In this issue

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Editorial

Welcome to CQ-DATV 38, this features part 2 of our Ampex History which is the story of the first VTR machine, this commemorates the 60 year anniversary of the VR 1000.

Since CQ-DATV 37, some problems have arisen with John G3RFL's pump-up mast rotator. It seems that the mechanics were brilliant, but the electronics suffered a setback and John has made some improvements.

Mike G7GTN has delivered the second part of his Teletext Article, Ken W6HHC has produced DATVtalk14 and Alessandro IW3RMR and Mauro IV3WSJ have been working on two designs working on 23cms reception of DVB-T.

The good news from Trevor is that he now has working Samsung bridge camera again after the extended 'slow boat to china' and its return in a non working condition.

Simply Electronics might not be his favourite supplier of equipment, but we all know the delays working with any company based in China. What was of more concern was sending a semi working camera back (No Flash) and receiving a completely non working camera back in return. The hope was just that one of the connectors had come adrift on route, but being under warranty, he was reluctant to open it up and check.

The upside was Samsung, after a contacting their call centre, they arranged for it to go to a UK repair depot and even sent the appropriate packaging which was post paid (well done Samsung). The camera returned a week later in full working order, with a note to say the main PCB was at fault and had been replaced, so a double down on Simply Electronics.

Having not seen this camera for 3 months it's back to the bottom of the learning curve!

The first problem was that it was shipped without the software update, which is on the Australian Samsung website, just a download away and a simple install and now everything seems to be perfect. So how about some more of the articles on using a bridge camera Trevor, now you have no more excuses.

Last, but least, CQ-DATV has been running a publicity campaign on the internet focused, not just on ATV sites, but on all the other Facebook amateur radio and electronic sites. It's not just readers we are searching for but contributors. Many of the constructional projects from Rotators to SWR bridges and dummy loads are not restricted to ATV. That is just our magazine focus.

So if our new first time readers have something they would like to contribute can I remind them the address they are looking for is *editor@cq-datv.mobi*. Remember a monthly magazine is a hungry magazine and needs a lot of feeding to grow and reach all the parts of the world. Don't worry if you have never written for a magazine before, we have a production team to help with suggestions and corrections. There is an article in every one of us. Just take that first step and tell us what you are doing in ATV, we will do the rest.

So please sit back and enjoy CQ-DATV 38 and plan your contribution to CQ-DATV 39 which is just a month away and remember, all our back issues are available free from *http://www.cq-datv.mobi/ebooks.php*

CQ-DATV Production team

Convention

The BATC's 2016 Convention for Amateur Television (CAT 16) will be held in the Conference Room of the RAF Museum Cosford (near Telford, Shropshire) on Saturday 24th September and Sunday 25th September.

ROYAL AIR FORCE museum COSFORD

The RAF Museum Cosford is near to junction 3 of the M54; further details can be found here *http://www.rafmuseum.org.uk/cosford/*. Attendees to CAT 16 will be able to view the Museum exhibits and time will be set aside in the programme for this. Details of suitable hotels nearby will be published in due course.

The BATC Biennial General Meeting will take place on the Sunday afternoon.

If you are planning to attend, please could you register online in the BATC online shop. Note that places for the guided tour can ONLY be booked through the BATC shop! *https://batc.org.uk/shop/cat16*. There is no charge at this stage – please just sign up (and use the pay cash option).

Entry to CAT 16 will be charged at £10 per day (payable at the Conference Room Door). This covers the cost of unlimited Tea and Coffee for attendees in the Conference Room throughout the event. There will be no charge for attendance at the BGM (only)

Note that in addition to a very interesting BATC lecture programme, visitors to CAT 16 will have the free access to the RAF Museum. Parking for CAT 16 visitors will also be free of charge.

We also hope to be able to offer members a free guided tour.

There will be plenty of opportunity to chat with other members and find out about their latest projects. Some test equipment will be available if required – but please make a prior request here on the BATC Forum, so that we can make sure that we have the right kit. There will be a “Show and Tell” area set aside for members to demonstrate their latest projects, and Kevin, G3AAF will be exhibiting his RF Design products.

Hope to see you there!
Dave G8GKQ

Colloquium 2016

The AMSAT-UK International Space Colloquium will be held on July 29-31, 2016 at the Holiday Inn, Guildford, GU2 7XZ, United Kingdom.

The event is open to all, admittance on Saturday and Sunday is £10 per day payable on the door, on Friday the price is £5. These prices are for admission, and do not include any meals, but do include tea/coffee. Please pay at the AMSAT shop (NOT hotel reception!).Parking is free.

The Colloquium attracts an international audience from across Europe as well as North America and the Middle East. Attendees range from the builders of the CubeSats and Nanosats, those who communicate through them and beginners who wish to find out more about this fascinating branch of the hobby.

It provides a rare opportunity to chat with satellite designers and builders, discussions frequently continue until the early hours of the morning.

As always the AMSAT-UK Colloquium starts on Friday afternoon with a special session for newcomers to the amateur satellite world. You will be helped through the complexities by three amateurs, Dave, G4DPZ; Carlos, G3VHF; and, hopefully, Drew KO4MA, who, between them, have thousands of hours of experience. They will explain the theories and talk about the practice of listening to and having satellite contacts through the ever increasing number of satellites in orbit. Again this year, we are hoping to have available copies of the updated AMSAT-NA publication "Getting started with Amateur Satellites 2016", but this is still to be confirmed.

Information on the event is at *https://amsat-uk.org/2016/06/30/amsat-uk-international-space-colloquium-2016/*

73 Trevor M5AKA

CQ-DATV dotMOBI

Check out the DKARS website at:- http://www.dkars.nl/

DATVtalk14
DATV-Express on Windows using Express DVB-S Transmitter Software

by Ken W6HHC

Reproduced from the Orange County Amateur Radio Club newsletter. *www.W6ZE.org*

Please Note – This is the Fourteenth article in a series of DATVtalk articles to introduce Digital-ATV to hams and to explain various aspects of this new area of ham radio. In the CQ-DATV5 issue, the DATVtalk02 article was an introduction article about basic Digital-ATV. This latest DATVtalk article describes progress on Express_DVB_S_Transmitter software for the DATV-Express exciter hardware board.

The old technology of analog-ATV suffers from susceptibility to snow and multi-path ghost images. Dig-ital-ATV (DATV) using new technologies like digital modulation, and Forward Error Correction (FEC) can result in robust video reception where analog-ATV fails, as well as providing more narrow band-widths on the ham bands.

Figure 01 shows the difference between receiving weak signals on analog-ATV and Digital-ATV using the same RF power amplifier and the same antennas.

The DATV-Express Digital-ATV exciter board was introduced in January 2014 to provide a more affordable product for hams to transmit DATV. The original DATV-Express software product ran on LINUX operating system…a very useful OS, but 95% of hams do NOT use LINUX…and most of those hams do NOT WANT to learn a new OS!!

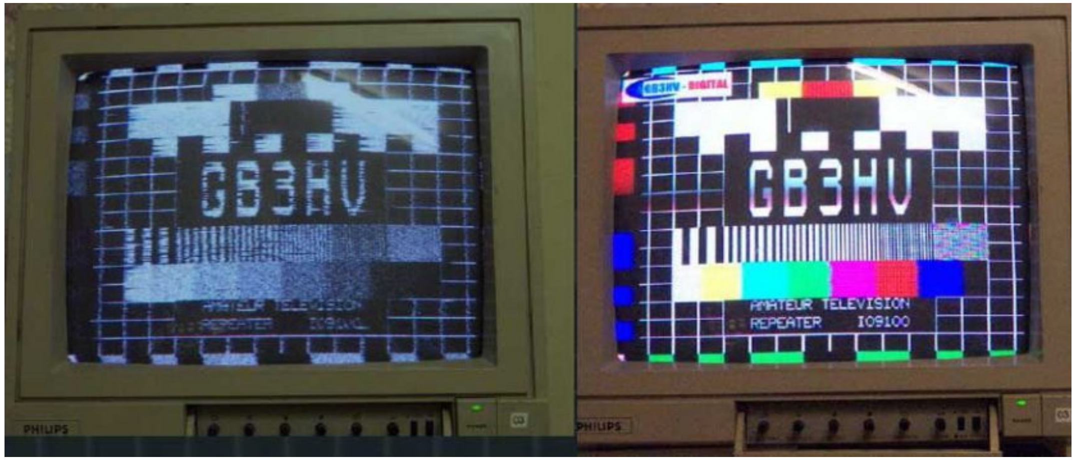


Figure 01 - Comparison of analog ATV video and DATV video using the same antennas with weak sigs (courtesy of G8GTZ & GB3HV)

Express_DVB-S_Transmitter software

The new Express_DVB-S_Transmitter software was written by Charles G4GUO to allow the DATV-Express transmitter board to operate in Windows (Win7, Win8, and Win10). A block diagram of a typical set-up is shown in Figure 02.

