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Editorial

Welcome to CQ-DATV 45 as you will see from the news, we have our first battle over the frequencies used by Television Equipped Drones. CQ-DATV has been following this technology and has publish several articles including in this issue, “Getting Television Off the Ground” a look back at this technology over the years, from the early days to modern equipment.

CQ-DATV can in no way condone using unauthorised frequencies and support the ARRL in their communication to the FCC. This technology is exciting and growing, but must be subject to the controls that govern use of the Radio Spectrum.

Also in CQ-DATV 45 news The DATV-Express project team has announced that the DATV-Express hardware boards are again in stock. You can order a board from the www.DATV-Express.com website using the link. You must register on this web site to purchase a board. All boards will ship from USA.

Our new column, Micro Corner, has Mike G7GTN, describing the ESP8266 “Smorgasbord” for project development - Part 1.

Ken W6HCC has been looking at the MiniTiouner receiver/analyser for Digital-ATV. For those of you not familiar with this project, it is the brainchild of Jean-Pierre F6DZP who has been modifying Digital-ATV receivers for the DVB-S protocol with software for years - in order to allow the tuner to provide the information that hams need.

Ian, our ePub compiler, has found an explanation of the use of CEC, a little-known one-wire bus, snaking its way through your HDMI products.

CQ-DATV Production team


DKARS MAGAZINE

De Stichting DKARS wenst u een voorspoedig 2017

In dit nummer/on this edition:

- Valbeveiliging en juist gebruik van middelen
- Hoe meet je het lineaire gedrag van je transceiver of eindtrap ?
- XX9TGM, Macau
- Een FUN-stukje door PA9JOO/P
- Write your own logbook
- And much nore...

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ISSN: 2452-1809

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Januari 2017 editie 30

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DATV-Express boards back in inventory

The DATV-Express project team is pleased to announce that the DATV-Express hardware boards are again in inventory at this time. Project production manager, Art WA8RMC, has finished inspecting assembled units and testing this next batch of hardware boards. After unexpectedly being flooded by orders around the end-of-the-year, the project team had to stop accepting orders for boards. The PayPal ordering button has now been reactivated on the project website. You can order a board from the www.DATV-Express.com website using the PURCHASE A BOARD link (along the top). You must Register on this web site to purchase a board. All boards will ship from USA.

Es'hail-2.

With the success of Es'hail-1 and the growing demand for a range of satellite services in the MENA region, we are currently working on the manufacture of our second satellite Es'hail-2.

Scheduled for launch in 2018, this high-powered, advanced satellite will further boost broadband delivery, broadcasting and global connectivity in Qatar, the entire region and beyond.

Es'hail-2 is being manufactured in Japan by MELCO (Mitsubishi Electric Corporation).

Es'hail-2 will have Ku-band and Ka-band capabilities and support TV distribution, telecoms and government services to strategic stakeholders and commercial customers who value broadcasting independence, interference resilience, quality of service and wide geographical coverage.

The satellite will also provide greater capability for anti-jamming protection and redundancy and back-up for Es'hail-1.

Es'hail-2 will also provide the first Radio Amateur Satellite Corporation (AMSAT) geostationary communication capability that connects users across the visible globe in one single hop and in real-time.

It will allow also the AMSAT community to validate and demonstrate their DVB standard.

Source:
https://www.eshailsat.qa/en/satellites/index/#tab-16

BATC meeting date fixed

We are pleased to announced that CAT17 will see BATC return to the Finningley Amateur Radio club near Doncaster on the weekend of September 9th and 10th.

Unfortunately there are no rooms available at the Reindeer in Sandtoft on Saturday night but we do hope to hold our informal meal there. However, the Travelodge at the Junction of the M180 and M18 (only 4 miles away) currently has rooms for £31 so get in quick!

More details nearer the time but thanks to Kevin and the team for the invitation.

Source:
http://www.batc.org.uk/forum/viewtopic.php?t=4842&p=11861#p11861

Illegal drone transmitters

The ARRL has filed complaints with the USA FCC against the frequencies used by a drone manufactured by Lawmate.

The Lawmate transmitters use frequencies intended for navigational aids, air traffic control radar, air route surveillance radars, and global positioning systems. Some of the transmitters operate on frequencies between 1010 and 1280 MHz.

1040 and 1080 MHz would directly conflict with air traffic transponders and represent the greatest threat to safety of flight. 1010 MHz could also create problems for air guidance.

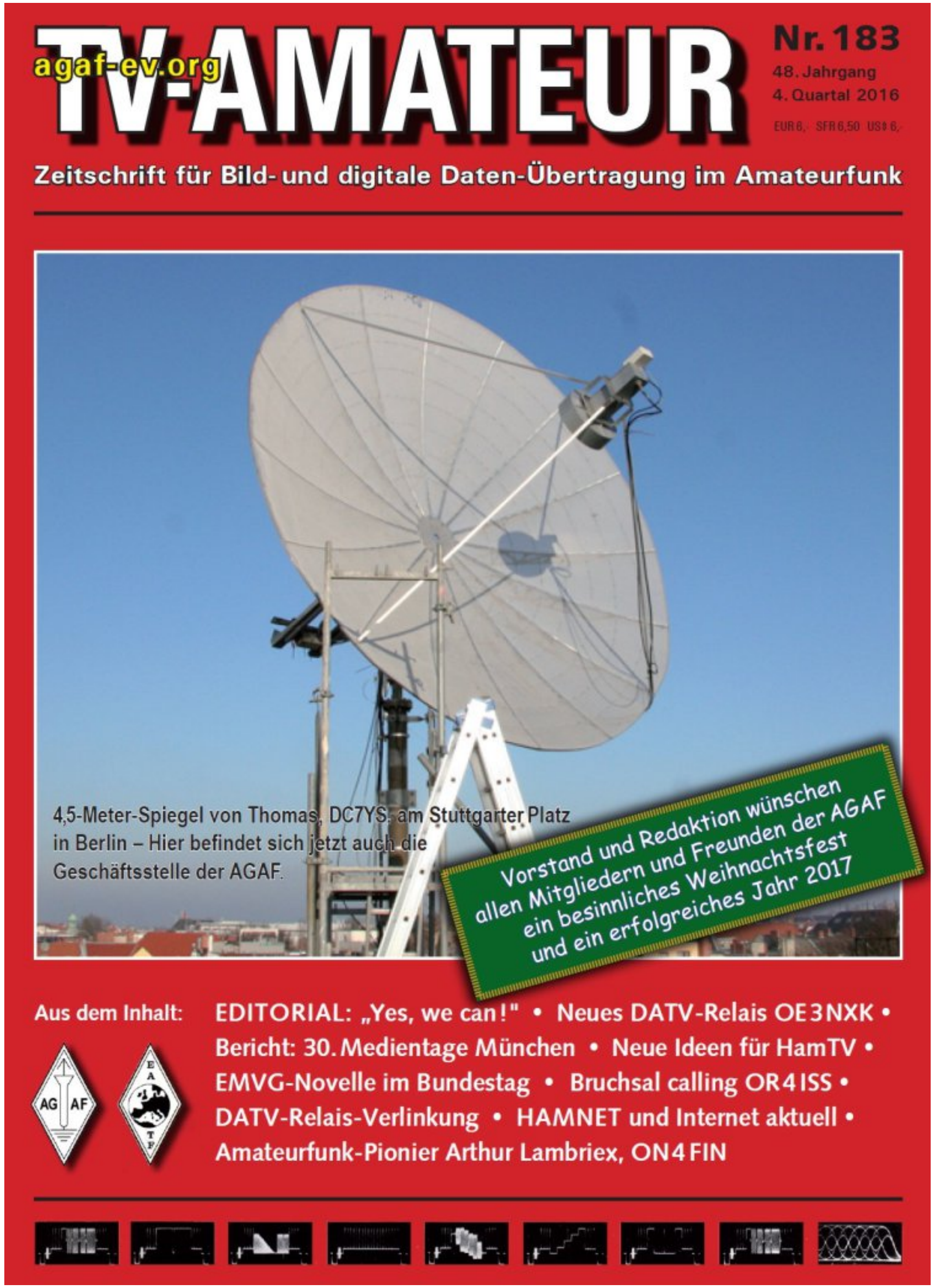
Only one frequency, 1280 MHz, is within ham radio bands...and even that frequency conflicts with “ARRL band plans” by using a frequency allocated for radio location use.

According to March 2017 issue of QST magazine, the Lawmate 6W unit is rated at six times over legal power limit, and not marked with any FCC ID number.

The ARRL believes the drone is targeting a market of drone hobbyists, and not ham radio....and is “blatantly illegal at multiple levels”.

The ARRL has told the FCC Spectrum Enforcement Division that they think these Lawmate units should be immediately removed from the marketplace.

Source: www.arrl.org



TV Amateur is a German Language ATV Magazine It is published 4 times a year and if you would like to subscribe go to http://agaf-ev.org/ NOTE new URL

DATVtalk16 - The MiniTiouner Receiver/Analyzer for Digital-ATV

by Ken W6HHC
Reproduced from the Orange County Amateur Radio Club newsletter. www.W6ZE.org

[Please Note – This is the Sixteenth article in a series of DATVtalk articles to introduce Digital-ATV to hams and to explain various aspects of this new area of ham radio. In the CQ-DATV5 issue, the DATVtalk02 article was an introduction article about basic Digital-ATV. This latest DATVtalk article describes an extremely useful DATV receiver/analyzer called MiniTioune.]

Jean-Pierre F6DZP has been modifying Digital-ATV receivers for DVB-S protocol with software for years - in order to allow the tuner to provide information that hams need. The main problems with commercial DVB-S receivers are (a) that if the signal is not good enough - they show only the “blank screen of death” and (b) they do not work with smaller Symbol Rates that some hams want to use. The MiniTiouner receiver/analyzer solves these two problems.

The MiniTiouner Unit

The MiniTiouner is a second-generation DATV receiver/analyzer for hams and is USB2based. Figure 01 shows a block diagram of the MiniTiouner Receiver/Analyzer connected to a PC desktop or portable.

The MiniTiouner makes a great receiver for receiving and displaying ham DATV signals, including from the International Space Station (ISS) broadcasts from Ham-TV transmitter.

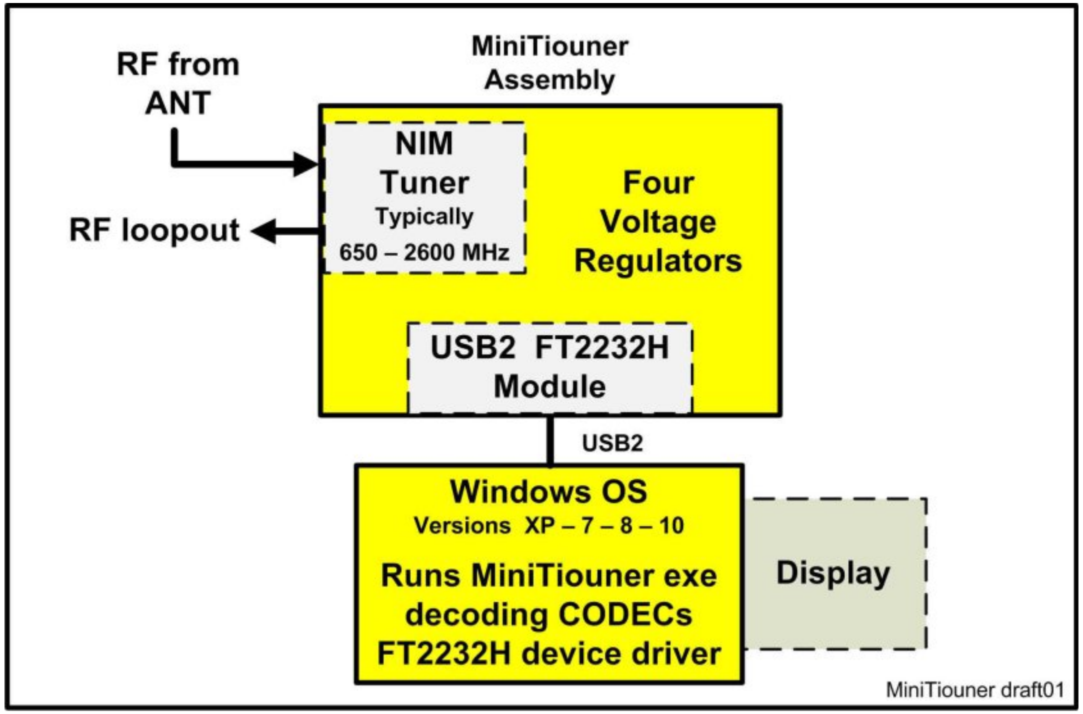


Fig01 – Block Diagram of MiniTiouner set-up for receiving DVB-S and DVB-S2 protocol

Figure 02 shows the construction and main components of the MiniTiouner assembly. The NIM-tuner, assembled FT2232H USB module, a hard-to-find 1.0 V regulator, and blank board can be purchased from the BATC online store. Other components can be ordered individually from an on-line electronic distributor like Digi-Key (some soldering is necessary).

