In this issue

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Editorial

Welcome to CQ-DATV 77 our November issue.

This starts with the implemnetation of the CQ-DATV index programme to help you navigate through all the back issues in the CQ-DATV library. This is the sole work of Ian our editor and we hope it will help when looking for information that is locked into our ever expanding knowledge banks.

In this issue there is a wealth of amateur radio news from a special event station in Bochum, the story behind IP addresses that start with 44. These are for use exculsivley in amateur radio digital communications.

The latest from the AGAF forum that took place in June, we owe a great deal to Klaus DL4KCK for the English translation of all the AGAF events and stories. Without this important link a lot of valuable experimentation and development would go unreported in English languge circles.

Jim Andrews KH6HTV is a someone who needs no translation and has become a major contibuter to CQ-DATV. In this issue he is reporting on DVD-T ATV. Jim has continued his ATV article from the previous issue on ATV repeaters with particular attention to RF duplexers so that a single aerial can be used for both RX and TX and if that is not enough, Jim has also contributed an article looking at DVB-T sidebands, Jim where do you find all the time.

Trevor G8CJS is looking at RGB video and how the results can be viewed on a SCART equiped TV. This is a mixture of golden oldie circuits and some ideas that we have not seen before. Trevor has also produced the Grass Valley Panel article 10.

Helmut Schroder DG3KHS is looking at DVR, NVR and HVR recorders that are widley used in the security industry. Helmut is looking with a view to using them in ATV.

One from the vault is a look back at previously published CQ-DATV circuits and in this Issue John Hudson G3RFL looked back at Trevor's ATV repeater GB3ET which is sadly no longer operational. In his design Trevor used a Z80 micro and 8255 port to control the logic. John gave this logic an update with a design for a filter to remover PLOPS and make the CW ident more palletable. We suspect that back in the GB3ET days Trevor would not have known good morse code from bad as a B class licence operator.

We have also extracted a report from the Boulder ATV repeater news letter, reviewing the ADF-5355 54MHz to 13.6GHz signal generator written by, yes you have guessed it Jim Andrews KH6HTV, can we refer you to our previous comment Jim where do you find the time.

If this magzine seems to be fired by the same named authors then all we can say is thank you for keeping the pages of CQ-DATV filled with interesting copy.

Please don't just read about ATV, think about contributing.

This platform was intended to share information around the world and report on activity happening world wide, but for this to work we need your input.

Please sit back and read what our contributers have delivered and think, could you not report on ATV in your part of the world.

CQ-DATV needs your input in order to survive, don't leave it to others

CQ-DATV editorial team

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

Search me!

In order to produce the CQ-DATV Index program,all the articles and authors details have been entered into a database. We can use this database information to enable an articles search facility on the main web site. You can search for articles by title, author surname or author callsign.

If you have any comments or suggestion on how this earch can be improved, then please email *editor@cq-datv.mobi*.

Special station DAØAPOLLO in Bochum

July 20, 1969 at 02:56:20 UTC the astronaut Neil Armstrong was the first man to enter the moon. He was followed by Buzz Aldrin, while Michael Collins orbited the moon in the command capsule. On July 24th 1969 at 16:50:35 UTC landed the Apollo 11 Crew safely back in the Pacific Ocean. The sensation was perfect, the US Americans had won the race to the moon.

The Bochum observatory received the astronaut´s signals live from the moon. This is the reason to join in 2019 with operations on different bands with the special call sign DAØAPOLLO. On the 20. and on the 21.07.2019 an action day was organized with visits to the observatory.

HAMNET conversion necessary

In 1981, the radio amateur Hank Magnuski acquired the right to use all IP addresses starting with 44. He made these addresses available to radio amateurs worldwide free of charge.

HAMNET live camera view of the Observatory Bochum with the special station below

Since the coordination of around 16.7 million IP addresses is complex, the sponsorship was transferred to the non-profit organisation “Amateur Radio Digital Communications”, or ARDC for short.

With the expansion of the Internet, IPv4 addresses became scarce, and the market value of the addresses is rising steadily. Recently the ARDC announced, that a quarter of the address space was sold.

The new owner is “Amazon Web Services Incorporated”. The fact of the sale was announced only after conclusion of the contract. There remain approximately 12.6 million IP addresses for amateur radio related applications.

The measure was justified by the fact that the addresses sold were “not in use and would never be used”. The collected “some millions of dollars” are to be used for charitable, amateur radio-related purposes.

The German HAMNET, among others, is located in the sold IP segment. As a direct consequence, reverse DNS resolution via public DNS servers no longer works.

In the foreseeable future all affected link routes, routers, services and end devices will have to be migrated to other addresses.

The German HAMNET coordination is already working intensively on the planning of this major relocation measure.

A concept will be presented at this year's HAMNET conference in Passau.

The complete press release of the ARDC is available at *www.ampr.org/amprnet/*

Source: ham radio news Cologne

Reprinted from TV-AMATEUR 194, translated by Klaus, DL4KCK *www.agaf.de*

Call for Articles

This magazine is only as good as it's content. We would like to feel that we are doing a reasonable job but it can be very hard work finding that content.

You can help by contributing something, either in the form of an original article about something you have built, somewhere you have operated from or news from your club.

We can even follow up on links to articles that you have seen. Some permit us to publish their articles after we explain what CQ-DATV magazine is all about, some don't, but that is alright.

Remember - no content = no magazine.

DATV forum on June 21

In the beginning there were about 50 guests in the Austria Room, welcomed by Pierre-Andre, HB9AZN (Swiss-ATV), who then handed it over to the first speaker Dave, G8GKQ (BATC). He provided an overview of the various DATV soft- and hardware. Currently new are "Portsdown 2019 nosolder" with 7-inch touch screen, RaspberryPi 3B and LimeSDR (Developer Evariste, F5OEO) and NVIDIA "Jetson nano", with H.265 codec.

Michel, HB9DUG (Swiss-ATV), presented his Portsdown-TX with LimeNetMicro as well as a new development by Marcel (in the QO-100-Chat known as "markro92"): "DVB-S2-GUI" with LimeSDRmini, sample rate up to 2 MS/s, and VLCPlayer. F4EXB (online at *github.com*) developed "SDRAngel". Graphical representations of the possible combinations of RX and TX variants made clear the variety of digital ATV solutions that has grown in the meantime.

Uwe, DJ8DW (AGAF), showed via beamer many documents and side notes from 50 years of color television in Europe, including color picture reproduction, color signal storage analog/digital, first HDTV developments (e.g. "Eureka 95 Project") with the introduction of the 16:9 image format), digital modulation methods such as OFDM (DVB-T) and 8-VSB (ATSC, both developed with the participation of Bergische Universität Wuppertal, the historical WDR-PAL color TV lab with many original equipment is available there) right up to the current 8-PSK modulation method.

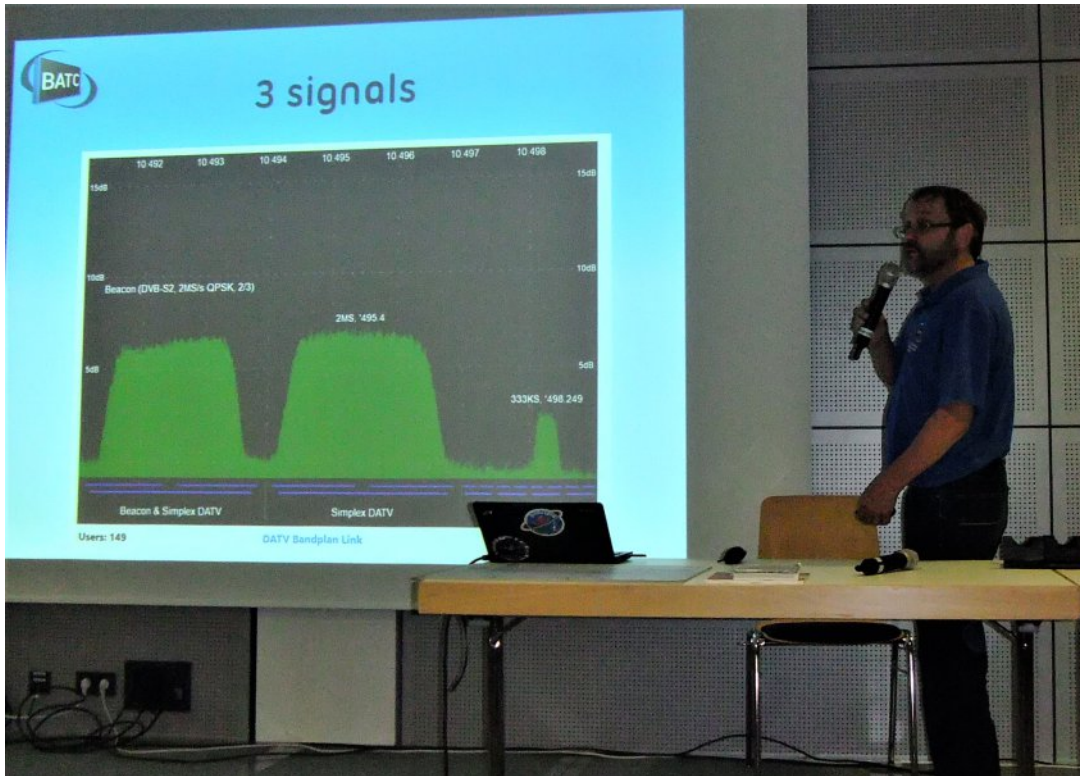
In the end, he paid tribute to some TV pioneers, including the US-American developer of the colour video vectorscopes and chief engineer in "Advanced Television Test Center", Charles W. Rhodes. In the nineties were developed amongst other things the still current digital HDTV formats 720p and 1080i.

Jens, DH6BB, and Peter, DB2OS, at the QO-100 presentation

Peter, DB2OS (AMSAT-DL chairman), and Jens, DH6BB (AGAF and AMSAT-DL), described the developments until the successful operation of the first geostationary amateur radio satellite Qatar-OSCAR-100 on board the Qatar TV satellite "Es´hail-2".

The German AMSAT-DL ground station at the foot of the 20 m dish of the Bochum observatory transmits the edge beacons to the narrowband transponder, but can also send video images to the broadband transponder.

The video beacon in QPSK-DATV with 2 MS/s comes from Qatar.



Noel, G8GTZ, at his QO-100 talk

Uwe, DJ8DW in conversation with Klaus, DL9KAS and Bernd, DL9KAR from DB0KWE

Noel, G8GTZ (BATC), gave hints for the DATV reception and operation on QO-100: an LNB with converted 9 GHz DRO oscillator is not stable enough for RB-ATV, PLL-LNBs are required. With an 80 cm offset dish, for example, a stable 250 KS/s QPSK transmit signal requires approx. 67 watts TX power at max. 5 dB MER. Noel presented many other combination variants in tabular form.

The AGAF booth

This time Uwe, DJ8DW, and Willi, DC5QC, with son Matthias installed the 23 cm receiving antenna on the roof of the hall which received the QPSK-DATV signal from Uwe's hotel at the Pfänder mountain (OE) on his flat screen in hall A1. Uwe had again sampled a list of questions about ATV for the "DARC Rally" as a contribution to youth work.

On Saturday Dave, G8GKQ, transmitted from the AMSAT-DL booth in hall A1 a DATV live video of the audience in front of the booth via QO-100 using parabolic antennas next to the hall. At the DARC-VUS chapter presentation booth the ATV repeater output of DBØHEX on the Brocken mountain was shown live, relayed via HAMNET-HF links across Germany.

The Munich ATV Group from repeater DBØQI was of course also there with their own stand again and a lot of self-made technology.

Also on Saturday Michael DL2SEK, Jens DL4AAS, Jan DG1SJF, Pico DF8AK, and Lucas OE2LSP, started a high altitude balloon under the callsign DBØTTM with transmitter payloads at 2 m, 70 cm and 13 centimeters.

High-altitude balloon preparation with parachute

DL2SEK holds the payload container with camera module, on the left narrated by DH3WR

This was probably the first time in the world that radio amateurs started a balloon wearing HAMNET payload. They used the network connection for an HD video stream, which was provided for the HamCloud and the Internet. The main part of the 13 cm payload consisted of a camera module connected to a Raspberry Pi 3B+ mini-computer and a modified commercial transmitter for 2.4 GHz / HAMNET. Tasks for the computer were collecting information from the navigation and temperature sensors and video encoding with the sensor data embedded in the video stream.

The balloon launch was carried out in the inner courtyard of the trade fair in front of many spectators, the participating HAMNET expert Ralf, DH3WR, explained the proceedings in German and English.

After filling the balloon at a long thin cord were hanging the parachute and underneath the distributed payloads. The video images from the cloud cover and from time to time the curvature of the earth were emitted live to the balloon project stand in hall A1 with a short vertical antenna until 20 km altitude, the balloon burst at nearly 33 km altitude. The flight track also shown by video beamer ran in a zigzag to the landing place west of Pfullendorf (approximately 35 km northwest of Friedrichshafen).

Reprinted from TV-AMATEUR 194, translated by Klaus, DL4KCK *www.agaf.de*

HiDes Product: BR-101E GAPFILLER/REPEATER - Preliminary Testing

Written by Dave Pelaez, AH2AR

Preliminary testing of the BR-101EH used as a cross band demodulator/modulator link shows excellent potential as one leg of a standalone cross band repeater.

For the test, I provided a signal from a distant DVB-t transmitter running on 428 Mhz (actually, the Dayton W8BI DVB-T output), and prior to the test, set the parameters of the BR-101E for the demodulator parameters of the incoming signal at 428 MHz with a 2 MHz bandwidth, QPSK constellation, with 641/642 PID value (See Photo #1. I configured the modulator side of the BR-101E to transmit on 1280 MHz, QPSK @ 2 MHz bandwidth, also set to the same PID values: 641/Video 642/Audio (see photo #2).

