In this issue

Production Team

Ian Pawson G8IQU
Trevor Brown G8CJS
Terry Mowles VK5TM
Jim Andrews KH6HTV

Contributing Authors

Jim Andrews KH6HTV
Trevor Brown G8CJS
Herbert Hommel DL4AWK
Ken Konechy W6HHC
Klaus Kramer DL4KCK
Dan Rapak WA3ATV
Gary Sutton WB5PJB
Rudi Pavlic, Stefan and others

Editorial

Welcome to issue 71 of our electronic ATV magazine.

In this issue

Trevor has delved a little deeper into the Grass Valley Control panel and is exploring the GVG push buttons and how they are addressed.

This project started back in CQ-DATV 68 when Trevor outlined the idea of looking at a specific surplus vision mixer control panel, the GVG 100, 110 and 1000 (these panels are all similar and interchangeable).

In CQ-DATV 69 he powered up the unit and designed an Exploratory Dongle using 3 PCF 8574 port chips that allowed the ESP 8266 to have I2C access to the unit using ESP BASIC for I2C control. This was expanded in CQ-DATV 70.

Dan Rapak WA3ATV introduces the Mid-Atlantic ATV Group. This is a collection of amateur radio operators in the north-eastern United States interested in experimenting with, and promoting activity, in digital television transmissions.

At a recent gathering, one of the items discussed was a list of questions regarding Federal Communication Commission (FCC) Rules and how they might pertain to the new world of digital television transmissions.

Dan propsed a number of questions to Scot Stone who is the Deputy Chief, Mobility Division, Wireless Telecommunications Bureau. Read the summary.

TV-AMATEUR, the German language magazine issue 192 is now out and Klaus DL4KCK has translated two of its articles for us.

Eachine Pro DVR used at ATV repeaters for DATV.

The article is written by Herbert Hommel DL4AWK and was inspired by an article in TVA 191. Herbert has ordered a Eachine Pro DVR. to investigate whether and to what extent the device is suitable for minimizing problems with the ATV repeater DB0THA.

Also from TV-AMATEUR, Herbert Hommel DL4AWK shares his experiences with the conversion and use of PLL-LNBs. This article originally appeared in TVA 189, but Herbert has run into thermal problems in temperatures below -20c. When the internal VCO moves upwards and the PLL adjusts. The full articles are in this issue

Jim Andrews, KH6HTV has produced a series on TV propagation that started in CQ-DATV 70. The next two parts will discuss computer programs which allow us to easily compute the anticipated path loss for a particular real world path.

The DATV-Express Project continues and Ken Konechy W6HHC reports that Art WA8RMC is “in the middle of” testing of MiniTiouner-Express PCBAs, the DATV receiver/analyser for DVB-S/DVB-S2. At the time of writing all parts had been received except the NIM tuners. The Chinese celebrations and small manufacturing issues have delayed the shipping.

Rudi Pavlič, Stefan and others have provided some useful links and information for DATV receivers and transmitters for Es’Hail2.

Gary Sutton WB5PJB looks at Video Transmission Using IP with off-the-shelf Devices.

IP cameras make convenient tools for checking our property from anywhere in the world where Internet access is available.

In public outdoor events where amateur radio is providing support communications, the same technology may be used in an ad-hoc wireless network to send live video images to a central command post.

The task for hams is to setup such a network and make it reliable enough to handle full-motion video from one or more IP cameras.

The CQ-DATV Production team

The "Occasional bit of Nonsense" column

HOW TO PROPERLY PLACE NEW EMPLOYEES

1. Put 400 bricks in a closed room.

2. Put your new hires in the room and close the door.

3. Leave them alone and come back after 6 hours.

4. Then analyze the situation:

----------------------------->

a. If they are counting the bricks, put them in the Accounting Department.

b. If they are recounting them, put them in Auditing.

c. If they have messed up the whole place with the bricks, put them in Engineering.

d. If they are arranging the bricks in some strange order, put them in Planning.

e. If they are throwing the bricks at each other, put them in operations.

f. If they are sleeping, put them in Security.

g. If they have broken the bricks into pieces, put them in Information Technology.

h. If they are sitting idle, put them in Human Resources.

i. If they say they have tried different combinations, they are looking for more, yet not a brick has been moved, put them in Sales.

j. If they have already left for the day, put them in Management.

k. If they are staring out of the window, put them in Strategic Planning.

l. If they are talking to each other, and not a single brick has been moved, congratulate them and put them in Upper Management.

Anonymous

News and World Round-up

DATV-Express Project

Production MiniTiouner-Express units are now available. MiniTiouner-Express units going to the EU will shipped from UK. All other MiniTiouner-Express units are shipped from USA. Thank you for your patience.

You can again order these MiniTiouner-Express units from the ORDER A PRODUCT link on the *www.DATV-Express.com* website. You need to be registered and signed-in on the website to see the order form. The orders are processed through PayPal.

The price for the fully-assembled and tested MiniTiouner-Express assembly is still just US$75 + shipping. * Shipping cost to the European Union is US$ 24.00 including the VAT. * Shipping cost to US is US$7.00 * Shipping to other world-wide countries is US$35.00

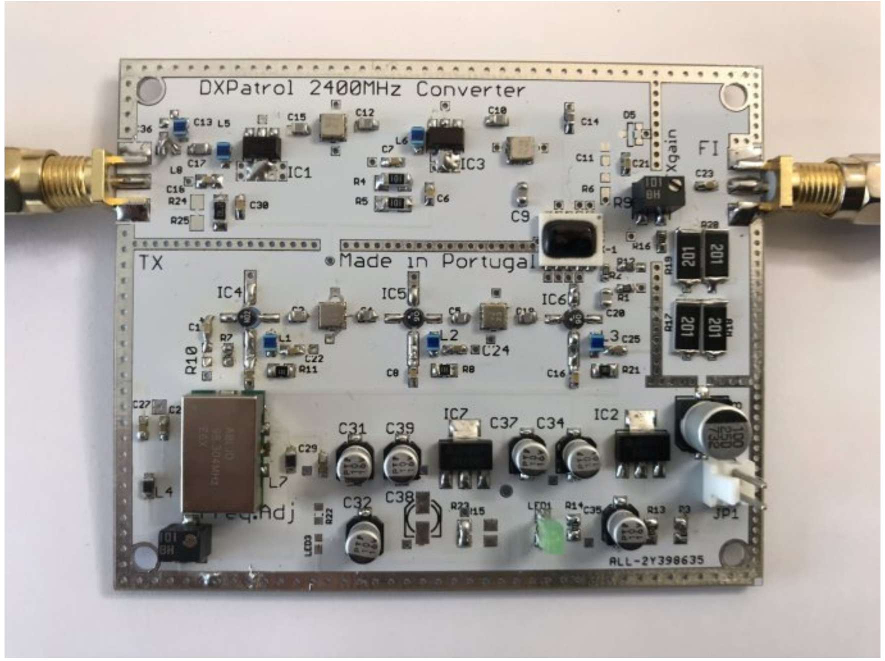
You can place your orders today. The plan is to have shipping begin from UK for EU countries by Thursday, April 25.

73...de Ken W6HHC

New Es´Hail Sat (OSCAR-100) Uplink Converter

DXPATROL ham-radio antenas

New assembled and tested kit from DXpatrol.
434MHz to 2400MHz Low Cost Up converter 100mW (or 8W) all mode TX uplink to Satellite



Specs

Input IF 434 Mhz
TX output 2400MHz
TX Power 100mW
Spurius Emissions 40dBs
Image rejection 60dBs
Input Maximum Power 5W (adjustable)

Source: *http://www.dxpatrol.pt/index.php/kits*

Grass Valley Mixer Conversions - Part 4

Written by Trevor Brown G8CJS

In this issue I would like to look at the GVG push buttons and how they are addressed. Can I first sum up where we are so far.

In CQ-DATV 68 I outlined the idea of looking at a specific surplus vision mixer control panel the GVG 100 and also the 110 and 1000 (these panels are all similar and interchangeable).

In CQ-DATV 69 I powered up the unit and designed an Exploratory Dongle using 3 PCF 8574 port chips that allowed the ESP 8266 to have I2C access to the unit.

In Issue 70 I refined the process to controlling individual lamps. I used ESP BASIC for my I2C control. This might not be everyone's choice, but I am not a software guru and when pushed into that world my choice of tools might be a little non standard, but never the less it works and allows me to straddle the line between software and hardware.

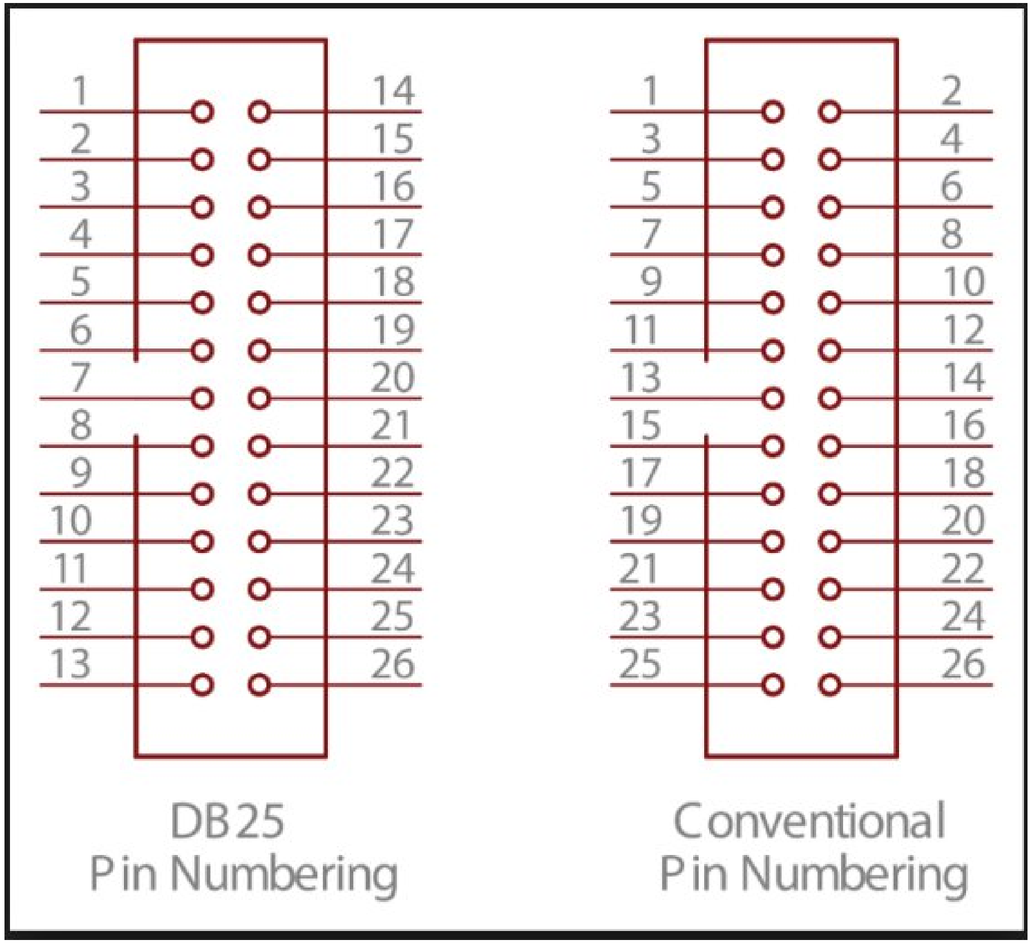
Once we have the hardware mapped we will be producing some custom software to drive modern software mixers like Vmix.