An important feature of this new software is that the video-capture-to-encoder function no longer needs to be performed on a Hauppauge video capture board. The Express_DVB-S_Transmitter software uses the FFMPEG CODEC library that is available in a Windows environment to perform the video encoding/compression (no more Hauppauge unit needed!).

The Main screen of the Express_DVB-S_Transmitter software displays all of the settings that the owner has made - as shown in Figure 03. There are seven tabs across the top of the Main screen that control the actual settings for the DATV transmission. For example: the CAPTURE Tab allows selecting the video and audio device and the MODULATOR Tab allows selection of frequency, Symbol Rate, FEC, etc.

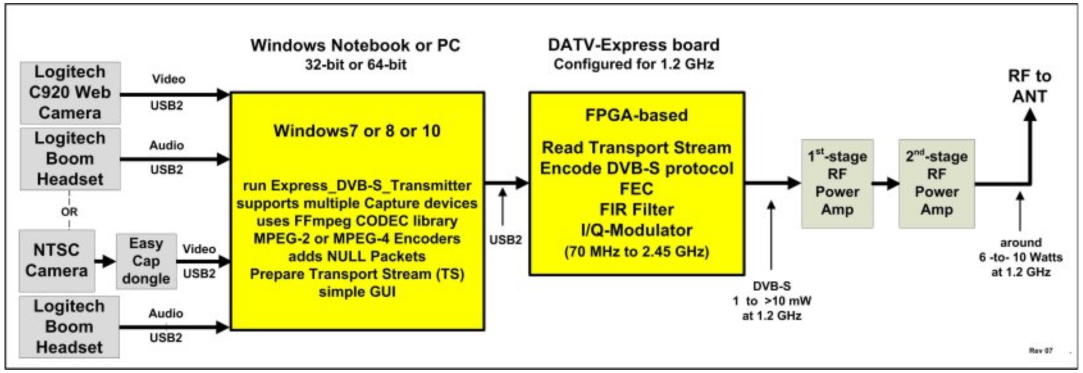


Figure 02 – Block Diagram for typical set-up running Express_DVB-S_Transmitter software on Windows

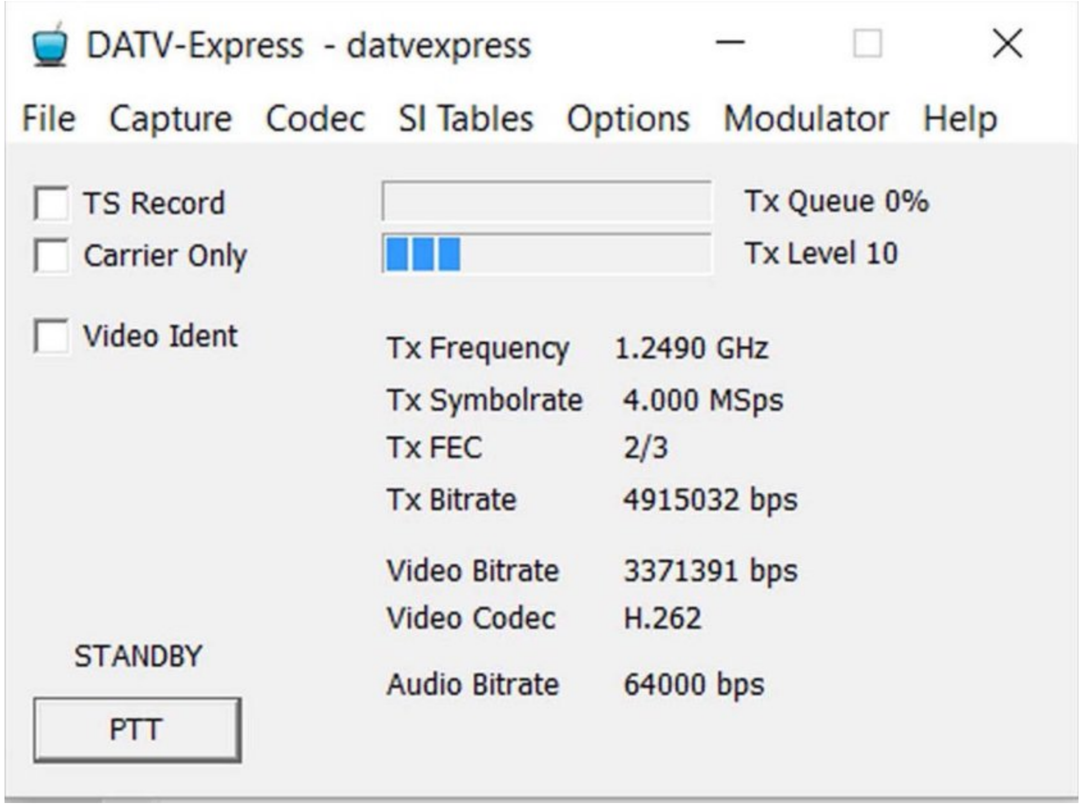


Figure 03 - The Main screen of Express_DVB-S_Transmitter software

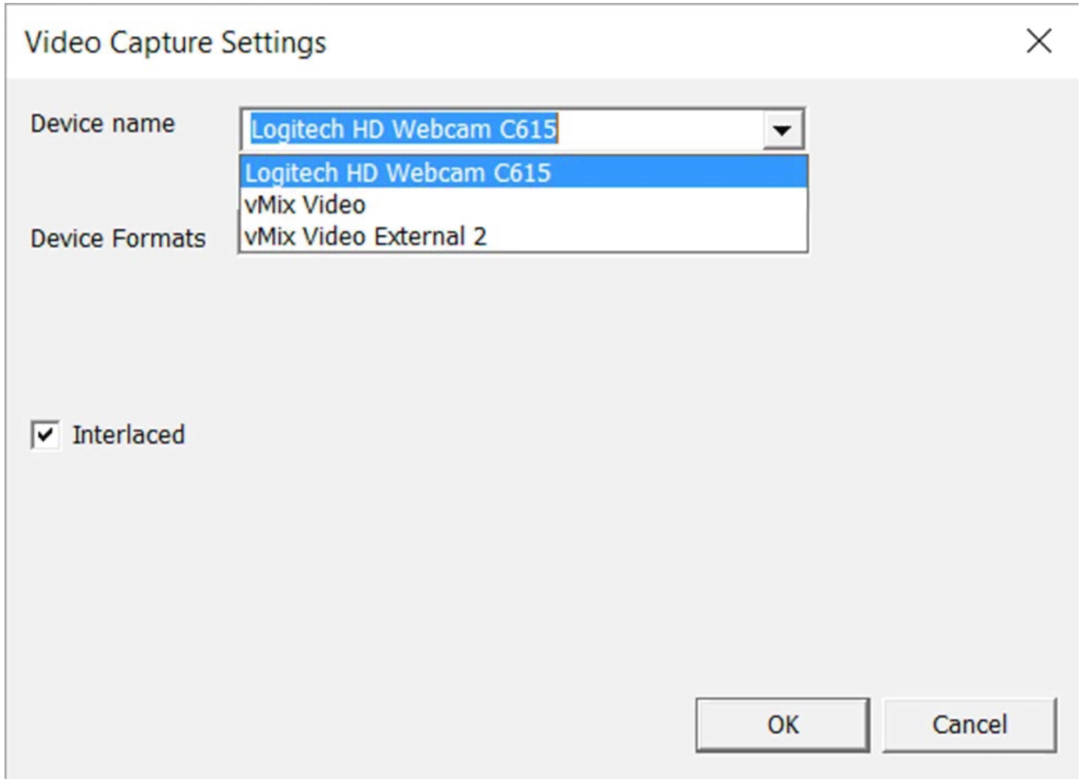


Figure 04 – CAPTURE Tab allows you to choose among cameras attached to the Windows PC

Choice of Cameras and Microphones

One big improvement made by this new Windows software for the DATV-Express hardware board is that there are many more camera models that can be used.

Use a USB-based web-camera such Logitech C920 and HD hand cameras as well as using your old NTSC hand-camera through a video-capture dongle like EasyCap (USB-based).

Even the camera and microphone on your note-book computer can be selected.

Choice of CODEC

A CODEC is a compression encoder. The CODECs Tab allows you to send H.264 (MPEG-4) video as the video-payload even though the soft-ware is using DVB-S protocol. In the commercial DTV world, the DVB-S protocol does NOT transmit H.264 CODEC, but DVB-S2 and DVB-T2 protocols do transmit H.264.