The DVB-T RF output of the re-transmitted signal from the BR-101E is -12dBm, and is adjustable with an internal attenuator/gain adjustment and the system parameters are initially configured with a Windows PC. It's important to note that a personal computer IS NOT required during its operation.

The unit has a "DONGLE/SDR appearance" (see photo) and a quick glance at the HiDes advertisement would wrongly infer that the dongle-sized unit appears as if it would require a computer for operation, (such as what is required for the HiDes UT-100 transceiver dongle), but this is not the case. Consequently, being standalone provides more reliable communications as computers in-the-loop sometimes create problems during power failures or computer crashes and are normally unusable at unattended sites.

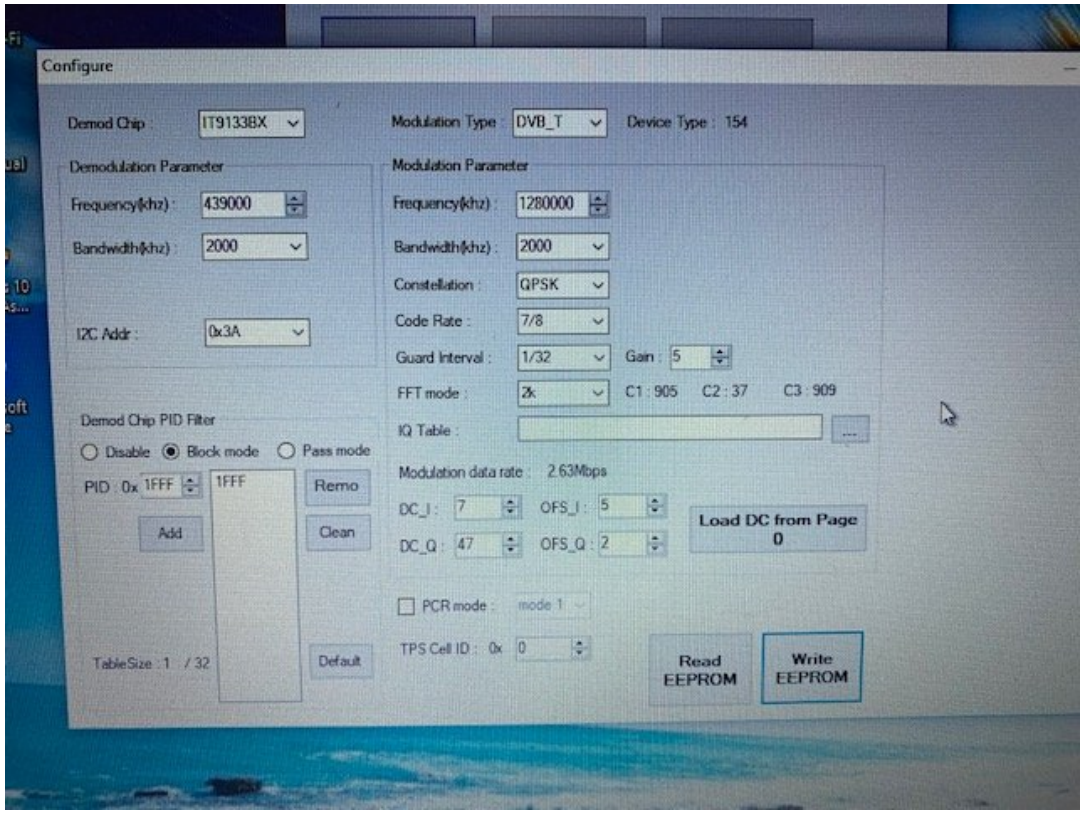


PHOTO #1: Straightforward configuration menu shows the GUI for the modulator and demodulator parameters

The unit is powered by a 5 vdc USB cable. This same USB cable that provides DC power is also used to initially configure the system parameters with free software provided by HiDes.

For the preliminary test, I used a MINI-CIRCUITS ZHL42W amplifier as a means to increase the BR-101E's transmitted RF power up to approximately 1 watt output (See photo) with a resultant acceptable 30 dB shoulder. There are a number of other amplifiers that can provide the necessary gain to bring the BR-101E' s -12dBm RF output up to a useable RF power level, in order to drive a larger amplifier.

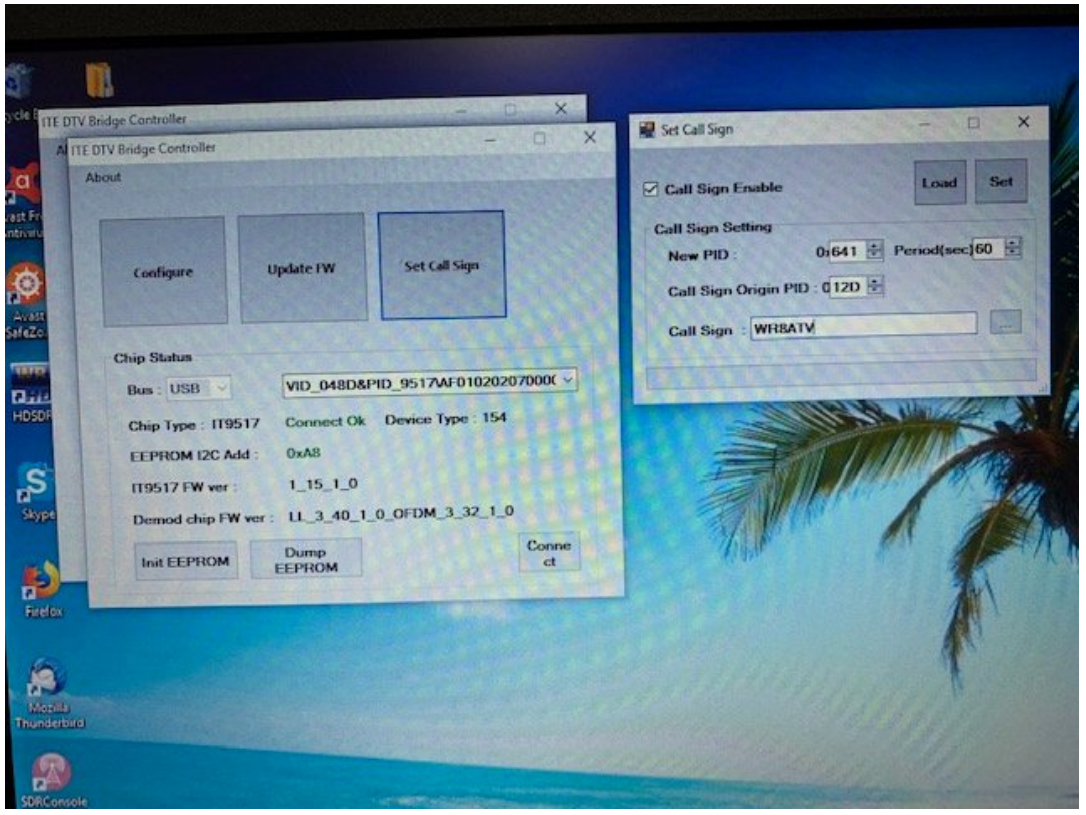


PHOTO #2 GUI for PID VALUE and Callsign Parameters for modulation section

We have yet to examine whether filtering will be needed for out of band harmonics.

When powered on, the BR-101E provides a continuous output with a blank raster (on 1280 Mhz in this case) when it is not receiving. It also has a CALLSIGN feature that can be set to any unique callsign within its graphical user interface during initial configuration so it will be enunciating a callsign with the somewhat brief instructions provided. The specified callsign/TS file transmission functionality that allows for timed callsign display has not been explored yet, and more information about this important function will be forthcoming. I was initially unable to understand how this function is properly configured with the instructions provided.

PHOTO #3: BR-101EH transmitting with "Valid Green LED" indicating demodulation in progress. Directly plugged into 5 VDC, with "gimmick" antennas for 70cm and 23cm antennas for testing in-shack

When receiving a distant signal, it retransmits whatever DVB-T signal it is receiving (with the configured parameter values) and there is no degradation of the retransmitted video as it uses a transport stream internally between its demodulator and modulator so no video or audio data is lost.

The gapfiller output looked as good as the original signal being transmitted, and for the preliminary test, the "eyeball" was the only test instrument to ascertain whether the unit faithfully retransmits the received video without loss of resolution or detectable pixelating.

For cross-band repeater use it works as well as advertised. I have as-of-yet to see whether it will work for in-band repeater use because modulator/demodulator de-sensing will likely will be an issue, since there is no physical isolation between modulator and demodulator and consequently likely won't work for that purpose, but as I get further into this, I will see whether this is even feasible. Jeff at HiDes indicated that he did not believe the unit can be used as an in-band repeater, but he stated that he is curious to hear what further testing may unearth.

Lastly, when it is demodulating a DVB-T signal, the PCB has a "green valid signal LED" that can be exploited to switch a relay or provide other functions. The valid signal LED is used on other HiDes receivers for relay control switching and there is no reason why this methodology can't be employed with the BR-101Eto support other functions also.

The unit gets very warm to the touch (but not hot) during extended operation and the heating could likely be helped to be brought down to a lower operating temperature by fan cooling for repeater use

Other functions that need further checkout: Its possible that any video latency that occurs between the BR-101EH's demodulator and modulator may be minimal when compared to a decoder/encoder handshake between an HV110 receiver and an HV-310 Transmitter, as an example. Shortened latency during re-transmission will be a big plus but this also has not been measured yet.

Hopefully, Jim Andrews KH6HTV will be able to provide a further in-depth review of this unique "micro" gapfiller/repeater that literally can be lost inside your pocket!

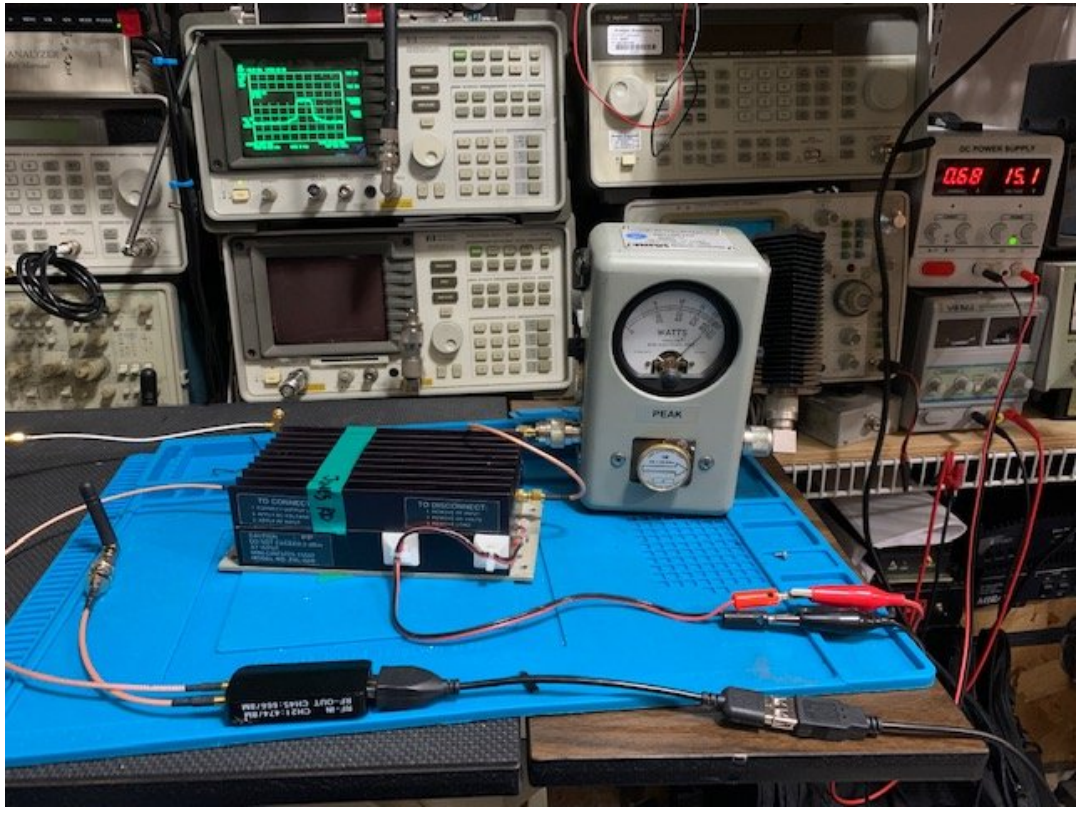
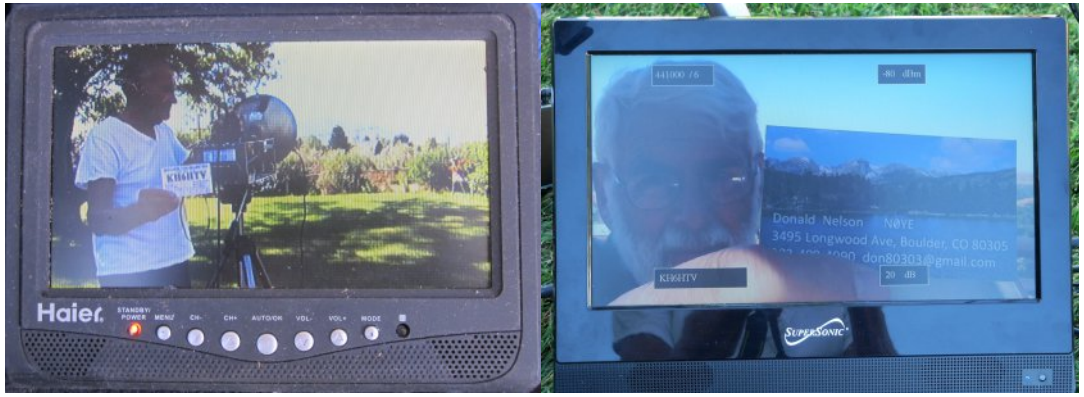