The USB-2 controller module is a preassembled module and plugs onto the main PCBA by a pair of dual-inline connectors.

The MiniTiouner Receiver

The MiniTiouner makes a great receiver for DVB-S and DVB-S2 protocols. Figure 03 shows the uncluttered video display on your Windows PC.

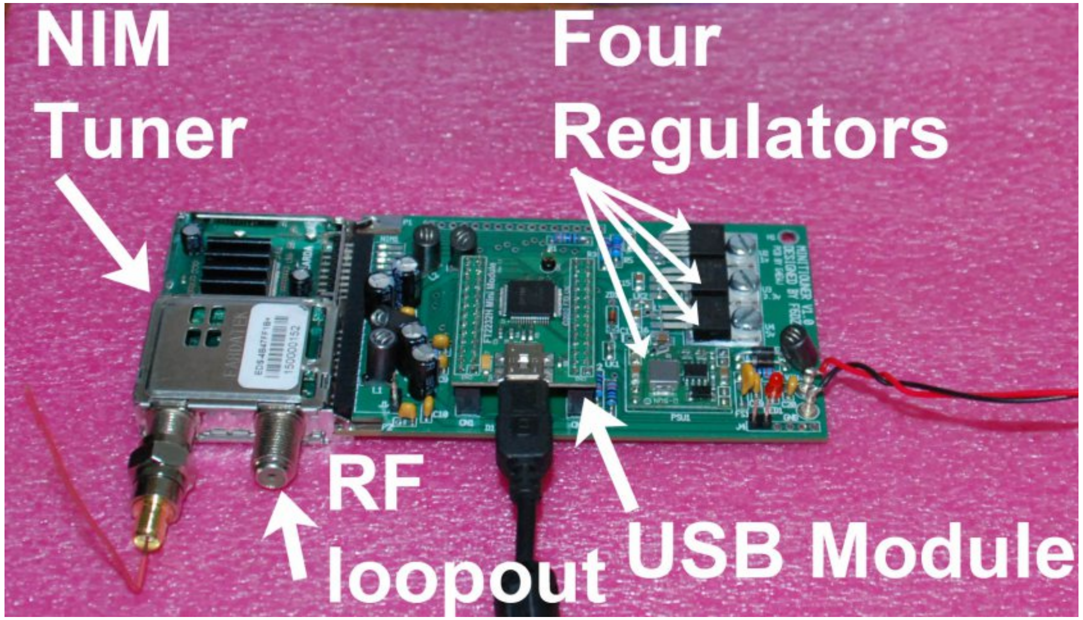


Fig02 – Main Components of the MiniTiouner Analyzer/Receiver

The MiniTiouner can accept NIM-tuners manufactured by different companies. Typically the “direct frequency range” of these TV tuners is from around 650 MHz to 2600 MHz. By adding the appropriate “up-converter” or “down-converter” in front of the receiver’s antenna connector, hams can receive DATV signals from 50 MHz to 10 GHz (and above). Video can be displayed in the video aspect ratio of 4:3 or 16:9 or even square (1:1).

The MiniTiouner Analyzer

The MiniTiouner is also a ham-radio analyzer tool for DVB-S protocol and DVB-S2 protocol. As Jean-Pierre F6DZP clearly explains: “On commercial receivers the DATV video is either good or missing...perhaps only with a signal strength reading to guide you. With MiniTiouner, Digital transmissions are not really ‘all or nothing’, in between there are many things that can happen; it’s important to be able to observe and define the various stages.”

The MiniTiouner as an analyzer can be switched into the “expert-mode” to:

- measure signal strength directly in –dBm units
- look at encountered FEC error rates,
- measure MER (Modulation Error Rate)
- visualize noise on modulation “constellation”
- deviation of frequency received
- deviation of Symbol Rate received
- display PIDs for video and audio
- confirm selection of H.262 H.264 or H.265
- enable/disable “anti-rotation”
- ...and the list goes on.

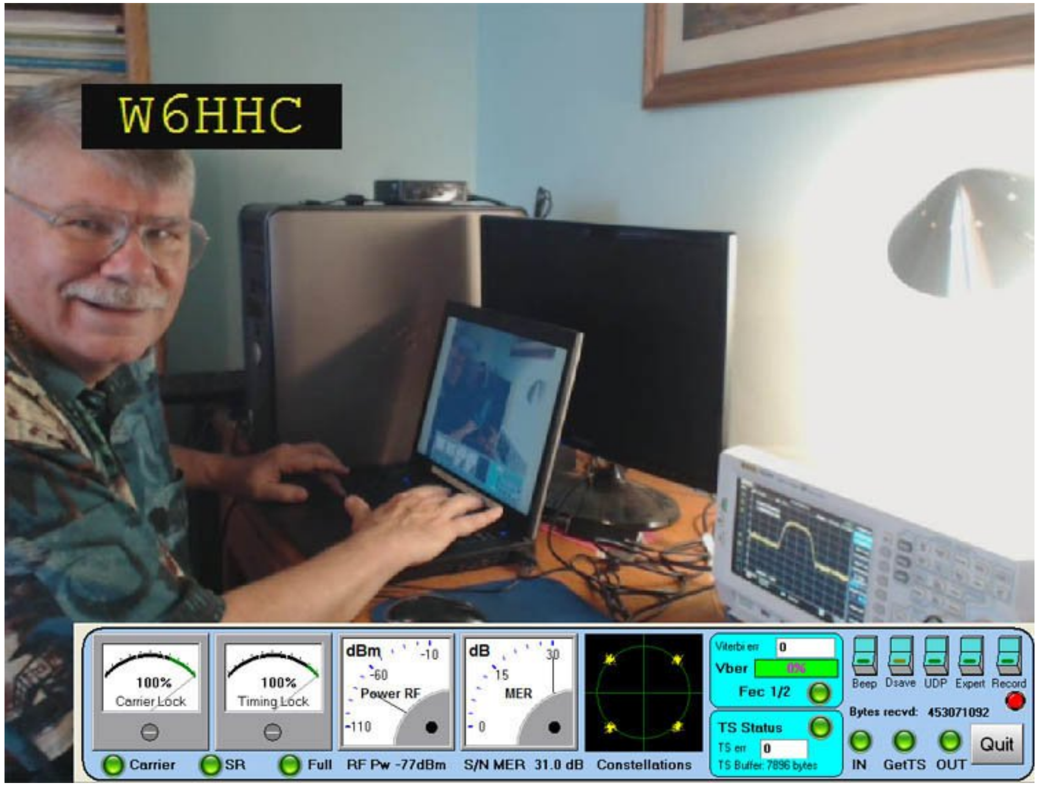


Fig03 - The MiniTiouner shown in receiver-mode for DVB-S. The Measurement-Panel at bottom can also be removed

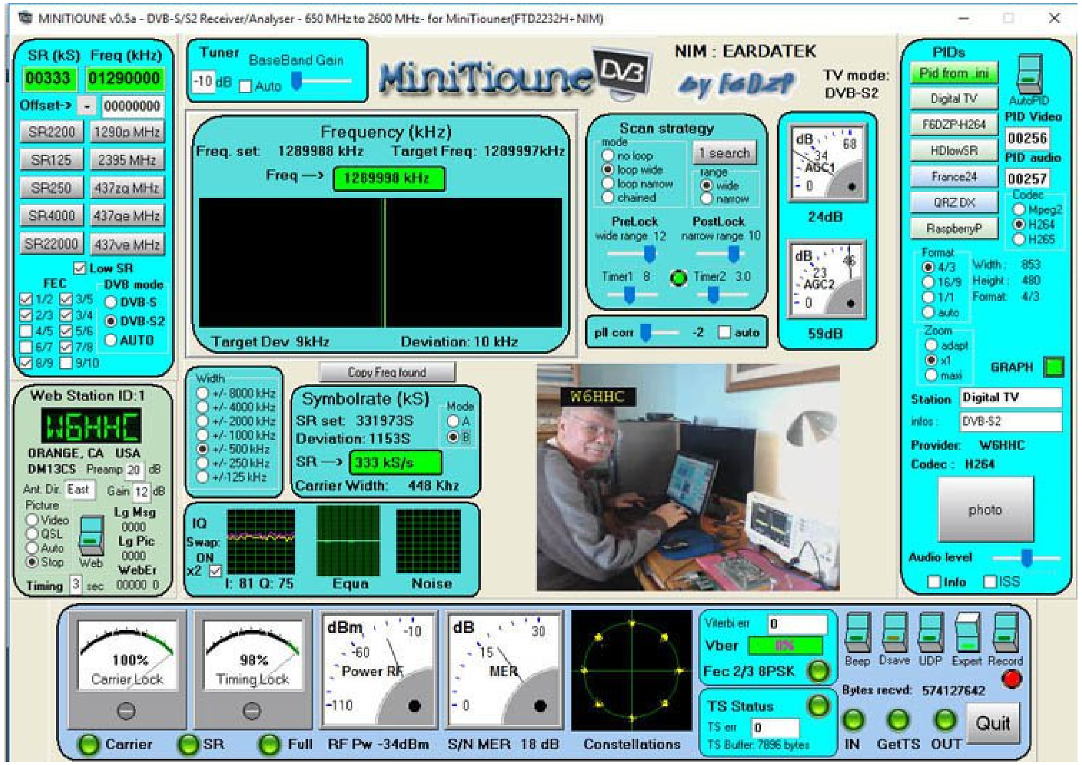


Fig04 - The MiniTiouner design by F6DZP is an excellent analyzer for DVB-S and DVB-S2. Shown in analyzer-mode (AKA “Expert” mode) looking at 8PSK modulation “constellation”.

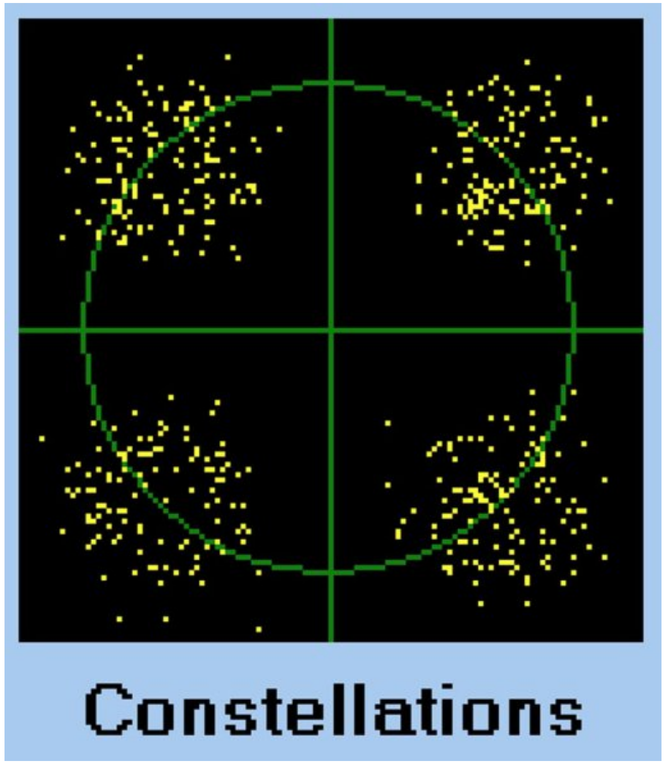


Fig05 – The MiniTiouner analyzer permits observing the “constellation” of the received DATV modulation (weak-signal QPSK in this case).

Figure 04 shows a typical the control panel display for the “expert mode analyzer” mode of the MiniTiouner for a DVB-S2 transmission.

Figure 05 displays a typical weak-signal modulation “constellation” for inspection (QPSK modulation in this screen-capture). There is a lot of noise being seen compared with the received DATV signal.

This “constellation” display also allows you to observe the quality of the modulation constellation being transmitted by your station (especially if your I and Q modulator gains have not been balanced).

Reduced-Bandwidth DATV

In 2015, hams in England were provided with a newly opened, but temporary, segment of 2 Meters (from 146.0 through 147.0 MHz.

The challenge made to the hams in England was to only use this new frequency segment for digital forms of communications (not just more FM repeaters) and to perhaps also invent a way to produce DATV in 0.5 MHz RF bandwidth...instead of just using the more typical 2 MHz RF bandwidth for DVB-S!! This new narrow band DATV mode is called RB-DATV.