The radio buttons along the top of the Figure 05 allow you to select one of three different CODEC VIDEO encoding technologies for your transmission.

- *H.262 is the standard MPEG-2 video encoding that is used by commercial DVB-S DTV transmissions. It works well but does not compress as efficiently as H.264 or H.265. H.262 is more compatible on older SetTopBox receivers (such as FTA before MPEG-4 was introduced).*

- *H.264 is the newer MPEG-4 video compression that is used by commercial DVB-S2 HDTV transmissions. H.264 encoding provides higher bit stream compression efficiency than H.262, but may have a little longer latency (video delay) than H.262. The good news is that H.264 CODEC can be used as the "payload" video stream inside the DVB-S protocol…as long as the receiver is capable of receiving both DVB-S and H.264…such as a DVB-S2 STB. Another advantage of the H.264 CODEC is that it works better (than H.262) in low Symbol-Rate environments under 1M Symb/sec. The significantly better low-SR video quality seen on the receiver is due to H.264 design using a more suitable macro block size. One caution is that if you insist on using HDTV quality video as an input, then the video bitrate will be very large and may require a 6 MHz BandWidth on the spectrum to receive that quality.*

  Hams can tweak the video capture format and SR and frame-rate (FPS) to achieve acceptable BW and video quality as the RB-DATV hams do on 2 Meters and have shown to reduce DATV spectrum bandwidth requirements on other ham bands like 70 CM and 10 GHz.

- *H.265 is a more recent video compression encoder that is also known as High Efficiency Video Coding (HEVC) can encode 4Kp60/10-bit video in real-time (with hardware encoder). H.265 can compress 480-line video with 50% more reduction and 1080-line video is reduced by 60% (both compared to H.264 CODEC). H.265 software encoding is very computer intensive and typically results in latencies nearly 10 seconds.*

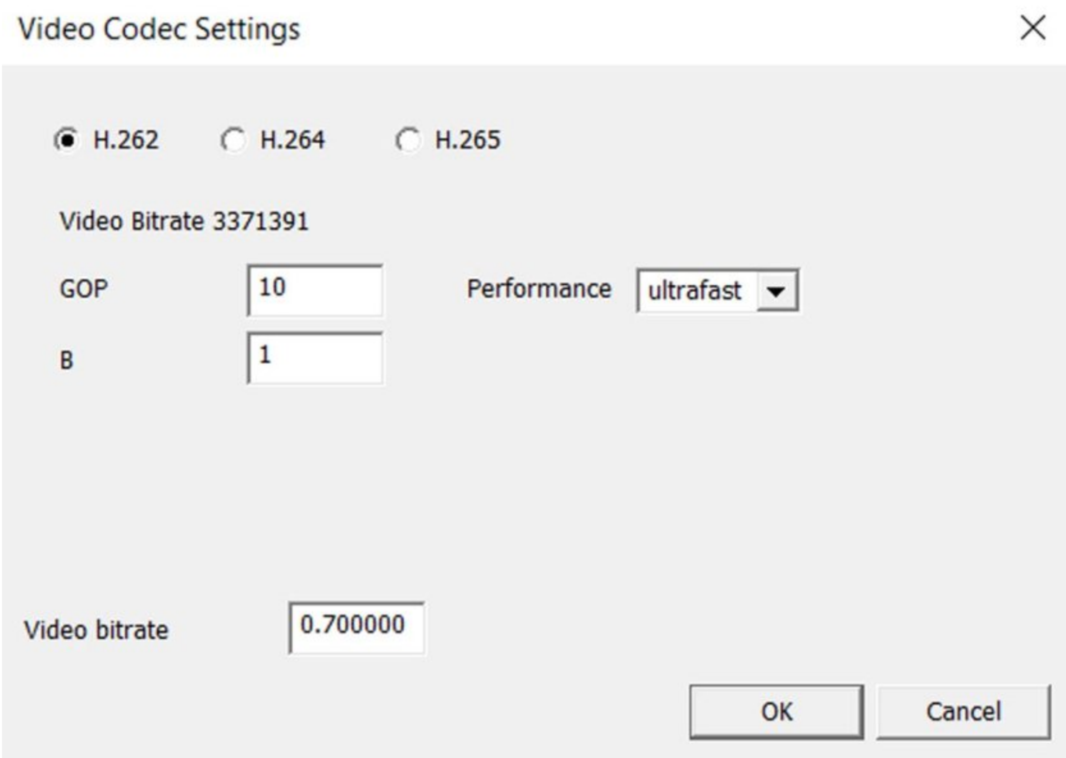


Figure 05 – The CODEC Tab allows selecting H.262 or H.264 or H.265 video encoding.

Figure 06 – The VIDEO IDENT feature can be enabled to display your call letters on the received transmission

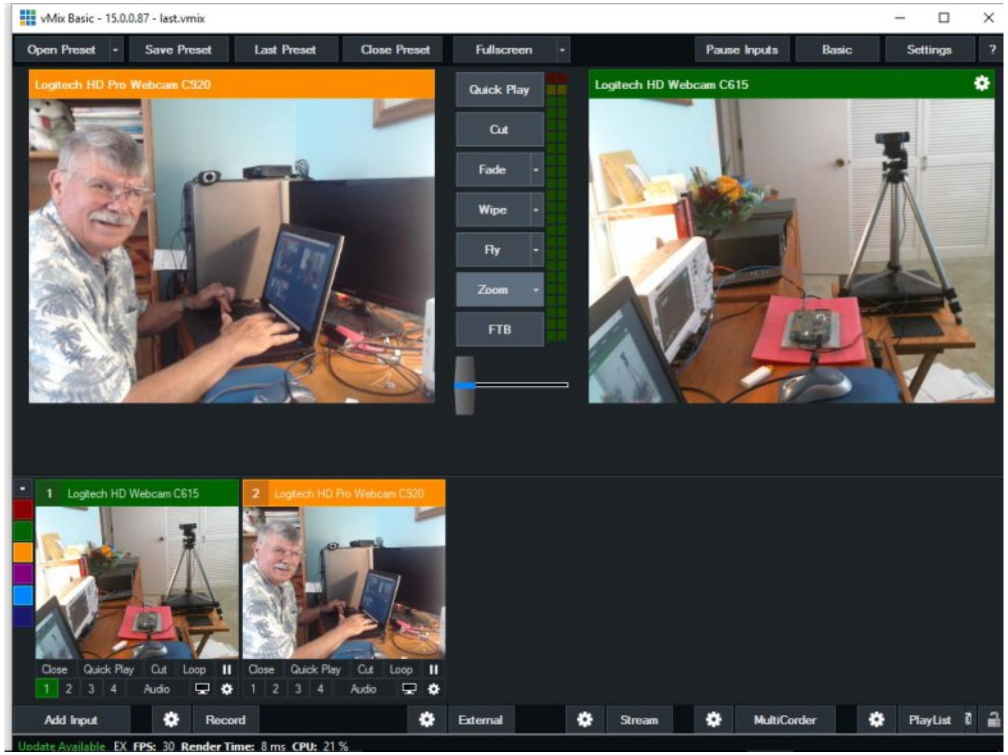


Figure 07 - Typical window for vMix Basic optional software can control multiple cameras and also create "green screen" video effects.

Simple Call Letters Overlay

Another new feature introduced in this Window software application is a simple video overlay for your call letters. This feature can be enabled by "checking" the VIDEO IDENT box on the Main window. Figure 06 shows how the video overlay field appears (shown as the call W6HHC) on the receiver's screen.

Adding optional vMix Video software

vMix is a great optional companion software tool. vMix Basic is a free video-editor software package for SDTV format video (Standard Definition) is available from *vMix.com*.

There are more-professional HDTV products of vMix available for sale, including the vMix Basic HD for US$60.

The free video-managing software allows you to control multiple cameras and audio microphones, create call letter overlays, create blue-screen and green-screen tricks, and perform fades-between-cameras.

You can capture any video that you can get onto your Windows computer via USB, Firewire, ASI, or HDMI (using a HDMI-USB capture card). When running, vMix will display as one of the available devices under CAPTURE – Video Devices and CAPTURE – Audio Devices.

Downloading Software and Manual

The Express_DVB-S_Transmitter software is currently available (and free) as a "BETA release" of v1.11. This beta software does already have many successful users around the world and is expected to be "production released" by September.

The software install package, a beta-grade Users Guide for Windows and a readme file, called NOTES.txt can all be downloaded from the *www.DATV-Express.com* web site on the DOWNLOADS page.

Installation instructions are included in the Users Guide for Windows. The instructions also explain how to use the ZADIG free tool to easily install a Windows device driver for the DATV-Express hardware board.

