the start of BBC TV OBs in 1937, the BBC bought and operated a number of Power Vans. This continued until the 1980s when it became easy to hire mobile generators. This article is the story of P5; the BBC used this Power Van for over 35 years, the longest service life of any OB vehicle in the UK.

The Broadcast Engineering Conservation Group (BECG) is now the proud owner of P5. We plan to restore it to its former glory. It's about the same age as our Vivat OB truck. P5 will be able to provide power for Vivat; the two vehicles will look great together.

P5 in use at Aintree race course in 1987, its last known appearance in service. (Photo: Harwood Hilly)


THE DEPARTMENT OF TRANSPORT AC 0598492

Vehicle Registration Document V5

Rev. Oct. 92

BRITISH BROADCASTING
CORPORATION
TRANSPORT GROUP
PARK WESTERN
41/44 KENDAL AVE
LONDON
W3 ORP 70921

Registration Mark: NGF 728 | Validation character: U

Please quote the Registration Mark in all correspondence

Taxation Class	RESTRICTED HGV
Make	BEDFORD
Model/Type	2-AXLE-RIGID BODY TRUCK
Colour(s)	GREEN
Type of Fuel	PETROL
VIN/Chassis/Frame No.	ML252847
Engine No.	
Cylinder Capacity	
Seating Capacity	
Taxable Weight	2407-6 KG UNLADEN
Date of Registration	02 11 53
Last Change of Keeper	
No. of Former Keepers	NONE SINCE JAN 78

The person named above is recorded as keeping the vehicle described opposite. **THE REGISTERED KEEPER IS NOT NECESSARILY THE LEGAL OWNER.**
This document is issued by the Driver and Vehicle Licensing Agency on behalf of the Secretary of State for Transport. Police officers and certain officers of the Department of Transport may require you to produce it for inspection at any reasonable time.
YOU ARE REQUIRED BY LAW TO NOTIFY CHANGES TO ANY OF THE DETAILS PRINTED ON THIS DOCUMENT AS SOON AS THEY OCCUR. (Failure to do so may result in prosecution and a possible fine of £1,000.) The notes overleaf and below explain what to do. For further information please ask at a post office or Vehicle Registration Office for leaflet V100 or ring The Vehicle Enquiry Unit (0792) 772134.

The previous recorded keeper is: NONE

1. IF YOU SELL THE VEHICLE FILL-IN AND RETURN THE TEAR-OFF SLIP BELOW.
2. IF YOU ARE THE NEW KEEPER AND YOUR NAME IS NOT SHOWN ABOVE TELL US NOW BY FILLING IN THE BACK OF THIS FORM. WE WILL THEN SEND YOU A NEW DOCUMENT IN YOUR NAME.

Document Ref. No. 3329 563 6907 25 11 93 3282A037*** 883280 36

B E C G

V5 registration document (logbook) showing P5 first registered on 2nd November 1953

Power Van P5

The chassis was made in 1952 and went into BBC service in 1953 with registration number NGF 728. P5 was built on the popular Bedford ML chassis which was used for many purposes from 1939 until the early 1950s.
We know that P5 stayed in service until at least 1987, lovingly maintained by the BBC's Manchester workshops.
It's a curious hybrid. The vehicle itself has a 6 cylinder petrol engine but the generator is driven by a Perkins 6 cylinder diesel. We think the maximum power output is 27kVA single phase, which is over 110A at 240V.

How did we buy it?

CVA Auctions contacted us because they had seen an article about the BECG's trucks in Commercial Motor magazine. By coincidence P5 was advertised in the same issue.

Because of Covid restrictions we couldn't see P5 until we collected it after purchase. A regular customer of CVA bought the vehicle on our behalf which was very convenient. The trustees managed to scrape together enough money at short notice.

P5 is not currently driveable. Then engine works well but there's no petrol tank! Sam, our regular driver, arranged transport to a dry store not far from our base near Lincoln.

Next steps

There is a lot to find out about P5. Where has it been since 1987? What happened to the roof rigging rails and when? Why have the front access doors been panelled over? What is the condition of the generator – it looks complete, but that's all we know.

We've tried to contact the last owner but without success.

Can't drive P5 very far without a petrol tank!

This spring we hope to transport P5 to our local HGV mechanical workshop. In addition to the new fuel tank and a general service, the brakes will need a thorough overhaul to make P5 safe to drive.

The bodywork needs extensive attention at a specialist bodyshop. This will certainly include fitting new rigging rails (visible in the 1987 photo), investigation of the front doors and repair or replacement of the front wings. Then it will need repainting. We plan to do the signwriting in original 1950s BBC style; it's currently a 1970s version.

The generator's Perkins diesel engine is known to be tough and reliable but will certainly need a service. The generator itself is quite sophisticated.

It has a magnetic amplifier stabiliser which controls both frequency and voltage to close tolerances. We don't yet know if the 50Hz output can be synchronised to TV field rate.

An unusual Bedford ML

You may think you've seen P5 before at a vintage vehicle rally. A somewhat similar Austin truck, P4, has been restored by others as a mobile home.

P5 will be restored as a unique working example of a BBC Power Van. To do this we need funds, by donation or sponsorship.

We plan to use P5 to power our historic OB vehicles when on display.

Further reading

BBC Power Generators by Richard Harris:

https://becg.org.uk/2020/11/12/bbc-power-generators-article/

Broadcast Engineering Conservation Group

We are a small association of experienced and motivated professionals dedicated to the survival and interpretation of television history. We have come together to put elements that individuals have collected into the BECG. Whilst we are currently privately funded, this has not been a bar to achieving many successes in this field.