Hams in England and France responded with enthusiasm and clever work to make this happen. The DATV-Express software was changed by Charles G4GUO to lower the Symbol Rates to 333 kSymb/sec (and lower) with changes to the anti-alias filters (all in software) to produce low-SR transmissions. Jean-Pierre F6DZP looked at the software of the older TuTioune design and the newer MniTioune design and with much perseverance was able to allow the MiniTioune RB-DATV reception to work down to less than 125 kSymb/sec (RF bandwidth around 170 KHz). Hams in England started setting distance records on the 2M band with DATV QSO's. These pioneering hams also observed that transmitting H.264 encoding with DVB-S protocol (instead of the normal MPEG2) provided a better (smoother) low SymbolRate video. Noel G8GTZ explained to me that the significantly better low-SR video quality seen on the receiver is due to the H.264 design using a more suitable macro block size.

Then even more benefits were confirmed (or better understood) from using RB-DATV than just reducing RF bandwidth to meet regulations. Reducing that bandwidth of the DATV transmission also increased the signal/noise (aka C/N) performance at the receiver. If you use the same transmitter power...but cut the signal bandwidth by one-half (perhaps going from 2 MHz to 1 MHz) then the receiver is looking at less noise (power) and therefore the signal/noise ratio is doubled (3 dB better)

Power required vs dish size vs bandwidth					
	8MHz	4MHz	2MHz	1MHz	0.5MHz
2.4m	100	50	25	12.5	6.25
1.7m	200	100	50	25	12.5
1.2m	400	200	100	50	25
0.85m	800	400	200	100	50

Fig06 – Comparing power required at transmitter as channel-bandwidth of Receiver gets smaller. (courtesy of Rob M0DTS)

Figure 06 shows that the power required at transmitter gets smaller as the channel-bandwidth of receiver is reduced: 25W for 2 MHz BW, 12.5W for 1 MHz BW and 6.25W for 0.5 MHz BW. Conversely, the same transmitter power will go further as the channel-bandwidth of the receiver gets smaller (and the signal S/N at receiver gets improved). [Note - this table was originally created by Rob M0DTS as he planned for ground stations transmitting on 2.4 GHz band to the future DATV satellite.]

Noel G8GTZ also pointed out to me that use of the RB-DATV approach is NOT limited to just the 2M band. Creating a more robust signal on 440 MHz, 1.2 GHz and even 10 GHz band by using RB-DATV communications theory also stretches the ability to work DX.

Receive DATV from ISS

Receiving DATV from the HamTV transmitter on the International Space Station (ISS) consists of dealing with three "hurdles" for hams:

- The ISS Is a moving target and you need a tracking antenna rotator.
- The ISS moving in orbit creates Doppler shifts in frequency.
- The DATV transmitter on ISS contains issues that prevent the video and audio PIDs from being inserted in the signal normally.

The MiniTioune can overcome the last two ISS challenges in software.

The MiniTioune software package also include a tool called Tioune Data Reader.

In Figure 07, the green bar at the top shows where a "solid DATV lock" occurred on this pass of ISS.

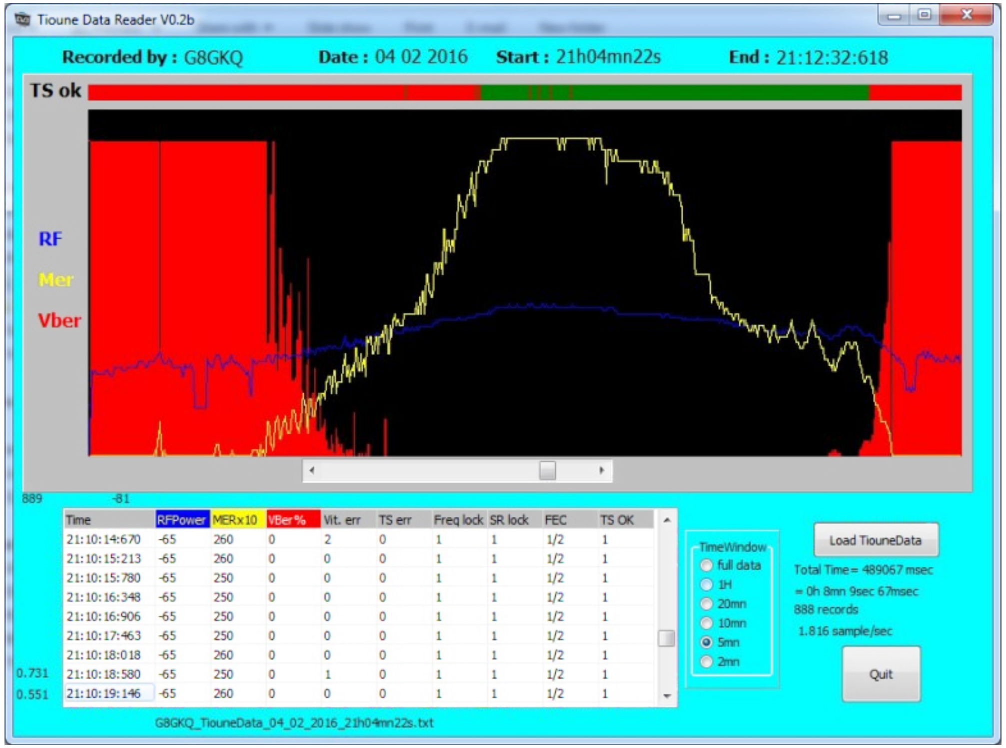


Fig07 – The Tioune Data Reader tool allows plotting the receiver DATV parameters during ISS pass. (Courtesy of Dave G8GKQ)

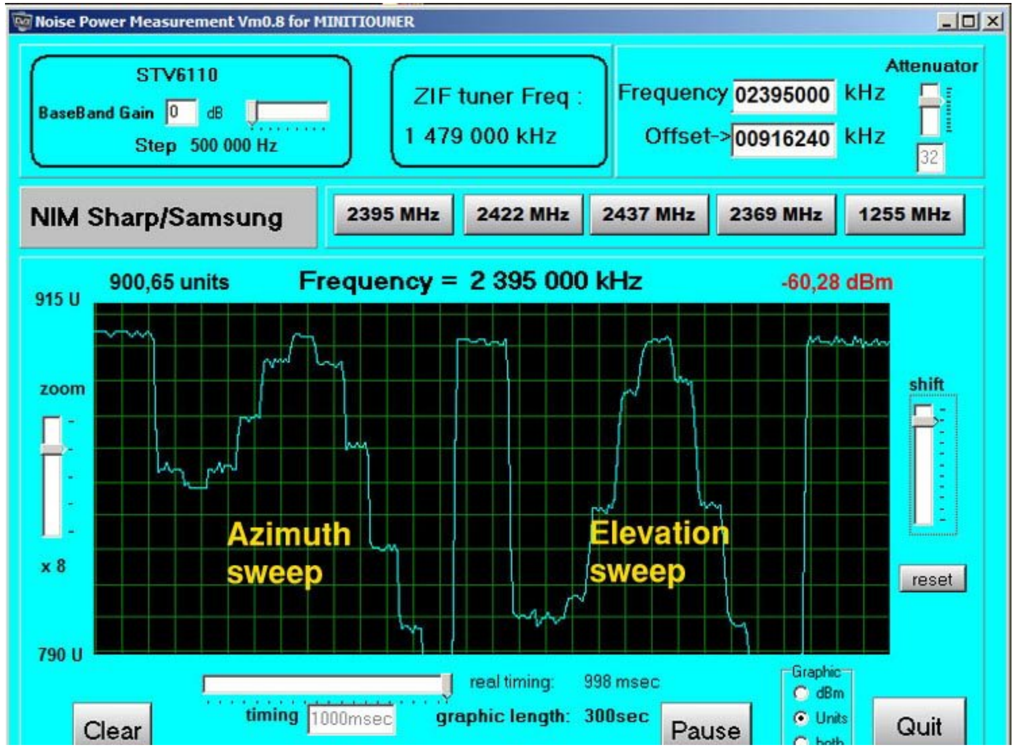


Fig08 - Display of Noise Power Measurement tool sweeping the Sun with antenna rotator (Courtesy of Jean-Pierre F6DZP)

Noise Power Measurement Tool

The VivaDATV website for MiniTioune software also contains another software package tool called NPM_USB.zip. The NPM tool can be used for (a) measuring the Sun noise, (b) sweeping their antenna dish around the good value, to be sure their antenna rotator tracking is set correctly (see Figure 08) or (c) for observing the noise/interferences.

In the example shown in Figure 08, we are tracking the Sun, sweeping the antenna at -10°, -8°, -6°, -4°, -2°, 0°, +2°, +4°, +6°, +8°, +10° in azimuth and in elevation. At 0° we must have the top of the pyramid.
If you obtain a symmetric pyramid, then your antenna is set well.

Software and Hardware

The BATC organization for ATV and DATV has created a terrific wiki site to place useful information in one (repository) web location. Included in the BATC wiki is a section devoted to the MiniTiouner details for hardware and software. (See the BATC wiki URL at the end of this article.) The wiki info on MiniTiouner is organized as five areas:

1. Hardware overview
2. Hardware parts-list and Assembly
3. Software Downloads
4. Software Installation
5. Receive up-converters and RF BP filters

Specifications (with MiniTioune v0.5a software)

- NIM-tuner frequency range – typically 650-2600 MHz
- DATV Protocols – DVB-S and DVB-S2
- Modulation constellations – QPSK, 8PSK
- Symbol Rate – 100 k –to– 22000 kSymb/sec
- Decoder CODECs - H.262 (MPEG2), H.264, H.265
- O/S – Windows XP, 7, 8, 10
- PC interface - USB-2
- Windows device driver – FT2232H from FTDi-chip
- Board power input voltage – 9–16 VDC.
- Assembled board size - approx 5.625 x 2.25 inches

Note that you must be registered on the VivaDATV.org website in order to download the MiniTioune software.

Plans

Jean-Pierre has discussed on DATV forums that he is interested in using a new NIM-tuner manufactured by Serit in Korea. The advantage of this Serit model FTS-4335 NIM-tuner is that the frequency range goes from 144 MHz up to 2450 MHz.

That means that the up-convertors would no longer be needed in order to receive on the 2M band and the 70cm band. Note that the pin assignments on the SERIT NIM-tuner are different than the first batch of NIM-tuners by SHARP and EARDATEK. So changes to the current MiniTiouner PCB board or an adapter cable may be necessary to use the SERIT NIM-tuner.

On the current v0.5a software for DVB-S2, only demodulators for QPSK and 8PSK are operational via the current SHARP and EARDATEK NIM-tuners.

In the future, the use of SERIT NIM-tuner can provide demodulation implementations for the other DVB-S2 modulation technologies of 16APSK and 32APSK.

Conclusions

Jean-Pierre F6DZP has provided hams with a very useful DATV analyzer. In addition, his design produces a DATV receiver that has capabilities that hams want...but are not provided by commercial DVB receivers. It is my favorite DVB-S/S2 receiver...so easy to use compared to commercial Set-Top-Box receivers!! I also want to give a very large “Thank You” to F6DZP for his help to me whenever I had difficulties or questions with my installing/testing of MiniTiouner.