Finally, a reminder that you can order the DATV-Express hardware board for US$300 + shipping on the PURCHASE page….but you have to be registered and logged-in to the web site in order to make the PayPal purchase.

Contact Info – the author may be contacted at *W6HHC@ARRL.net*

Useful URLs

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

CQ-DATV online (free monthly) e-magazine –
www.CQ-DATV.mobi

DATV-Express Project for Digital-ATV (User Guide and downloads) – www.DATV-Express.com

G4GUO github for DATV-Express source code –
https://github.com/G4GUO/datvexpress_gui.git

Chris MWØLLK discussions on vMix and FFMPEG software on Windows to create transport stream –
http://www.tannet.org.uk/using-ffmpeg-to-generate-a-transport-stream-more-details-and-how-to-add-text-overlays/

Orange County ARC entire series of newsletter DATV articles and DATV presentations –
www.W6ZE.org/DATV/

vMix Basic free optional video software tool download –
www.vMix.com

Yahoo Group for Digital ATV -
http://groups.yahoo.com/group/DigitalATV/

Two ways to make a down converter for the range of 23cm DVB-T

By Alessandro IW3RMR

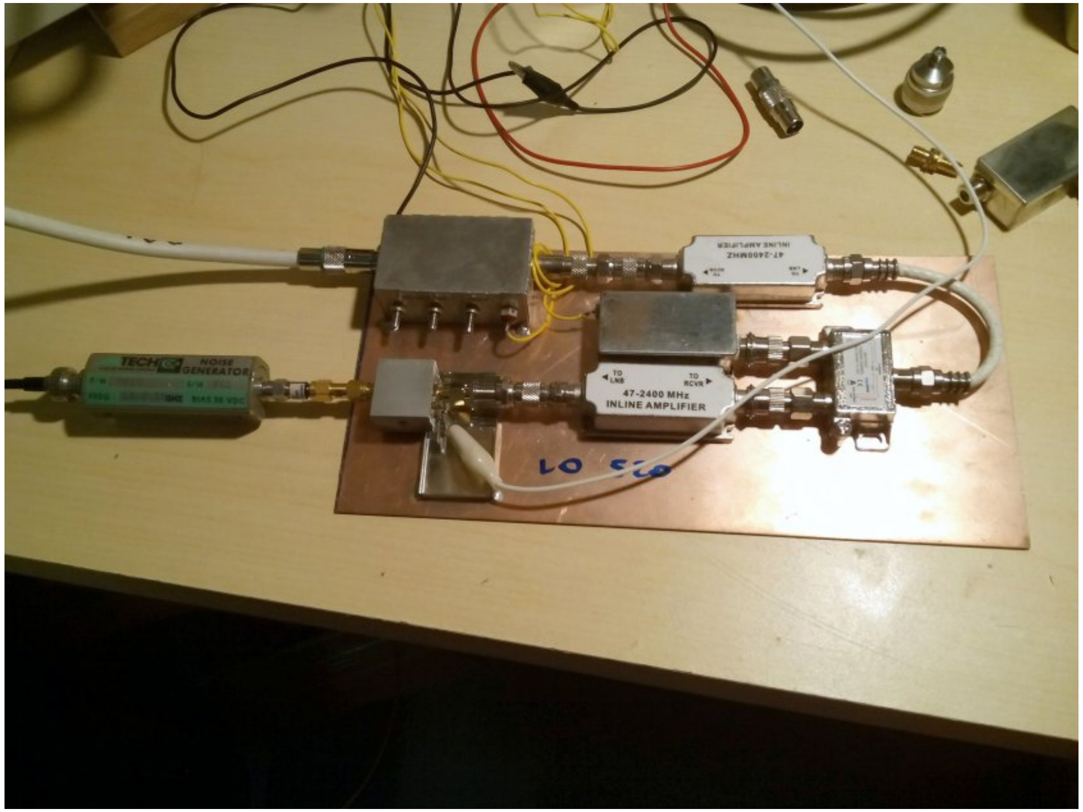
The first converter

Here's the new converter, easy to implement, and provides good performances!

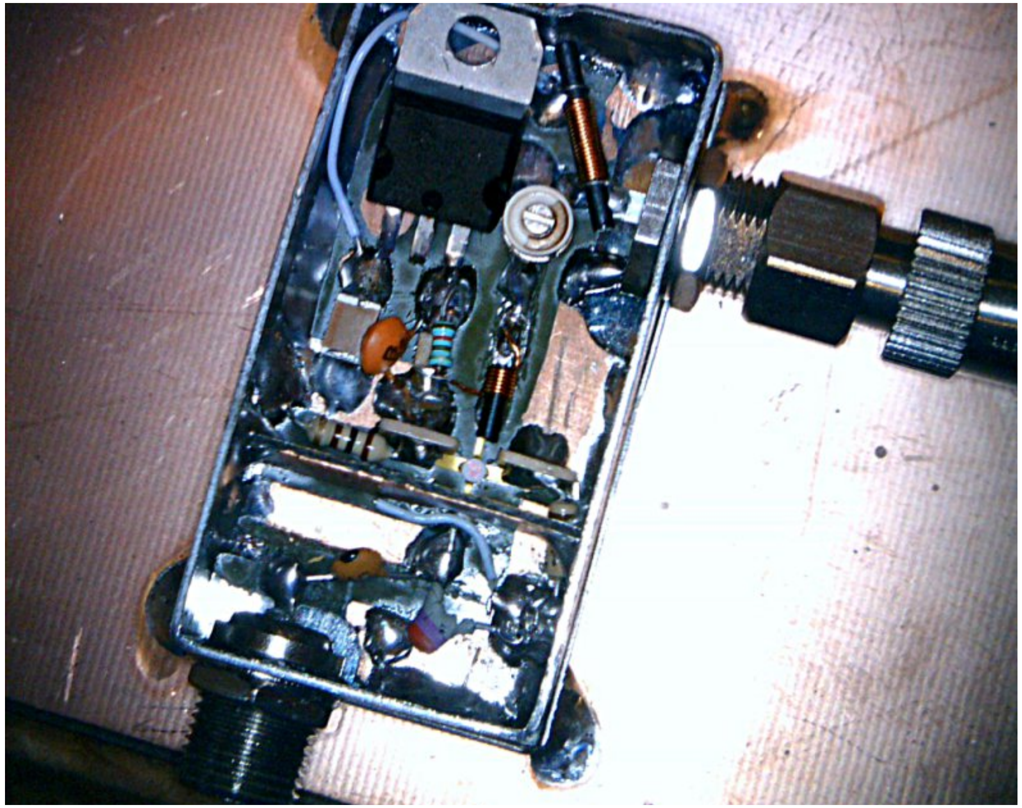
For the input stage I preferred to use a low-noise preamplifier stage, using a MGF1302. But nothing prevents you to use another type of component, the choice of who creates it.

It follows a broadband 47-2400MHz line amplifier, which has a gain of 18 db, and is affordable at a cost of €3,60. The local oscillator is made with a VCO to 104MHz at a cost of €2, followed by two coils tuned on the 5th harmonic at 520MHz, with an output level of 100dBuV.

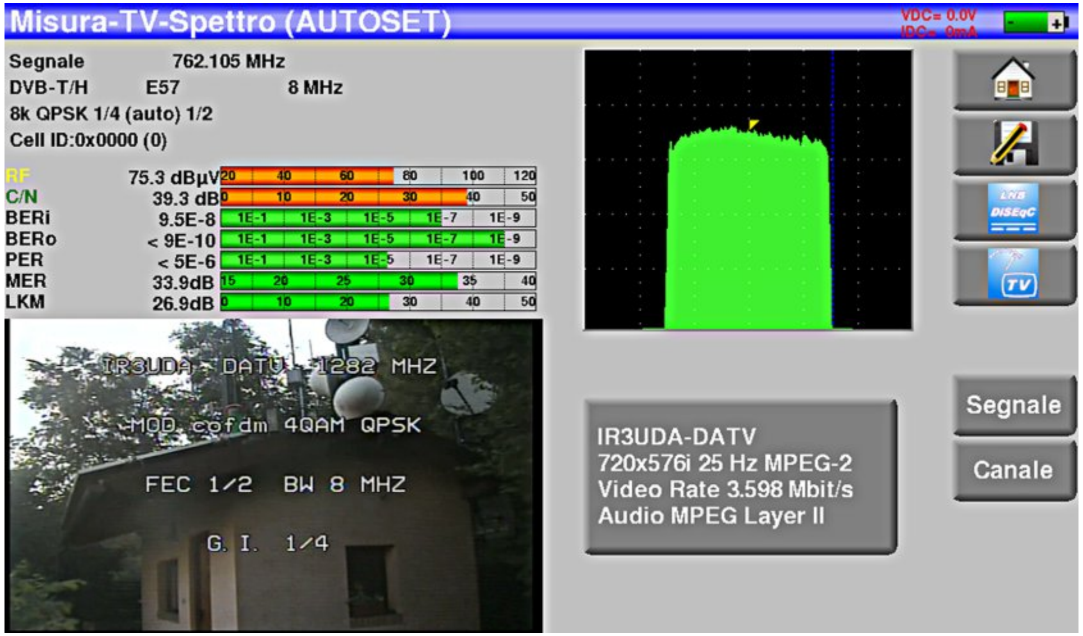
Both LO and RF signals are injected into a mixer SAT-TV, at a cost of €3. The ego signal is connected to the TV and the RF input SAT. Please note this is not a mixer, but a coupler of the two signals that are ready to be sent to another line amplifier, like the previous one. This second amplifier mixes the two LO and RF signals, and the output, the difference IF signal, enters a band pass filter calibrated on the affected frequency. For the filter you can also use the type stripline, built on a base of FR4.