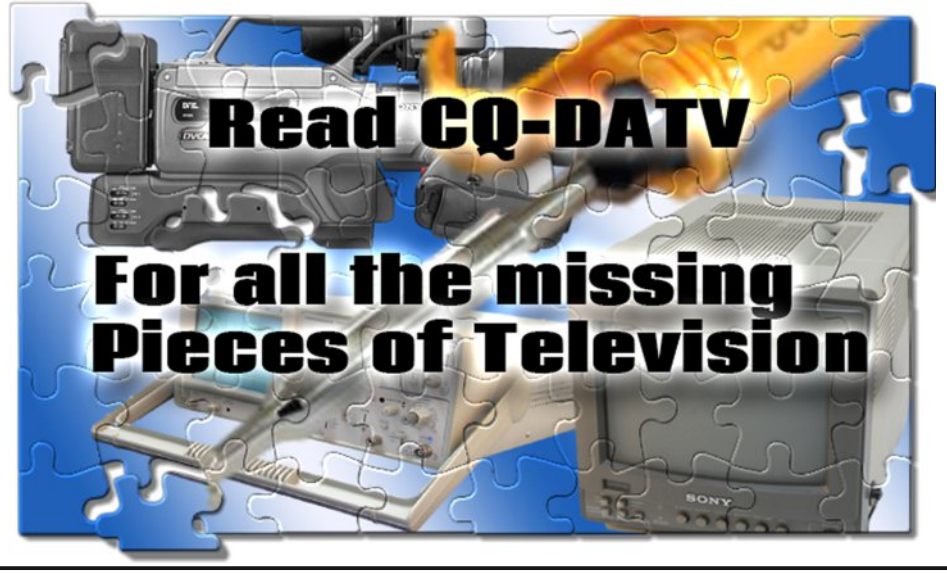
We have many cameras, monitors, video tape recorders and all the less visible paraphernalia that are needed to make TV programmes. The biggest and most visible parts of our equipment are several outside broadcast trucks. Promoting and demonstrating vintage television is the main purpose of the group.

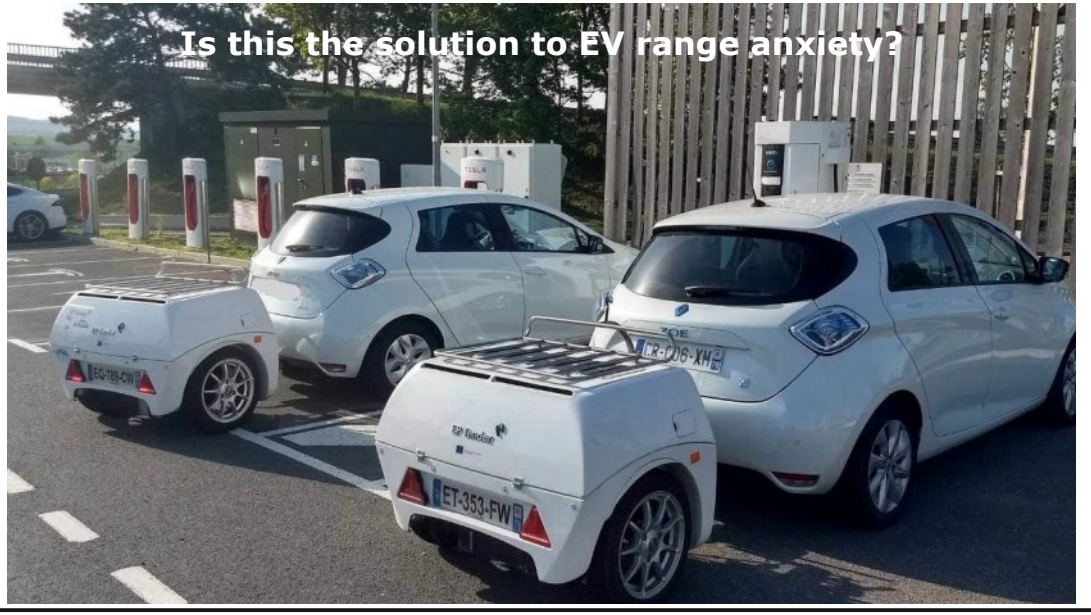
The authors are both founding trustees of the BECG. The BECG is a registered Charitable Incorporated Organisation (CIO), number 1189469. The BECG is financed entirely by the founders and by private donations. If you would like to learn more about us, or help us in any way please email: *contactus@becg.org.uk*

More information on the trucks, their equipment and other BECG activities can be found at: *https://becg.tv*
Much of the BECG's equipment is available to hire for film and TV production.