Another problem has arisen in that I produced a table of connections for J2 and J3 these are IDC connectors and the pin numbering in the GVG mixer panel differs from the norm.

The IDC standard is to put the odd number down one row and the even numbers down the other row. These plugs are usually connected with ribbon cable.

D connectors also are produced in a format that can be connected to ribbon cable, but they number the pins differently, the problem comes when you connect a D connector to an IDC using ribbon cable. To this end the three connectors J1 J2 and J3 inside the panel have adopted D numbering and the numbers are silk screen printed along side.

The problem was discovered by Mike G7GTN when he laid out the I2C dongle PCB and found it adopted the correct IDC standard not the DB standard which allows DB and IDC cables to be mixed. Thanks Mike, I understand a new PCB design is now underway.



IDC Pin Numbering for conventional and DB numbering

I have explained how the lamps are addressed and explained that this was not an ideal configuration as illuminating a lamp in the PGM bank could clear a lamp in the key bank (they share a common latch). Another problem is the hardware will not allow the processor to read the state of any of the lamps, these short comings were solved in the original MC 6801 processor by a soft map that stored the state of the lamps and the positions of all the analogue pots. This enabled the software to update say the PGM bank and to modify the commands by including a command to illuminate any lamps that stood to be extinguished by a latch refresh process.

Our software will have to do the same and provide soft images of the latches that can be read and manipulated to retain wanted pushes and clear any unwanted, E.G. previous selection. I have called them groups where one button will light and all other buttons in the same group will be cleared.

The push buttons suffer from the same multiplex arrangement as the lamps only there is one saving grace all push-buttons are momentary contact, with no latching, so they can be scanned and read, less of a problem than was presented by the lamps which have latched storage and no way to read their state.

The buttons are mounted on two PCB’s the majority are on the larger horizontal board which controls all the video switching, keys and mixing along with the manual mix paddle.

The smaller board at the top is connected by an IDC connector called J1 and has the wipe pattern selection, key 1, 2 and DSK selection and the auto transition rate. I have no documentation of this panel in my possession so I will restrict all my descriptions to the main board, but if anyone has and drawing of this secondary control panel then please get in touch.

The following programme will allow the buttons to be explored, do not run it, instead use the debug option and run the programme in this mode, this is slightly slower, but not a problem as it shows more.

The programme will pause whenever a button is selected, this will indicate it is working and allow you to note down the BS3 position as scanned by Port 3 and the Port 4 read data which again is in decimal as we are using BASIC.

```
' GVG Panel
let PRT1=63    'control port
let PRT3=61  'address
let PRT4=56  'data bus
 i2c.setup(4,5)
'gosub   [lamp test]
gosub [clearlights]
     i2c.begin(PRT1)        'control port
       i2c.write(61)       'scan buttons
            i2c.end()
            i2c.begin(PRT4)             'data bus
              i2c.write(255)
                i2c.end()
Do
  for B=0 to 6
      i2c.begin(PRT3)        'address port
        i2c.write(B)              'scan buttons bs2 low
           i2c.end()
   i2c.requestfrom(PRT4,1)
      d = i2c.read()
          i2c.end
             let   e = val(d)              'change to a value might
not be needed
next B
if e<  255 then delay 9000   ' button pressed
Loop until 0
end
```

GVG 1000 Panel

Port 4 read	BS0	BS1	BS2	BS3	BS4	BS5	BS6	BS7
254	E - MEM	KEY 0	PGM 0	PST 0	PGM 8	NORMAL	KEY 1	EXTRUDE
253	AUTO SELECT	KEY 1	PGM 1	PST 1	PGM 9	BORDER	KEY	OUTLINE
251	PST PTN	KEY 2	PGM 2	PST 2	KEY 8	DROP SHADOW	BKGD	
247	LUM KEY	KEY 3	PGM 3	PST 3	KEY 9	EFFECTS SEND	EFFECT	
239	LINEAR KEY	KEY 4	PGM 4	PST 4	PST 8	BUS AUX	DSK CUT	
223	CHROMA KEY	KEY 5	PGM 5	PST 5	PST 9	WIPE	DSK MIX	
191	KEY MASK	KEY 6	PGM 6	PST 6	CUT	MIX	FTB	
127	ASPECT ON	KEY 7	PGM 7	PST 7	AUTO TRANS	KEY INVERT	DSK PVW	

The Button Map

The Button Map

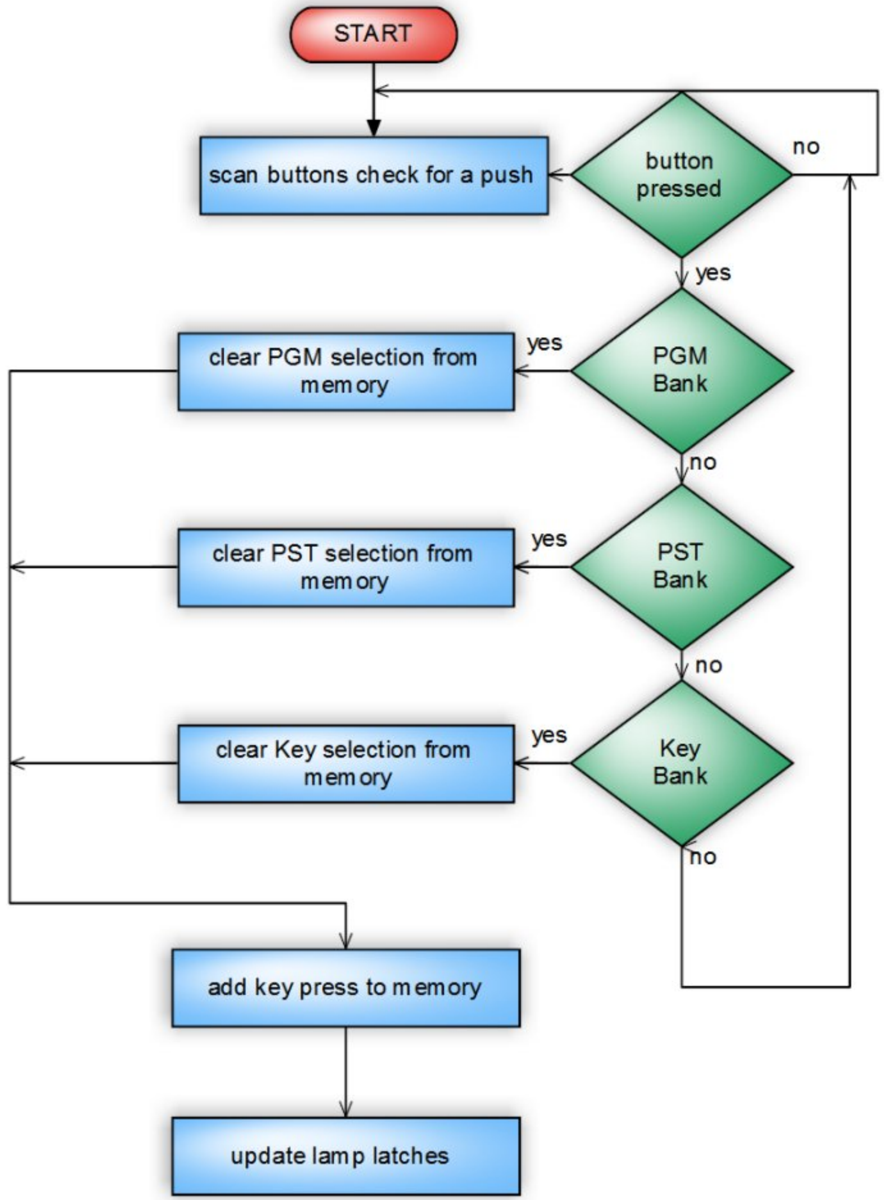
We need then to think about groups and button functions, remember we have software control and any button can be in any group. It is likely we will not ever be driving a GVG mixer again, so we have in effect a button box and one that we hope we can customise some of the functions. I have in my mind some of the buttons could be assigned to LANCS control and either move a camera under this protocol or something more home grown, but that is all in the future.