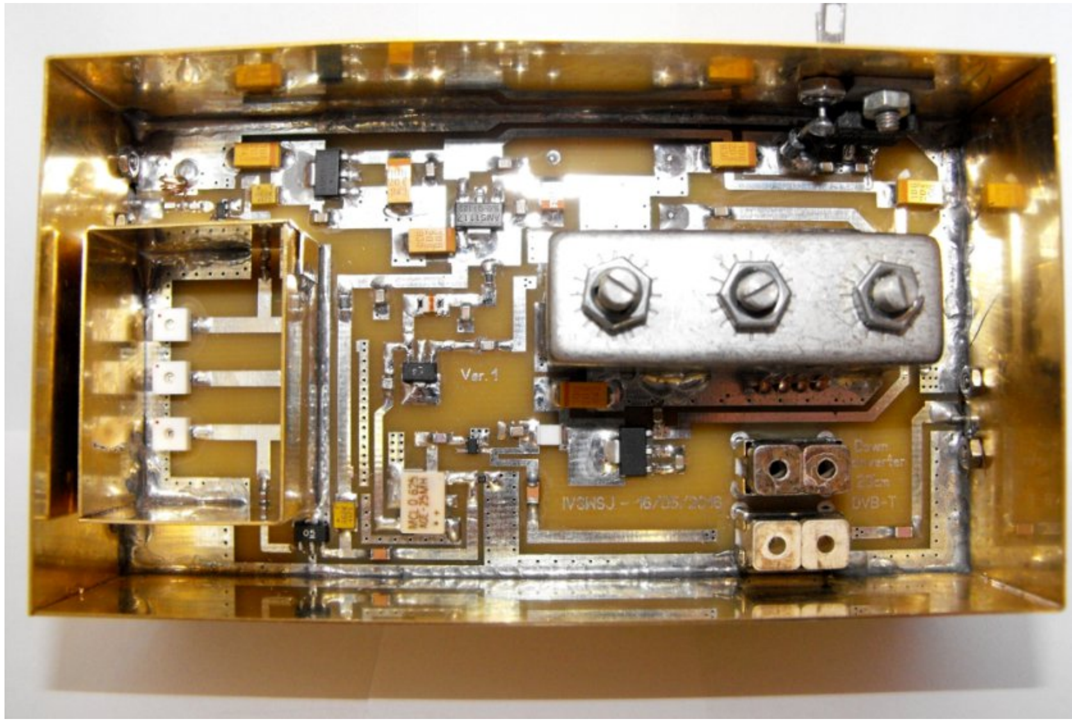
The complete converter



The preamplifier



A receive test



Checking through the spectrum analyser the filter with air coils, the spectrum was spotless, while the stripline filter harmonics did not exceed -40 dB attenuation.

I ran some comparisons with other models, built in a professional manner, but the difference was negligible. The cost to make the down converter is very low and therefore I recommend you try to make it happen.

Have fun.

The second converter

By Mauro IV3WSJ

The down converter I am presenting is the result of many experiments of many prototypes, created on the classical FR4 1.5mm, with the traditional system, Home Made.

To satisfy my curiosity, I decided to draw the printed circuit board with a professional program and leave the manufacture of the PCB to a specialised laboratory.

One of the basic rules for working in DVB-T is the adaptation of impedance of the individual stages.

To have a good sensitivity and a low noise level on the input circuit, I used a monolithic amplifier Mini-Circuits, the PSA4-5043 +.

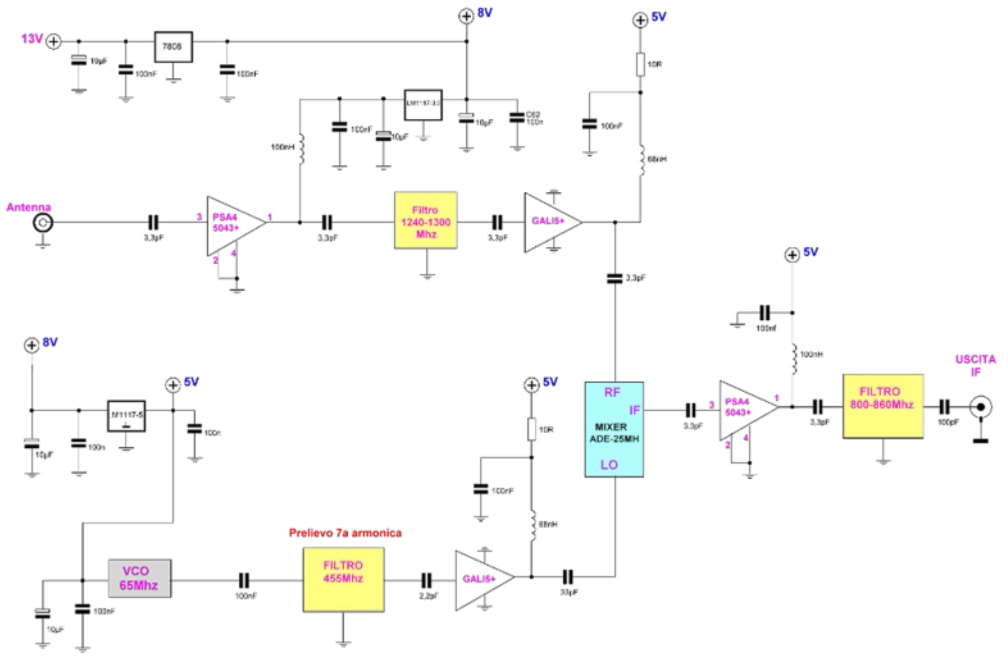
The input signal is amplified, enters a bandpass filter stripline, and before entering the mixer is again amplified with a Gali5 +.

To create the local oscillator I chose a VCO with 65MHz frequency. The VCO signal enters a filter with three cells (helical filter), and the filter extracts the seventh harmonic, which in this case is 455MHz.

After the filter, this signal is amplified by an MMIC and then switches to the LO mixer (ADE-25MH). The IF signal output from the mixer, which is the product of the difference between the frequency of the input signal and the local oscillator frequency. For example: if the input signal is 1280MHz and 455Mhz local oscillator is, the IF frequency will be: 1280-455 = 825Mhz (IF frequency).

The IF signal is amplified by a PSA4-5043 +, enters the filter (Gigafil), and by the filter goes to the output connector. The result I obtained is a level of the conversion signal of 26db and a value of attenuation of the harmonics of 45db.

At the beginning, I noticed that the second harmonic of the local oscillator was too high, but then I solved the problem by using another type of MMIC. Have fun.