PHOTO #4: Mini Circuits amplifier (driver) in line on the test bench with the BR-101EH gapfiller/repeater. (Note that the Bird 43 wattmeter is being used for relative RF output only… Wattmeter indicating approximately 1 watt)

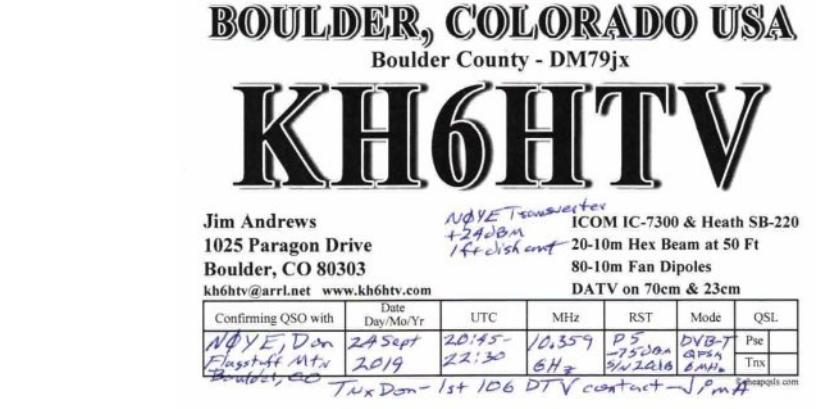
10 GHz DVB-T Progress in Boulder

Written by Jim Andrews KH6HTV



Left: KH6HTV as received by N0YE
Right: N0YE as received by KH6HTV

On Tuesday, 24th of Sept, Don, N0YE, and Jim, KH6HTV, were successful in making a 2 way DVB-T QSO on the 3cm, 10 GHz band. Jim was at his QTH south-east of Boulder while Don was at Panorama Point on Flagstaff mountain. The distance covered was 6.2 miles (10 km). Jim was using an N0YE, 3cm Transverter running +24dBm into a 1 ft. dish antenna. Don was running +18 dBm, also into a 1 ft. dish. Perfect, P5, digital pictures and CD quality audio were received. Jim's HV-110 receiver showed Don's signal to be -75dBm at the antenna with a 20dB S/N.



BOULDER, COLORADO USA

Boulder County - DM79jx

KH6HTV

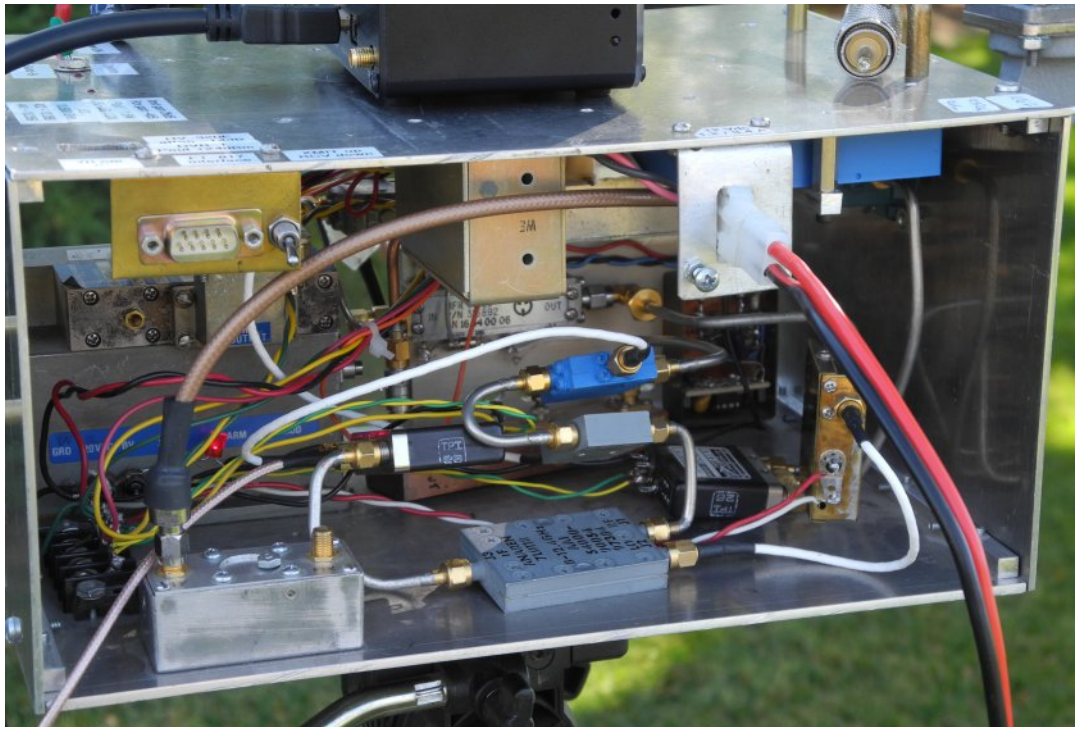
Jim Andrews
1025 Paragon Drive
Boulder, CO 80303
kh6htv@arrl.net www.kh6htv.com

N0YE Transverter +24dBm 1ft dish ant

ICOM IC-7300 & Heath SB-220
20-10m Hex Beam at 50 Ft
80-10m Fan Dipoles
DATV on 70cm & 23cm

Confirming QSO with	Date Day/Mo/Yr	UTC	MHz	RST	Mode	QSL
N0YE, Don Flagstaff Mtn Boulder, CO	24 Sept 2019	20:45-22:30	10,359 GHz	P5 -75/20dB S/N 2016	DVB-T QPSK 6 MHz	Pse Tnx

Tnx Don - 1st 10G DTV contact - JIM

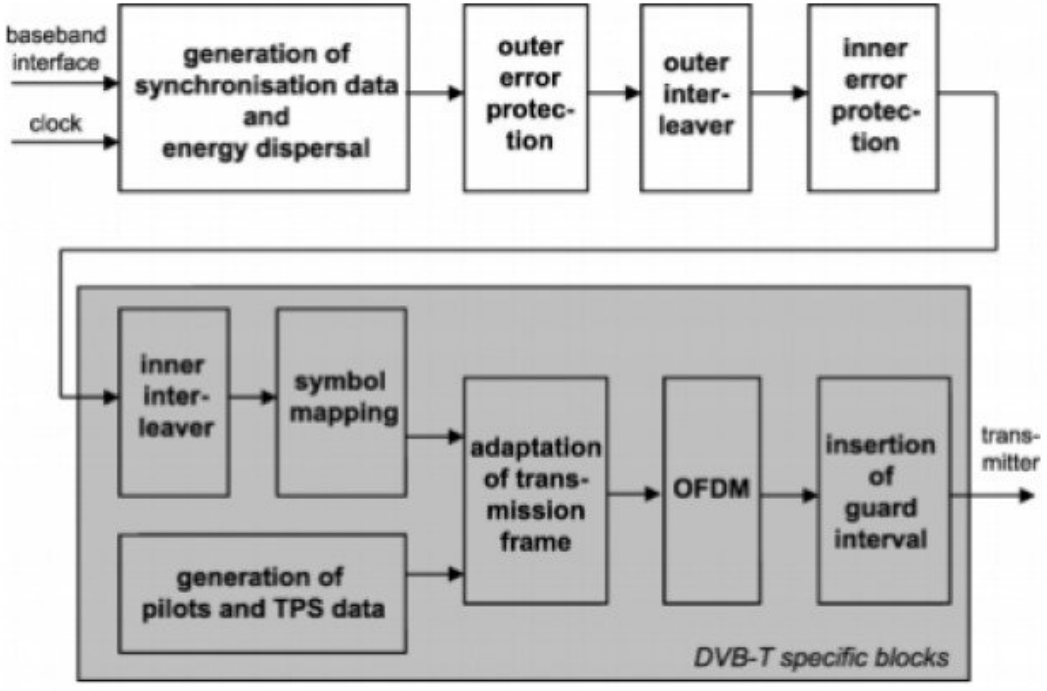


Above: Interior View of N0YE 10GHz Rig
Below: N0YE on Flagstaff Mtn

DVB-T (**D**igital **V**ideo **B**roadcasting-**T**errestrial) is the DVB European-based standard for the broadcast transmission of digital terrestrial television. DVB-T is more complex and robust than DVB-S because it must cope with a different noise and bandwidth environment and multi-path.

The system has several dimensions of receiver 'agility', where the receiver is required to adapt its decoding according to signaling. The key element is the use of OFDM. There are two modes: 2K carriers plus QAM, 8K carriers plus QAM. The 8K mode can allow more multi-path protection, but the 2K mode can offer Doppler advantages where the receiver is moving.

The DVB-T system transmits audio, video, and data through MPEG-2 streaming, using COFDM modulation.



The DVB-T Standard is published as EN 300 744, "Framing structure, channel coding and modulation for digital terrestrial television".

This is available from the ETSI website, as is ETSI TS 101 154, "Specification for the use of Video and Audio Coding in Broadcasting Applications based on the MPEG-2 Transport Stream", which gives details of the DVB use of source coding methods for MPEG-2 and, more recently, H.264/MPEG-4 AVC as well as audio encoding systems.

Many countries that have adopted DVB-T have published standards for their implementation. DVB-T has been further developed into newer standards such as DVB-H (Handheld), now in operation, and DVB-T2 now fully implemented.

The MPEG-2 video formats include: HDTV 1920x1080i/p, 1440x1152p, etc. in 16/9, SDTV 720x576 4/3 or 16/9, and Audio MPEG-2 or Dolby AC-3. Moreover, other types of data-stream can be transported as generic data or MPEG-4.

It supports interactive contents by using return paths such as Internet, cellular or telephone.

The DVB-T signal is an Orthogonal Frequency Division Multiplexed (OFDM) signal with either 2k or 8k subcarriers depending on the operating mode. Symbols are organized into frames, with each DVB-T frame consisting of 68 OFDM symbols.

A super-frame consists of four frames and is used to match the OFDM signaling with the framing for the error control coding in the system.

The OFDM symbols carry data belonging to three different types: 1) the MPEG- 2 video data stream, 2) the DVB-T transmission parameter signal (TPS), and 3) pilots.

1. Data: *The MPEG-2 stream first passes through a series of stages including bit-randomization, outer-coding, and inner-coding before being mapped into the signal constellation. This process results in the information appearing on these carriers as random data. This also leads to the flat spectrum of the signal. The data carriers are modulated with Quadrature Phase Shift Keying (QPSK), 16-Quadrature Amplitude Modulation (QAM), or 64QAM depending on the operating mode.*

2. Transmission parameter signal (TPS): *The TPS carriers convey information about the parameters of the transmission scheme. The carrier locations are constant and defined by the standard and all carriers convey the same information using Differential Binary Phase Shift Keying (DBPSK). The initial symbol is derived from a Pseudorandom Binary Sequence (PRBS).*

3. Pilots: *The pilot symbols aid the receiver in reception, demodulation, and decoding of the received signal. Two types of pilots are included: scattered pilots and continual pilots. The scattered pilots are uniformly spaced among the carriers in any given symbol. In contrast, the continual pilot signals occupy the same carrier consistently from symbol to symbol. The location of all pilots carriers are defined by the DVB-T standard.*

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RGB

Written By Trevor Brown G8CJS

I have spent a long time working with PAL for ATV projects and I feel it is time to move on. It was good in its day but needed lots of sophisticated engineering that did not always make it into the amateur world.

Unlocked subcarrier and PAL encoders using TV games chips with poor filtering may have brought the component count down and enabled simple home construction, but the picture quality was always the first casualty.

It's a question of where to take home construction next. Full HDMI interconnects might suit the home video equipment but make it difficult, for those of us who still own a soldering iron, to adapt modify and create projects.

I still have a CRT TV in the shack with a SCART socket that went out to one or two rallies to show the results of the Teletext Pattern Generator that I designed, One or two of you might remember it. The simple design looked good when viewed via the RGB SCART input and I thought there might still be some mileage in using a TV in this way.

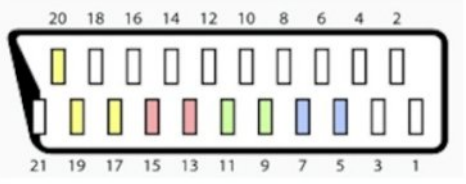
SCART sockets were the first attempt at getting colour TV pictures on the screen without going through the PAL decoder. The origin of this socket came from a trade war to restrict imports into an EU country from, I think, mainly Japan. The connection data was deliberately vague and if your TV set did not have a socket that complied with all the necessary connections and protocols, then it could not be imported.

Today it seems well documented and has some additional switching for aspect ratio that I don't remember being there on the original socket.

It now seems to be called the Euroscart, so I assume the powers that be in Brussels have been involved. There are still some features that don't quite reach muster. The major one being component, yes it has pins for Y, Pr and Pb, but the SCART socket does not have a selector switch to enable it to switch from RGB to component.

This is apparently a function left for the TV set manufacturers to implement, pity my TV set does not seem to have this or I have failed to find it in the menu. So let's assume all SCART equipped TV sets will not switch to component, (note to self we need a future circuit for this). Sad as I could see a future CQ-DATV project as a SCART switching and interface box for RGB, component, composite and all the different aspect ratios.

The problem with RGB is it is a four-wire standard E.G. R,G,B and Sync. There was a standard called BGR (alphabetical) which was a three-wire version of the RGB standard, with the G channel having the sync pulses added.