Useful URLS

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

BATC wiki site https://wiki.batc.tv/MiniTioune

CQ-DATV online free monthly e-magazine www.CQ-DATV.mobi

Orange County ARC newsletters DATV articles and DATV presentations www.W6ZE.org/DATV/

Yahoo Group Forum for Digital ATV
https://groups.yahoo.com/neo/groups/DigitalATV/info/

VivaDATV forum
http://www.vivadatv.org/viewforum.php?f=80 (English section)

Noise Power Measurement page
http://www.vivadatv.org/viewtopic.php?f=60&t=365

Contact Info – W6HHC@ARRL.net

Micro Corner - The ESP8266 “Smorgasbord” for project development - Part 1

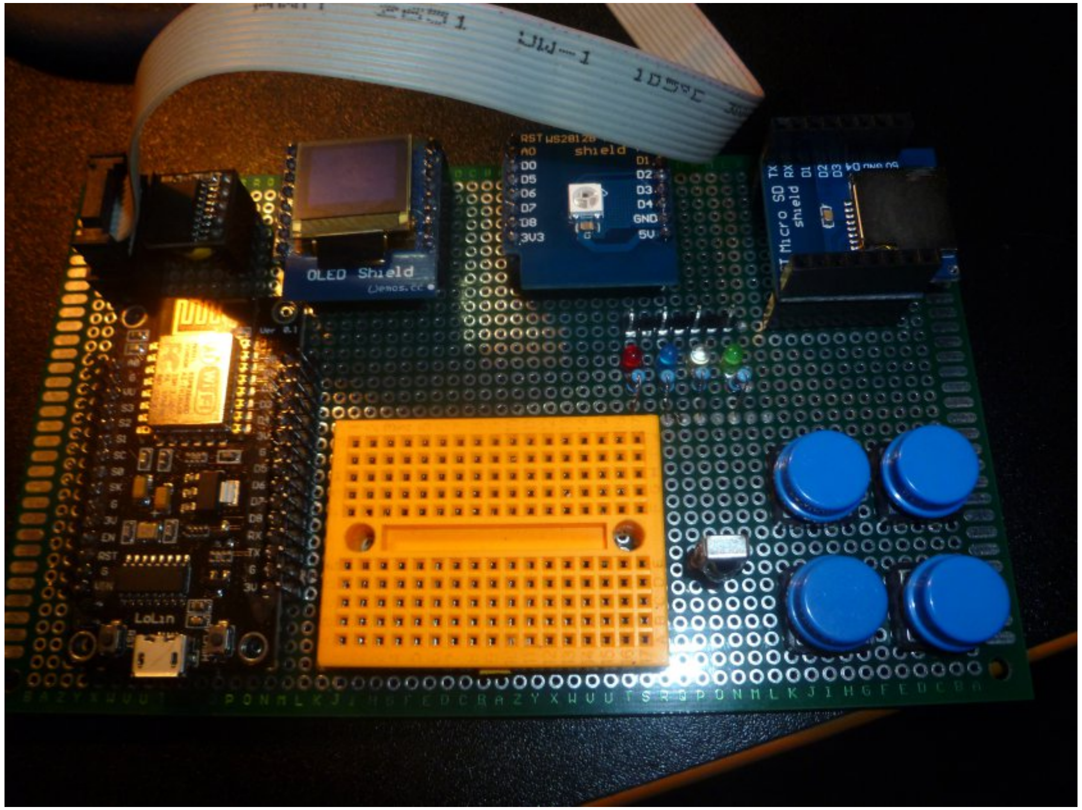
Mike Stevens G7GTN

Introduction

For doing some development on the ESP8266 modules I put together a very simple little development board to allow easier or faster prototyping of projects. Called the Smorgasbord (electronic buffet of sorts) as allows the individual constructor the opportunity to integrate the parts they develop with the most.

For me I knew that many of the parts were going to be controlled via the I2C bus so have fitted a small DS3231 Real-time clock module, 24LC512 Eeprom device hidden under the OLED (64X48) display. These three individual parts are all hard wired to the ESP8266 NodeMcu module I2C SCL being on D1 and SDA on D2 I/O pins as now fixed assignments.

The other modules that I decided to use from the WeMos D1 shield range can be mixed and matched reasonably freely with the proviso about +5V powering.

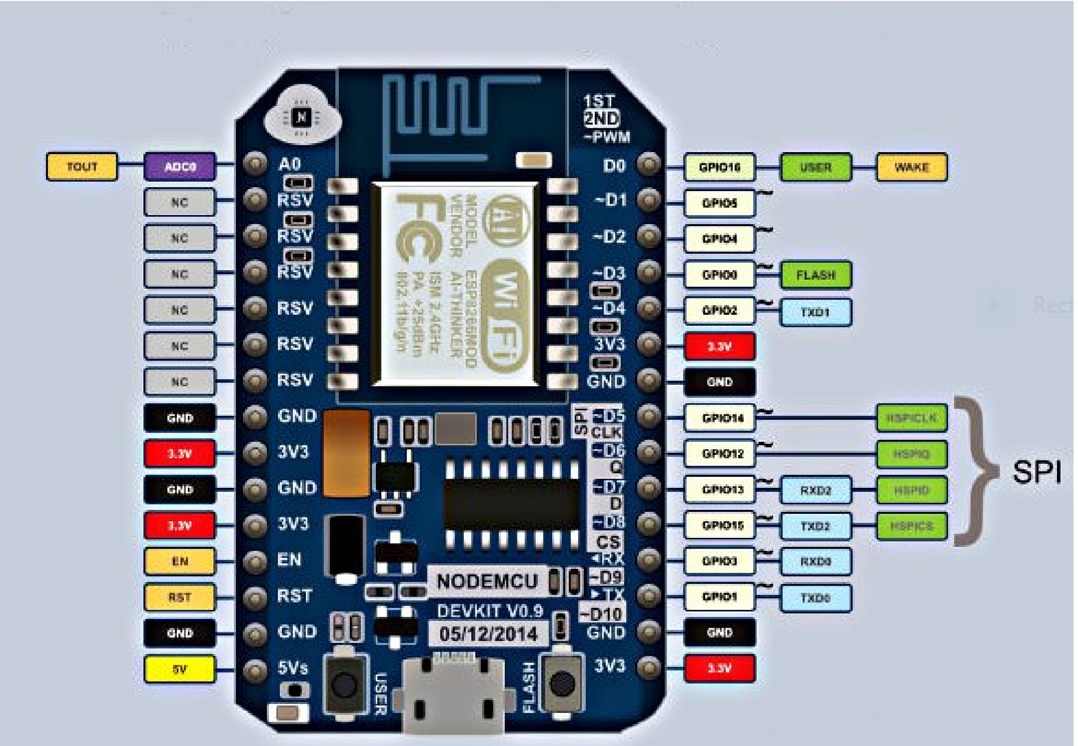


This only applies to the WS2812B RGB LED and Relay module the others are all being powered directly by a normal 3V3 supply taken from the NodeMcu ESP8266 module used on the card.

Because our available I/O is still somewhat limited it stands to reason that not all the modules or individual components on the card can be used at the same time.

With reference to the chart we can identify the modules from the WeMos range that will work well together. This still works reasonably well for me at present with the types of control projects I actually envisage using the modules for.

This will become a non-existent problem when the new ESP-32 range is more commonly available for purchase.



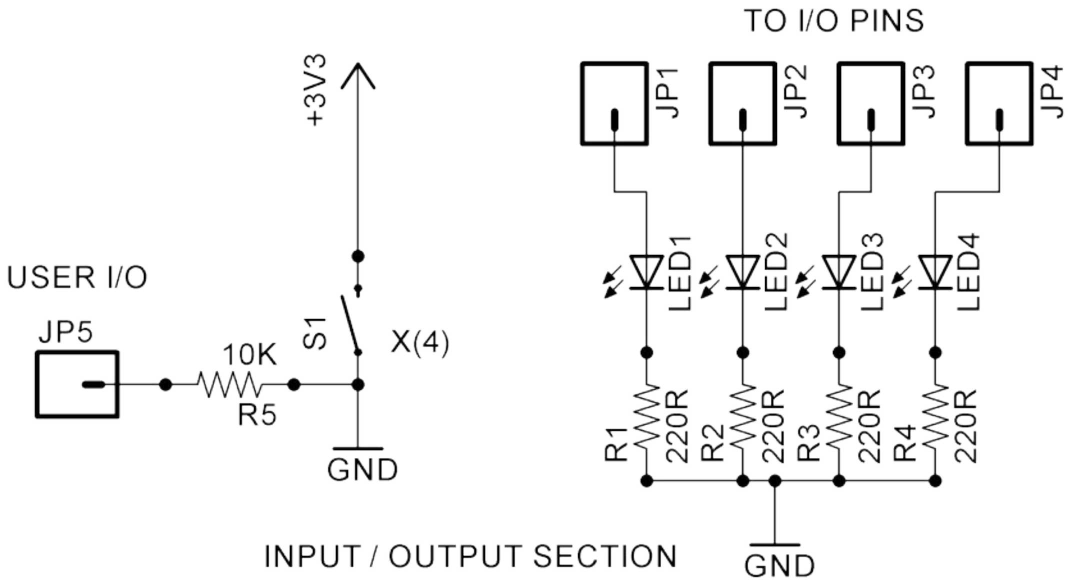
The Pinout of the ESP8266 NodeMcu board and compatibility with WeMos D1 Shields

Shield	D1	D2	D3	D4	D5	D6
OLED	SCL	SDA				
Relay	Contact					
MicroSD					CLK	MISO
Motor	SCL	SDA				
DHT Pro				Data		
DHT				Data		
DS18B20		Data				
WS2812B		Data				
BMP180	SCL	SDA				

As Trevor G8CJS has already been demonstrating we still have the option to use I/O expanders such as the PCF8574 to increase our useable pin count. This has the benefit of sitting on the I2C bus and thus not requiring any additional pins and providing we can then write software to control this is a fully workable solution. We can of course move this exact same principal towards such slightly newer devices as the Microchip MCP23017 16 port expander and gain further available I/O facilities. I2C seems to be an appropriate direction to go here. This allows us to still use the SPI bus alongside for modules such as the SD card shield.

User Inputs & Outputs

The LEDS are connected to 220Ω resistors to ground, with the other ends being connected to your required I/O pin on the processor module. The four push button switches are all connected to ground with the 10K resistors to the requisite I/O Pin you wish to use from the 4 way male pin header. The headers are to allow small jumper cables to be attached with a male pin on the other end (if required) to further allow the use of the small yellow breadboard that was attached to the proto card.



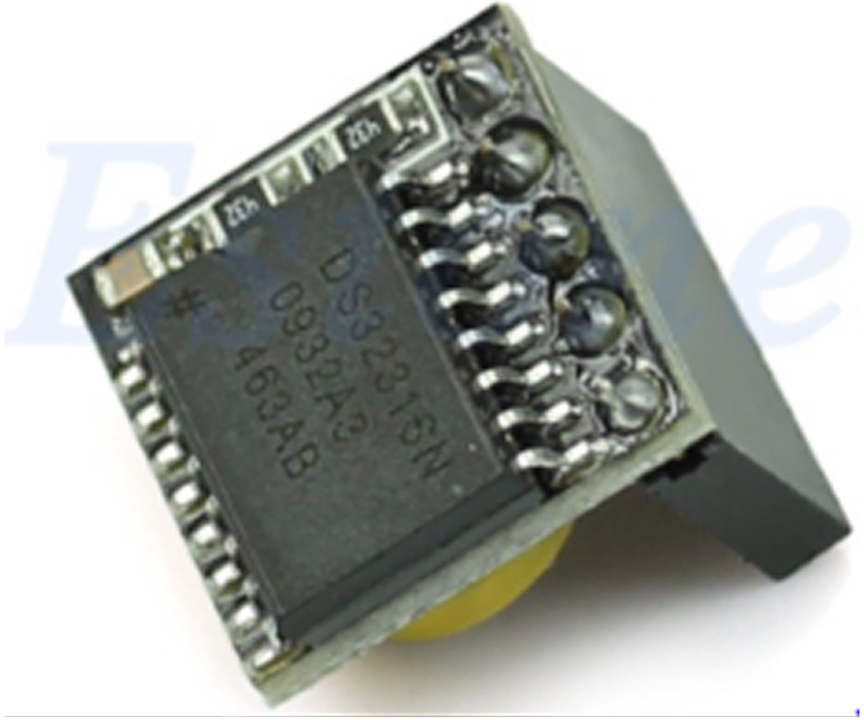
INPUT / OUTPUT SECTION
SWITCHES & LEDS

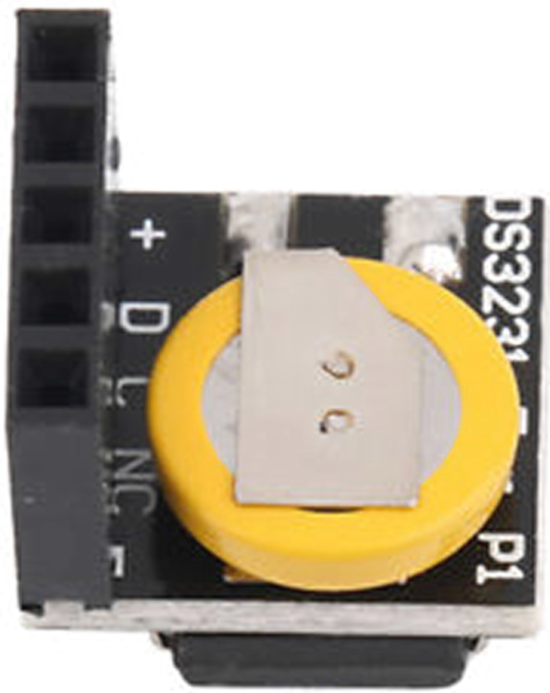
DS3231 Real time clock & 24LC512 64K Eeprom