The generator

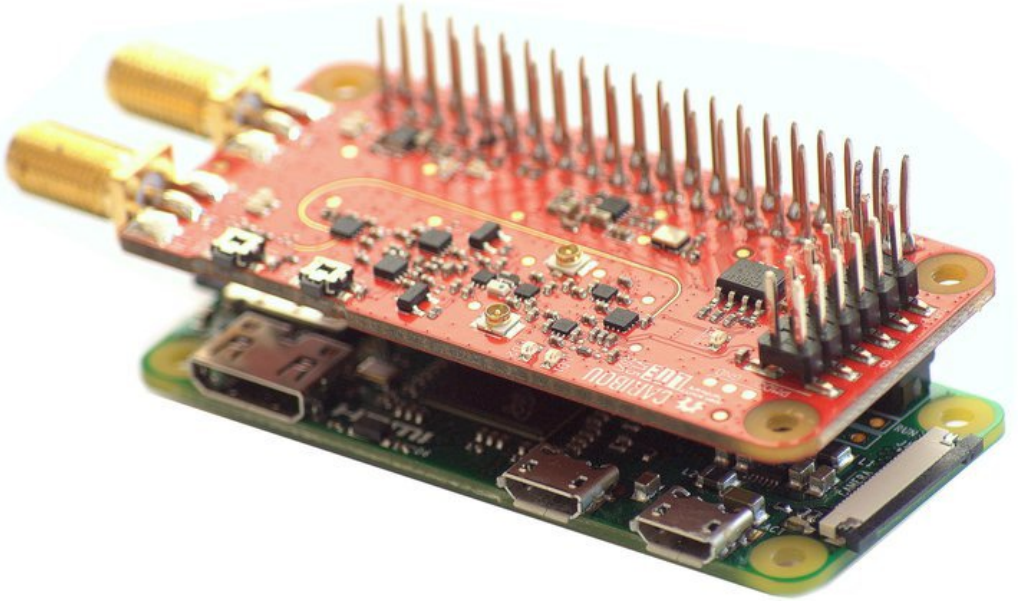
P5 safely stored near Lincoln

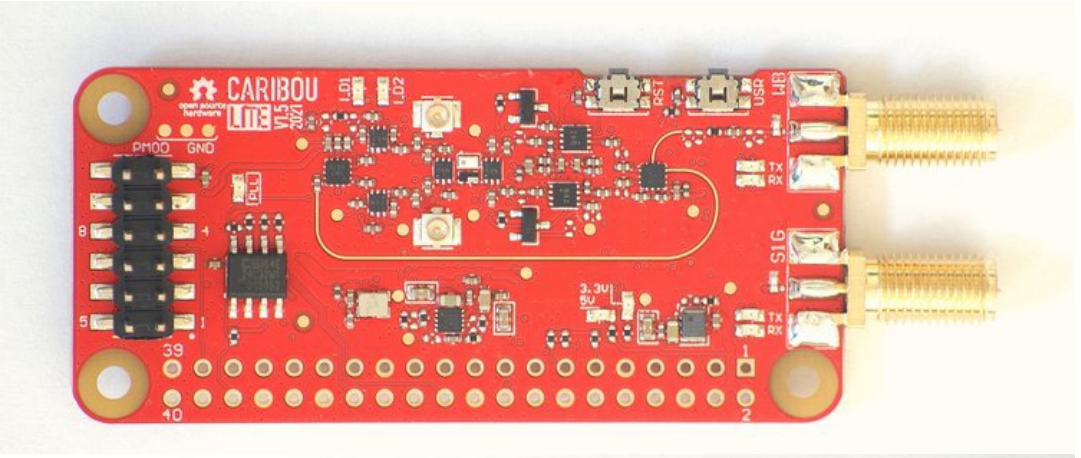


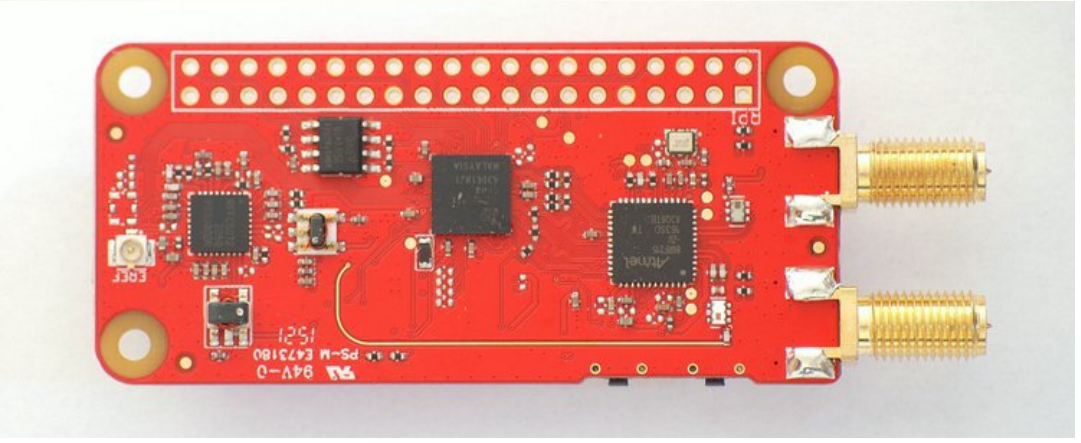


CaribouLite

A fully open source dual-channel SDR Raspberry Pi HAT with up to 6 GHz tunable range







CaribouLite is an affordable, open source dual-channel SDR (Software Defined Radio) platform and Raspberry Pi extension (HAT). With CaribouLite, your Raspberry Pi computer becomes a self-contained dual-channel radio Tx/Rx spanning a wide tunable frequency spectrum (up to 6 GHz, see below).