Female connector seen from the front

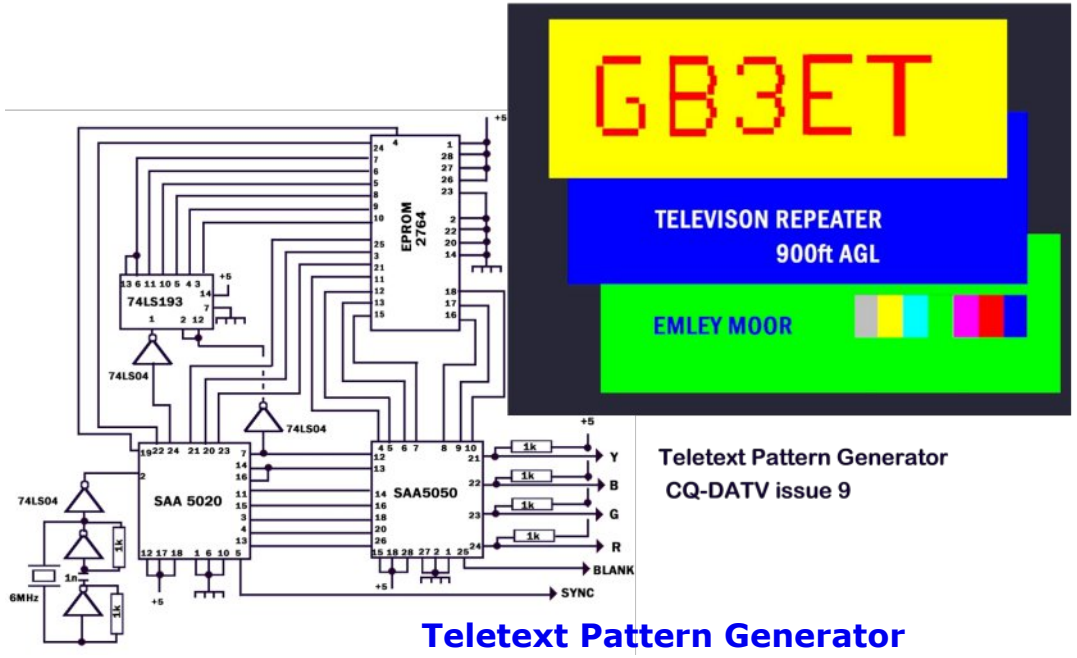
Pin 1	Audio output (right)
Pin 2	Audio input (right)
Pin 3	Audio output (left/mono)
Pin 4	Audio ground (pins 1, 2, 3 & 6 ground)
Pin 5	RGB Blue ground (pin 7 ground)
Pin 6	Audio input (left/mono)
Pin 7	RGB Blue up S-Video C down[a] Component P_B up[b]
Pin 8	Status & Aspect Ratio up[c] • 0–2 V → off • +5–8 V → on/16:9 • +9.5–12 V → on/4:3
Pin 9	RGB Green ground (pin 11 ground)
Pin 10	Clock / Data 2[d] Control bus (AV.link)
Pin 11	RGB Green up Component Y up[b]
Pin 12	Reserved / Data 1[d]
Pin 13	RGB Red ground (pin 15 ground)
Pin 14	Usually Data signal ground (pins 8, 10 & 12 ground)
Pin 15	RGB Red up S-Video C up Component P_R up[b]
Pin 16	Blanking signal up RGB-selection voltage up • 0–0.4 V → composite • 1–3 V → RGB
Pin 17	Composite video ground (pin 19 & 20 ground)
Pin 18	Blanking signal ground (pin 16 ground)
Pin 19	Composite video output S-Video Y output
Pin 20	Composite video input S-Video Y input
Pin 21	Shell/Chassis[e]

output/input denotes symmetrical links
up/down denotes links to/from the TV set

SVHS (another SCART option) is really composite with the chroma and luminance on separate connections (E.G. a two-wire standard) It solved a problem with the interleaving of chroma and luminance sidebands, on SVHS replay where the chroma was stable and the luminance had Jitter and as a result the interleaving suffered. Not a problem with standard VHS as the sidebands were truncated due to poor picture resolution. This two-wire standard does have the chroma modulated onto subcarrier and was something I wanted to avoid, so let's kick this into the long grass.

For the time being let's keep it RGB and look at one or two projects that could be used with this RGB connection. If we can avoid PAL inputs to digital transmitters producing the worst of both worlds, then we may be moving in the right direction.

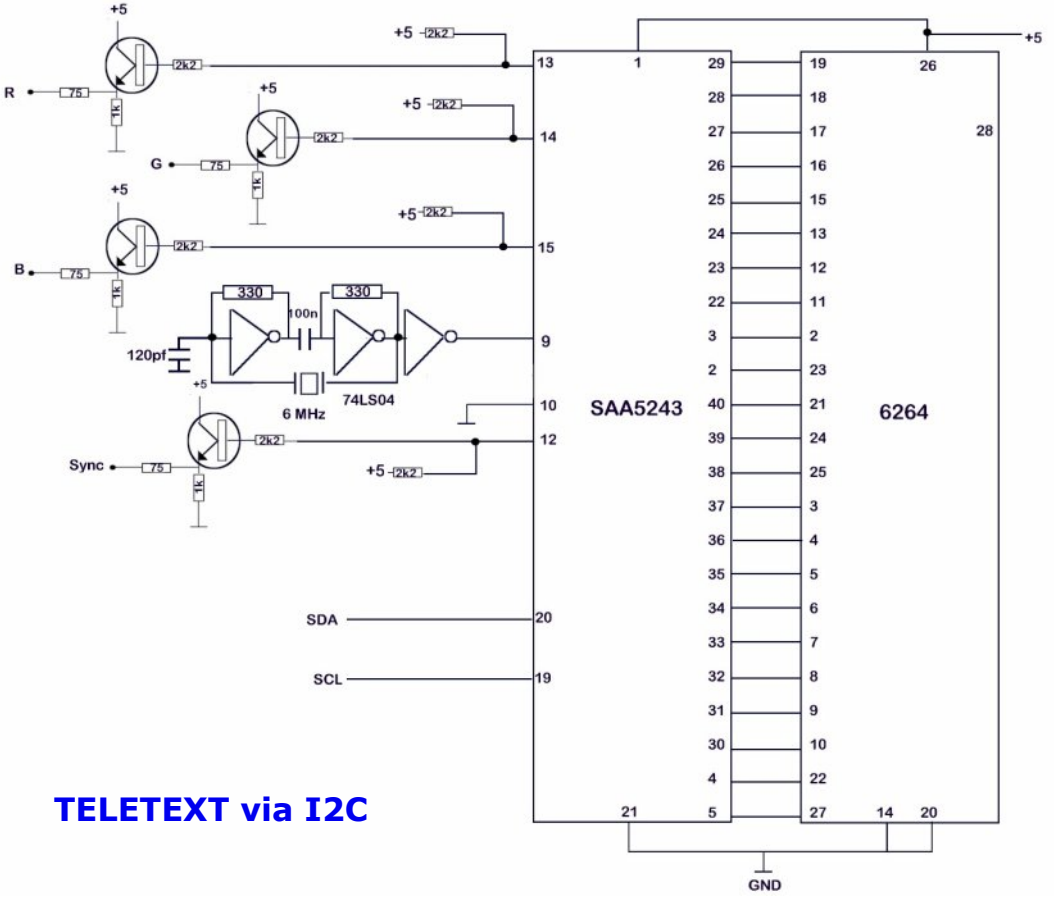
The first circuit is a golden oldie that I designed rather further back than I care to remember. The Teletext Pattern Generator.



Teletext Pattern Generator
CQ-DATV issue 9

Teletext Pattern Generator

It was a simple design using an EPROM which could be programmed to produce some pleasing TV patterns, via an RGB SCART connector. You can read more about it and how to program the EPROM at:-
https://www.cq-datv.mobi/atvc.php.
See also the ATV Compendium for full details and CQ-DATV 9 (both in the library). Pictures do look so much better without subcarrier. GB3ET is now defunct but those of you that saw it and worked it, only saw a PAL version of the time out screen. The output stage could probably have used some better engineered buffers, but it worked, and a lot of people built it. The chips are old, and it might be worth revisiting using more recent Teletext chips.



TELETEXT via I2C

A more modern approach is the SAA5243 where, instead of an EPROM, we could have a RAM chip and use an I2C bus to write a Teletext screen.

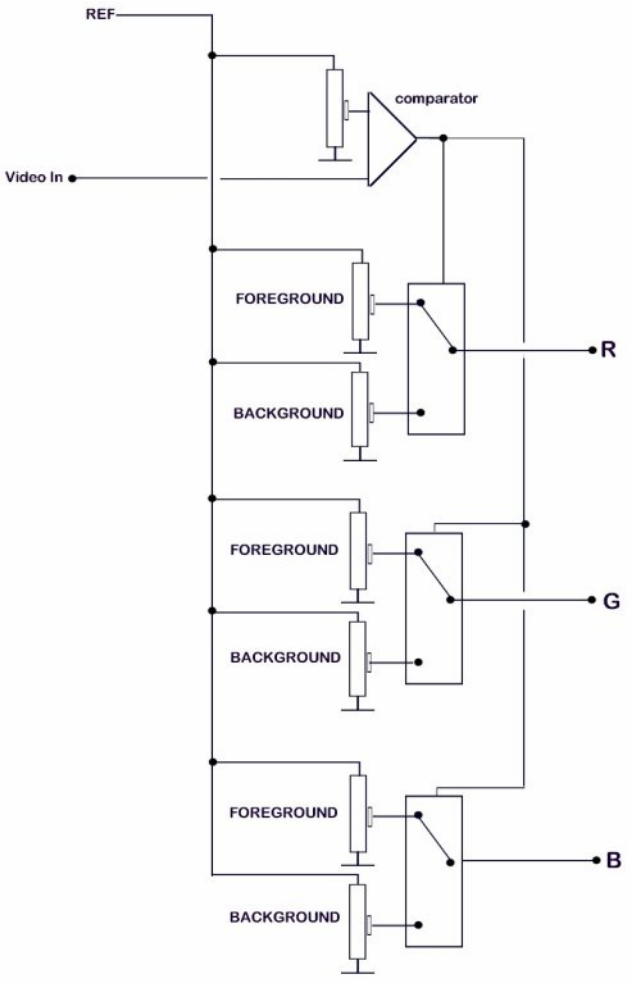
If we used the ESP 8266 micro, we have been using in the GVG project, we could use Annex BASIC to write and store the screens as the 6264 will lose the screen data on power down (unless we add battery backup), but the data could be stored in the ESP 8266.

If you want to enlarge the circuit to include genlock with the addition of the SAA531 then there is a circuit in the I2C handbook in the CQ-DATV Library
https://www.cq-datv.mobi/i2c.php.
Note the circuit will simplify down, I think I still have a couple Eurocard PCB's around from the development of this project. Drop me an email if you are interested in one.

Another thought for an RGB circuit is the technology to colourise a black and white TV picture. This has been around a while and uses different names from EMI-chrome to colour Mat. The most memorable name being the Cox Box from Cox electronics.

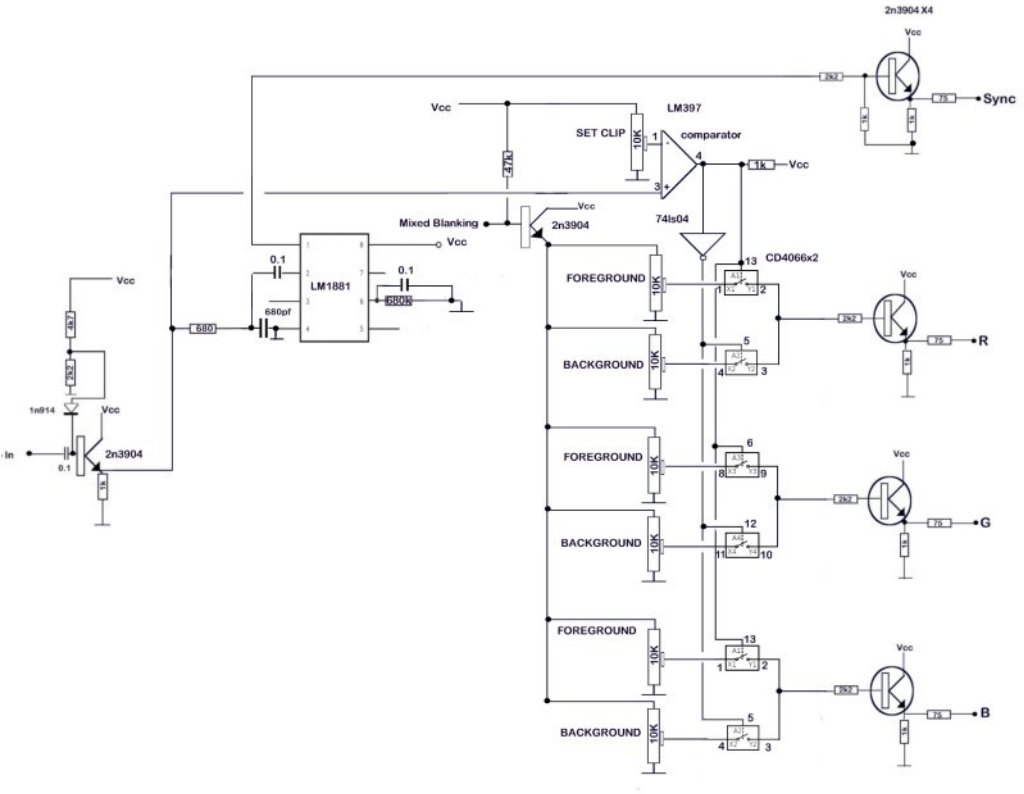
The principle involved splitting the TV picture into two levels and to the assign different colours to the levels. This was only for colourising TV captions although the Cox Box had three levels. If we put together a design that has RGB outputs, then a lot of the complex engineering becomes redundant and we will get some clever results from a relatively simple circuit. This is only a two-level design with RGB controls and shows how these units worked.