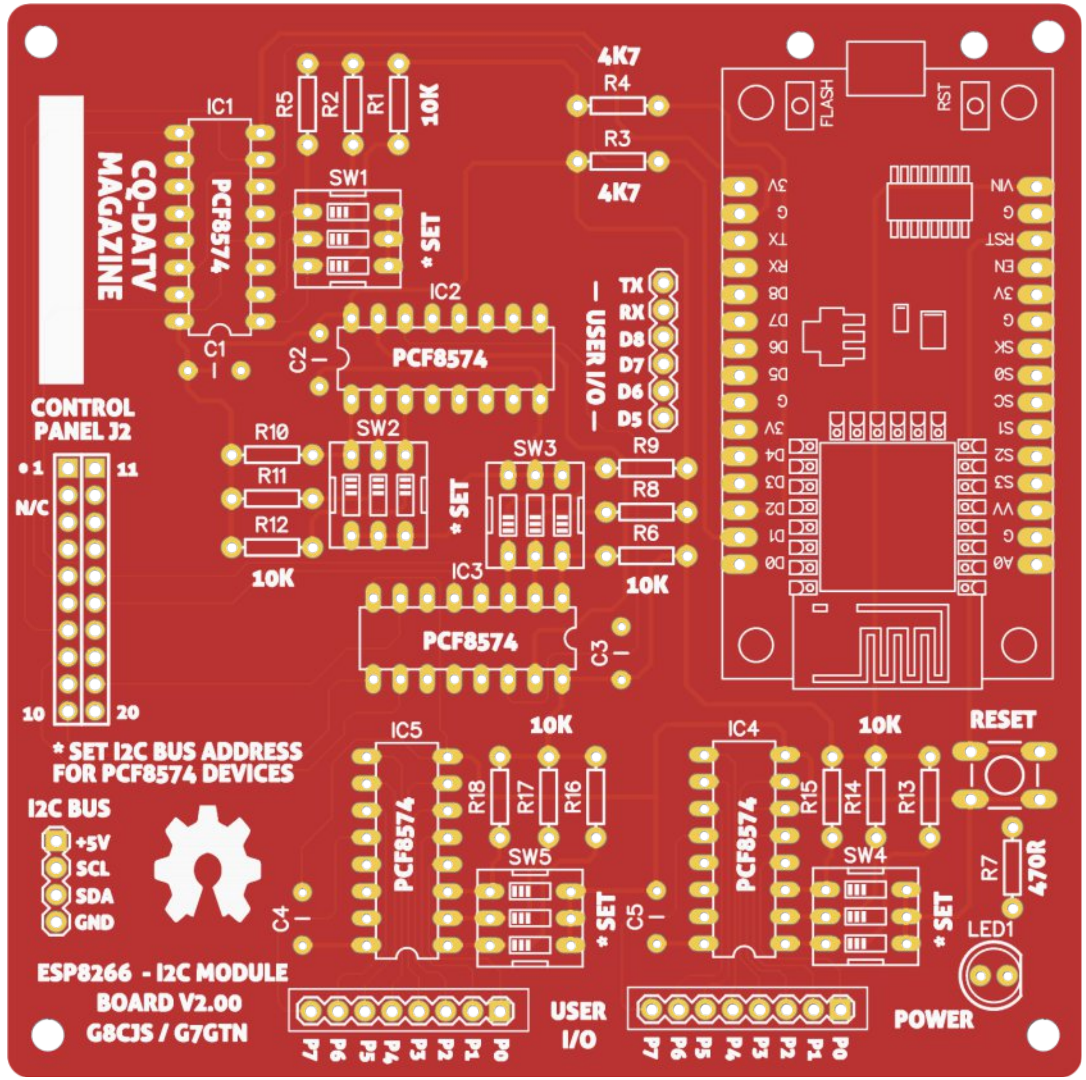
If you note down all the pauses of the debug routine, you can map out the address of each button press. The buttons need grouping Key, PGM and PST are obvious and only one of each group can be illuminated at once. The other buttons can be grouped and the GVG grouping may not be ideal as you are going to use the panel to drive something other than the original panel for now let's concentrate our efforts on the three banks.

We have a routine that will check for button press and reveal it as a Port 4 read or as a BS column when the data pauses in debug, we can read them, but electronically sorting them can only I think be done by a let statement for each button. Yes that 30 lines of code just for the three banks.

The memory for the key presses will be 8 variables (one for each latch) so we can update a button without clearing one from a different bank (remember the layout of the latches).

It's important to only clear the appropriate bank push-buttons from each memory or soft latch, so we will only have one key pressed in each bank. I am unsure how much code will sit in the tiny ESP 8266 micro, but I will press on and see if I can sort the button pushes into groups and store the selection in memory and update the lamps for the next issue.





Dongle PCB revised

To be continued...

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

The Mid-Atlantic ATV Group

Written by Dan Rapak WA3ATV

The Mid-Atlantic ATV Group is a coalition of amateur radio operators in the north-eastern United States interested in experimenting with and promoting activity in digital television transmissions. Our core group consists of hams with prior experience in ATV, hams owning or interested in constructing ATV repeaters and hams generally interested in experimenting with this relatively new mode.

At a recent gathering, one of the items discussed was a list of questions regarding Federal Communication Commission (FCC) Rules and how they might pertain to the new world of digital television transmissions. For those located outside the US, the FCC is the governmental body that licenses and regulates amateur radio in the United States.

I posed the questions to Riley Hollingsworth, who as many readers know worked with the FCC's Enforcement Division before his retirement and now represents us with the ARRL. Riley in turn, directed me to Mr. Donald Stockdale who is the Bureau Chief of the Wireless Telecommunications Bureau of the FCC. Today (4/2/19) I received a reply to the query from Scot Stone who is the Deputy Chief, Mobility Division, Wireless Telecommunications Bureau. Here is a summary of what was learned:

1. Repeater Timeout Provisions *- There is no mandatory requirement for amateur repeater stations to timeout after a specified period. However, the control operator must have the ability to shut the repeater down when necessary. A repeater timeout function is optional, though most repeaters employ this function to shut the transmitter off when it is hung up due to interference on the input or in the case of long-winded QSOs.*

2. Station Identification *- Given that a station's call sign can be programmed into the PSIP metadata and is therefore continually transmitted as a part of the digital stream and can be viewed by anyone with a receiver at any time, the question arose as to whether stations transmitting DTV signals were still required to make separate video / audio identifications at the start and end of a transmission and every ten minutes during a transmission. Mr. Stone acknowledged that the ID is always present and can be readily viewed, but the rules haven't yet caught up with this. Therefore, the normal station ID procedures still apply. It is important to note that this means that a DTV beacon station must also adhere to the station ID requirements. That's not a problem when the beacon transmits a test pattern containing the call sign. However, should the beacon transmit a camera or other video source, care must be taken to insert the call sign as required. The call sign embedded in the PSIP is not sufficient at the present time.*

3. Classification of a DTV Emission *- The FCC Rules describe several types of emissions. Three of them could conceivably apply to digital television signals. The question became, does the Commission consider a digital television signal to be:*

- *An "image transmission"*
- *A "data mode"*
- *An "unspecified digital code" as described under 97.309(b)*

Again, this is a case where the rules have not quite caught up with the technology, but Mr. Stone feels that based on the intent of the rules, DTV signals should be classified as "image transmissions" as that is the fundamental intent.

4. Official Emission Designations *- As you know, the ITU established a coding system to describe various emission types. According to Mr. Stone, the emission designations* *used in the Part 97 Amateur Rules do not yet sync up with the codes currently in use for ATSC or DVB transmissions. Therefore, he could not provide specific emission codes for the various modes and various bandwidths of digital television transmissions. We'll have to work this out for ourselves. This isn't a big deal. The only place this might come into play would be for repeater coordination applications at some point in the future and perhaps not even then.*

Below is a table of what I believe would be the correct emission designations as I read the ITU standard. Note that this is NOT a comprehensive list. I recognize that there are other types of modulation that are favored by groups in other geographical areas. This list only includes the codes of interest to our Mid-Atlantic group.

Modulation		Bandwidth (MHz)	ITU Emission Designator
Mode	Type		
ATSC 1.0	8-VSB	6	6M00C7W
ATSC 3.0	COFDM	6	6M00G7W
DVB-T, T2	COFDM	2	2M00G7W
DVB-T, T2	COFDM	4	4M00G7W
DVB-T, T2	COFDM	6	6M00G7W
NTSC (Analog)	VSB	6	6M00C3F
PAL (Analog)	VSB	7	7M00C3F

- *First four characters: "nM00" = Bandwidth in MHz. (The "M" = MHz and is in the position of the decimal point.)*
- *Fifth character: "C" = vestigial sideband modulation, "G" = phase modulation*
- *Sixth character: "3" = one channel containing analog information, "7" = More than one channel containing digital information>*
- *Seventh character: "F" = Video / Television signals, "W" = Combination of signals (video, data, etc.)*

An optional " N" can be appended as an eighth character to any of the above to indicate full-color video images. Of course, in the current day, that's pretty much a given. Example: "6M00C3F N"

So that's the official word from the Commission along with some unofficial emission code stuff from me. I hope this helps clarify some of the US regulatory questions.

If anyone is interested in learning more about the Mid-Atlantic ATV Group, our web address is:

https://groups.io/g/MidAtlanticATV

Eachine Pro DVR used at ATV repeaters

Written by Herbert Hommel DL4AWK

Reprinted from TV-AMATEUR 192 by kind permission.

The article by Klaus, DJ700, in TV-AMATEUR 191, page 9, made me so curious that I immediately ordered a DVR in DL. After two days it was in the mailbox - of course at double the price. The part was disassembled, intensively examined and survived all mistreatments.