Down converter 23cm DVB-T 13-07-2016 IV3WSJ

New by HiDes

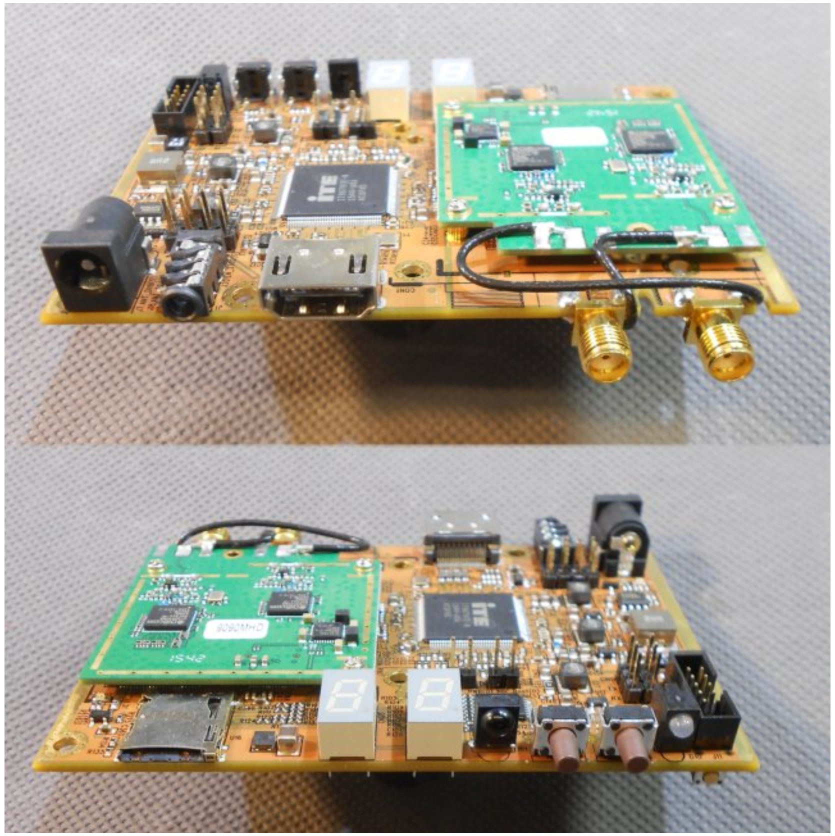
1MHz Bandwidth DVB-T Receiver 1.....8MHz Bandwidth , for more data look here:
http://www.oe7forum.at/viewtopic.php?f=7&t=410&start=345#p2017

New version HV120-DCA stand-alone receiver with Bandwidth from 1MHz to 8MHz

From look and function like new stand-alone receiver his predecessor HV120, new is the input part with Dibcom hardware also 1MHz bandwidth economy.

Advantages over HV120 are: 1MHz bandwidth and diversity from 2, 5MHz BW (antenna main entrance is Port1) is

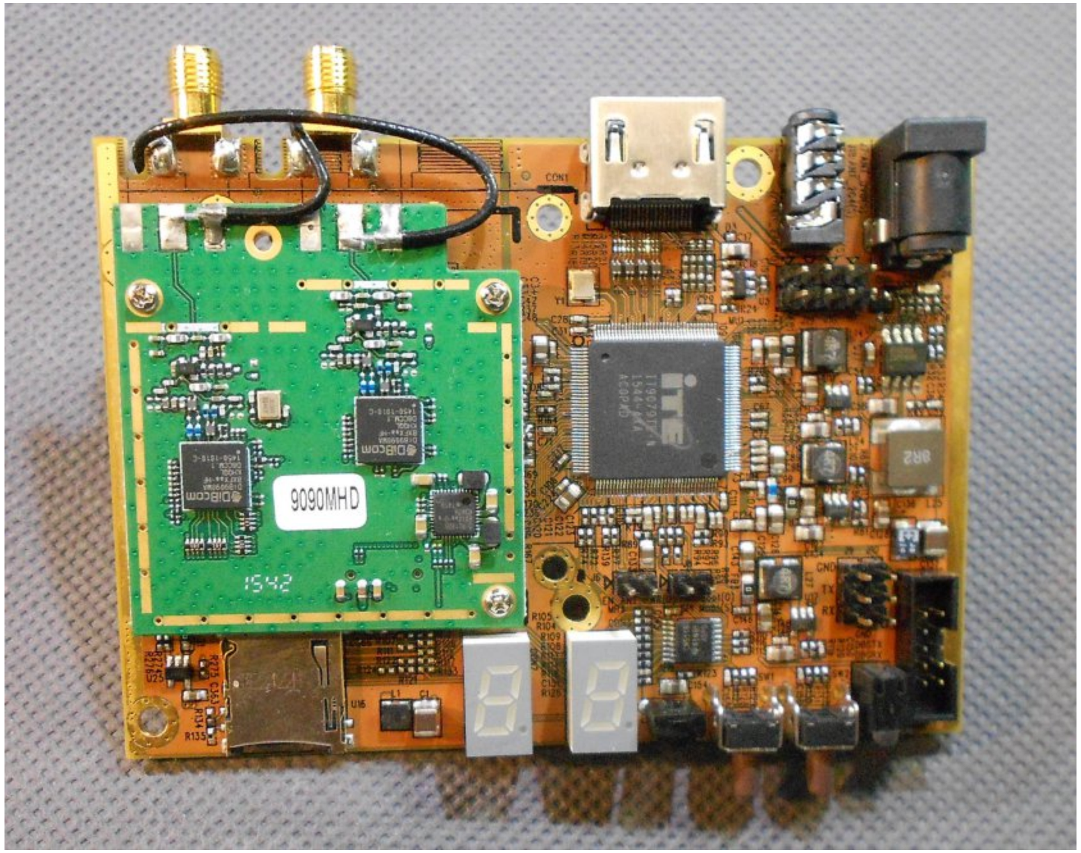
disadvantage compared to HV120: HV120-DCA makes only 170MHz 862MHz .... in combination with BD300 down-converter in 23cm and 13cm useful.

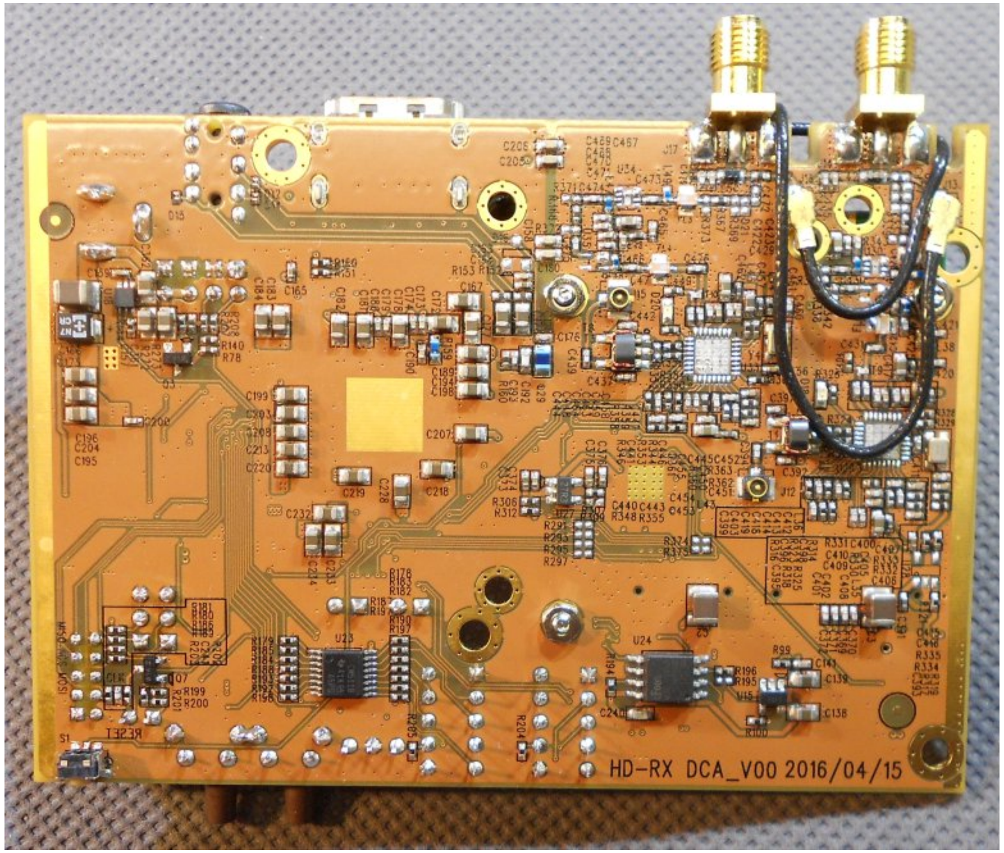


A receiver with a lot of potential especially for European close populated 70cm band or contest for ATV (narrower = sensitive !!) option 12V for low-noise preamplifier on two SMA ports is also available (the mount call directly antenna).

This receiver also has an integrated PVR good for verifying contest QSOs as well as decrypting hardware for special HiDes transmitters (not allowed in ham radio!).