The incoming video is applied to a comparator and compared with an adjustable DC voltage, to set the slice level of video into foreground and background levels. These can be controlled by the appropriate pots to set the colour selection.



My original thought for a two-colour synthesiser

The original units worked in composite mode and had circuitry to stop illegal colours being generated (well some did). In this simple circuit the background colour would be present in Sync and Blanking. The three pots don't easily interface to the GVG control panel that I have been working on as the GVG Mat controls are labelled Lum, Hue and Saturation. The video input is not clamped so any changes in average picture level could change the settings of the clip level control, which sets the operating point of the comparator.



Working synthesiser. Simple ideas always seem to grow before they become to something that will work

Let's flesh this out onto a working design that could be used with an RGB SCART. The first problem is to stop the DC level changing with average picture level and that requires either a black level clamp or DC restorer. I have gone for the simpler option, a DC restorer. The sync bottoms will be set to a voltage provided by a simple potential divider and an In914 diode that will control the charge voltage on a coupling capacitor. This will stop the clip operation varying with any picture content changes.

The next addition would be to process the pictures with a feed of mixed blanking so that colours can only be turned on during active picture only.

Mixed blanking is a signal produced by a Sync Pulse Generator and is High during active picture and low where the TV picture requires suppressing. The problem was getting a mixed blanking signal, the LM1881 will not provide this.

If your video is locked to a sync generator then no problem, mixed blanking will be provided, but that would rather remove the flexibility of processing remote TV sources.

Without mixed blanking the colours would colourise more than the active picture area, including vertical and line blanking and would not be too kind to a sync separator within the TV set.

Because the SCART uses a separate feed of TV syncs then you can get away with omitting this. I have added a 47k pull-up resistor to keep the transistor turned on in the absence of mixed blanking and the colours active throughout the entire picture.

The required TV syncs are extracted from the incoming video with the popular LM1881 TV sync separator chip the 680-ohm 680pf capacitor form a very simple chroma filter to remove any colour burst that might be present and stop false triggering.

I also added some buffers. SCART sockets don't always present a 75-ohm impedance, but if we want to adapt our RGB signal to formal component signal e.g. Y, Pr and Pb, they may be required, or if we want to feed a long coax cable with this signal then they would not hurt and if you are connecting to a professional TV monitor then they are a must.

70 cm, DVB-T, Television Repeater with a Duplexer

Written by Jim Andrews, KH6HTV

Application Note, AN-23, in 2015, has previously discussed the basics of what is required to build a Digital TV (DTV) repeater. More recently, AN-23e (2019) added a section on using a Duplexer to permit using a single, common antenna for both receive and transmit.

Most TV repeaters are built using separate antennas for receive and transmit along with very sharp cut-off band-pass filters on both the receiver and transmitter. Duplexers for TV service are more difficult to build, and are more costly. They serve the same function as the Rx/Tx band-pass filters but include internal cross coupling between the two filters. A TV duplexer will not give as much isolation as the separate Rx/Tx BPFs & two antenna arrangement.

Thus a duplexer will typically work only with lower powered transmitters. This application note gives the details on a low power, 70cm TV repeater built using a TV Duplexer.

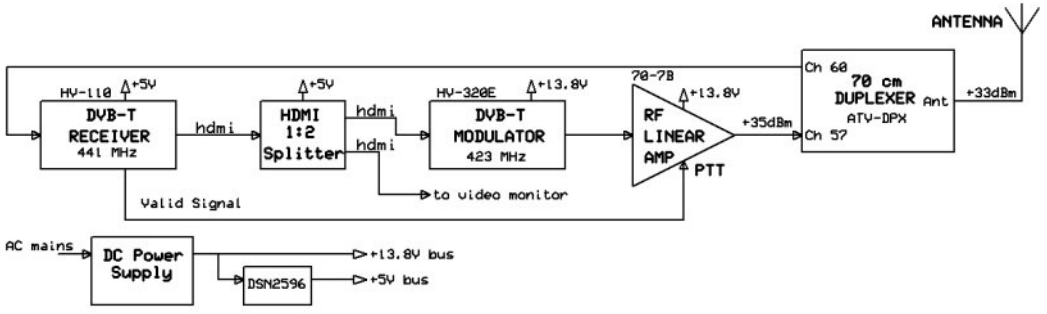


Fig. 1 70 cm, Digital TV Repeater with Duplexer, block diagram

Fig. 2 KH6HTV Video model ATV-DPX, 70cm, TV Duplexer

Fig. 1 (left) is the basic block diagram of 2 watt, 70cm, TV repeater built with a duplexer. The major components used in this repeater were: Hi-Des model HV-110 Receiver, Hi-Des model HV-320E Modulator. KH6HTV Video model 70-7B RF Linear Power Amplifier and KH6HTV Video model ATV-DPX Duplexer.

The key element in this repeater is the Duplexer, Fig. 2.

All of the isolation between the receiver and transmitter is provided by the duplexer. Fig. 3 shows the measured S parameters of the duplexer used in the repeater. The duplexer's bandwidth at 10MHz is wider than the 6 MHz required for a standard USA TV channel.

The duplexer was tuned to place the Ch 57 BPF upper corner at 426MHz and the Ch 60 BPF lower corner at 438MHz. It was also tuned to minimze the S32 coupling from the Ch 57 transmitter to the Ch 60 receiver.

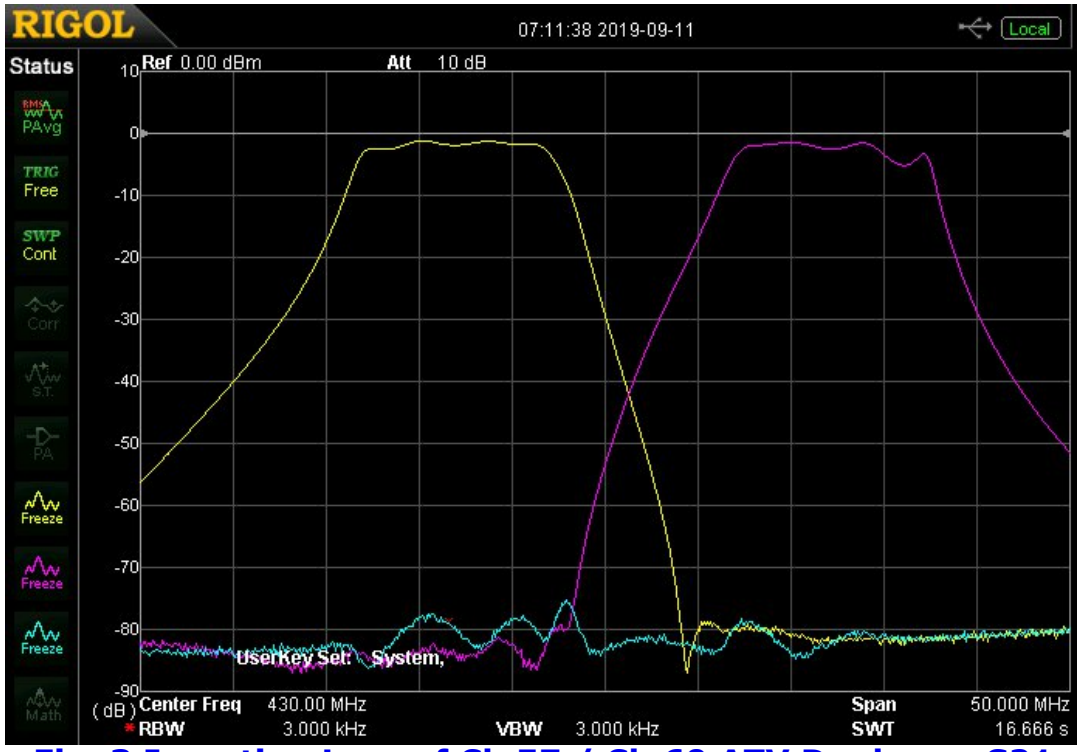


Fig. 3 Insertion Loss of Ch 57 / Ch 60 ATV Duplexer, S21 = yellow, S31 = magenta, S32 = cyan Center freq = 430 MHz, span = 50 MHz (5 MHz/div), Vert = 10 dB/div. Noise floor is -83dB

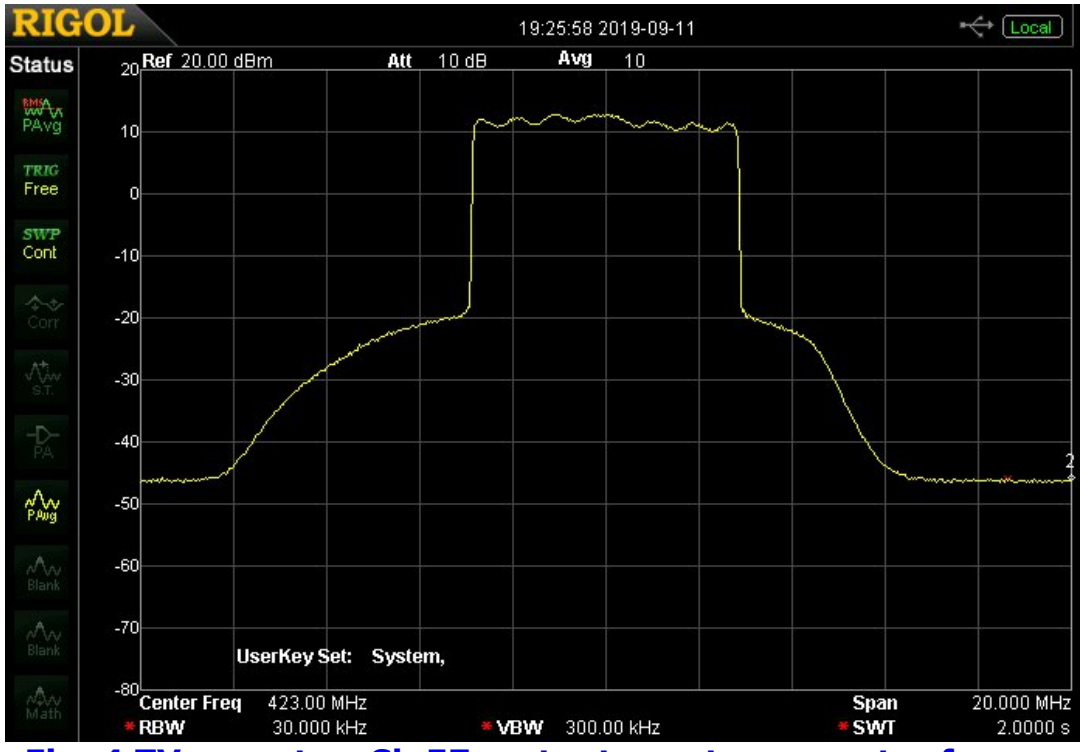


Fig. 4 TV repeater, Ch 57, output spectrum. center freq. = 423MHz, 20 MHz span. 10dB/div & 2 MHz/div. Power out to the antenna, Pout = +33.7dBm = 2.3 Watts rms

Sensitivity tests were run on the repeater to determine the maximum transmitter output power possible without desensing the receiver. To do this, a 20dB directional coupler was inserted in the antenna coaxial line to inject controlled levels of a weak, 441MHz, DVB-T signal.

Rather than using an antenna, the duplexer antenna output was terminated in a high power, 50Ω dummy load. An HDMI monitor was connected to the second port of the HDMI splitter to watch the received video.

The highest transmitter power which worked reliably was approximately +35dBm (3 Watts). With the transmitter turned on, the measured receiver sensitivity was -94dBm with no desensing apparent. The input test signal was a "normal" DVB-T signal with the following parameters: 441 MHz center frequency, 6 MHz bandwidth, 1080P resolution, 6 Mbps, QPSK modulation, 8K FFT, 5/6 FEC, & 1/16 guard.

A +35dBm output level is the typical high power output from a KH6HTV Video model 70-7B amplifier. Thus it is the ideal choice for use in such a repeater. For the particular 70-7B amplifier used, it's output power was +35.4dBm (3.5 W rms). The output power from the repeater to the antenna is diminished by the -1.7dB insertion loss, S13, of the duplexer. Thus the output to the antenna was +33.7dBm, i.e. 2.3 Watts rms. Fig 4 shows the output spectrum of the repeater. The out of channel, sideband skirts are seen to be asymmetrical.

This is due to the duplexer's bandwidth of 10 MHz being wider than the 6 MHz TV channel and the fact that the upper channel edge at 426MHz was placed on the upper corner of the duplexer's passband. The drive power to the amplifier was set to maximize the output power while still keeping the skirt shoulder at least -30dB below the in channel power. For Fig. 4, the shoulder attenuation is -32dB measured at ±3.2 MHz from the center. For comparison, see Fig. 8 in AN-48. It shows a cleaner spectrum with greatly reduced spectrum skirts for a repeater built using two antennas and seperate band-pass filters.

The cost to build this TV repeater, including antenna, is approximately $2,000. The below table lists the major items required and their estimated cost (as at September 2019). This does not include an enclosure to house all of the components.

Item	Mfgr	Model #	Cost
DVB-T Receiver	Hi-Des	HV-110	$125
DVB-T Modulator	Hi-Des	HV-320E	$369
RF Power Amplifier	KH6HTV Video	70-7B	$350
Duplexer	KH6HTV Video	ATV-DPX	$800
HDMI 1in/2out Splitter	Amazon or E-Bay	many available	$15
DC Power Supply	13.8Vdc, 10 Amp	many available	$100
70cm Antenna	Diamond	X-50NA	$100
Antenna Coax	LMR-400, 50ft, N		$80
Amp->DPX Coax	LMR-400, 3ft, N		$25
SMA cables (2)			$30
N/SMA adapter			$10
HDMI cables (2)			$10

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Is DVB-T Sideband Sensitive?