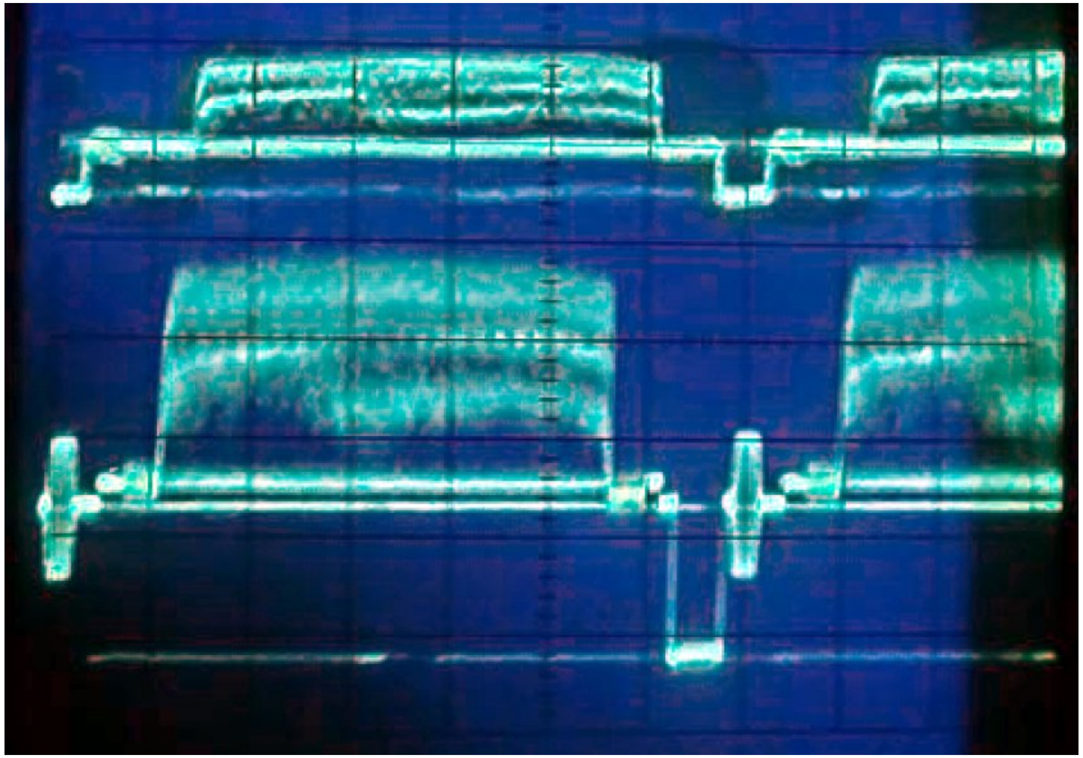
To be clear, the actual function as a DVR was not investigated and also the use as a "bluescreen killer" is of minor importance for me. Before I ordered further DVRs in the Far East, I wanted to investigate whether and to what extent the device is suitable for minimizing problems with the ATV repeater DB0THA.

For a better understanding I have to go a little further:

DB0THA was developed from the year 2000 as a pure ATV node, because at that time many ATVers still had the dream to realize a link from the coast to the Alps on a purely HF technical basis.

From DB0DLH in Hamburg to DB0HTG on the Hesselberg in Bavaria, it had already worked when 2007 much had to be dismantled due to the new (DFMG) user contracts. We have saved a lot, so that DB0THA today still enables connections between more than five ATV relays.

The core is an 8/6 A/V matrix, Lechner Uni2 remote controllable via DTMF and network, a 9x splitter for the preview image and an additional matrix 16/1 for four cameras, test images, audio test signals, measured value displays etc. On 23 cm we receive the digital channels of DB0HEX (Brocken) and the analog repeaters DB0SCS in



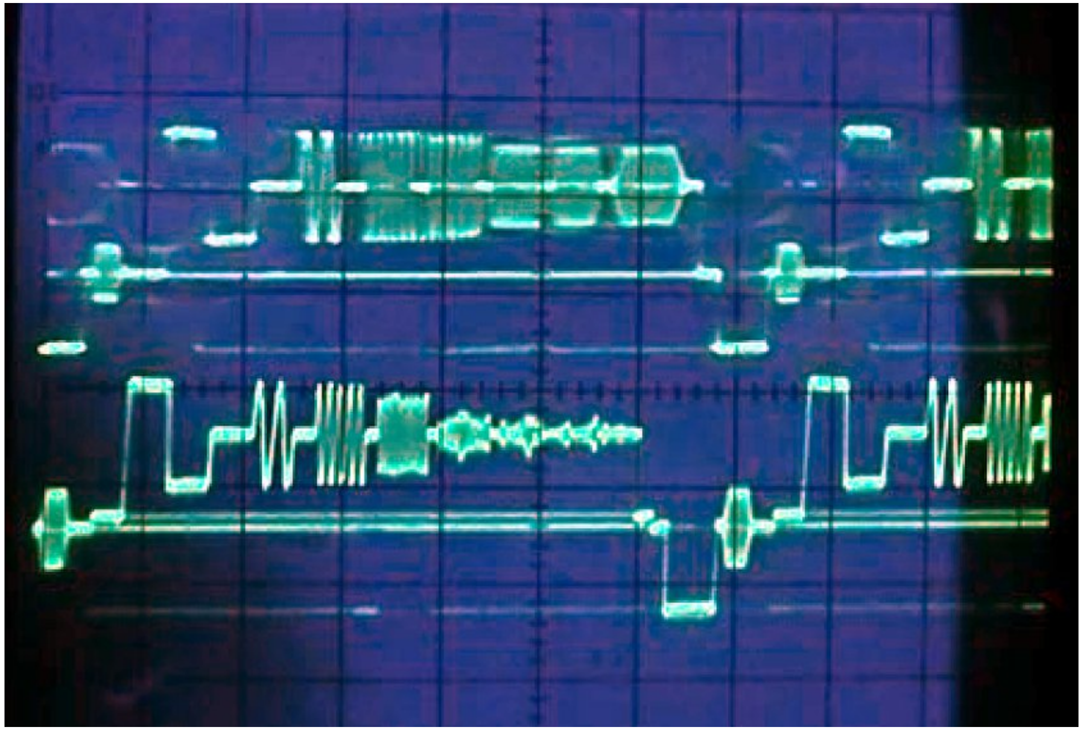
Eachine level-control

Nuremberg and DB0KNL on the Knüll in East Hesse.

On 10 GHz we receive DB0SHL in Suhl, DB0TAN on the Wasserkuppe and DB0TVI on the Groβen Inselsberg. Besides to DB0SCS, switchable link lines on 10.380 MHz exist to the five other relays. Via the free 6th output of the AV matrix, an NSV stream is temporarily generated on port 8450.

The complete description with block diagram and list of control commands can be found at *www.dB0tha.de* in the download area.

If you know how sensitive analog video signals are to external voltages, level losses, pulse distortion, etc., you will understand that just adjusting the large number of different video and audio signals with amateur means can become a



Eachine multiburst attenuated

standing order. And in addition there are multiple conversions with the well-known quality losses. My own signal goes through three different BBAs, transmitters and receivers before it is digitized at DB0HEX, and on the way back the reverse game again.

The video signal therefore has several chances of being degraded.

So far I was an opponent of automatic video level controls, because with some only the peak-to-peak value was regulated, depending upon brightness the sync pulse was compressed or increased and the black level was changed. I had hoped that the DVR would be useful for a simple video restoration because a sync pulse is added to a noise signal.

But now to the test results:-

1. Power supply

The device works reliably between 3.6 and 6 volts. The changing current consumption can be inferred from a step-down control. The self-heating in continuous operation is about 50 degrees Celsius.

2. Operation

It doesn’t work without an SD card. The three control buttons can be extended to external buttons via an enclosed cable. The setup menu is easy to operate if you adhere to the long or short keying times. PAL, camera on and the picture was immediately visible on the monitor. Obviously no loss of quality and no juddering with fast hand movements.

Switching the video resolution between VGA, Dl and HD does not affect the output signal, but only the recording time displayed on the OSD. Unfortunately, the OSD does not switch itself off, but there is a trick. Press recording button “Arrow >”, LED starts flashing. Time display switches to red, press menu key until the OSD disappears, stop recording by briefly pressing “Arrow >” again.

The module retains this operating state until the next restart. The audio signal is not switched through.

3. Measurements on video signals

The DVR was connected to a 2-beam oscilloscope, impedance terminated and tested with video signals of different quality. Even without an input signal, a standard-compliant synchronous pulse with color burst is applied to the output. Video signals with levels between 0.5 and 1.5 Vpp are adjusted to 1 Vpp. The control takes place gently within 1 to 2 seconds. It will be interesting to see how the control reacts to radar pulses.

The video bandwidth was measured with different multiburst generators and is similarly modest as with many quad splitters. The 2 MHz burst is already visibly attenuated, above 3 MHz all signals are in the cellar. However, this can also be advantageous for the multiple transmission of ATV signals, because any remnants of a sound carrier present in the video can no longer be transmitted and cannot lead to interference in the following BBA. No deterioration of the image transmission can be seen with the naked eye.

Conclusion

The small, inexpensive module is suitable for the simple restoration of ATV signals that do not conform to standards. Equipped with a backup battery, several such modules will soon be used in a new assembly at DB0THA.

Translation by Klaus DL4KCK

TV Propagation - Part 2 (using Radio Mobile to create rf coverage maps)

Written by Jim Andrews, KH6HTV

In part 1 of this CQ-DATV series on TV propagation, I discussed the basic equations used to predict rf path loss. The next two parts will discuss computer programs which allow us to easily compute the anticipated path loss for a particular, real world path.

Pioneering radio propagation research was done right here in Boulder, Colorado, USA, in the late 50s and 1960s at the USA Govt., National Bureau of Standards (NBS), Central Radio Propagation Labs (CRPL) [1]. This pioneering work was led by Phillip Rice and A.G. Longley. By 1968, a computer program was available for making predictions of rf path performance based upon this research [2]. (note: Our own Boulder DTV ham (2018), Roger, K0IHX, was part of this pioneering work, assisting in writing the first computer program.) It is now today, universally referred to as the Longley-Rice propagation model. It is also sometimes referred to as the ITM model, or Irregular Terrain Model. The model works for frequencies above 20MHz, i.e. VHF and higher. It does not include HF, over-the-horizon, ionospheric effects. The model contains a lot of statistical estimates for the many variables, including diffraction and scattering from topography, urban clutter, vegetation clutter, atmospheric changes, etc. The results are not an absolute, guaranteed value, but a statistical estimate.

Computer Programs

There are several computer programs presently available which use the Longley-Rice model [3]. They include: CRC-COVWEB, Radio Mobile, SPLAT!, QRadioPredict, and Pathloss. Most of these are programs which must be installed on your computer along with a massive topographical data base. CRC-COVWEB and Radio Mobile provide free, on-line calculator versions and use Google Earth maps. [4 & 5]. The author's only experience is with these two on-line calculators. My personal preference is now Radio Mobile-Online. It has much better spatial resolution than COVWEB and also provides in addition to coverage maps, a detailed point-to-point rf path profile analysis. The remainder of this paper will be devoted to using Radio Mobile-Online.