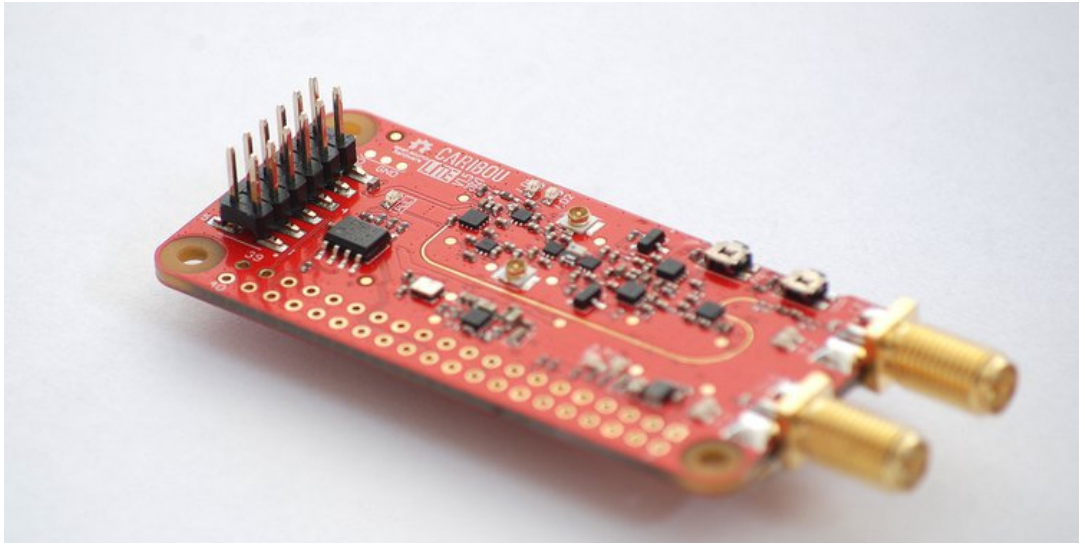
It is easy to control, modify and program CaribouLite through a Raspberry Pi computer, using the IceStorm FPGA toolchain and our fully open source code and documentation, all contained in our repository tree and linked at the bottom of this page.

CaribouLite is built for makers, hackers, educators and researchers and is designed to complement the current SDR ecosystem as a high-quality, affordable, standalone SDR building block for the Raspberry Pi computer.

Capability & Range

CaribouLite gives two Tx/Rx SDR channels: (1) 30-6000 MHz, and (2) Sub-1GHz. The 4MSPS I/Q samples (both Tx and Rx) are transmitted over the RPI's secondary memory interface, where CaribouLite acts as a high throughput memory peripheral.

CaribouLite has an internal accurate RF clock source (TCXO @ +/-0.5 ppm), low noise Rx capabilities (NF < 4 dB under 3 GHz) and high Tx power (up to 18 dBm). It also has a fully controllable read / write 8-bit expansion port (PMOD) to support advanced features such as direction finding, synchronization, and more.



On the software side, Raspberry Pi's high-level APIs like Soapy / GNU Radio, etc. are fully supported, through which the HAT's complete feature-set can be accessed.

Fully Open Source to Support Your Projects

As a fully open source SDR, users can reprogram, modify and improve CaribouLite's capabilities for their own custom use. To support such an ecosystem, we will provide the community with the fullest documentation and source code for the project possible, including the required toolchains and programming guidelines. We are also excited to hear your ideas, and support them fully.

Closer to campaign launch, we are planning to provide our own library of usages, such as:

- *A wide range spectrum analyzer*
- *Signal / protocol generator*
- *Analog / Digital (DAB+) radio receiver*
- *ADS-B receiver*

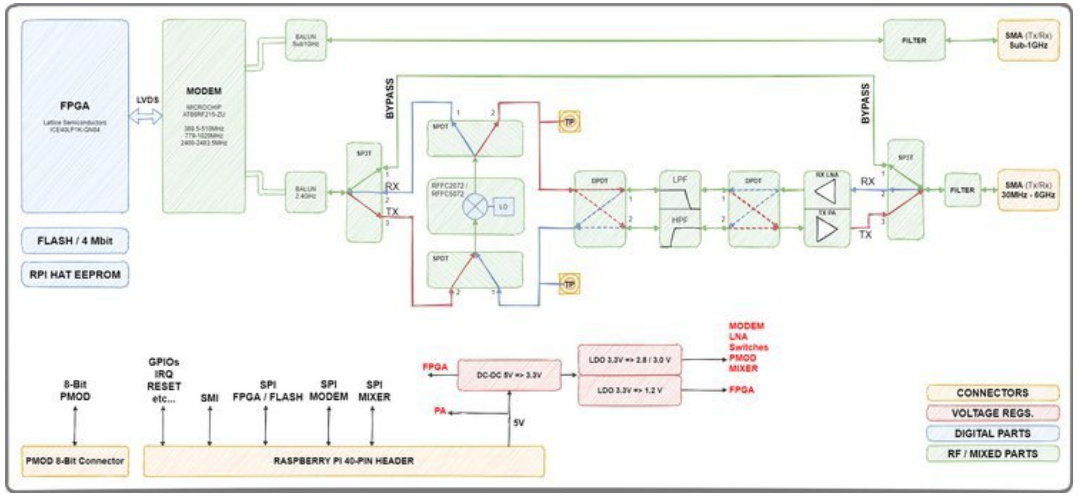
…and more!

Useful Linux Software

The software side contains a Linux driver that recognizes the stacked CaribouLite boards and configures them. SDR APIs and applications, such as GNU Radio, are accessed as if they were connected through the USB port. The Linux driver gives access not only to the "SDR" part of CaribouLite, but also the IEEE-802.15.4 PHY built-in core implemented within the AT86RF215-ZU (Microchip's modem). With the IEEE-802.15.4 PHY radio channels, communication nodes such as Zigbee(Pro), Thread, and others will be implemented without the need for any further SDR programming/design.

Features & Specifications

Block Diagram:



Power:

CaribouLite is powered by the Raspberry Pi's 5 V rail from the 40-pin header. That gets converted to 3.3 V, which is then filtered and down-converted again (using an LDO) to the 2.8 V RF voltage source and the 1.2 V FGPA voltage source. The LDO outputs are filtered and distributed to the consumer ICs. This power micro-architecture is used to minimize power waste and heat dissipation, and provides decent RF filtering and region isolation using the LDOs and filters.