Written by Jim Andrews, KH6HTV

Application Note, AN-36, in 2017, has previously discussed the basics of what is required to operate at microwave frequencies with DVB-T.

We can purchase from Hi-Des in Taiwan, both modulators and receivers that will work up to the 13cm (2.4 GHz) band.

Above those frequencies, we need to then start using mixers and local oscillators to up/down convert. So, one question arises right away – "What happens when sidebands are inverted ?"

When using a mixer and LO, the resultant output contains two mixing product signals, fusb = flo + fif and also flsb = flo - fif.

The polarity of the RF sidebands remains the same as the IF for the plus (+) mixer product. But the polarity of the sidebands is reversed for the minus (-) mixer product. When running single sideband voice, this makes a big difference. Inverting the sidebands results in un-intelligible speech. What does it do to a DVB-T, digital TV signal?

The quick answer is NOTHING ! It still works.

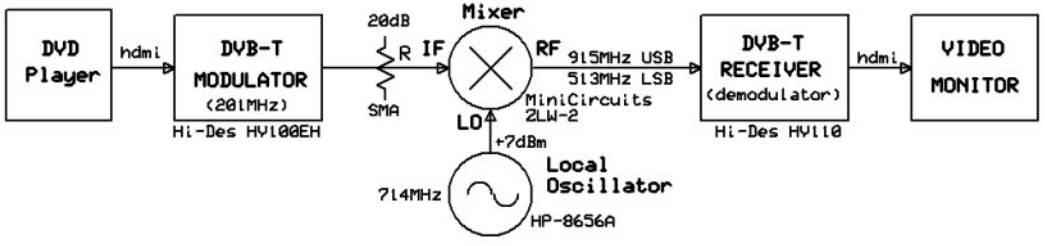


Fig. 1 Test set for mixer/LO tests of DVB-T

To experimentally determine this, I set up a controlled experiment. See above Fig. 1. I started with a DVB-T receiver which had already been trained to receive normally 915 MHz on 33 cm band. I also then trained the receiver to receive normally on 513 MHz.

I then reprogrammed the HV-100 modulator to put out a normal DVB-T signal on Ch 11 (201 MHz). With a local oscillator set to 714 MHz, the USB product was 915 MHz, while the LSB product (with inverted DVB-T signal) was on 513 MHz.

Connecting the HV-110 receiver to the mixer output, I was able to successfully receive both the 915 and 513 MHz signals. This thus proved that inverting the sideband polarity of the DVB-T signal had no effect.

Frequency Offset

With this LO/mixer test set, it was then a simple matter to determine the sensitivity of a DVB-T receiver to having a signal with the center frequency offset from the correct frequency. Adjusting the LO frequency of the HP signal generator, I found that I could move the LO up or down about ± 550 kHz and the receiver would retain lock. Thus, a DVB-T signal with Doppler shift up to this amount should still work.

Phase Noise

The next test was also simple to perform. What happens with phase noise? I was able to simulate this by turning on the FM modulation of the HP signal generator. What I found was the DVB-T receiver was very sensitive to small amounts of FM deviation of the center frequency. With a 1 kHz test tone, the receiver worked only up to about 600 Hz deviation. With a lower 400 Hz test tone, it was worse. 200 Hz deviation caused pixelization and anything higher, the receiver failed.

The following table shows the degradation of a DVB-T signal's signal to noise ratio (S/N) with increasing FM deviation with a 1 kHz test tone. (the test DVB-T signal was QPSK, 1080P, 6Mbps, 1/2 FEC, 1/16 guard). Bottom Line – DVB-T can not tolerate much FM or phase noise.

Deviation	S/N
none	23 dB
100 Hz	23 dB
200 Hz	20 dB
300 Hz	14 dB
400 Hz	11 dB
500 Hz	9 dB
600 Hz	8 dB
700 Hz	0 dB (i.e. no picture).

Grass Valley Mixer Conversions - Part 10

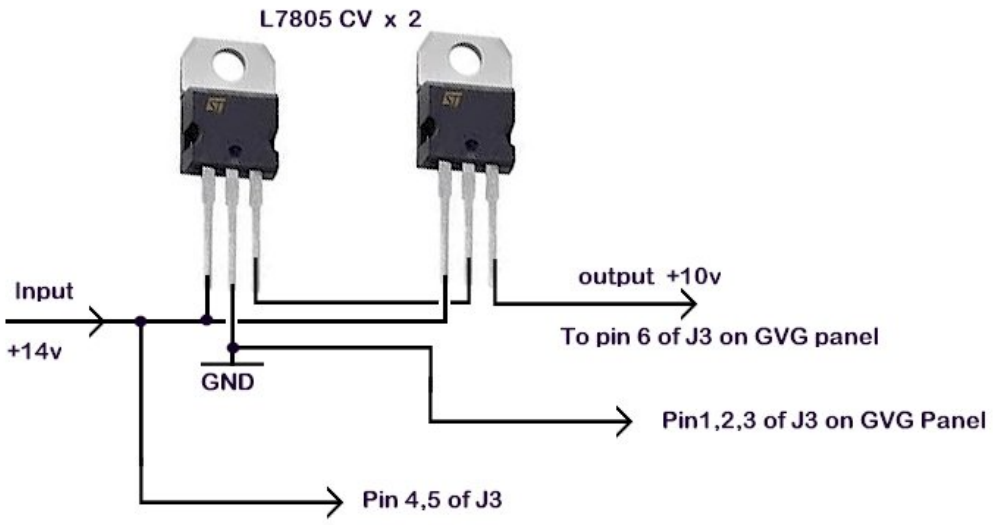
Written By Trevor Brown G8CJS

Because this project is being developed in real time between issues, I always try to make a guess at the end of each segment as to what I will be working on for the next issue. I have no buffer, it is just a guess and I was going to complete the I/O which I started in the last issue. I have had a change of mind as the next stage of the analogue I/O is still being decided upon.

I also wanted to pause and sort one or two hardware and software sections of this developing project. The first is the hardware and it's the power supply. I have been running the panel from two bench power supplies delivering two rails +14V for the lamps and +9V to drive the panels +5V on board regulator for the logic. I am running out of space on my kitchen table and wanted to develop a power supply that could free up one of the bench power supplies and provide some space for my breakfasts.

The +9V was changed to +10V only because I used the parts that were to hand e.g. two 5V regulators that could be cascaded to provide +10V. The GVG Logic is fed from an on board regulator so 1V increase should be something the unit will cope with.

The L7805 regulators will supply 1.5 amps and the panel at the moment is only drawing less than 0.5 amps on the 10 volt rail. Both regulators are at the moment in free air but they get hot to the touch and I will be adding a heat-sink in the near future. It's important if they share a heat sink to isolate them from each other with a mica washer insulation kit.



D Connector	J3 IDC Connector	Function
9, 10, 11	Pins 1,2,3	Ground
12, 13	Pins 4,5	+14 Lamp supply
14	Pin 6	+9 v Supply to on board 5v regulator

The single power pack is showing 0.8 amps for both rails and that is at switch on, when all the lamps are illuminated, before the software is run. This then drops to 0.5amps when the software extinguishes all but the a single lamp on the three banks Key, PGM and PST. Once I have finished the R&D and have the panel back in its case, the final solution should be an in-line plug top power supply.

The GVG panel has a mild steel bottom plate so that might make an ideal heat sink for an internal power regulation solution. There are also solutions on the internet to convert the illuminated push buttons to LED's and a single rail power requirements. That might be an option before I get locked into dual rail power requirement.

There is also a different solution to my software being demonstrated on the internet by Ian Morrish. Ian has also replaced the on-board panel micro but with an Arduino Mega. The Arduino allows communication with Windows or Mac computers using the Firmata protocol to control the LED's and detect switch states. Ian is also using PowerShell, this might be beyond my pay grade, but Ian is doing all the heavy lifting and has made a software download available.

I will close with the link to Ian's work and go back to muddling with my BASIC on the grounds that "I have started and so I will finish" to quote the popular TV quiz show.

I am in the tidy-up process and will revise the website software when I have reduced the number of subroutines and provided better comments so you can follow my work.

Ian's software and the new affordable ATEM mini (see CQ-DATV 76 write-up) might just be the way forward. The video looks brilliant and provides much food for thought.

https://ianmorrish.wordpress.com/2018/04/21/gvg-atem-controller-using-arduino-and-windows-powershell/

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HVR (Hybrid Video Recorder) integrated into ATV repeater DB0KO (Cologne, Germany)

Written by Helmut Schröder, DG3KHS

DVR, NVR, HVR units come from the security systems area, it's video/audio recorder mostly with hard disk (not absolutely necessary).

The video inputs are mostly analog composite or digital (SDI, HDMI, etc.). The video images can be output to a monitor output individually or e.g. via a 4 or 9 frames mosaic (as FBAS or HDMI with audio), so they can be easily integrated into the ATV repeater.

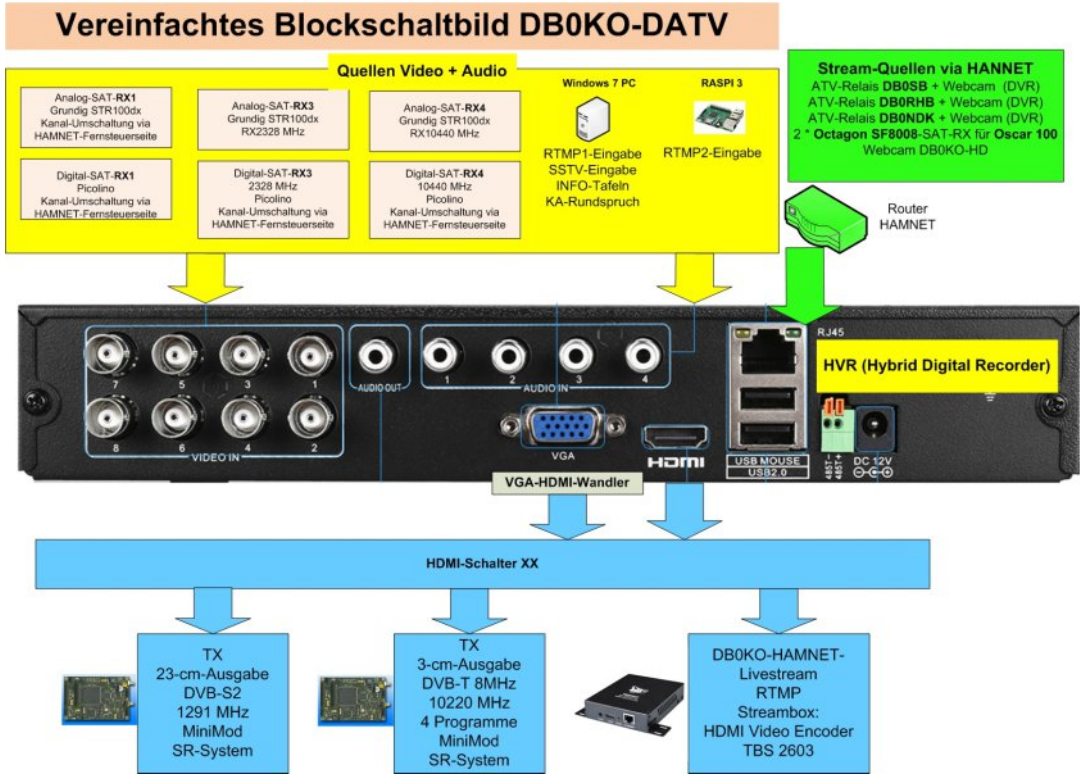
The DVRs can also stream the input signal into the network. With a repeater with HAMNET access, all channels can then be called up with the VLC player or suitable client software.

DBØKO uses a HVR (Hybrid Video Recorder), which can be used for eight analogue channels plus eight digital channels displayed via HDMI or FBAS and distributed in the network.

The digital channels come from other DVRs that are available on the network. Therefore it is possible to use the local ATV inputs and to show and stream other repeaters via the digital channels.

With DBØKO our users with HAMNET access and the client software CMS, that is available on Android or I-Phone and for Windows, can view the ATV inputs and the digital Retrieve channels.

The client software is a network video centered management software and comes on CD with the purchase of a DVR.