Radio Mobile Online

This program was written and copyrighted by Rodger Coudé, VE2DBE [5]. The free, on-line version is dedicated to amateur radio use and as such will only accept input frequencies in the amateur radio bands. The mathematical model is a mix of the Longley-Rice model, the two rays method, and the land cover path loss estimation. Radio Mobile first calculates the free space path loss. It then adds estimates for the excess path loss contributions from: Obstruction Loss, Forest Loss, Urban Loss, and Statistical Loss (typically always set to about 6.5dB). To demonstrate this program, the coverage area of the new, Boulder, Colorado DTV/ATV Repeater transmitter will be used [6]. Comparing Radio Mobile's point-to-point predictions with the results from actual, mobile, field measurements has shown good agreement. The TV repeater coverage maps also correlate well with the field measurements [7].

Input Parameters

Radio Mobile [5] requires one to input to the on-line program, all of the following system parameters: Transmit Antenna Type, Gain, Height, Azimuth and Tilt; Transmit Coax Line Loss; Transmitter Frequency & Power; Receive Antenna Gain and Height; Receive Coax Line Loss; and Receiver Sensitvity Threshold.

For the calcuations, the following other parameters also need to be specified: Required Reliability (70% - default); Strong Signal Margin (10dB - default, adjustable as desired); Strong Signal map Color (light green - default); Weak Signal map Color (light yellow - default), Opacity (50% - default); Max. Range (choices are - 10, 25, 50, 150, 200, 250 & 300km); Resolution { choices are low (601x601), med (1001x1001) or high (1668x1668 pixels)} & selection of using either or both "land cover" and/or two rays modeling.

Receiver Sensitivity

The value used for sensitivity is strongly dependent upon the receiver bandwidth and type of modulation used. The receiver noise floor is set by the laws of physics and is a function of the receiver noise temperature.

The noise power is given by: Pn = KTBW, where K is Boltzman's constant (1.38 x 10-23 J/oK), T is absolute temperature in Kelvins, and BW is the receiver bandwidth in Hz.

For typical bandwidths, at 290^{o}K (room temp.), the results are: (CW) 300 Hz => -149dBm, SSB 2.4kHz => -140dBm, FM (15 kHz) => -132dBm, Broadcast FM (200kHz) => -121dBm, TV (6 MHz) => -106dBm.

The noise figure of a receiver then adds additional noise. Just from these numbers alone, it is seen that the coverage area of a TV repeater vs. an FM voice repeater with similar output powers and antennas will be dramatically different.

Lab measurements which I have performed on TV receivers using various modulation methods typically gave sensitivities in the -90 to -100dBm range. However, for all analog receivers, signals at these levels result in extremely poor, P1 to P2 images. For digital TV receivers, with the digital cliff effect, it is either a perfect P5 image or none at all.

The cliff effect width is typically about 1dB, with pixelization and/or freeze frames occurring at threshold. Typical receiver sensitivities are listed in Table I below. Adding a low noise, pre-amplifier typically improves these values by about 3 to 6dB.

Table 1 - TV Receiver Sensitivities

Modulation	P1	P2	P3	P4	P5
VUSB-TV	-94dBm	-88dBm	-80dBm	-74dBm	-60dBm
FM-TV	-100dBm	-95dBm	-93dBm	-89dBm	-84dBm
DVB-T QPSK	na	na	na	na	-95dBm
DVB-T 16QAM	na	na	na	na	-90dBm
DVB-T 64QAM	na	na	na	na	-82dBm

Note: data in this table comes from references [8, 9&10]

For the Sept. 2016, mobile field survey [6] of the new Boulder DTV repeater in the DVB-T, QPSK mode, I never was able to receive any pictures with receiver signal strengths less than -92dBm. This was while using a low noise pre-amp in front of the DVB-T receiver. Thus, for my calculations of repeater coverage maps, the threshold was set to -92dBm.

RF Coverage Maps

Radio Mobile can generate very detailed maps showing the coverage area of a transmitter. See Fig. 1 for an example of such a map. The on-line version of the program only allows one to plot two different rf levels. The master program which needs to run on your own computer is capable of plotting a rainbow of colors denoting many different rf levels. The computed results are overlaid onto a Google Earth map or aerial photo. Radio Mobile generates these maps by performing a point-to-point path profile analysis for each and every pixel within the designated max. radius. The pixel resolution in meters is dependent upon the selected resolution (low, med. or high) and max. radius in km.

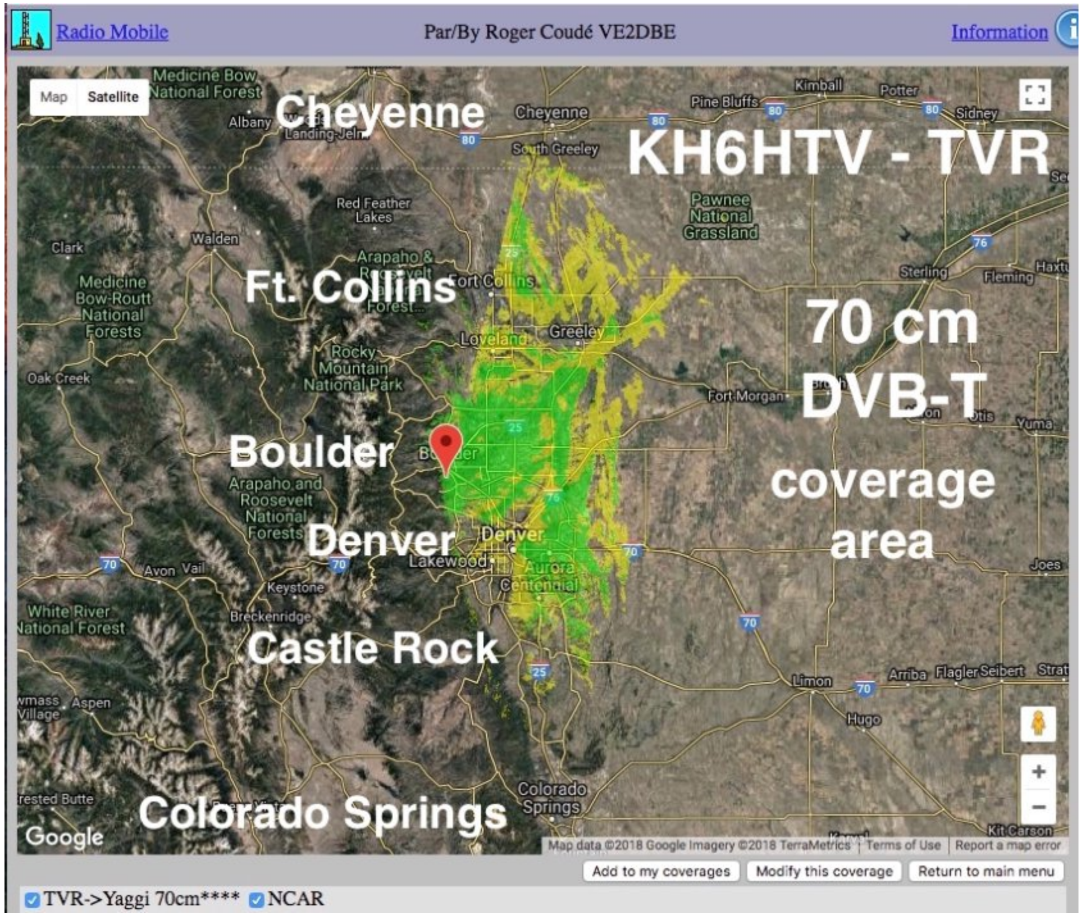


Fig. 1 Radio Mobile predicted 70cm coverage map for Boulder, Colorado DVB-T Repeater. The red tear drop indicates the location of the repeater

Fig. 1 above shows the rf coverage area of the Boulder, Colorado, 70cm, DVB-T repeater, (from it's new, 2018 location) as predicted by Radio Mobile. The yellow shaded areas are the "weak" signal areas with signal strengths of -90 to -80dBm. The green shaded areas are the "strong" signal areas with signal strengths > -80dBm. Actual mobile field surveys have verified this map.

The photo shown previously in Fig. 1, Part 1 of this series is documentation of a successful, DVB-T, DXpedition to the farthest point on the map. This was on the border between Colorado and Wyoming, near Cheyenne, Wyoming. The distance to the repeater was 77 miles. Successful two way QSOs were held on both 70cm and 23cm.

Part 3 in this series will discuss further the use of Radio Mobile to calculate the anticipated performance of a specific Point-To-Point RF path, including topographical profiling. This series of papers is based upon my application note, AN-33a [7].

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10. "P5 - TV Signal Quality Reporting", Jim Andrews, KH6HTV Video Application Note, AN-5, Sept. 2011, 2 pages

DATV-Express Project Report

Written by Ken Konechy W6HHC

Art WA8RMC reports that he is "in the middle of" testing of MiniTiouner-Express PCBAs, the DATV receiver/analyzer for DVB-S/DVB-S2. All parts had been received except the NIM tuners. The Chinese celebrations and small manufacturing issues have delayed the shipping of the Serit NIM Tuners and the tuners will not ship to Art until April 03. It will take another 2 or 3 weeks for units to reach Art. Art expects that MiniTiouner-Express units will be available for shipment again, sometime in May.

Charles G4GUO has released an updated version of the Express DVB Transmitter software for Windows, v1.25LP.14. The new update improves the software timing of the PCR/PTS/DTS timestamps for H.262 and H.264 CODECs. When transmitting, make sure TX queue level remains below 10% (if it starts to climb, your transport stream will become non-compliant).

However, the current v1.25LP.14 implementation created a small problem with H.265 dropping frames. Art was having some intermittent video during his recent MiniTiouner-Express PCBA testing…and the new v1.25LP.14 software corrected the problem. Charles reports that he understands the new H.265 problem…and will try to fix the software.

Jean-Pierre F6DZP has released a new MiniTioune software version, v0.9-beta, for MiniTiounerPro or BATC MiniTiounerV2 units. The new software adds more preset buttons for Symbol Rates and Transmitting Freq buttons. So far, the beta software has not been made compatible with MiniTiouner-Express hardware units. Charles G4GUO confirms that v0.9-beta is NOT yet compatible MiniTiouner-Express units… so please DO NOT UPGRADE to the v0.9-beta software with MiniTiouner-Express units.