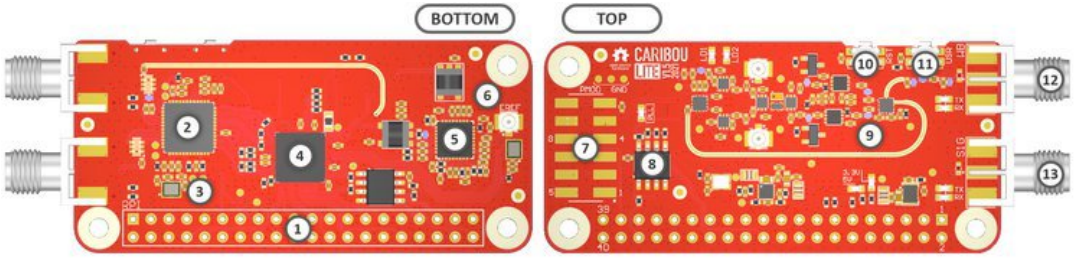
Connectors:

- *RPI - 40-pin header connection with 40-pin Raspberry Pi boards.*
- *PMOD - a header (unpopulated as default) containing 8-bit of FPGA signals, 2-pin GND, and 2-pin VCC. This is a 2.8 V logic connector. Maximal draw current from the power rail is 150 mA.*
- *RF 6GHz - a widely tunable RF ANT connector supporting 30-6000 MHz Tx and Rx.*
- *RF S1G - a sub-1 GHz RF ANT connector supporting 389.5-510 MHz and 779-1020 MHz Tx and Rx.*

Buttons:

- *USER / PROG: (marked USER) - a dual purpose button used mainly for user-programmable functionality or to enable access to the HAT EEPROM*

Board Layout



Bottom

1. Rasperry Pi 40-pin connector
2. Modem - AT86RF215
3. TCXO - 0.5 ppm @ 26 MHz
4. FPGA - iCE40LP
5. Frequency mixer with integrated synthesizer - Qorvo RFFC5072
6. External reference clock connector (may be used to achieve coherence between many CaribouLite units)

Top

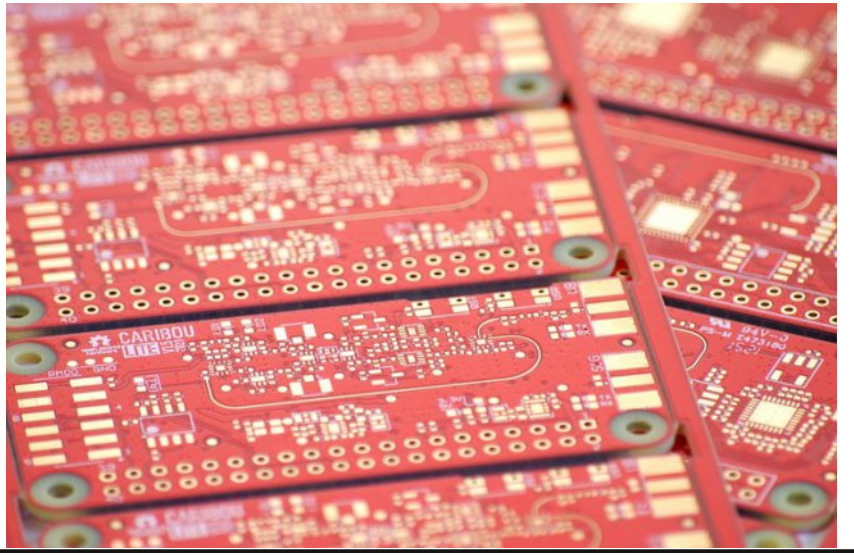
7. PMOD connector for FPGA expansion
8. Raspberry Pi configurable EEPROM (following Raspberry Pi HAT specifications)
9. RF front-end - switches, amplifiers, and filters
10. Reset switch
11. User custom switch + RPI HAT EEPROM reconfiguration (write-enable) switch
12. Wide band SMA connector
13. Sub 1-GHz SMA connector

Open Source Documentation

CaribouLite is extensively documented on GitHub *https://github.com/cariboulabs/cariboulite* including schematics, pcb layout and firmware/software.

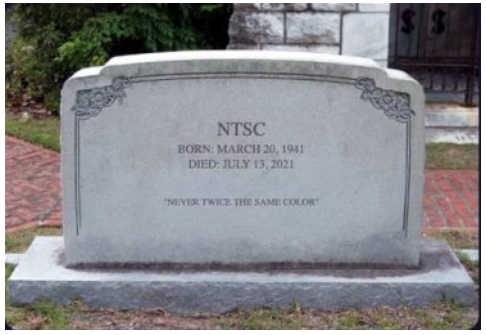
Larger image of the block diagram and board layout:- *https://www.crowdsupply.com/img/64f0/cariboulite-block-diagram.png*

https://www.crowdsupply.com/img/0637/cariboulite-board-layout.png



End Of An Era: NTSC Finally Goes Dark In America

by Jenny List July 14, 2021



A significant event in the history of technology happened yesterday, and it passed so quietly that we almost missed it. The last few remaining NTSC transmitters in the USA finally came off air, marking the end of over seven decades of continuous 525-line American analogue TV broadcasts. We've previously reported on the output of these channels, largely the so-called "FrankenFM" stations left over after the 2009 digital switch-over whose sound carrier lay at the bottom of the FM dial as radio stations, and noted their impending demise. We've even reported on some of the intricacies of the NTSC system, but we've never taken a look at what will replace these last few FrankenFM stations.