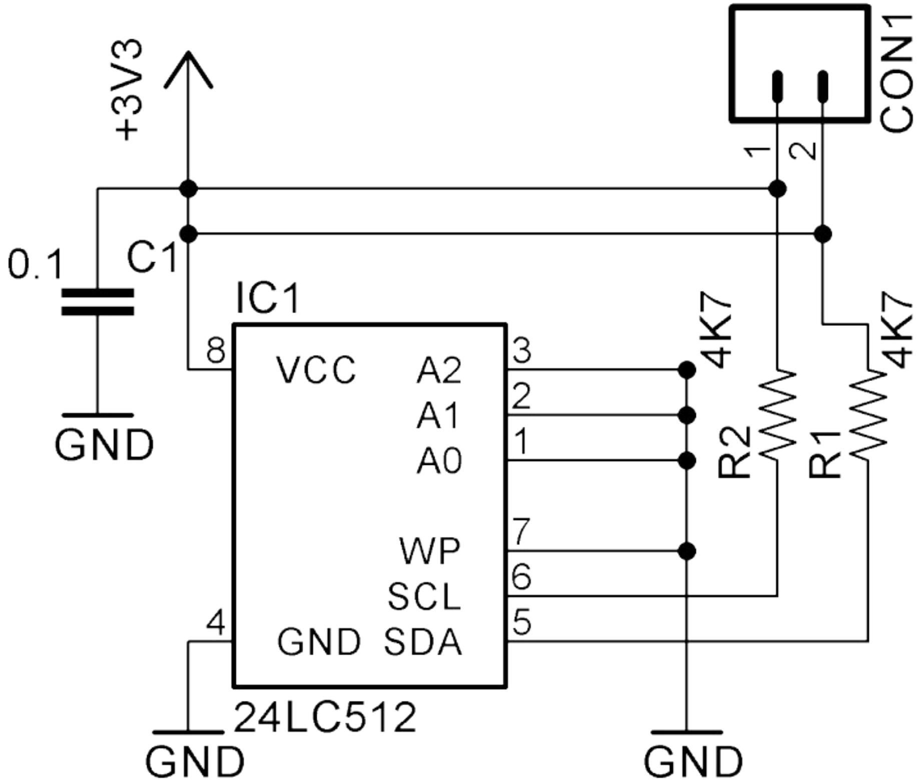
A simple solution was sought to provide a real time clock for when the ESP is not connected to the internet to be able to retrieve the time from a Network Time Protocol (NTP) server. A little eBay module based on the DS3231 had that problem resolved and being I2C controlled required no extra I/O pins. These two modules seem to be commonly available one with an additional Eeprom whilst the second one loses this but gains on being a smaller size. I believe this was originally intended to be used on the Raspberry pi range of single board computers.

Unlike the majority of the I2C devices the address of the DS3231 is hardware fixed at (0X68) hexadecimal.

The 24LC512 64K Eeprom address can be set by tying the A0 – A2 pins in different combinations of either +3V3 or GND. In my implementation these three pins were all taken to ground to give an address of (0X50)







Layout & General Construction technique

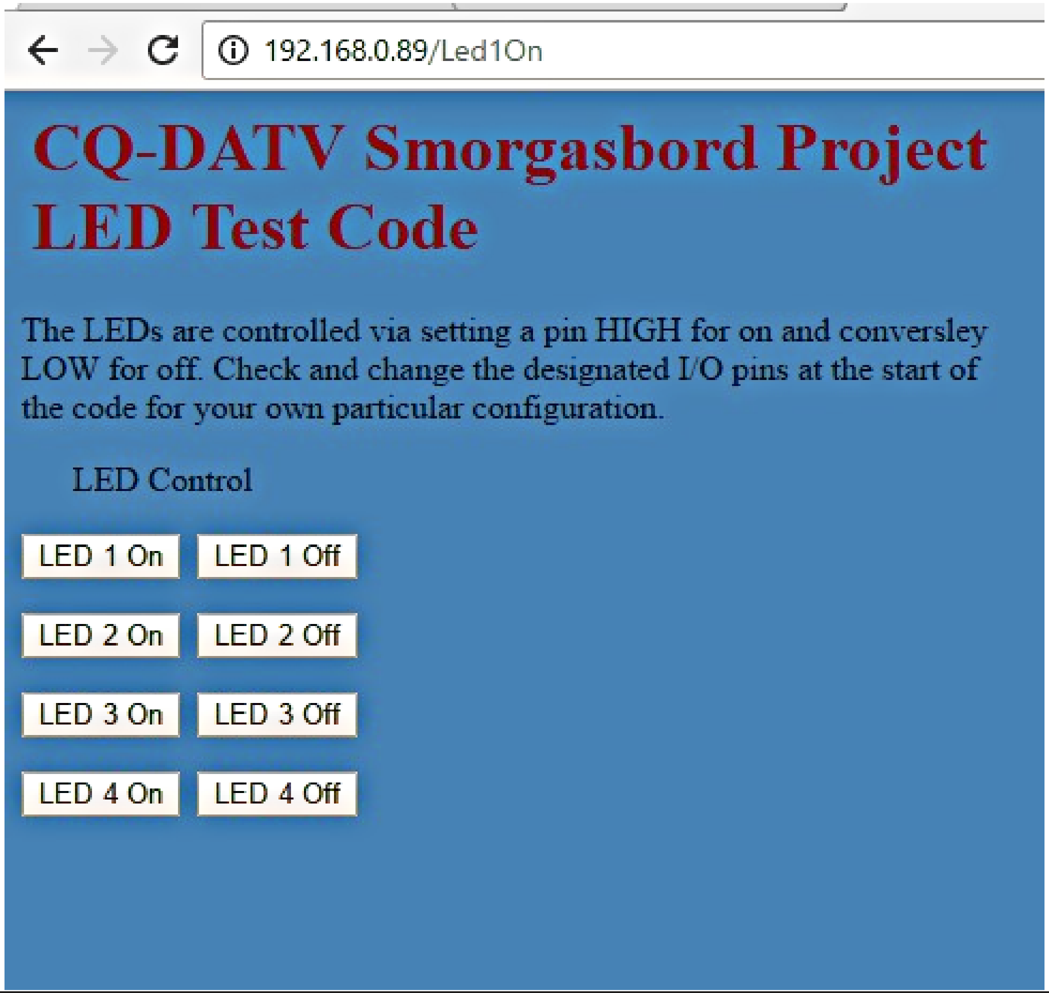
I used a (150mm X 90mm) single hole pad board as this was available in stock, this created a reasonably neat solution for point to point wiring of the main elements on the underside of the card. For this a surplus length of solid core CAT-5 cable was stripped and used.

Using 8 way female headers allows the individual modules to be quickly removed if needed for another project, but as well neatly allows additional components to be hidden between them, such as the 24LC512 Eeprom used which sits directly under the I2C OLED.

The board is powered via USB from your computer; this is also used to download the test code on to the ESP8266 module.

Test Code Serial & Web Based

For each element installed on the board an individual test code has been produced; this is controlled via 115200 baud rate serial from a terminal with certain elements and with your routers Wi-Fi credentials entered in to the code where indicated which also as serves a simple webpage for several of the tests that can be used directly from your normal web browser. As depicted here I used a static IP address of 192.168.0.89 set within code for each element that had a browser control page. You will need to enter the SSID and also Password for your own Wi-Fi router.



This demonstrates the ability to now very quickly embed basic web control pages directly in to your own future projects if desired. All the samples have been created to be easy to follow and use as the starting point for working on your own specific creations. In preparation for Part 2 we firstly need to download some code writing development software.

Web Browser Control Samples

The code is written in the Ardunio IDE along with the required ESP8266 Libraries which are a separate download. The IDE is freely available from https://www.arduino.cc/en/Main/Software for different operating systems whilst the libraries can be freely downloaded from https://github.com/esp8266/Arduino full instructions are provided at this link to get these correctly installed on your own development machine. Where some code might also require additional libraries this is fully mentioned within the source with a download link to follow to allow either download or installing directly from the Ardunio IDE.

Plenty of original Ardunio libraries have now been successfully modified to work with the ESP8266 modules, so software development is eased slightly with known familiar code we are able to freely integrate in to our own projects.

The test software will be available with Part 2 from the CQ-DATV download page under the filename smorgasbord.zip

Useful Internet Links

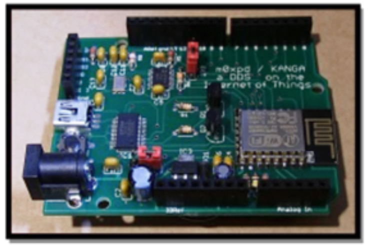
https://www.arduino.cc/en/Main/Software

https://github.com/esp8266/Arduino

https://www.wemos.cc/

http://ww1.microchip.com/downloads/en/DeviceDoc/21754M.pdf

http://www.ladyada.net/library/i2caddr.html



Getting Television off the ground

By Trevor Brown

As Television engineering evolves and it changes from the nightmare engineering it once was, we now see new applications almost every day. Foremost are the dash board TV cameras in cars to record accidents, police and emergency services wearing body cameras, even battlefield footage from helmet cameras worn by soldiers. The applications are endless and we don’t think twice about seeing pictures on our evening news from any of these sources.

Picture from Dave G3ZGZ home equipped Quadrocopter

Dave’s tripod in the sky

This picture (Left) was taken by Dave G3ZGZ on a home equipped Quadrocopter (see CQ-DATV 30). The picture shows the progression of an engineering works near his home in Lancashire, and to use Dave’s words was the start of his “tripod in the sky”.

This was upgraded to a Mobius “action camera” that for those who have not heard of it before is a small battery powered unit with 1080p recording capability. This was mounted under the quad on an anti-vibration mount and gave some outstanding still and video footage, down a 5.8GHz video downlink.

The results were stunning and commercial TV equipped Quadrocopters are now in almost every model and toy shop. This was not always the case.

The first time I saw a TV equipped model was at an ATV rally at Crick Post House, the architect behind the technology was Brian Parkinson and the camera used tube technology, but it was small and lightweight enough for a small model helicopter to lift and deliver live television back to the ground. https://www.youtube.com/watch?v=BzLMO2U8g6I

If we wind the clock back to 1946, the equipment was not always so user friendly. The picture shows RCA's block airborne television system on board a company plane for a public demonstration of something originally cloaked in Military secrecy.

In the early or mid 1950's, CBS Engineers place a RCA-TK-30 Camera in a Helicopter

RCA's 1946 airborne television system

KTLA's Telecopter

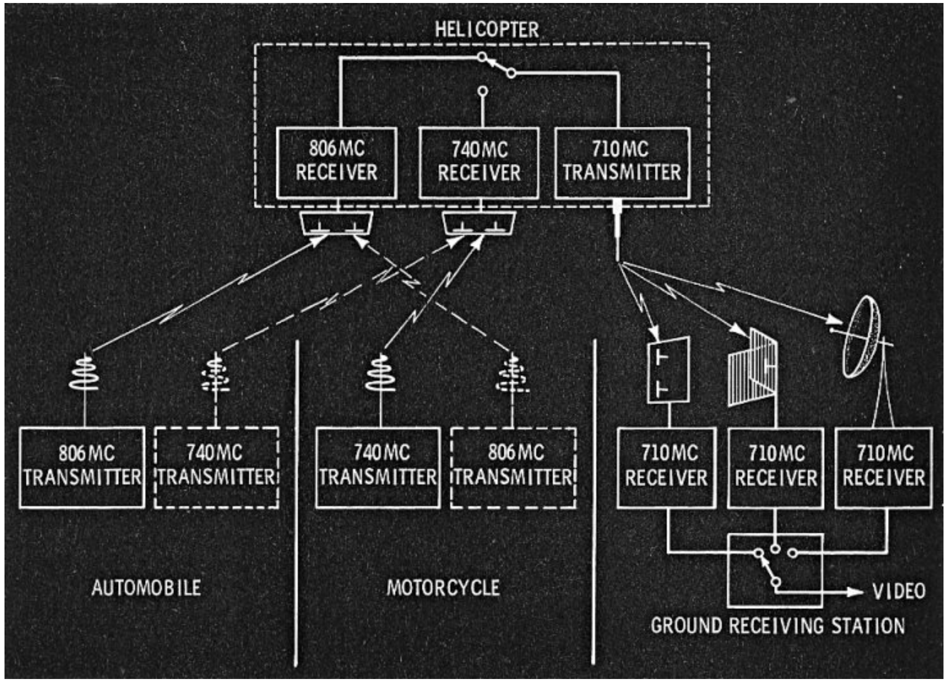
10 years later (1958) the news media were quick to get on board and this time replaced the plane with a helicopter. Just as well as you see from the picture the television camera (TK 30) was linked to a remote truck on the ground via 100ft camera cable which limited the height of the helicopter and mobility was limited to where the truck could follow the helicopter.