Charles G4GUO continues to have fun with DATV QSOs using the Es'hail-2 OSCAR-100 DATV satellite. Charles reports that the round trip of a transmitted DATV signal using O-100 takes about 6 seconds - with most of the delay consumed in the transmitting software. With a two-way QSO, the total delay runs about 12 seconds when one station turns it over to the other station.

Update

Just a quick announcement that the v1.25LP14 version of software improves the software timing of the PCR/PTS/DTS timestamps for H.262 and H.264 CODECs. The Windows set-up.exe file and the NOTES file are now available at *www.DATV-Express.com* on the DOWNLOADS page.

Many thanks to G4GUO for his continuing efforts.

Project Speed is set to slow....de Ken W6HHC

DATV receivers and transmitters for Es'Hail2

Written by Rudi Pavlic, Stefan and others

To summarize the research, we have all the useful information in one place.

DATV receivers

OCTAGON SF8008 Linux
https://www.satking.de/en/sat--co/tv-receiver/sat-receiver/octagon-sf8008-4k-uhd-2160p-h.265-hevc-e2-linux-dual-wifi-dvb-s2x--t2c-combo-receiver

Amazon
https://www.amazon.de/OCTAGON-DVB-S2X-Vorinstalliert-Digital-schwarz-Schwarz/dp/B07NWLNT65/ref=sr_1_8?crid=2FXVNB45CNN4W&keywords=octagon+sf8008+4k&qid=1554020809&s=ce-de&sprefix=octagon+%2Celectronics%2C164&sr=1-8

eBay
https://www.ebay.de/itm/OCTAGON-SF8008-UHD-4K-H-265-E2-Linux-Wifi-DVB-S2X-Sat-Receiver-USB-3-0-MicroSD/113470584041?epid=6031074527&hash=item1a6b5fb4e9:g:BSsAAOSwrqhcnQB1

Good receiver, SR manually adjustable up to **100ks/s**, right so freely adjustable frq. LO, it has Blind scan. Some people say it's not under **800ks/s**.

Others (see below) that it does not go below **250ks/s**.

The manufacturer of the FB Forum
https://www.facebook.com/pg/octagongermany/posts/?ref=page_internal
says it goes up to **100ks/s**, which is probably for audio broadcasts.

So right now we do not know what is true and what is not. The only record where he wrote that he received a DATV with **250ks/s** was from one German and from the Italian.
I already agree with the manufacturer to process firmware so that the RX is not limited to 950 MHz below. Then this rx could currently be one of the most suitable commercial for DATV.

KOQIT S2U2
https://ru.aliexpress.com/item/North-South-America-1080P-DVB-S2-DVB-S-Digital-Satellite-Mini-Size-Receiver-Tuner-Wifi-IKS/32765776496.html?spm=a2g0s.9042311.0.0.39f133edZUhOKI

goes officially to 1MS, has Blind scan and is useful for DATV to this SR. It does not allow: free LO input, does not allow SR to be input under 1 MS, does not allow IF under 950 MHz. I did not find anyone processing it for a lower SR, although all of the mentioned hardware makes it possible.

MECOOL KI PRO
https://www.aliexpress.com/wholesale?catId=0&initiative_id=SB_20190328040918&isPremium=y&SearchText=MECOOL+K+pro (Android)

probably very good rx but we do not know where the lower limit is SR, is it possible SR and LO manually enter, whether Blind scan, whether it is usable without special processing.

The new class probably belongs to the newer and faster K III PRO

https://www.geekbuying.com/item/MECOOL-KIII-PRO-DVB-T2-S2-TV-BOX-399855.html
which has a newer RF frontend chip.

MiniTiouner Pro
https://forum.amsat-dl.org/index.php?thread/44-minitiouner-hardware-f6dzp/&pageNo=2

(F6DZP reports: v2 comes in short on the market) rx needs to run PC computer, the receiver goes down to 140 MHz. The newest version with the NIM FTS 4335 tuner covers 143.75 - 2459 MHz. (which is also 2m and 70cm narrowband DATV), all adjustable manually, can accept all modes of operation and also all SRs. The question or can you also take a reception?

MiniTiouner Express
https://www.datv-express.com/#Item5 USA version of this DVB receiver with the same software, 144 MHz d 2420 MHz. Others like MiniTiouner Pro.

None of them covers 70 MHz frq. belt.

LNB

I opened up a few PLLs of LNBs, they also destroyed some of them, at least half of them have crystals under the circuit, which can be glued to the casing. In those where the crystal could be removed, none operated below 24,200 MHz. They work on the external LO source easily. All of them were orig. crystal 25 MHz. DATV is not necessary GPS station stabilization LO, for narrowband work (SSB, CW) is almost necessary.

OPTICUM LSP-02G
https://www.amazon.de/Opticum-Single-Satelliten-Receiver-Full-ready/dp/B002E3ROGE (25 MHz)

Share PLL for 9750 MHz / 390, sharing for 10600 MHz / 424 PLL starts to operate only above 24.183 MHz (room temp.). Good LNB, it will be useful if SMD crystals are found between 24,200 and 24,305 MHz.

DICOM TWIN II
https://www.satline24.net/lnb-twin-dicom-ii

some report that it works on 24 MHz crystal BP. They are marketed in Portugal, Greece and Chile.

Is this really the STRONG SRT L722 *https://www.anvimur.com/es/tv-satelite/128-lnb-twin-02db.html* ?

Reception is a force - with some loss even with upconverter and unmanaged LNB. The Upconverter maps the 700 MHz IF band from unprocessed LNB up. One such is the old ADX plus Global communications (UK), which shifts the IF by about 500 MHz upwards. LNB must not have pass filters!

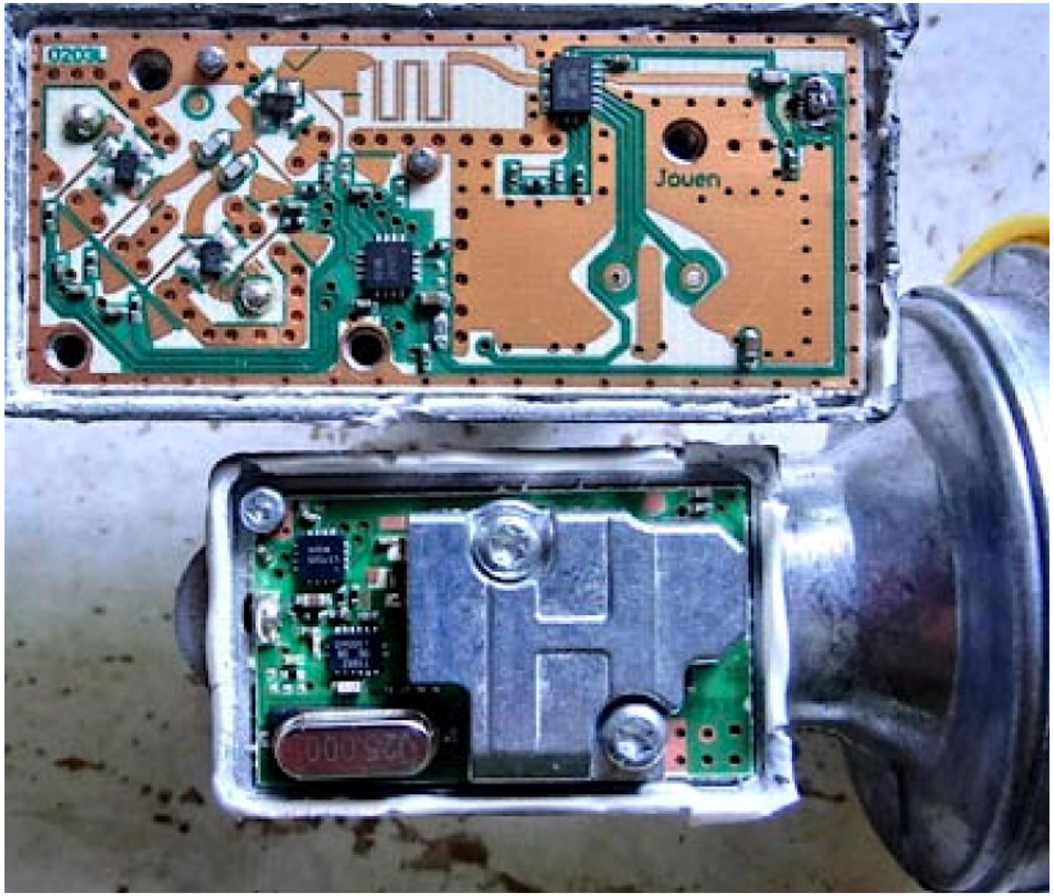
Please note:- Links are correct as of May 2019 and may have changed if you are reading this at some future point

Experience with the conversion and use of PLL-LNBs

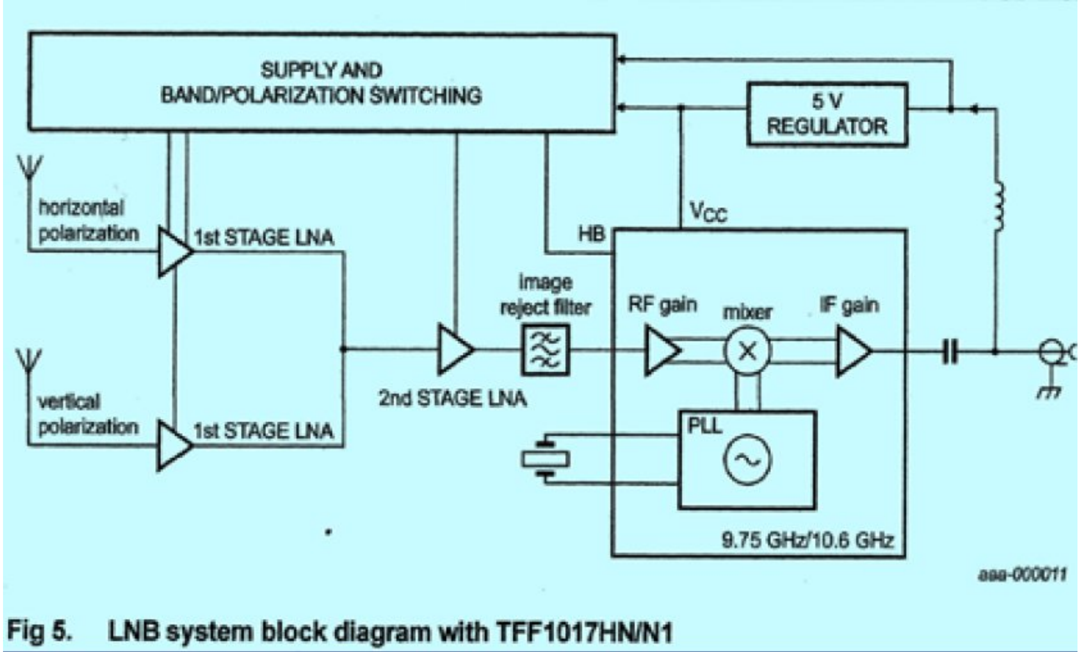
Written by Herbert Hommel DL4AWK

Reprinted from TV-AMATEUR 192 by kind permission.