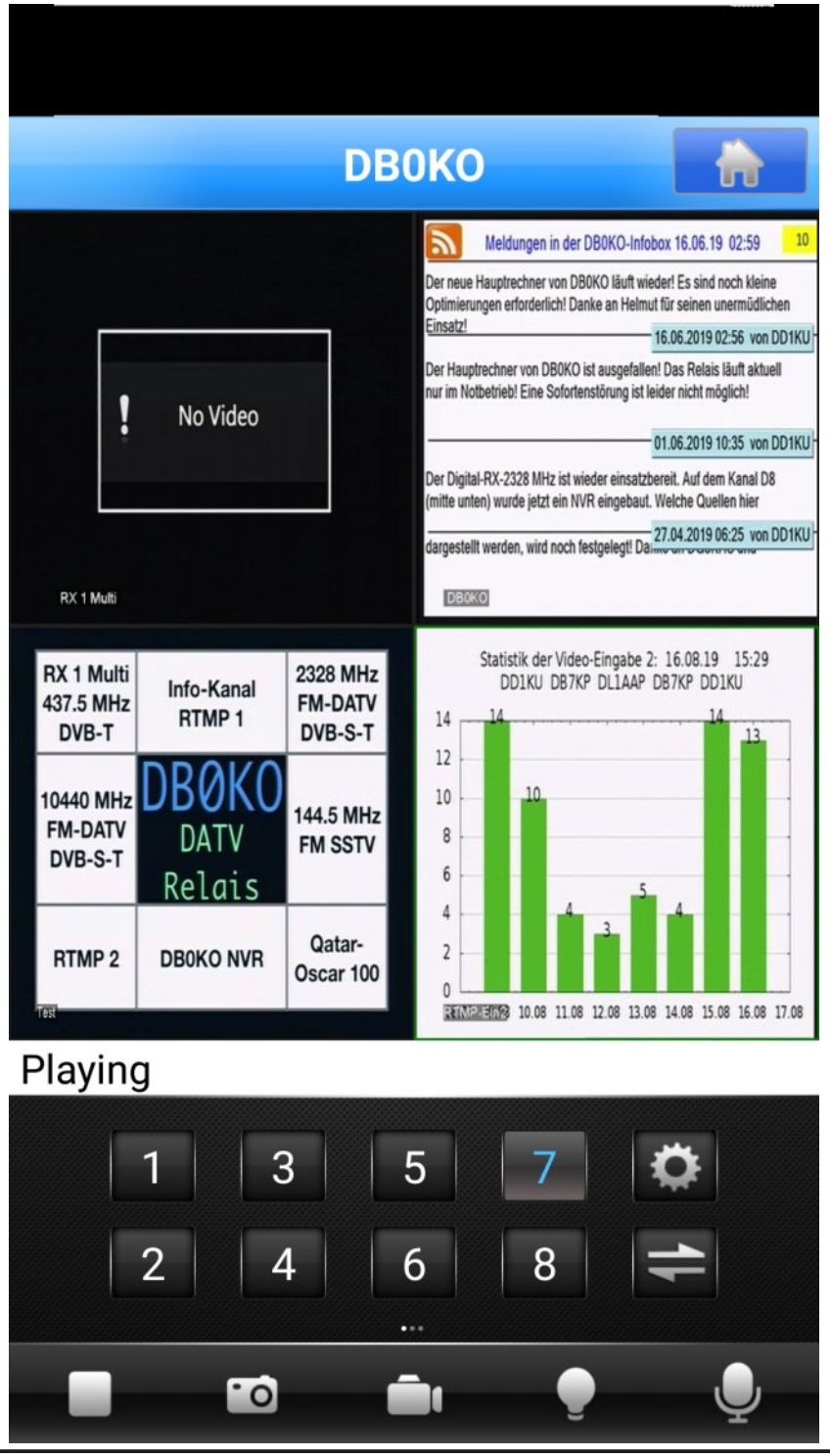
The block diagram by DD1KU shows the HVR connections within DBØKO

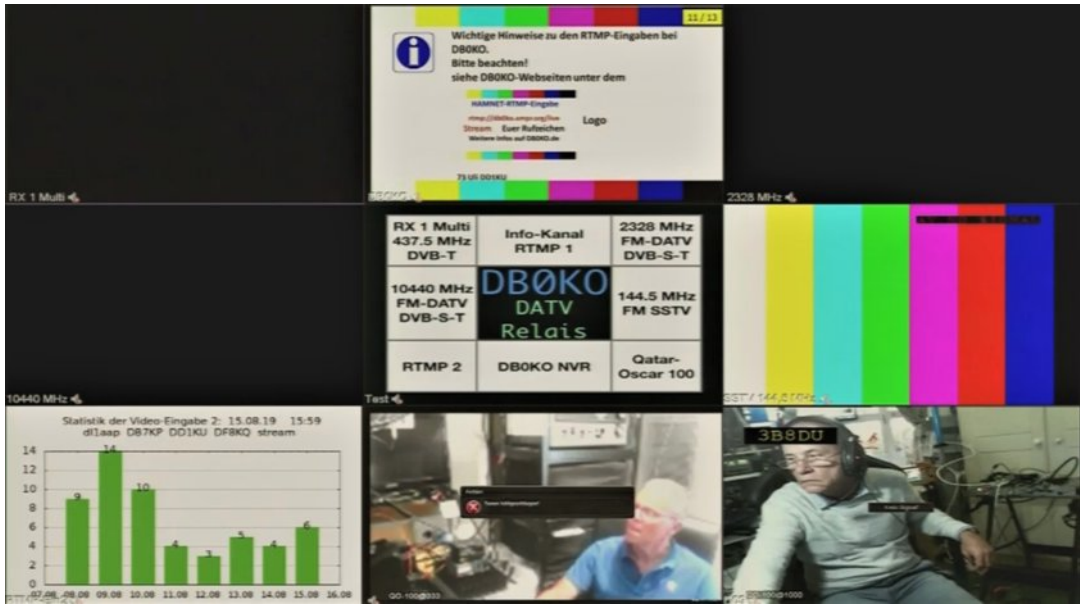
I myself can use my Smartphone or Tablet via "HAMNET VPN Tunnel" to view the channels of DBØKO.

With the DVRs mostly from the Far East (in Germany they are much too expensive) the ATV repeaters can be modernised well.

I receive the QO-100 videos automatically with the DVB-S2 receiver Octagon SF-8008 and the program listing, that I once put together.

Reprinted from TV-AMATEUR 194, translated by Klaus, DL4KCK *www.agaf.de*





Above: Automatic reception of 2 QO-100 videos with different data rates (here one from Mauritius)

Left: Smartphone CMS interface

Product Review — ADF-5355 54 MHz - 13.6 GHz, Signal Generator

Reviewed by Jim Andrews KH6HTV
Reprinted from Boulder Amateur Television Club TV Repeater's REPEATER October, 2019 by kind permission

In my Feb. 2017, application note, AN-36, "Microwave TV Transmitters & Receivers", I discussed using the new Analog Devices, model ADF-XXXX, microwave, frequency synthesizer chips as local oscillators. AD offered the ADF-4351 (up to 4.4GHz), ADF-4355 (up to 6.8GHz) and the ADF-5355 (up to 13.6GHz).

Several Chinese companies were offering the 4.4 and 6.8GHz versions in complete packages with the necessary support boards to easily program the frequency along with an display panel. AN-36 reviewed their performance.

In 2017, the 13.8GHz version was not available in a turn-key, packaged version. Now here in 2019, it is finally available in an easy to use package.

They can be found online on E-Bay. I just purchased the one shown above to evaluate. It came from Hong Kong for $156 + $10 postage.

The RF generator is shown in the above photos. It is packaged in a nice, all metal, extruded enclosure. A 12Vdc wall wart was supplied to power the generator.

It has 3 SMA outputs on the rear panel. The two labeled A+ & A- output the same signal with a range from 54 MHz to 6.8 GHz.

The ADF5355 is basically a 6.8 to 13.6GHz oscillator followed by programmable digital dividers. Thus the RF-B output is direct from the VCO, while the RF-A outputs are from the dividers.

The frequency is programmed directly from the front panel. There are 5 push buttons on the front panel, left, up, OK, down, and right.

You only can enter Frequency A (lower line) up to 6.8 GHz. Whatever VCO Frequency (B) is required to give Frequency A is internally calculated and then displayed as the upper line.

If you want to generate a specific frequency above 6.8 GHz and use the B SMA output, you enter on the lower line, a frequency of 1/2 the desired B frequency.

For example to get 10 GHz (B), enter 5.00 GHz (A).

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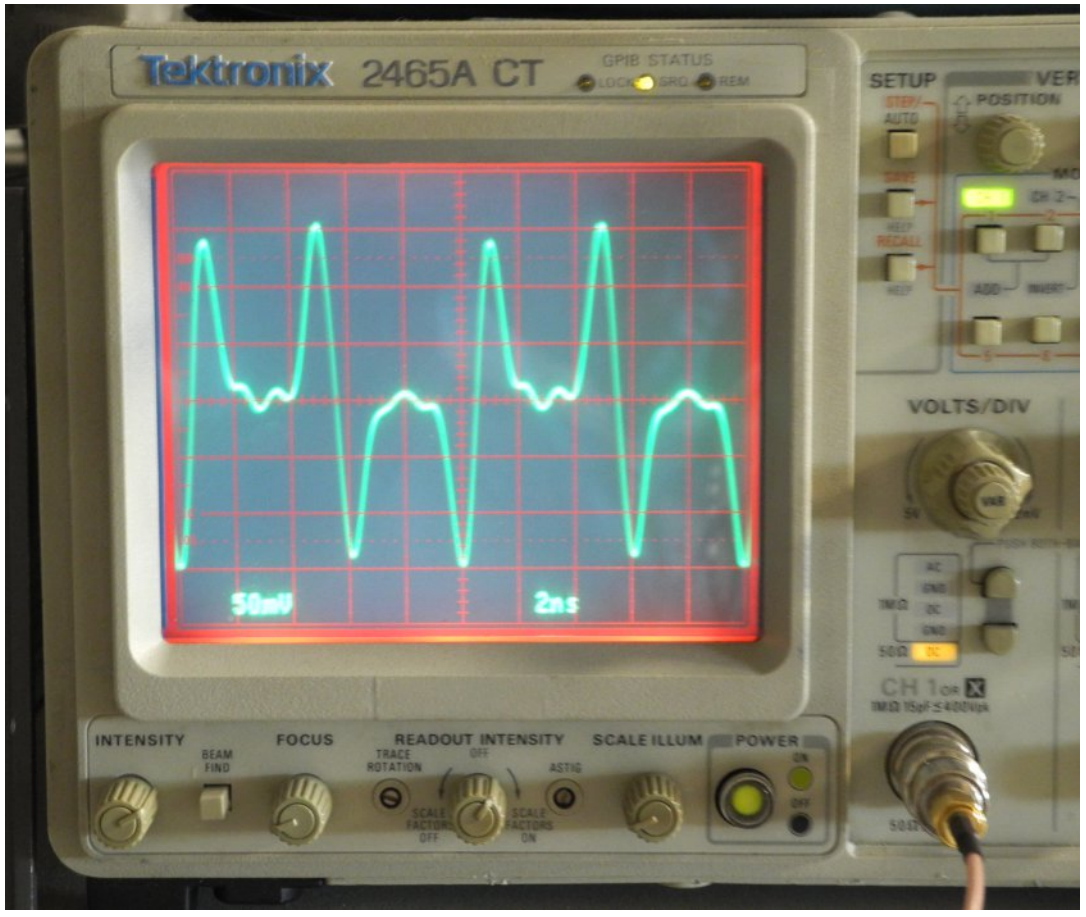
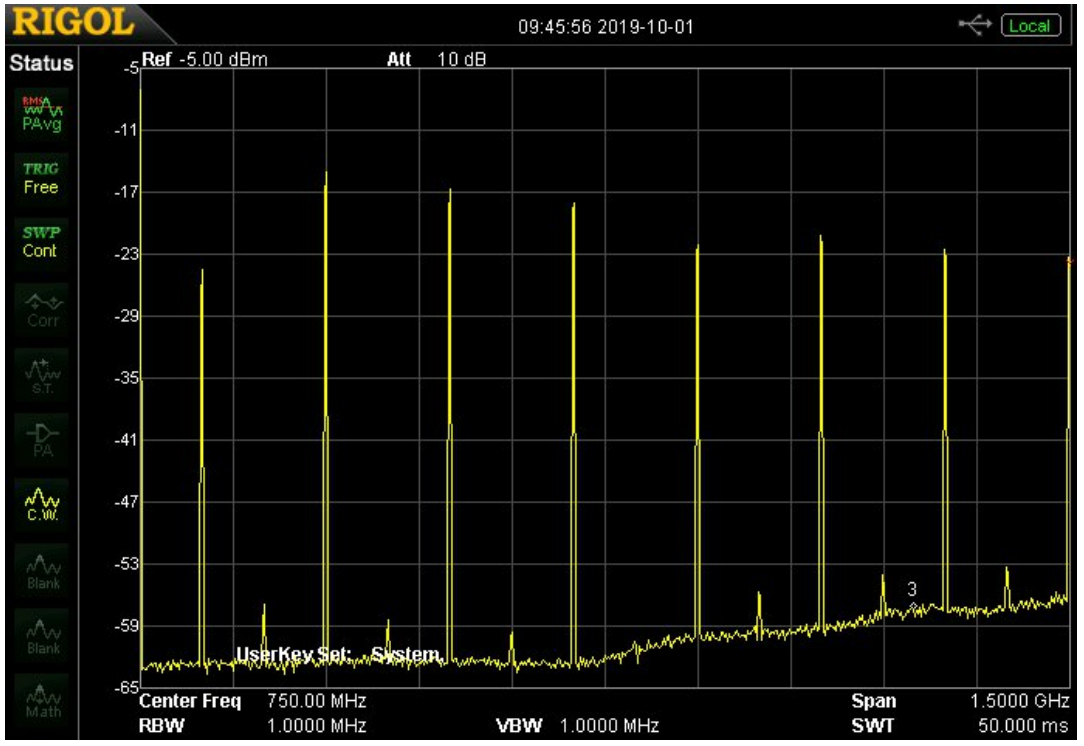
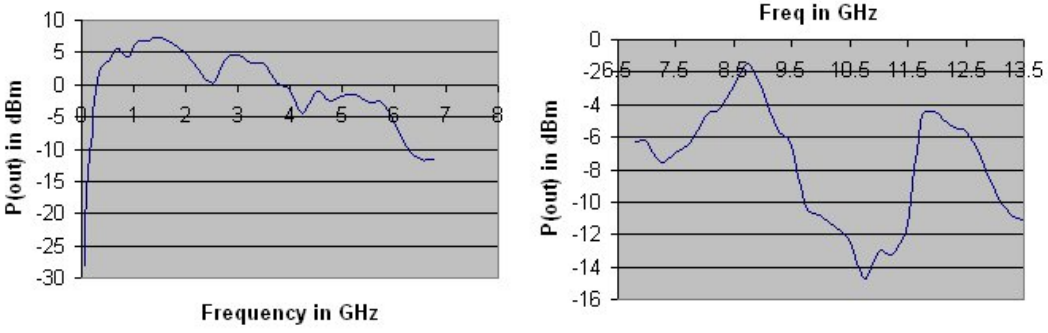




RF Output - A waveform (2ns/div) (left) and (above) spectrum (1.5GHz span) Freq = 100 MHz



Left - RF Output A Right - RF Output B

The RF-A output has an unusual waveform. It is not the normal sine wave or square wave. It instead is a positive doublets followed by a negative doublet.