On July 3, 1958 the first TV news helicopter, KTLA's Telecopter, appeared in L.A and changed the news forever and also introduced a new word Telecopter.

By 1965 the technology had evolved to self-contained helicopters with all the equipment on board and RF links to the ground.
This had even progressed to using the helicopter, not only as a picture source, but to provide an RF relay of other TV equipped vehicles.

RTV (Radio Television Francaise) the French broadcasters were one of the first to embrace and develop this technology for coverage of the "Tour de France" a bicycle race like no

Helicopter with on board Transponder



Block diagram of the on-board transponder

Fig. 1. Auto-top camera used in Italy.

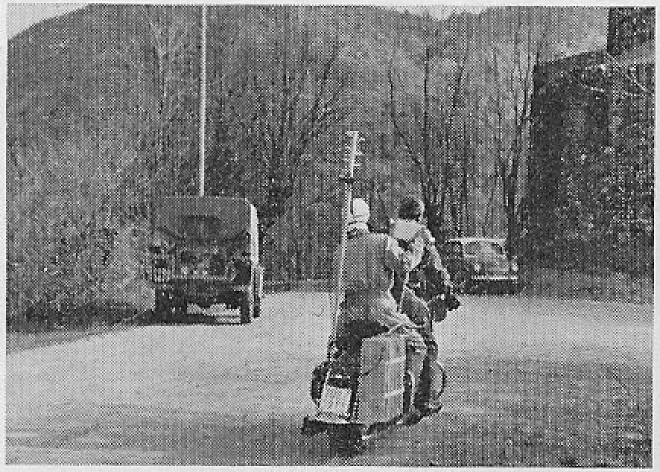


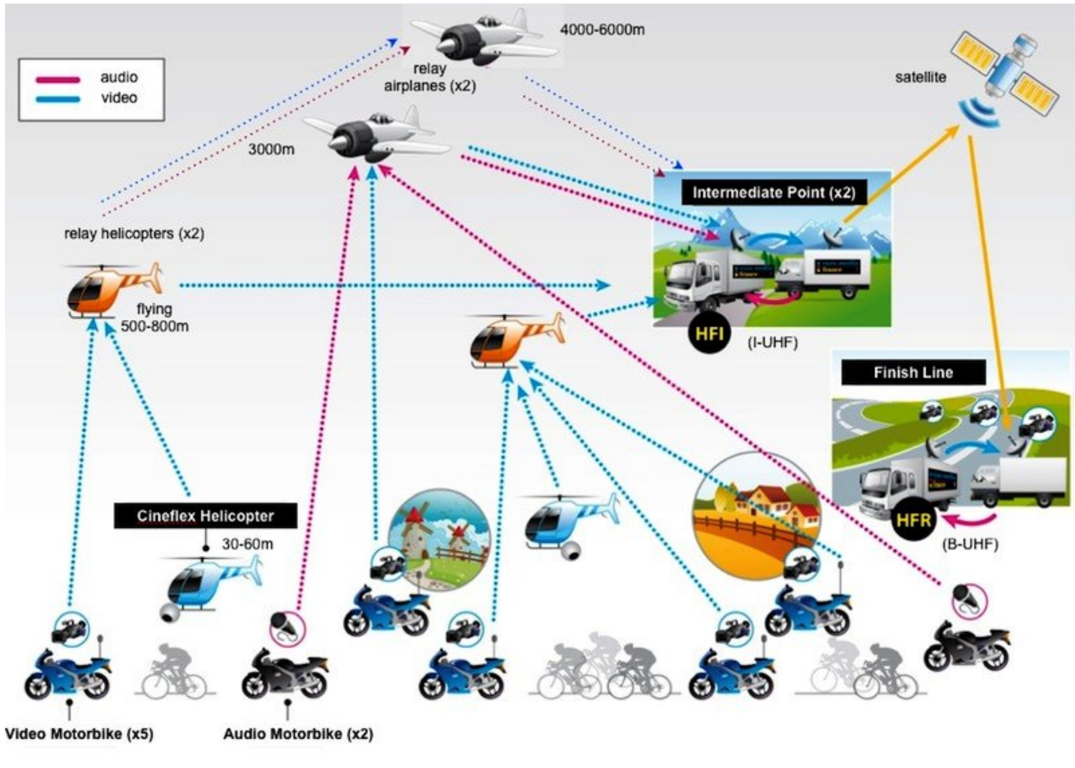
Fig. 2. Motorcycle camera uses vidicon.

Fig. 3. Multiple-antenna ground station.

other and with unique broadcasting problems requiring a bespoke engineering solution. A helicopter was used both for direct aerial shot and as a relay for signals transmitted from video cameras mounted on motorcycles. This has now grown to a multi motorbike, multi helicopter solution with fixed wing aircraft and even satellite relays.

The motor cycle cameras use VHF links to relay pictures to helicopters flying at ~600 meters altitude. The signal is then re-transmitted to aircraft flying at 3000-8000 meters (dependant on weather). These aircraft (some are unpressurised) need to circle very slowly therefore the turbulence can be highly uncomfortable for the pilots and technicians. If the weather turns bad then the use of the aircraft flying above the clouds becomes integral to the broadcast. In this case the GPS system on each bike becomes very important so that the aircraft can actually locate the motorbikes from 25,000 feet in the air.

Humble beginnings you may say, but as the technology evolves, so does its implementation. Perhaps a little corny to say the sky is the limit, but I think “The International Space station” would soon disprove that.



Modern coverage of the Tour de France

Project Jenny 1966

In October 1965, a US Navy aircraft equipped as an airborne broadcast station performed an airborne radio relay broadcast of the World Series over South Vietnam becoming the world's first operational airborne broadcast station.

In February of 1966, television arrived on the scene in South Vietnam and another new page went into the broadcasting history book. TV shows were broadcast on Channel 11 for AFVN (the American Forces Vietnam Network), and on Channel 9 for THVN TV (the official station of the Republic of Vietnam).

Inside the Project Jenny Aircraft

TV was broadcast from U.S. Navy NC-121J (Super Constellation) aircraft. These aircraft were known as Blue Eagles and operated as Project Jenny. The aircraft were assigned to the U.S. Navy aviation squadron VXN-8 (originally OASU) home based at the Naval Air Test Centre, Patuxent River, Md. Two Blue Eagle aircraft were based at Tan Son Nhut AB in Saigon to provide TV broadcast services for AFVN and THVN. A third aircraft was based at DaNang AB to provide airborne PSYOPS. radio broadcast services for MACV-SOG.

A slightly different spin was a project called Stratovision. This was the use of an aircraft flying at high altitudes, to bring television to small rural areas, so that they enjoyed the same benefits of the large metropolitan areas.

Stratovisions B29 Aircraft

The system proposed by Glenn L. Martin Co. and Westinghouse, advocated television coverage of small towns and rural areas as well as the large metropolitan centres. This would ultimately require 14 aircraft to cover 78% of the United States. The system was adopted for use for domestic broadcasting in the United States, but not on this scale, though it did find use by the military in Vietnam.

The Experimental Stratovision (a modified B29) flying at 25,000 feet over the Pittsburgh area rebroadcasting telecasts picked up from the east coast television network. Programmes from the ground were picked up by a tail aerial and rebroadcast on the antenna shown.

Stratovision technology re-appeared in a project called MPATI's (Midwest Program on Airborne Television Instruction) in 1961 and ran until 1968.

MPATI's programming broadcast from two DC-6AB aircraft based at Purdue University Airport in West Lafayette, Indiana. One of the two aircraft would go aloft for six to eight hours at a time flying at an altitude of 23,000 feet. From this position the range of transmission was approximately 200 miles in diameter.

When on station the plane would reduce speed, and then lower a forty-foot antenna mast which was now gyroscopically stabilized so

The Stratovision Project circa 1945

One of the two DC-6AB aircraft

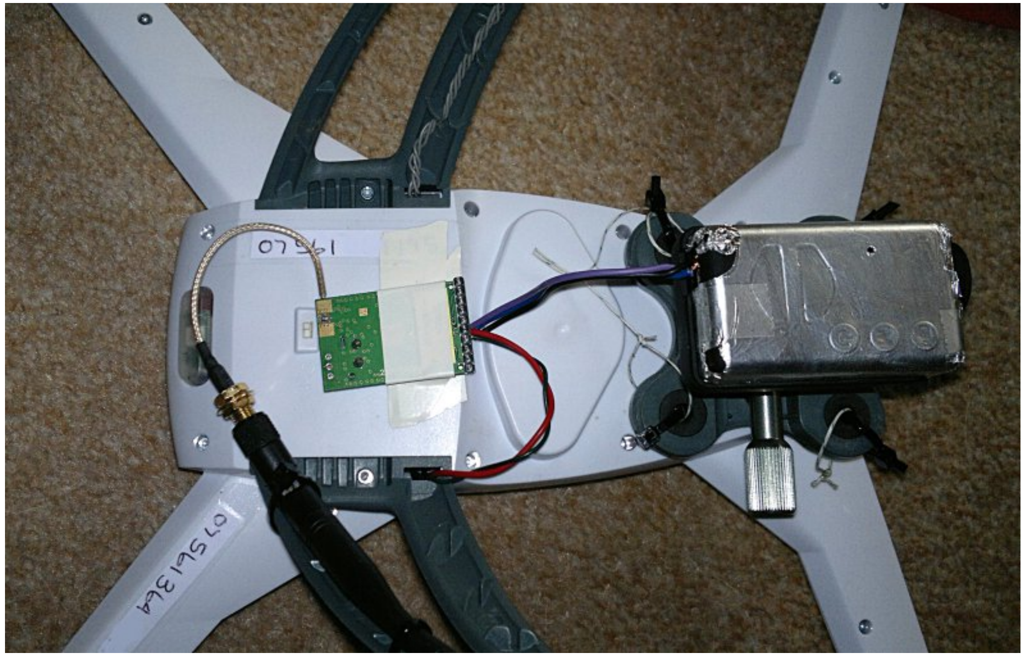
that the antenna always aligned from the aircraft to the centre of the earth. This stabilization feature helped to maintain polarization of the signals.

Programming from the planes was always pre-recorded and supported by a suite of two-inch video tape duplicating equipment housed in the basement of the Stewart Centre.

Frequently snowy pictures were what students saw from the low power transmitters of KS2XGA or KS2XGD channels 72 and 76 UHF respectively.

The television equipment and transmitters were powered by a gas-turbine electrical power plant in the aft end of the DC-6 fuselage; equipment similar in design to auxiliary power units

DC6 with a forty-foot gyroscopically stabilized antenna mast



Dave G3ZGZ's mark one Quadrocopter

later jet transport aircraft use for engine starting.

Let's finish as we started, now we know all the history, development and projects involved in bringing you this:-

Dave G3ZGZ's home constructed Quadrocopter, no it does not relay GB3FY, the pictures are never snowy unlike the low power transmitters of KS2XGA or KS2XGD channels 72 and 76 UHF respectively. The controls don't look like this either. Dave has now up-rated his Quadrocopter.

The camera on this new rig is a 4K ultra HD version with a three axis stabilised gimbal. It can take stills or video with various resolutions and frame rates.

The camera has a micro SD slot that will allow recording of the stills or video for later processing.

← Cockpit of a DC6 Used for the MPATI

Dave G3ZGZ's latest 4K ultra HD equipped Quadrocopter

Control to the quad is on the 2.4GHz band (normal R/C band) and video is digitally transmitted to the ground on 5.8GHz.

The controller a screen shows what the camera is seeing (very useful for framing a shot). The controller records the incoming video and telemetry for later analysis. The video recorded on the controller is a low resolution back up copy.

Telemetry includes the status of the GPS reception on both the quad and the controller (there is a "return to home" function that will actually return to the controllers GPS location, rather than a take off point - the controller also has a GPS built in).

Altitude above ground, distance from the controller and the aircraft speed are also available together with the voltage of the flight battery.

Telemetry recorded on the controller includes much more information such as the pitch, yaw and roll angles of the aircraft and the flight mode being used.

This is what is seen on the controllers screen.