In TV-AMATEUR, issue 189, I had described the conversion of the PLL-LNBs in detail on page 15. Unfortunately, in practice there were thermal problems: some specimens with 23.512 MHz quartz crystals were subjected to drop-outs at temperatures below five degrees Celsius.



Inside Goobay LNB_GM-201



LNB block diagram

In a test series of five converted LNBs, four worked at minus 20 degrees, one dropped out at around five degrees.

Measurements on several LNBs confirmed here the suspicion that some specimens are not suitable for a LO frequency of 9.170 GHz due to manufacturing tolerances.

With a 23.512 MHz crystal, we are already operating the internal PLL in the TFF1017 IC at its limit. Pin 9 provides a reference voltage of 2.74 volts, which unfortunately cannot be set externally.

The control voltage at pin 8 is 1.75 V at room temperature with 25 MHz quartz, 2.36 V with 24 MHz quartz and 2.65 V with 23.512 MHz quartz.

With a current consumption of about 70 mA, the LNB no longer heats itself to any significant extent, unlike in the past.

When temperatures drop, the internal VCO moves upwards and the PLL adjusts. However, if the voltage difference between pin 8 and pin 9 is less than 0.05 Volt, the PLL disengages and the VCO oscillates undefined.

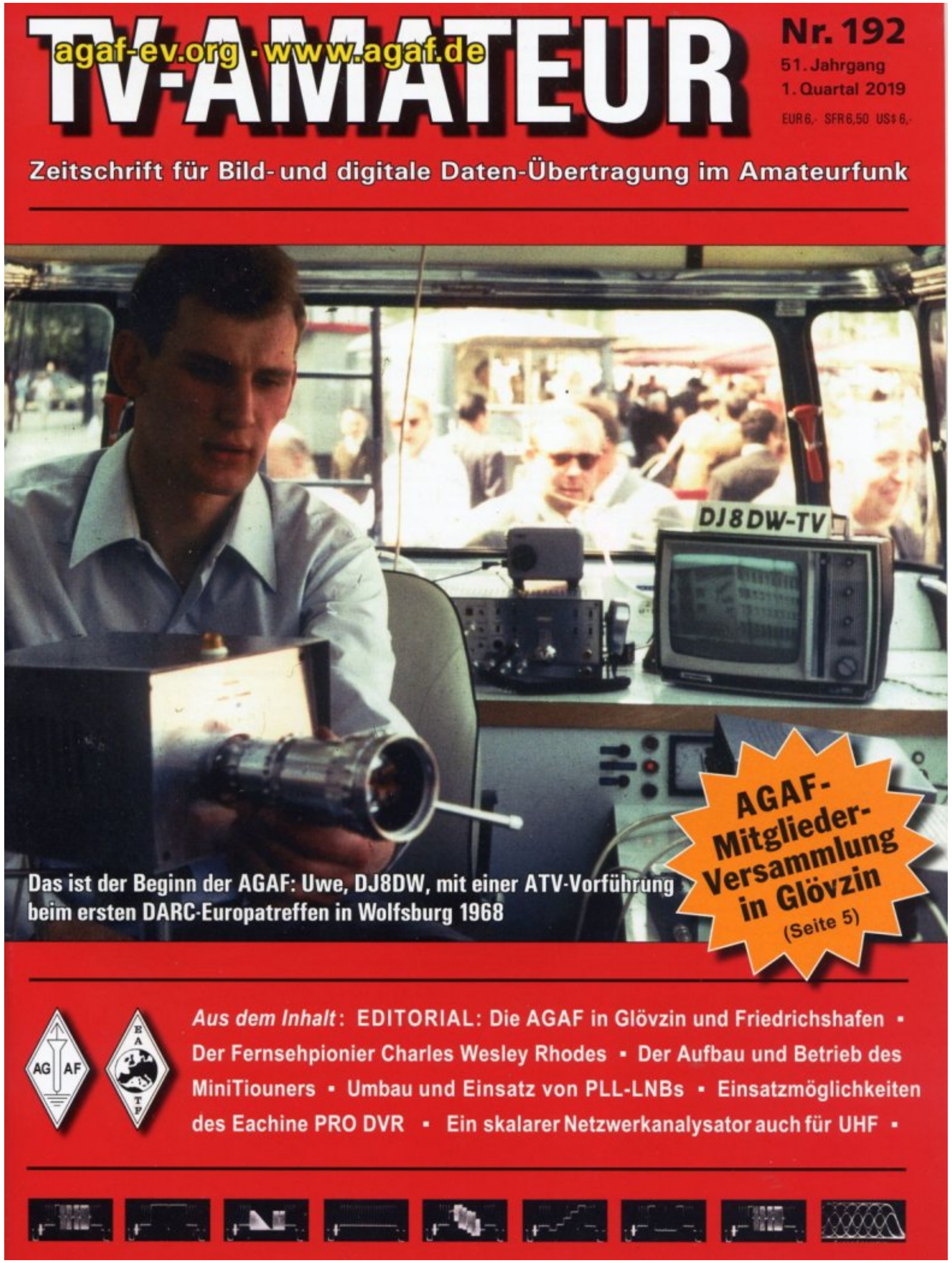
All LNBs show the same behaviour with different intensity. In order to be able to use the sorted out LNBs for amateur radio, I ordered a larger number of crystals HC49S, 23.70625 MHz, from Mouser.

The control voltage is reduced to 2.58 V, at minus 20 degrees it is increased to 2.65 V. The LO frequency is then calculated to be 9.245437 GHz.

ATV reception with commercially available SAT-RX is thus possible from 10.195 GHz upwards. The narrow band range transverter of the Es'Hail-2/QO-100 is then converted to 1244 MHz, DVB-S-WB to 1230 MHz.

If you need HC49S crystals (23.70625 MHz), you can order them at cost price plus postage via mail to *dl4awk@gmx.de*

Translation by Klaus DL4KCK



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Video Transmission Using IP with off-the-shelf Devices

Written by Gary Sutton WB5PJB

Reprinted from BOULDER TV Repeater's REPEATER April, 2019

Introduction

While live full-motion video using NTSC or one of the DVB variants has now been a mainstay of amateur radio for years, there is an alternative to those transmission protocols that can sometimes be more beneficial to use in public events where amateur radio is providing support communications and the geographic area of the event is relatively small.

Using Internet Protocol (IP) as a medium for video transmission has proven to be a successful means of getting live images from temporary field locations back to a Command Post.

Many of us have IP cameras in our homes for security reasons, and they make convenient tools for checking our property from anywhere in the world if Internet access is available.

In public outdoor events where amateur radio is providing support communications to a served agency, the same technology may be used in an ad-hoc wireless network to send live video images to a central Command Post.

The task for hams is to setup such a network and make it reliable enough to handle full-motion video from one or more IP cameras.

With the availability of off-the-shelf products from companies such as Ubiquiti, Mikrotik and others, the hardware tools are available to hams to setup wireless networks that have the ability to convey video information from IP cameras setup in various locations around the geographic area of the event.

While this may sound fairly easy to do on the surface, there is a combination of RF knowledge and networking knowledge required by hams to successfully accomplish this task.

The off-the-shelf products operate in the microwave bands assigned to amateur radio operators, so being familiar with microwave antennas and propagation is important, as well as, understanding how to setup a network with switches and routers, and administering IP addresses and host names.

Pre-planning is essential to increase the chances of a successful outcome and understanding the limitations of these devices will help you to not overreach on expectations.

The purpose of this article is not to get into the details of the Ubiquiti or Mikrotik products, but to give an example of a simple outdoor event where a single IP camera feed located a mile away is used to send full-motion video to operators in the Command Post.

This particular event is a 5K walk/run held each Thanksgiving morning in Highlands Ranch.

A rest stop is located one mile away from the Command Post (CP) and the desire is to have video in the CP showing the activity at the rest stop.

Step 1

Step one was to investigate the feasibility of such a request based on the geography of the area. As stated above, the RF transmissions would be using either the amateur radio 13 cm band (2.4 GHz.) or the 5 cm band (5 GHz.) because those are the frequencies used by the off-the-shelf products.