If you are an American you may have heard of ATSC 3.0, perhaps by its marketing name of NextGen TV. Just like the DVB-T2 standard found in other parts of the world, it's an upgrade to digital TV standards to allow for more recent video compression technologies and higher definition broadcasts. It has an interesting backwards compatibility feature absent in previous ATSC versions; there is the option of narrowing the digital bandwidth from 6 MHz to 5.5 MHz, and transmitting an analogue FM subcarrier where the old NTSC sound carrier on the same channel would have sat. Thus the FrankenFM stations have the option of upgrading to ATSC 3.0 and transmitting a digital channel package alongside their existing FM radio station. It's reported that this switch-over is happening, with one example given in the Twitter thread linked above. (See original source - Ed)

The inexorable march of technology has thus given better quality TV alongside the retention of the FrankenFMs. We have to admit to being sorry to see the passing of analogue TV, it was an intricate and fascinating system that provided a testbed for plenty of experimentation back in the day. Perhaps as we see it slip over the horizon it's worth pondering whether its digital replacement will also become an anachronism in an age of on-demand streaming TV, after all it shouldn't have escaped most people's attention that in 2021 the good TV content no longer comes to your screen via an antenna socket. Meanwhile we'll keep our CRTs running, just in case we ever want to relive a 1980s night in with a VHS tape of Back To The Future.

Header image: Mysid, Public domain.
Source: *https://tinyurl.com/kwykusxu*

BATVC - ATV Loaner Equipment

Written by Jim Andrews, KH6HTV

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

The Boulder ATV group has an assortment of ATV equipment to loan out to prospective hams who express an interest in getting into ATV. The first step for an interested ham is to borrow one of our digital ATV receivers. The purpose is to prove to themselves and us that they can actually receive the DVB-T signals from our Boulder ATV repeater at their QTH. If they are successful in receiving signals, then we are willing to loan them a TV camera and TV transmitter. The loans are not permanent., but for a short term. If the prospective ATV ham then decides to really jump into ATV, we expect him/her to then purchase their own ATV gear. The following is a list of the equipment available for loan:

1. DVB-T, digital TV set-top box receivers. Requires a 70cm antenna and a video monitor. The monitor can either be high-definition with an HDMI input, or older analog TV with RCA composite video plus audio inputs. (note: items 2 - 6 comprise a complete 70cm digital ATV transmitter)

2. DVB-T modulator -- Hi-Des model HV-320E. includes AC/DC wall wart power supply.

3. 70cm, 6 Watt (rms), RF Linear Power Amplifier, KH6HTV prototype.

4. 13.8Vdc Power Supply -- Samlex model DC1212, to power the amplifier.

5. Hi-Def (1080P) Camcorder --- Canon model VIXIA HF-R80, has HDMI A/V output

6. Camera Tripod (note: items 7-8 comprise a complete 70cm analog ATV transmitter)

7. 70cm, 10 Watt (pep), NTSC, VUSB-TV, analog ATV transmitter -- built by K0RZ

8. TV camera, older JVC model GX-N7 --- includes set of assorted C mount lenses & extension cable. It gets it's DC power from the K0RZ transmitter.

9. 70cm Base Station Antenna -- Diamond X-50 (2m/70cm)

10. Antenna Tripod Mount

11. Coax Cable -- 35 ft. of RG-8

Pass the word around. We are always looking for new ATVers to join in the fun. If you have ham radio friends who might be interested in trying out ATV and are interested in borrowing any of the above items, have them contact Jim, KH6HTV. *kh6htv@arrl.net*

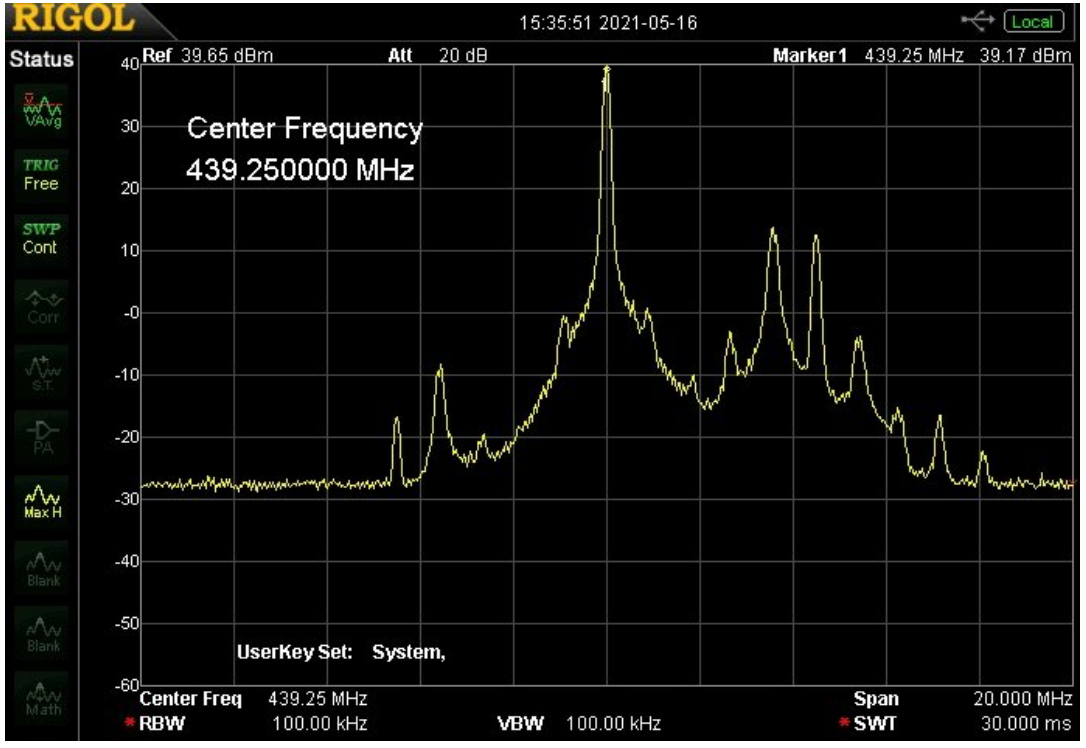
K0RZ, 70cm, Vestigial Upper Side-Band, TV Transmitter

One of the pieces of TV equipment in our club's inventory for temporary loan to prospective ATVers is a fine, 70cm analog TV transmitter. This transmitter was built by Bill, K0RZ, in the early 90s.