Anchorsholme park in early July

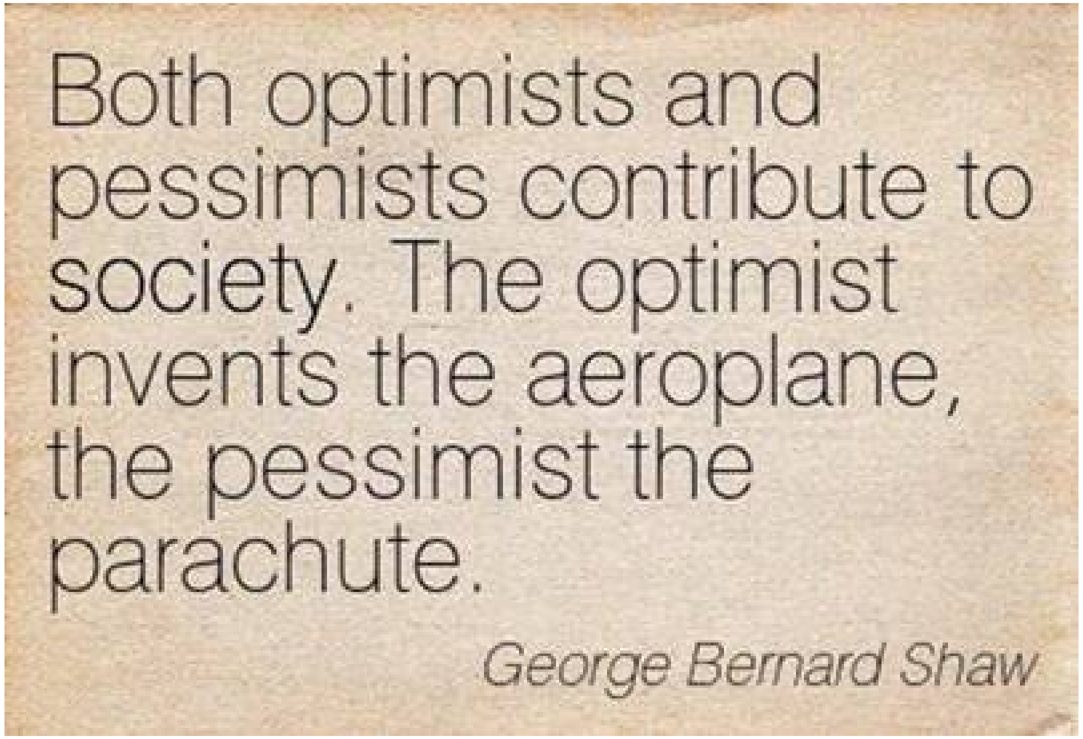
The controller is similar to most R/C transmitters but with the colour LCD screen.

The image is what is being viewed by the camera and around this are telemetry data and also the settings buttons for the camera (touch screen).

The camera can have auto and manual settings for white balance, exposure time and aperture plus the resolution and frame rate of the image recorded.

As for the Anchorsholme Park well that is how it looked in July and you can see the full story at https://youtu.be/cdlB1yzRQ_c

Our thanks to Dave G3ZGZ and Ed Sharpe at the Southwest Museum of Engineering, Communications and Computation. http://www.smecc.org/



DATV-Express Project - January update report

By Ken W6HHC

The project's Manufacturing/Testing manager, Art WA8RMC worked hard during January to ship out all remaining DATV-Express boards in inventory.

Art reports that a new production batch of boards has been ordered. All of the discrete components have already arrived and the blank boards (PCBs) should arrive soon. We expect the assembly of the boards to begin around Feb 13 or 14. If everything proceeds as planned, then tested boards will be able to ship before the end of February.

Ken W6HHC reported that a French Translation of the DATV-Express Users Guide for Windows has been prepared by Pierre HB9IAM / F8BXA.

The TRADUCTION FRANCAISE of the Windows Users Guide (draft10) is now available on the website at http://www.DATV-Express.com under the DOWNLOADS link.

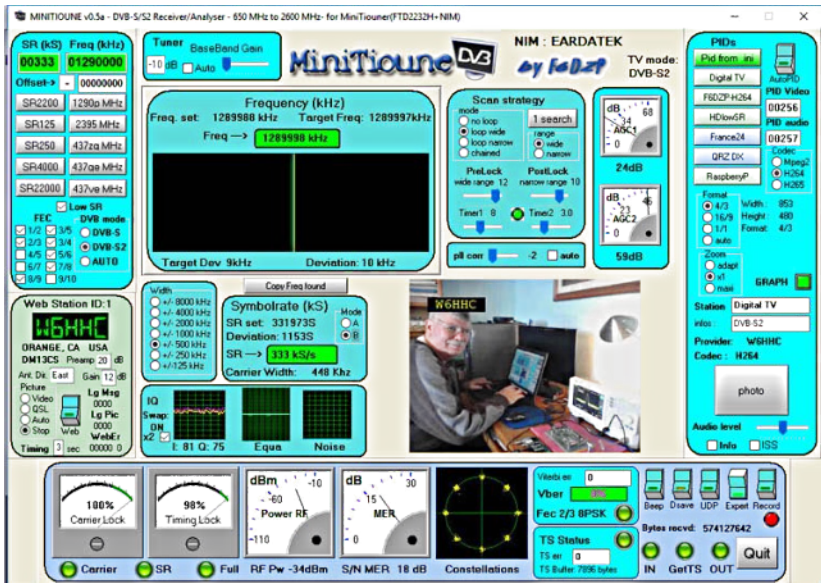
Ken W6HHC had a chance to do DVB-S2 testing after Jean-Pierre F6DZP released the DVB-S2 code (v0.5a) for the MiniTiouner receiver-and-analyzer.

The new code can currently receive H.262, H.264, and H.265 CODECs and SymbolsRates down to 125 kSymb/sec and QSK and 8PSK modulation signals.

The MiniTiouner (v0.5a) is shown in analyzer-mode for DVB-S2 at SR=333 kSymb/s with a modulation constellation of 8PSK.

Charles G4GUO has done some programming and has been able to get his LimeSDR TX/RX board running GNUradio code. LimeSDR is currently shipping some 500 early bird units. This initial LimeSDR production batch is in the hands of Parcel Force at the moment so Charles should get three more boards in a week or so. Further study of implementing a RF Channel-simulation application for testing receivers at microwave frequencies reveals this proposed application is most likely beyond the reach of the LimeSDR FPGA size. Simulating multiple reflections of the received signals quickly doubles and even x12 the size of the code and data handling needed in the FPGA.

"Project speed set to Working Hard for more production"...de Ken W6HHC



CEC Explained

This article is taken from the 2008 quantum data white paper. Quantum Data, Inc. www.quantumdata.com

There is a little-known one-wire bus snaking its way through your HDMI products. The bus, known as the consumer electronics control (CEC) bus, is the basis for a new level of automatic control in HDMI interfaced systems.

The basic technology of the CEC bus originated in Europe, on the SCART interface, where it's been used with great success for many years. HDMI borrows and improves on the basic SCART technology, allowing AV products to discover and communicate with one another across a system.

CEC makes possible global controls, which build on existing point-to-point E-DDC-based "plug & play" automation to minimize the number of IR remotes and key-presses required for basic operation of a system.

CEC assumes that all AV source products in a system are directly or indirectly connected to a "root" display. HDMI connections form an up-side-down tree, with a display as the "root", switches as "branches", and various source products as "leaf" nodes. For example, CEC allows users to connect a mix of AV products as shown in Figure 1, place a DVD into the player, press PLAY, and let CEC handle the rest.

CEC will automatically power-on the appropriate products, route the DVD player's audio will cause the television program on the "root" to be automatically routed to and recorded on that device.

In short, CEC enables automatic equipment discovery and simple "one touch" operation in HDMI-interfaced systems.

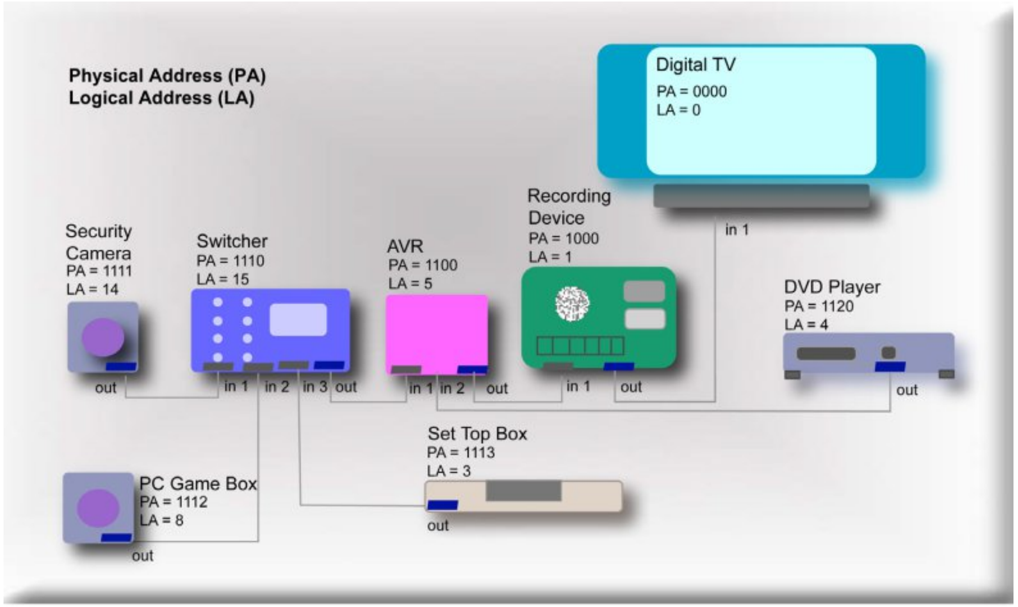


Figure 1 – HDMI CEC System

CEC Technical Overview

The CEC bus is a one-wire, "party line" that connects up to ten (10) AV devices through standard HDMI cabling. The CEC protocol includes automatic mechanisms for physical address (topology) discovery, (product type based) logical addressing, arbitration, retransmission, broadcasting, and routing control. Message opcodes support both device specific (e.g. set-top-box, DTV, and player) and general features (e.g. for power, signal routing, remote control pass-through, and on-screen display).

Electrical Characteristics

When idle, pull-ups within CEC devices lift the CEC bus voltage to between 2.5 and 3.63 volts. CEC devices assert bits by pulling the bus down to between 0 and 0.6 volts. All devices monitor the logical state of the bus by comparing bus voltage with a state dependent threshold, which provides approximately 400 millivolts of hysteresis.

Rise and fall times may be purposely slowed to avoid ringing. Signal rise and fall times only need to be less than 250 and 50 microseconds, respectively.

Maximum leakage current is limited to 1.8 microamps to prevent devices from affecting the CEC bus, when they are disconnected from the power company. Since the CEC bus can include ten 100pF devices and nine 700pF cables, the maximum bus capacitance is 7200pF.

Bit-level Protocol

Communication is always between an initiator and one (or more) follower(s). Both initiator and follower(s) can assert bits. Initiator asserted bits provide data, while follower initiated bits provide acknowledgement. Bit-level communication is very slow by modern bus standards with bit rates of less than 500 bits/second.

Messages begin with one long start bit and are immediately followed by a number of shorter data bits. Start bits last 4.5 milliseconds and have a low period of 3.7 milliseconds (Figure 2a).

Data bits only last for 2.4 milliseconds and have a low period that depends on the logical data value being communicated. Here, logical zero bits have a longer low state than logical one bits (see Figure 2b).

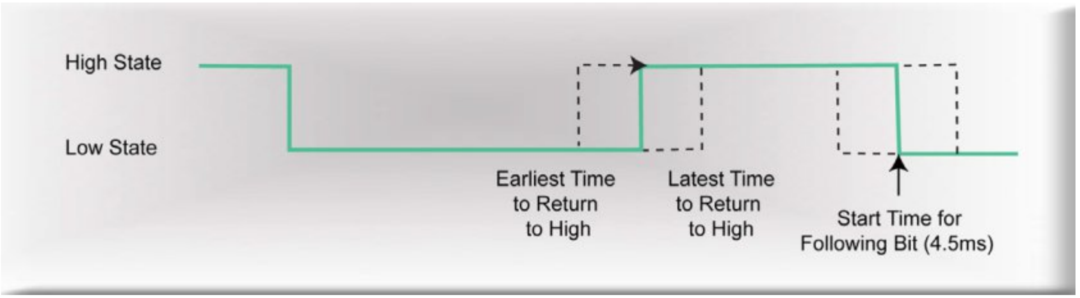


Figure 2a – HDMI-CEC Start Bit Timing

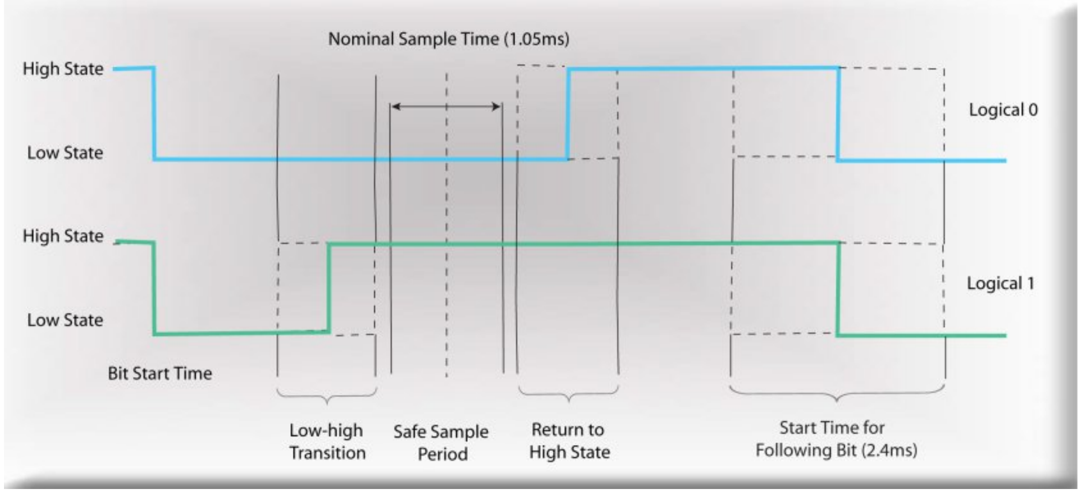


Figure 2b – HDMI-CEC Data Bit Timing

Block-level Protocol

Bits are grouped into 10-bit header and data blocks. Both header and data blocks include 8-bits of data along with EOM and ACK bits.