A doublet is a positive going impulse followed immediately by a negative going impulse. An impulse is generated by the first derivative, dV/dt, of a step function. A doublet is the second derivative.

Thus it appears that the RF-A output waveform is being generated internally by taking the second derivative of an internal logic square wave. Such a waveform is extremely strong in all odd order (3ed, 5th, etc.) harmonics as shown in the measured spectrum.

I found the RF output power to be somewhat disappointing. There were no specs. given on E-Bay for what to expect. The power, except from 1-2 GHz, was too low to directly drive a diode mixer. Thus to drive a mixer, one would need to use an external amplifier on the output of this generator.

Also I found the rf power to vary dramatically over the frequency range. It dropped like a rock below 300 MHz. The above plots show my measured results. Caution should be taken when measuring the RF output-A power due to the unusual waveform and strong harmonic content.

For example measuring the 100 MHz output shown above with an HP thermistor (rms) power meter gave a reading of -3.2dBm while measuring only the 100 MHz signal on a Rigol spectrum analyzer, it was found to give a very low -18dBm strength. Only when setting the generator to frequencies > 1.4 GHz were the HP power meter and spectrum analyzer readings found to be essentially the same.

This indicated that the harmonic content for f > 1.4GHz was quite low.

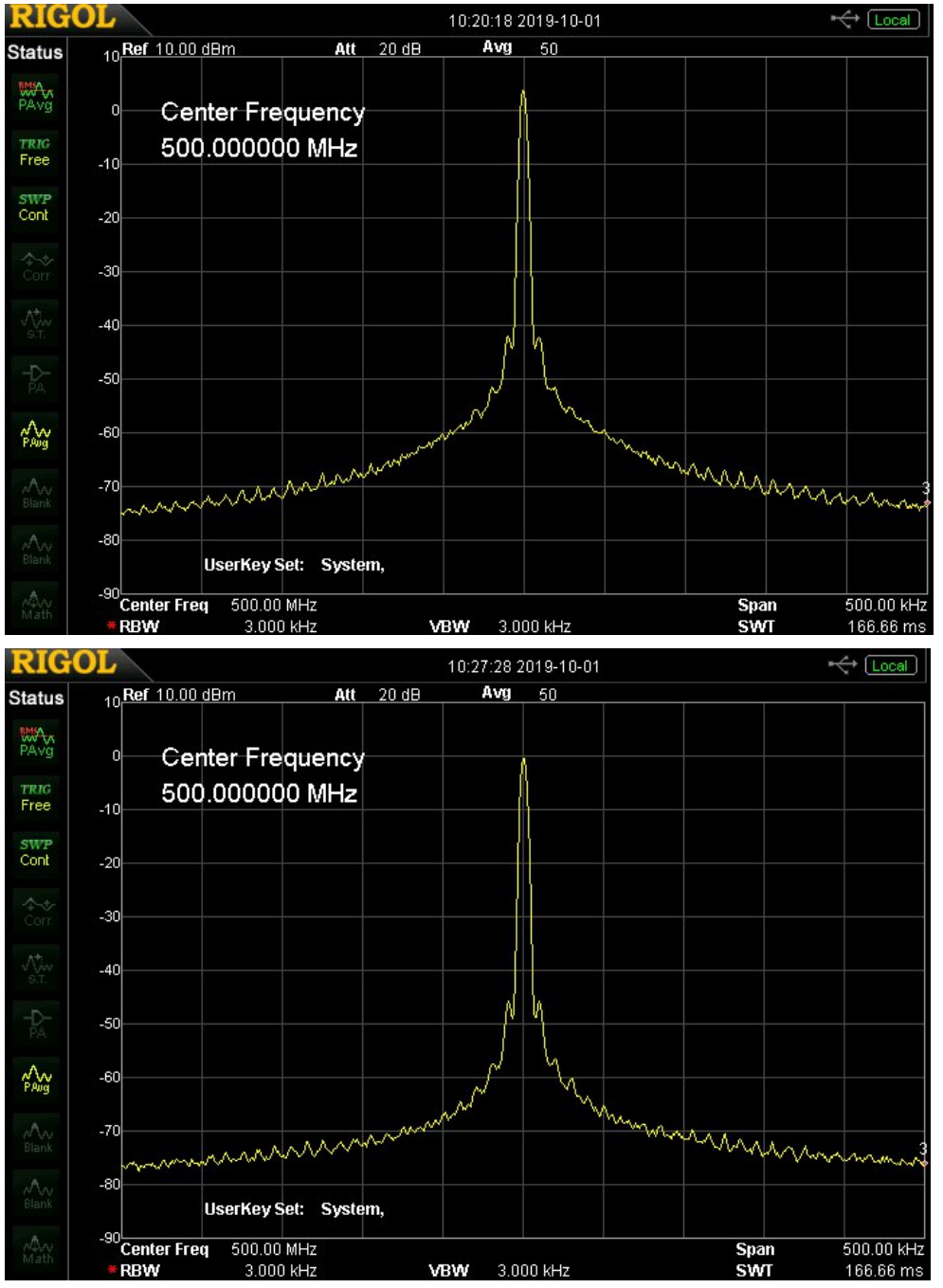
I also measured the frequency accuracy of the generator. To do this, I took it to Bill, K0RZ's ham shack. Bill has a very precise, 18 GHz HP frequency counter with an external HP-107 reference quartz oscillator.

Bill says he can measure a signal to 1 part in 10^{10}, roughly 10 Hz at 10 GHz. We set the ADF-5355 to the amateur band, SSB calling frequency of 10,368 MHz.

We found the ADF-5355 to be very accurate as it was only 10 kHz low ! ! ! It was also very stable and didn't drift. Thus, it could be used as a good frequency marker.

Bill also listened to the signal on his 10 GHz SSB receiver and said it was a very pure tone.

It should be noted that this generator's internal standard is an HWT, 10.0 MHz, TCXO which does also include an accessible trimmer capacitor. It can be seen in the above internal view photo.



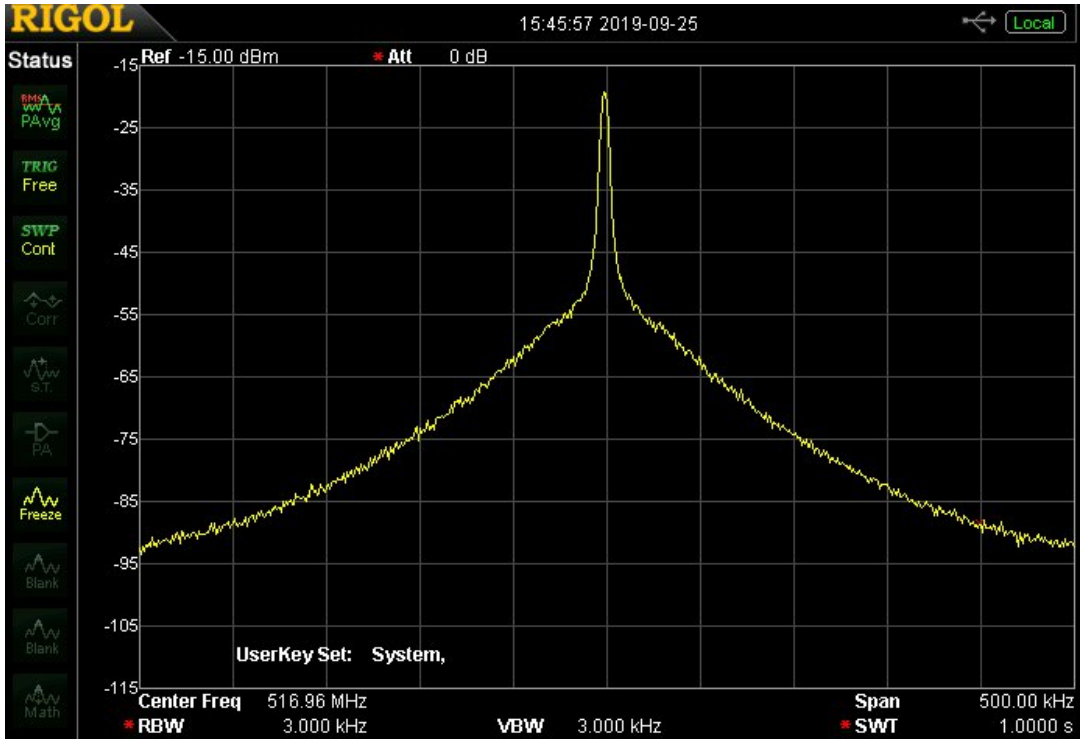
Phase Noise measurement at 500 MHz: 3kHz BW, 500 kHz span, 10dB/div top is ADF-5355 and bottom is HP-8656A

I then set up to measure the phase noise of the ADF-5355. The first measurement was at 500 MHz (RF-A output). Also shown is a 500 MHz signal from an HP-8656A for reference. They are very comparable.

I next measured the phase noise at 10 GHz. To do this, I used my Frequency West, brick oscillator and a mixer. My FW oscillator is on 10.885 GHz. I used it to drive an Anzac MDC-171 mixer.

I observed the IF on my Rigol DSA-815 spectrum analyzer with the same 3 kHz narrow band-pass filter. More phase noise is shown, but it is not possible to say if it came from the ADF-5355 oscillator - or the Frequency West oscillator.

ADF-5355 basic board with touch-screen display - available on E-Bay $150



Phase Noise measurement at 10.368 GHz: 3kHz BW, 500 kHz span, 10dB/div

The ADF-5355 can also be purchased as a basic pc board as shown in the above photo. Colin, WA2YUN, has found an article on-line from 2018 Microwave / EME symposium in Poland.

http://www.dd1us.de/Downloads/A%20low%20cost%20signal%20generator%202018-06-09%201v0.pdf

It is a paper presented by Matthias Bopp, DD1US, on the ADF-5355 using this basic board. Matthias found severe phase noise on his board and his paper discusses his improvements. They were mainly in replacing the board's voltage regulators with very low noise regulators. For the unit I tested which was packaged differently, I found that it used as voltage regulators, a 78M06 for 6 Vdc and an AMS-1117 for 3.3 Vdc.

First published in issue 9

GB3FY CW Generation

Written by John Hudson G3RFL

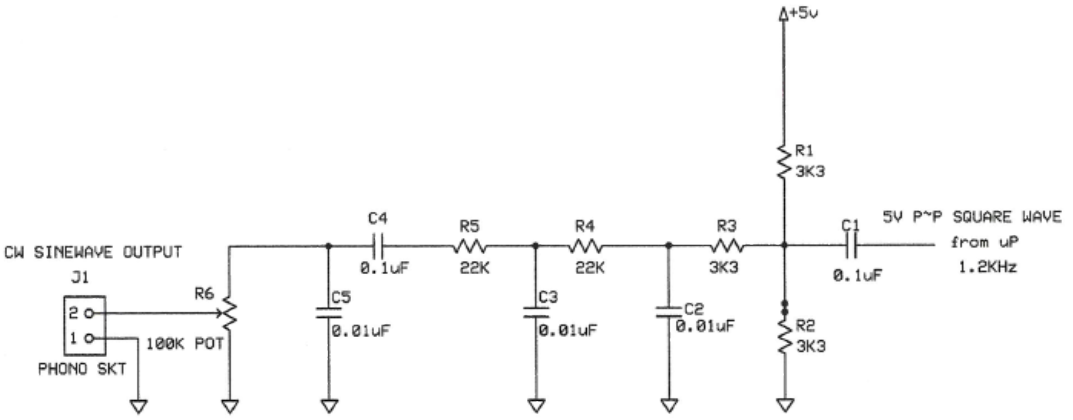
Interesting to read Trevor's story of GB3ET and how it was developed using Z80 logic, (Yes I see a copy in advance of publication). GB3FY uses a PIC micro controller which was not around when Trevor was putting GB3ET together.

The PIC has a built in I/O port, RAM and Programme storage memory so it does not need the 8255, the 6116 or the EPROM. This makes for a much smaller control logic and considerably simplifies the construction of this part of the repeater.

One problem both logic's have in common is that they generate the Morse code identification for the ATV for the repeater. The I/O pin that delivers this signal, delivers a series of dots and dashes using a 1.2KHz tone at 12 WPM, this is all produced by the repeater software.

It also delivers a PLOP as it tries to get a mean dc level and some unwanted high frequencies, because it is a digital port, so it is either on or off i.e. the output is a square wave. To remove the Plop and to filter the digital square waves to a much more agreeable sine wave, we need some extra filtering.

First the plop. R1 and R2 put the DC level at half the supply (2.5V). The DC blocking cap C1 is also required to isolate the 2.5V from the I/O pin which has been declared as an output. Next we roll off some of the higher frequencies with a few RC filters R3-C2, R4-C3,R5-C4=C5-R6 POT.



The DC is removed by C4 and the output level is set by R6 100K POT to suit your sound switching level…..a reasonable CW action is done by gating in Software the PORT pin on the u/P.

Both GB3XG and GB3FY have been implemented with this circuit and it has stood the test of time and also negated any criticism from some of the hardened CW operators.

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