It has long time have all Hides transmitter also the option 1MHz bandwidth, now is with HV120-DCA also receiving line entirely. from out look and function like new stand-alone receiver his predecessor HV120, newly is input part with Dibcom so hardware that work with 1MHz bandwidth. Advantages over HV120 are: 1MHz bandwidth and diversity from 2.5MHz BW HV120-DCA makes only 170MHz 862MHz





Disadvantage Compared to HV120 is thus combined with BD300 down-converter in 23 cm and 13 cm well usable. It has long time have all Hides transmitter so the option 1MHz bandwidth, now is with HV120-DCA therefore receiving line Entirely

Features

- *Standalone Digital DVB-T receiver*
- *Support 1080 Full HD H.264 and MPEG2 decoding*
- *Frequency Band Support - VHF and UHF bands (170-862 MHz)*
- *Two Antenna SMA connectors (master and slave)*
- *Composite video output / Stereo analog (L / R) output*
- *Digital HDMI audio and video output*
- *On-screen display Menu*
- *Automatic or manual channel scan*
- *1 / 1.5 / 2 / 2.5 / 3/4/5/6/7/8 MHz Bandwidth support*
- *12V active antenna supported (up to 500mA)*
- *demultiplexing UART data in received TS transmitted by Hides transmitter*
- *Decrypt encrypted TS data transmitted by Hides transmitter*

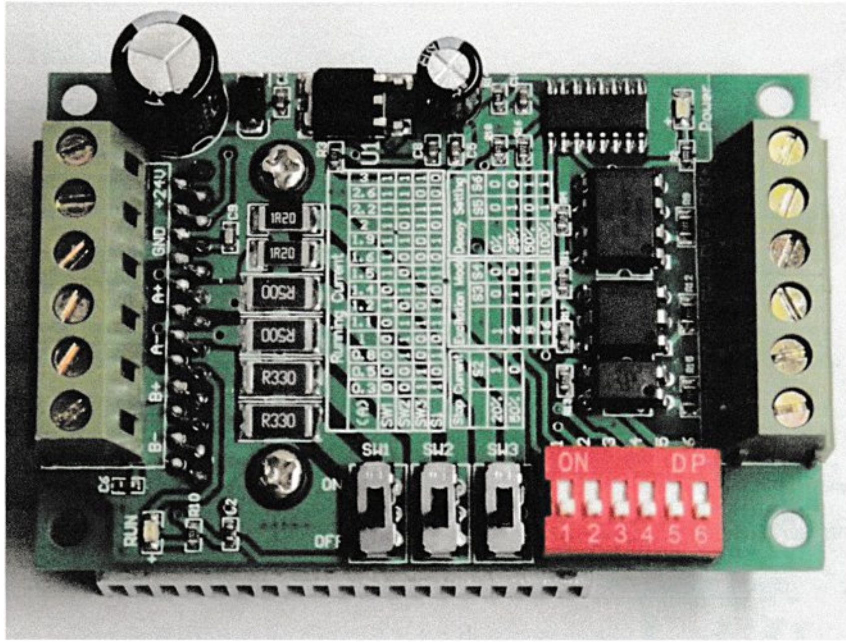
A full list of specifications and pricing is available at the following link:

http://www.ebay.com/itm/HV-120-DCA-Full-HD-Diversity-Digital-TV-Receiver

New Pump-up Mast Aerial Rotator Part 2

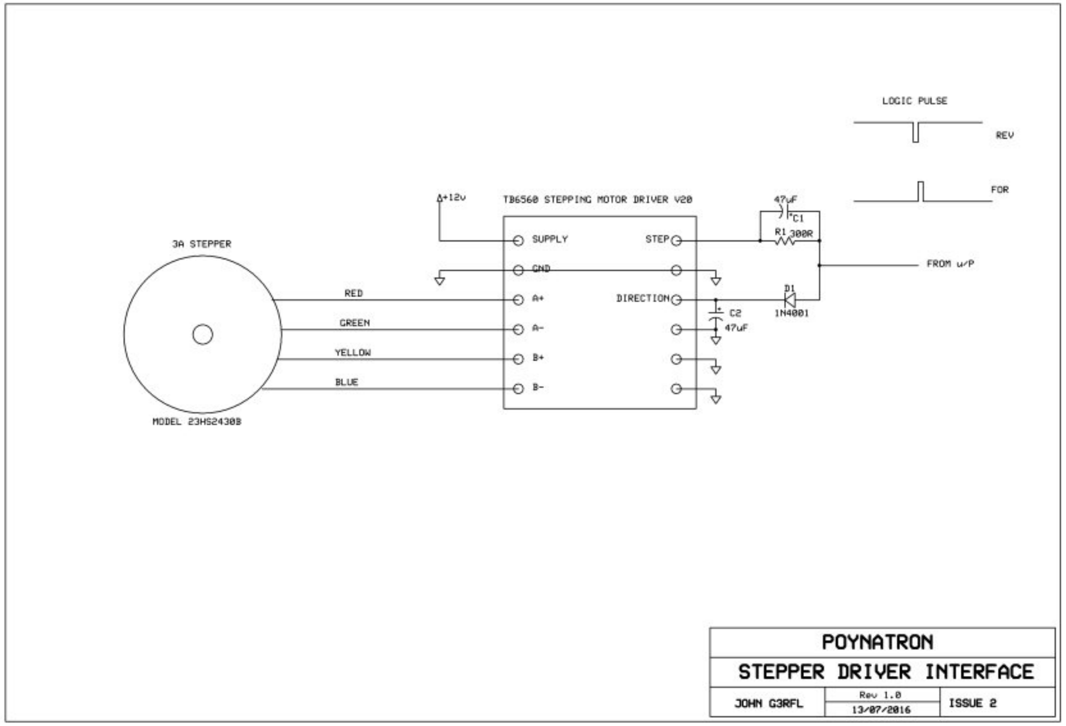
By G3RFL

There has been a lot of reader interest in my pump up mast, rotator, I have not seen a commercial unit available that does the same thing, most people are using, as I did, a dish positioner and settling for limited rotation. So having 360° rotation and indication of which way the aerial is pointing, I am to say rather pleased with myself, or was when disaster struck, I managed to blow it up!!



The stepper driver module

It seems the motor I had chosen needed a higher power driver module. The new driver provides a lot more turning power. The new driver can supply 2 amps when powered at 12volts. I also updated the cable to a much thicker 4 core cable rather than the inexpensive 4 core telephone cable.



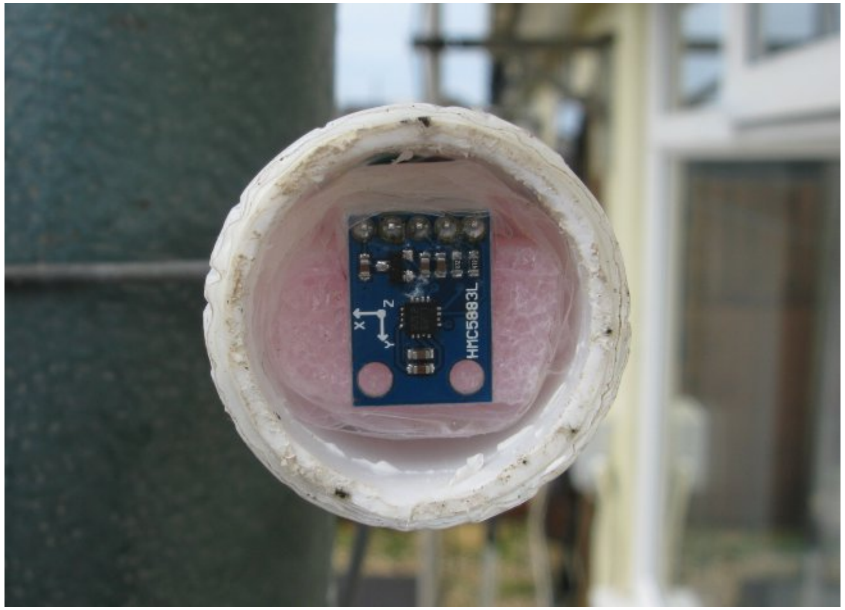
The circuit diagram

I have revised the software so that I can run the mag detector using the Hx and Hz 16bit signed maths to get the 0 to 360° angle. The sensor is now mounted in a water pipe, by first sello taping it to a small foam cube (note other people also make sticky backed plastic), then building it up to just fit the tube. By bending some threaded rod around the 5” mast and through the tube at the rear.

The sensor has to have its PCB vertical, components facing you, and the connector at the top.

I fitted a plastic top on the end of the tube over the sensor to weatherproof it… Lastly I pushed a thin plastic bag up the rear of the tube to seal it. The TFT touch screen does work and returns two values, X (0-480) and Y (0-340) pixels very accurately. But I have not used this yet this.

Stepper and toolkit show the mounted stepper motor and gear



Sensor is to show the way the compass PCB is orientated

Compass is installed on the mast.

It will be good for setting up preset stations once I know the values, so that the system automatically goes to a selected location.

Again this will be breaking new ground as I have yet to see a touch screen operated rotator. The touch screen is poled in the software and does not run on IRQ, but either way I am confident I will be able to add this feature at a later date and it is something I can experiment with on the cold winter evenings as everything that needs work is at the shack end.