The EOM bit signals the final block in a message. A ‘0’ indicates that one or more blocks follow and a ‘1’ indicates the message is complete. When a single follower provides an ACK to an initiator, it does so by “overriding” the output from the initiator (i.e. by pulling the bus to a logical ‘0’ while the Initiator sends a “passive” logical ‘1’).

Broadcast messages have special rules for handling simultaneous ACKs from multiple devices. Here, the logic is reversed and a group of followers ACK by not “overriding” the initiator (i.e. by allowing the Initiator to send a “passive” logical ‘1’).

CEC devices have both physical and logical addresses. Normally, upon each hot-plug, each CEC source obtains a physical address by reading the EDID of the sink it is attached to.

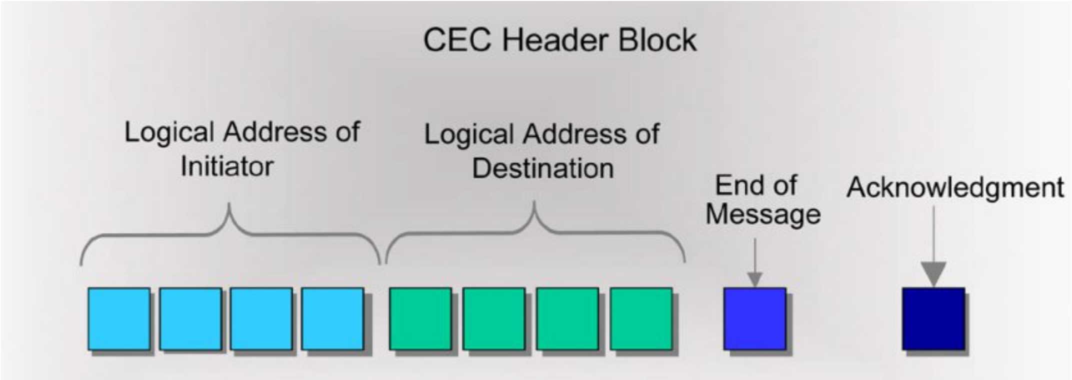


Figure 3a – HDMI CEC Header Block

The physical address of each CEC device is expressed as four numbers and indicates where it is relative to the “root” display, whose address is always fixed at 0.0.0.0.

For example, a source attached to input #1 of the “root” display, will have a physical address of 1.0.0.0 (see Figure 1).

Each CEC device also obtains a logical address reflecting its product type by negotiating with other CEC devices in the system. For example, the first STB in the system is always given the logical address 3.

Header blocks contain the 4-bit logical address of the Initiator and 4-bit logical address of the Destination in their data bit field as shown in Fig. 3a. Data blocks contain 8-bits of arbitrary data as shown in see Figure 3b.

Frame-level Protocol

HDMI CEC messages are sent using frames. Each CEC frame consists of a start bit, a header block and possibly data blocks as shown in Figure 3c.

As an example, a message from a source device to a TV might display a text message on screen (On Screen Display – OSD).

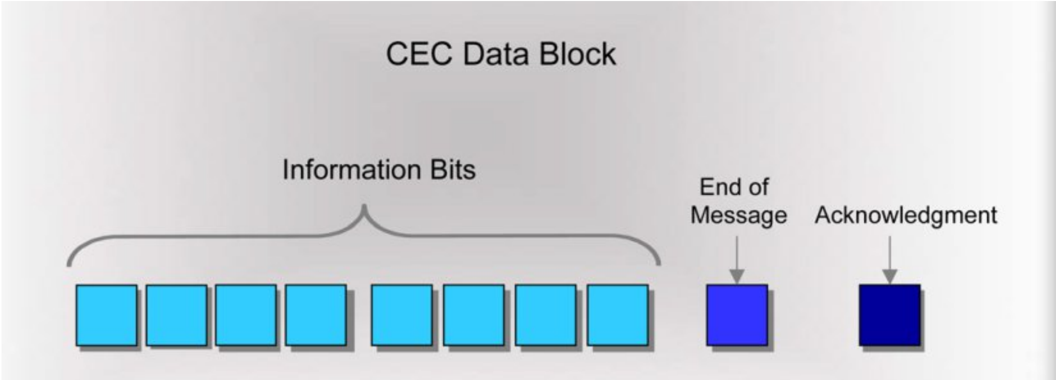


Figure 3b – HDMI CEC Data Block

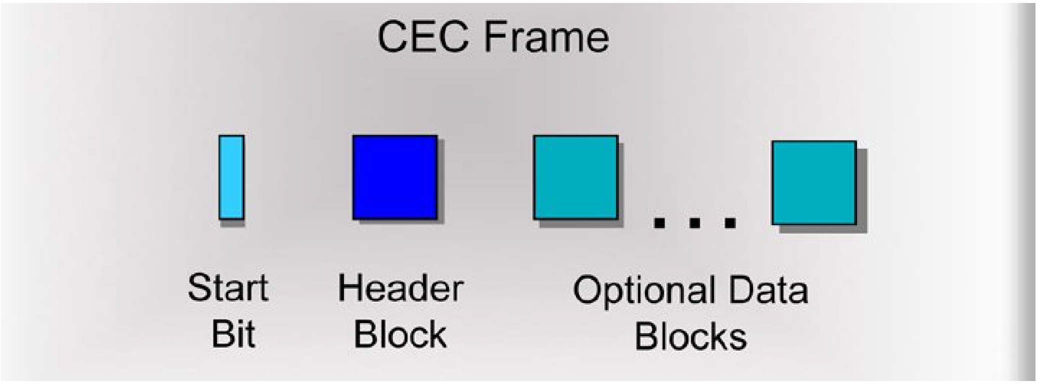


Figure 3c – HDMI CEC Frame

Such a message begins with a start bit, followed by a header block (with proper initiator /destination addresses), followed by data blocks containing an opcode 0x64 and parameters to control the duration time and the text to be displayed.

Each 10-bit block (except the last one) will have the EOM set to ‘0’, while the last block will have it set to ‘1’. Each block sent by an Initiator must have its ACK bit “overridden” by the destination device. If the destination is address 15, the message is deemed a “broadcast” and all devices may ACK by not overriding the Initiator’s ‘1’.

Reliable communication is provided via frame retransmissions. If any block in a frame is not acknowledged - or other bus errors exist - initiators will sense the condition and may retransmit up to five (5) times. When destination devices withhold their ACKs, initiators retransmit.

Since the CEC bus is a single wire, bus arbitration is very important. The CEC specification calls for a signal free time before sending.

To allow other devices a chance to send, the time for a current initiator to send another frame is longer than that of a new initiator that wants to send a frame, and signal-free times for retransmissions are the shortest.

If multiple devices try to send a message at the same time, a priority scheme is used to give a single initiator precedence.

CEC Device Architecture

As extensive as the HDMI-CEC specification is, it makes no recommendation regarding architecture for implementing a CEC device in a product.
To some extent your architecture will depend on what, if any, off-the-shelf intellectual property is available. The corollary to this is how willing you are to develop your own components. But setting that aside, it is important to identify the layers in the architecture and how they will interface with one another.

Figure 4 (next page) illustrates a typical layered architecture, with options.

At the bottom is a physical layer (PHY), which simultaneously drives and monitors the CEC bus. The PHY has a 1-bit control input and 1-bit monitor output. The control input tells the PHY when to pull the bus low, while the monitor output indicates the current logical state of the CEC bus.

Above the PHY is a bit-level protocol layer, which is similar to a serial UART. The UART layer serializes and deserializes bit streams, while buffering transmit and receive byte strings.

Here you have some options. If the speed of the product's microcontroller is sufficiently fast (e.g. with less than 100 microsecond uncertainty), the UART might be implemented in code - as part of the microcontrollers firmware. If not, hardware logic may be required. In this case, UART logic might reside in a specialized peripheral IC along with the PHY.

Above the UART is a driver layer, which composes and interprets the standardized CEC messages defined by the HDMI standard. Above that is the main body of embedded product feature code, which implements the unique overall behaviour of the product.

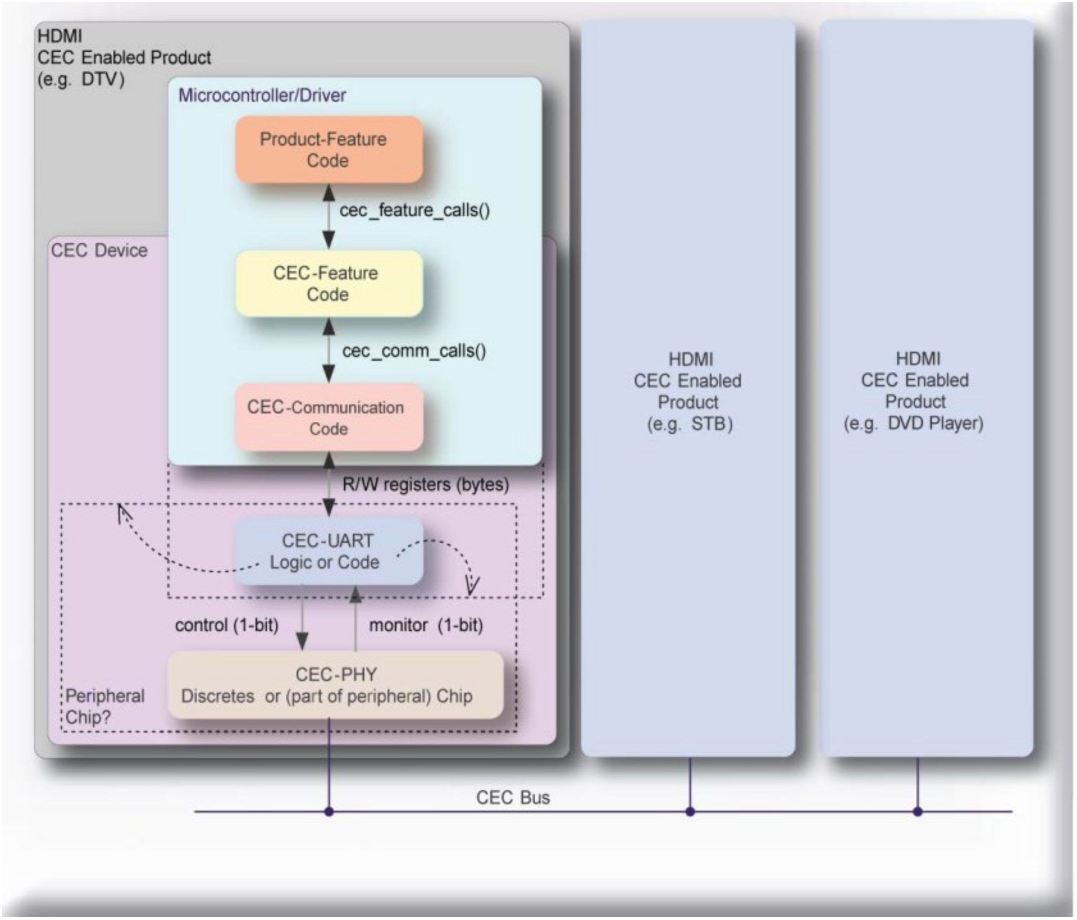


Figure 4 – Example HDMI-CEC System Architecture

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

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

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

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