Bill donated it to our group to be used as a "loaner". Joe, AD0I, has been using it successfully to put a really fine, P5, NTSC analog signal into our W0BTV repeater. Joe recently returned it to our equipment pool to be loaned out to someone else.

This photo shows the high quality construction technique Bill used in building this transmitter. Bill used a PC Electronics model TXA5-70A exciter board along with a model FMA5-F, 4.5 MHz sound sub-carrier board.

The low level RF output from the exciter board was then amplified by a Toshiba SAU-4, RF brick amplifier module. The output from the SAU-4 was a 15 Watt (PEP), full, double side-band, AM-TV signal with a bandwidth well in excess of 12 MHz. To eliminate the lower sideband and convert the signal to a commercial standard, 6 MHz, TV channel bandwidth, VUSB-TV signal, Bill included in his transmitter a pair of inter-digital, band-pass, channel filters. These filters were made by Spectrum International. SI was the dominant supplier of such filters in the 1990s. Bill's original transmitter operated on channels 57 & 58 (421.25 & 427.25 MHz). The RF output from the transmitter after the channel filters is 10 Watts (PEP).



Spectrum of K0RZ, 10 Watt, ATV Transmitter. Top reference line is +40dBm (10 Watts). 10dB/div & 2MHz/div. Test signal was NTSC color bars

Bill also included a quality RF coaxial relay to switch the antenna between transmit and receive. There is an F connector on the rear panel to attach the transmitter to a separate analog TV receiver. Bill also included coax relays to switch in the appropriate Ch 57 or 58 (now 60), SI band-pass filter.

The transmitter was designed for multiple A/V inputs. Standard composite video & line level audio with RCA connectors are found on the front and rear panels. It was also wired with a special A/V connector to use with an old JVC color TV camera which Bill also donated to our group. Adjustable audio and video level controls are provided on the front panel. The transmitter also included a Video IDer from Elktronixs. The IDer has a custom burned EPROM with a selection of four different test patterns with the call sign K0RZ. The IDer would ID the transmitter automatically every 10 minutes. The transmitter is totally self contained as it also includes a built-in, hefty, 12 Volt linear power supply for operation from 120Vac mains. The nice 17" x 4.5" x 19" cabinet weighs in at a hefty 36 pounds.

Our Boulder ATV repeater accepts 70cm, analog, NTSC, VUSB-TV signals as one of it's three possible inputs. It is on Channel 60 (439.25). The other inputs are digital, 6 MHz, DVB-T on 441 & 1243 MHz. To work on our repeater, Bill's transmitter needed to be modified. Jim, KH6HTV, found a surplus crystal for 439.25 MHz. It was installed in the transmitter and the transmitter was retuned to optimize performance on Ch 60. Don, N0YE, modified the Ch 58, SI, BPF to work on Channel 60. This involved shortening the resonator rods to 6.45" length and retuning the filter.

From the vault - YIG FM transmitter for 23 CMS

Written by
(Edited version of the article from CQ-DATV 8)

It seems a long time since I designed GB3FY the 10GHz FM ATV repeater located in Fleetwood. I used a different approach to the transmitter, by using a YIG, let me explain.

Yttrium **I**ron **G**arnet or **YIG** for short

These small balls are about 10 to 30 thou in diameter. It's sliced from the grown garnet and then diced and tumbled to produce the finished ball. The value of the raw material on the open market is several million dollars per pound, don't worry you don't have to buy the whole pound, garnet balls are available on eBay at affordable prices as part of functioning surplus telecom equipment. These small self-contained devices can be powered up and modulated with video either analogue of digital or provide the bases for a transmitter.

YIG's are nothing new they have been around quite a few years and are they are used in expensive high end test equipment. What has changed is they are now appearing on eBay at prices affordable by amateurs. This because they are extremely stable, and now that GB3FY has been operating for 2 years using one as a video transmitter. I can also report that they are reliable and ideal for FM ATV.

They question I have been asking myself is are they suitable for other ATV bands in particular 23 cms, sometimes the only way to find out is to power one up and see.

The key to controlling and modulating these devices is via a magnetic field.

There is magic number to set the frequency of a YIG and this is 2.8 MHz per gauss of an applied magnetic field. So, if a 1000 gauss field were applied to the YIG it will oscillate at 2.8GHz, similarly 2000 Gauss would move the frequency to 5.6GHz.