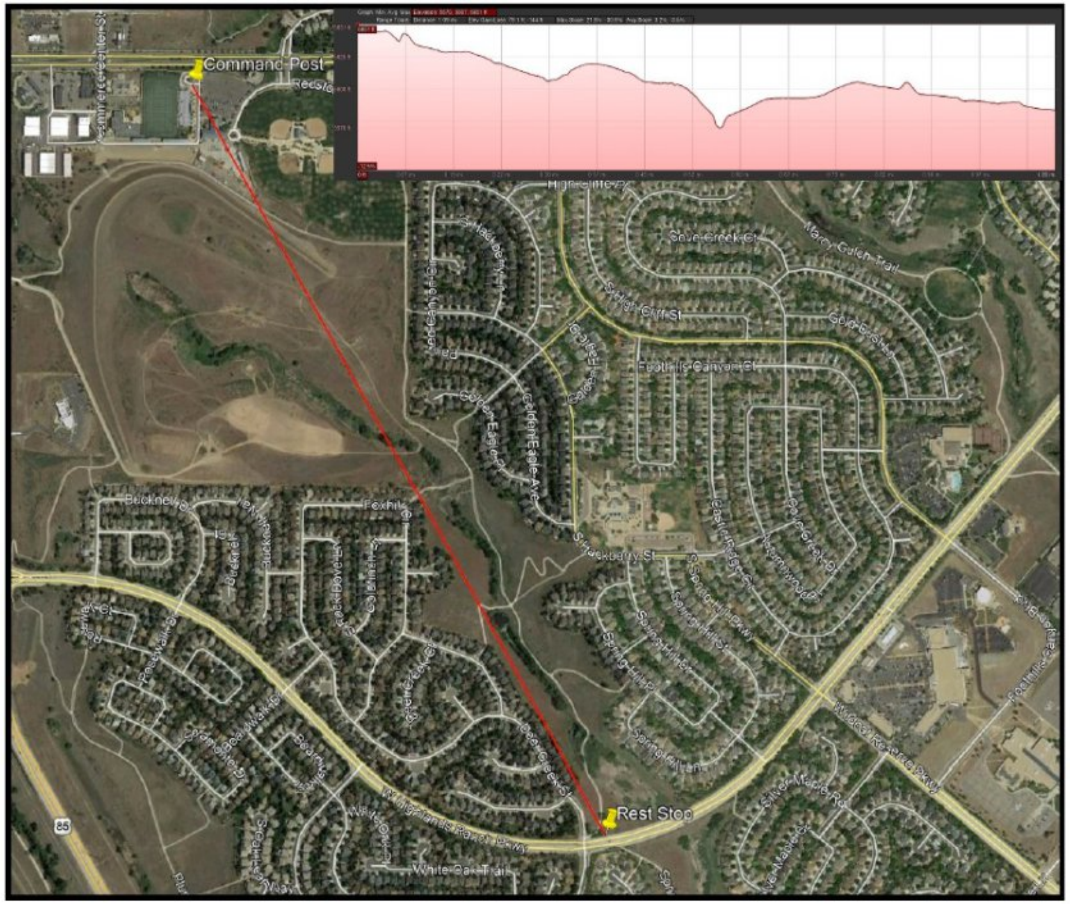
A physical site visit to both the rest stop location and the CP location, along with Goggle Earth analysis of the path between the two locations, made the possibility look somewhat favorable for obtaining a successful microwave path.

As it so happens, a length of open space land existed between the two locations, so any blockage of microwave RF from houses would be minimal. Likewise, no land features would significantly protrude into the Fresnel zone (*https://en.wikipedia.org/wiki/Fresnel_zone*) of the path between the two microwave transceivers. There were some trees and tall bushes in the path, which would definitely be protruding into the Fresnel zone, so that raised some concern.

Experience with using microwave frequencies around trees has shown that trees and their leaves love to absorb microwave energy, so there is always some concern when there are a lot of trees in a microwave path.

The only advantage we would have is that this was a Thanksgiving day event, so the deciduous trees had dropped their leaves.

Overall, it was determined that the RF path had a reasonably good chance at success, and this was an amateur radio endeavor, so experimentation to see if something works or doesn't work is all part of the fun.



Goggle Earth© map and elevation profile of the path between the rest stop and the CP

Step 2

Step two was to pick the RF and camera hardware. The RF choice was between using 2.4 GHz. or using 5 GHz.

This was an easy decision because there was no budget for new equipment, so based on the hardware that was on-hand, 5 GHz was the chosen band to use.

As a note, we have done this event with video for several years and we have always used 5 GHz.

The camera source has evolved over the years, with initially using an analog NTSC camcorder camera (provided by the Douglas County Sheriff's office) combined with an analog-to-digital IP converter to using strictly an IP camera that streams H.264 or MPEG video out a network port.

Step 3

Step three was to gather the necessary accessory parts and pieces to make a complete operational setup. This involves power sources, tripods, masts, cables, etc.

This step needs special attention in pre-planning, as there is nothing worse than getting everything setup in the field and then finding out a cable is missing that keeps the whole system from functioning.

It is advisable to create a detailed checklist of the various parts and pieces that will be required and check off all of the items as you load them into your vehicle for transport to the site. The checklist can also be used at the end of the event to make sure all of the items have been retrieved.

Step 4

Step four was to plan and pre-test the operational functionality of the entire system. This includes configuring all of the IP devices with appropriate IP addresses and subnet masks. This includes the camera source, the RF transceivers and the laptop at the receiving end that will display the video.

Setting the devices up in a test scenario at home and testing the video path prior to going on-site can help guarantee a smooth implementation in the field. It doesn't totally eliminate the "it-worked-on-the-bench" scenario, because you can't account for all of the variables that can happen in the field on the day of the event, but it does increase the chance of success significantly.

It is during this step that knowing how to configure and use the off-the-shelf RF transceivers comes into play.

The details of configuring these devices is beyond the purpose of this article, so for the purposes of keeping this to an overview of using video over IP, it is sufficient to think of the transceivers as a wireless data path similar to using a Wireless Access Point (WAP) in your home or work, except it is working over a much greater distance.

Implementation

The actual implementation of this very simple video system has gone quite well over the years. Some of the initial concerns about vegetation causing an issue with the microwave signal have been alleviated, as the 5 GHz. signal makes the one mile path with no problem.

Initial site visit raised some concern over the vegetation in the microwave path

First year setup at the rest stop using a Ubiquiti PowerStation on a short mast and an analog NTSC camera that was converted to IP

At the CP, a Ubiquiti 5 GHz. NanoStation on a push-up mast to the left of the dual band V/UHF vertical antenna

Setup of the equipment in the field has been relatively easy and we have had no issues with the hardware itself.

The transceivers we have used (both Ubiquiti and Mikrotik) are designed to be used outdoors, so extreme temperatures or wet conditions should have no affect on their operation.

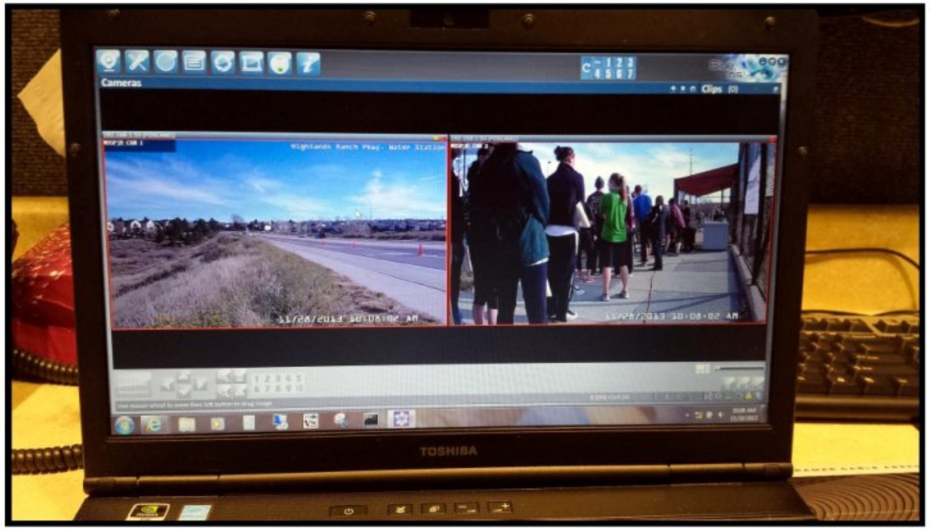
At the rest stop, we have switched from using the analog camcorder camera to using an IP camera.
There are some advantages using the camcorder camera in that it has good zoom capabilities and can also record audio and video locally, so in some instances an analog camcorder might still be a valuable asset.

The advantage of the IP camera is the quicker setup, fewer parts to make it work and better video quality compared to the analog-to-IP converter.

At the Command Post, we have primarily used a laptop running either Blue Iris or VLC Media Player software.

The Blue Iris software is primarily a security camera software and it has the ability to work with most IP cameras on the market and is regularly updated. It is not freeware, but it has always performed well for this task and has worked out better than some of the free software we have tried.

RF-wise at the CP, we have primarily used a very small and lightweight transceiver mounted either on a push-up mast or on top of the stands of a stadium that happens to be next door to the CP.



Blue Iris software running on a laptop in the CP

This past Thanksgiving (2018) we used an IP camera at the rest stop and another on top of the stadium looking down on the Start/Finish area. The stadium camera was a PTZ camera, so that offered the ability to remotely pan, tilt and zoom easy to do with IP camera systems

Summary of experience

Over the years of using IP for video transport at this particular event, the success rate has been 100 percent. Using IP cameras for video and Ubiquiti or Mikrotik for RF transmission is not exactly plug-and-play, however. It does take some upfront planning to make the system function properly and there are a number of configuration settings that can be gotchas if they aren't set properly.

The RF reliability of the Ubiquiti and Mikrotik devices is excellent. They simply work. If you can get a good microwave path, then the chances of the devices "seeing" each other RF-wise is good.

Issues arise when the RF paths are anything less than perfect. Data rates will drop off very rapidly as the signal strength between two nodes is reduced. The nodes may show they are connected to one another (a "connection" requires very little bandwidth), but if the signal strength isn't very strong, they may not be able to provide adequate bandwidth for video.

These are low power devices, relatively speaking. Typically the power output of the device is a Watt or two, at best. The antenna may provide a lot of gain, such that a higher EIRP is obtained, but that comes at the cost of a more narrow antenna beamwidth, which begins to eliminate an easily obtainable omnidirectional setup that has decent gain.

A high gain omnidirectional setup may be obtained by combining multiple transceivers at a location and pointing them in different directions, but that comes with greater complexity in system setup and higher cost.

These are microwave devices that operate at a wide bandwidth, so it must be kept in mind that their useable working distance is limited.

Where you might be able to get a 70 cm or 23 cm DVB-T signal out of a not-so-prime RF location, these off-the-shelf transceivers may not work at all.

Like anything else in a ham radio operator's communications toolbox, the off-the-shelf IP transceivers can serve a useful purpose as video transmission devices if used properly within their limitations.

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

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

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

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

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