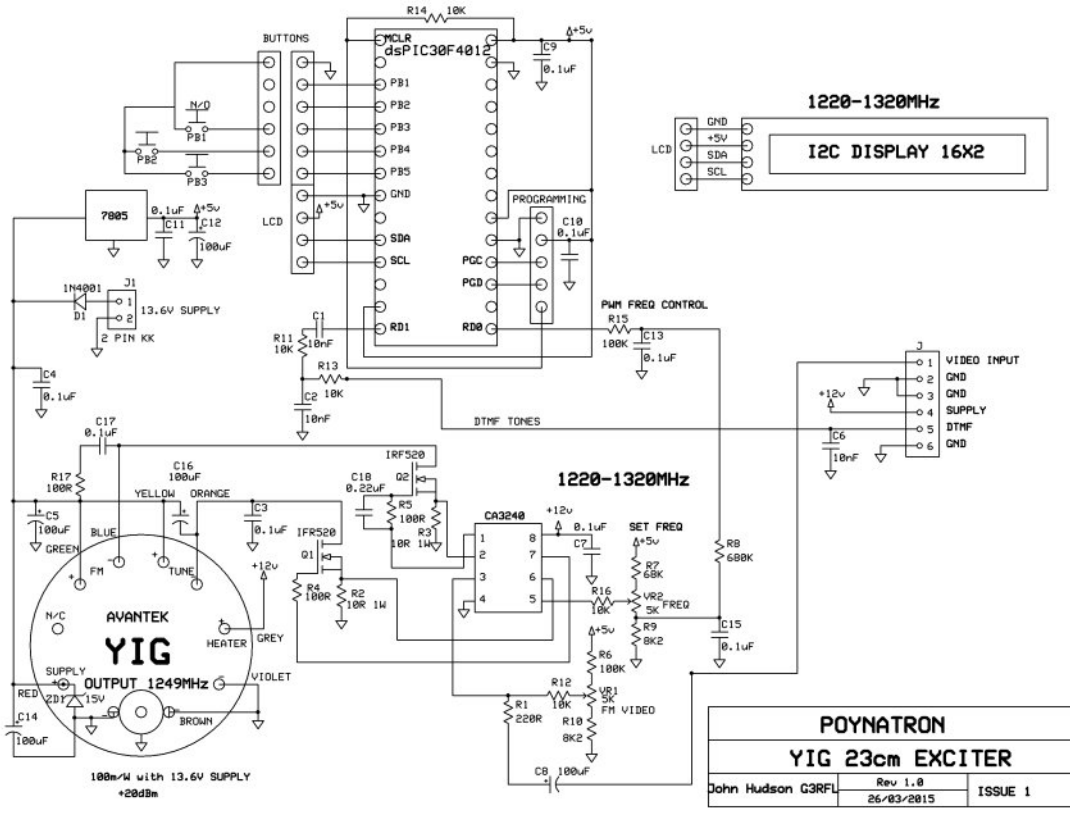
However, the STELLEX devices I used in GB3FY have built in magnets, so they just cover a small frequency range. My STELLEX 6755 728 covers 9.5 to 10.43GHz, and without any power being applied to the coil it runs at 9.985GHz.

The control coils (yes there are two) can add or subtract from the frequency. The main coil is about 15 ohms and creates a lot of frequency change per m/A of applied current. The smaller FM modulation coil is about is 1 ohm and has an inductance of 2uH. Driving this inductor was the first problem, not too difficult up to 500 KHz, but above that frequency we need some sort of EQ or current drive, to compensate for the inductance. So far, I am still in a learning curve, but I have managed without any serious equipment to create a watchable modulation system good enough for ATV.

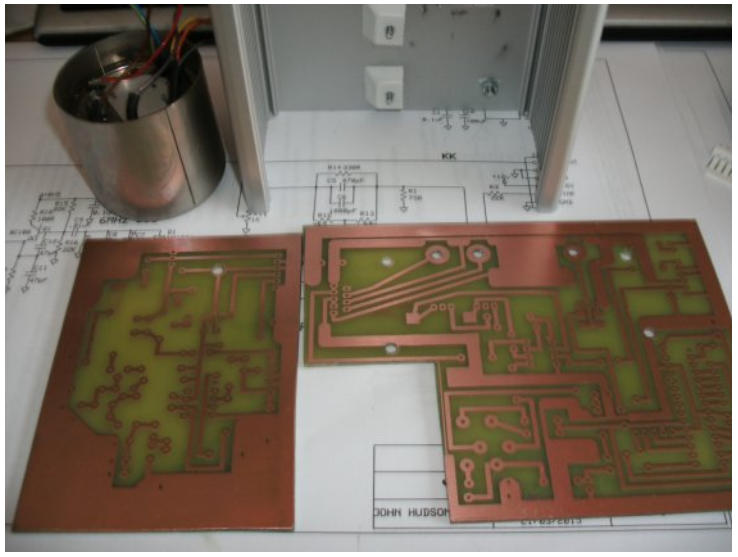
For my 23cms I used an Avantek YIG again purchased form eBay, in common with the Stellex unit it has two coils one that can add or subtract from the frequency. This coil is about 15 ohms and creates a lot of frequency change per m/A of applied current.

The smaller coil is for FM modulation and is about is 1 ohm and has an inductance of 2uH. Driving this inductor was the first problem, not too difficult up to 500 KHz, but above that frequency we need some sort of EQ or current drive, to compensate for the inductance. So far, I am still in a learning curve, but I have managed without any serious equipment to create a watchable modulation system good enough for ATV

Fig 1 shows the circuit design that I have developed to evaluate the unit.



Construction again using two home etched PCB's



Both coils are driven with by IRF520 FETS which are in turn driven from one half of a CA3240 op amp (not too dissimilar to my original 10GHz design). The PIC is programmed with a look up table to match the displayed frequency to a given voltage that will adjust the YIG via the main coil to match. The PIC driven display is via and I2C interface to a 16x2 LCD display. I did include VR2 for calibration purposes so that is the YIG was replaced the look up table would not need to be re written, but the stability and ability to change the YIG with little adjustment shows testament to the stability and interchangeably of these units.

The smaller modulation coils are driven in a similar manner, but here we limit the current to 200m/A just in case you have a fault to protect the coil. The modulation of this coil requires CCIR 405 Pre emphasis in, in order to compensate for the poor spectral energy in the FM side bands, which reduces in power as the modulation frequency increases. All the FM ATV receivers have as standard CCIR De emphasis, so there are no options, it must be part of the modulator.

Being me, I added a rather fetching box just to finish the unit off and keep sticky fingers out of my work.

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