On the main PCB you need to short out the 1K resistor from the control port pin RD1 (pin 14) to the terminal block that feeds the stepper control Step/Direction. At the moment the speed is set to be slow to suit my 10GHz dish with just two buttons, CW and CCW. Switches on the stepper driver should be set to 3A sw1, sw2, sw3 and the 8 DIP switches all “OFF”. (see the switch plan).

Step size is set at 1 so it's 1.8° 200 per rev. I have yet to mount it all in its box and with the driver, but I want to finish my VNA unit, so it will have to wait a while. The new stepper driver was on EBAY about £8.75p inc delivery.

The sensor was less the £2. My development budgets are quite frugal these days and require home office approval at every stage.

This project is now delivering excellent result, and good control, which is necessary when you start remote panning a dish on 10GHz. It does require some exceptional mechanical work and had it not been for the help of Alan G3SXC, it would have been just a good idea and not the reality it is now.

Warning:

1. *Check the connection twice ! The Tb 6560 chipset can be damaged if the motor or the power supply are not connected properly.*

2. *Don't apply a motor of a rated current of more than 3A to this driver.*

3. *Do not set the current more than the motor rated current!*

23cm beam and small 10GHz dish

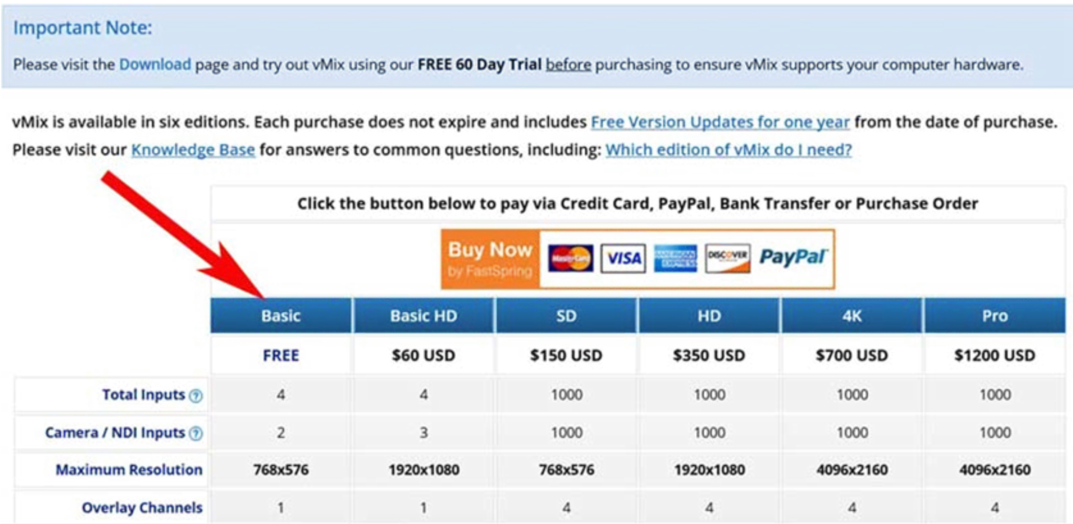
TV Amateur is a German Language ATV Magazine It is published 4 times a year and if you would like to subscribe go to http://www.agaf.de/

DATV-Express Project - June update report

By Ken W6HHC

Ken W6HHC reported that the beta Users Guide for the Express-DVB-S_Transmitter software for running on Windows is now available to download from the *http://www.DATV-Express.com* web site DOWNLOADs page.

The Users Guide for Windows (draft04) now includes improvements from one external review (thanks to Mel VK6ER) and I added a small write up on the companion video-management software vMix Basic (free) since it is not intuitive to know what you will want to download when you reach the *http://www.vMix.com* web site. The NOTES.TXT file (aka README) was also updated on DOWNLOADS page to match v1.11



Important Note:

Please visit the Download page and try out vMix using our **FREE 60 Day Trial** before purchasing to ensure vMix supports your computer hardware.

vMix is available in six editions. Each purchase does not expire and includes Free Version Updates for one year from the date of purchase.
Please visit our Knowledge Base for answers to common questions, including: Which edition of vMix do I need?

Click the button below to pay via Credit Card, PayPal, Bank Transfer or Purchase Order

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	Basic	Basic HD	SD	HD	4K	Pro
	FREE	$60 USD	$150 USD	$350 USD	$700 USD	$1200 USD
Total Inputs	4	4	1000	1000	1000	1000
Camera / NDI Inputs	2	3	1000	1000	1000	1000
Maximum Resolution	768x576	1920x1080	768x576	1920x1080	4096x2160	4096x2160
Overlay Channels	1	1	4	4	4	4

Array of vMix available products. The free vMix BASIC allows switching 2 cameras, preparing "green screen" video tricks, etc.

The DATV-Express project team was running very low on inventory of hardware boards, so Art WA8RMC purchased components, ordered assemblies, and tested another batch of production DATV-Express boards. Board inventory is full-up again.

Charles G4GUO during June was focusing on supporting beta users of the Express-DVB-S_Transmitter software. Charles prepared beta-release v1.11 to fix some FPGA code that had inadvertently disabled the non-sequenced PTT output line on connector J4. Charles has no other software changes in the queue right now….however there is suspicion that ZADIG may not correctly install LIBUSB.DLL file in a Win7 environment?

Ken plans to continue working with external reviews of the beta User Guide during July.

73…de Ken W6HHC (project speed set to slow…)

Teletext Page 100 updated from CQ-DATV 36

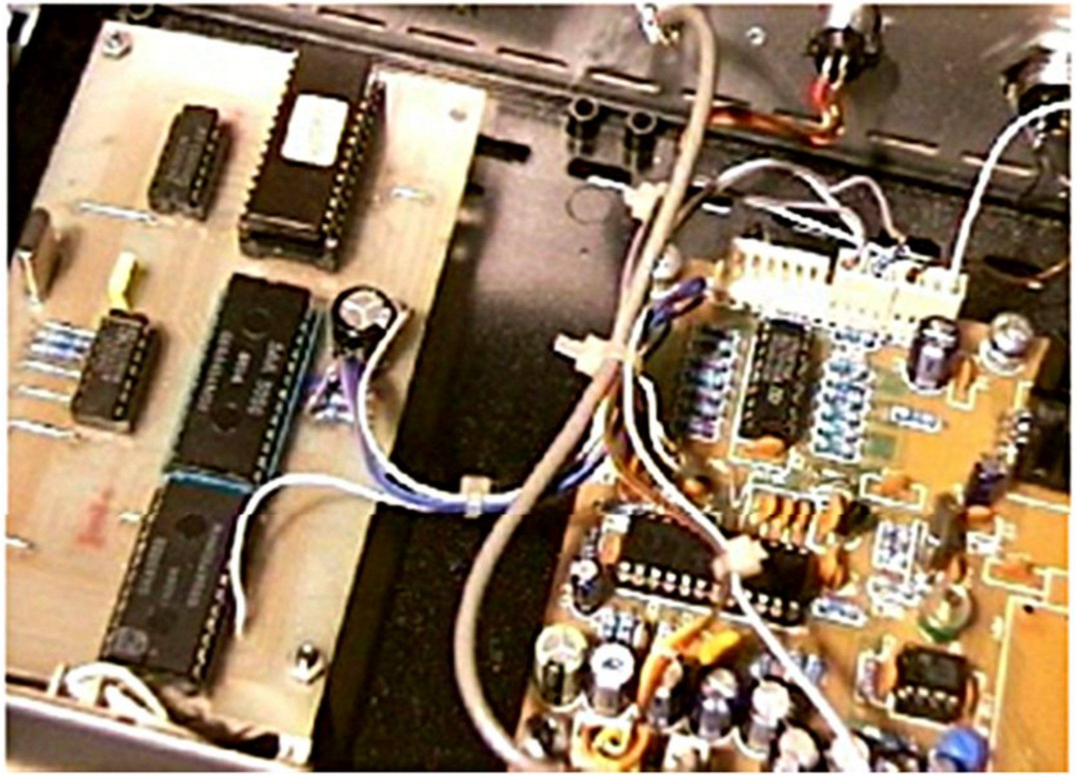
Mike G7GTN

Following on from the quite fascinating personal introduction from Peter Kwan on his professional involvement within the teletext field to then being followed up with a recollection and also actual photographic proof of receiving Teletext 1973 style from Alan G3XSC Using his home constructed decoder. It quickly makes us realise quite how far we had travelled within just this one sphere of Television technology.

Alas though and quite sadly it has now totally disappeared from our screens certainly within the UK. My first introduction to being able to access this technology for a different purpose was from the design in the BATC Compendium handbook by a certain Trevor Brown G8CJS that being his Teletext Pattern Generator project. As many of us will certainly remember used a SAA5020 timing generator and the famous SAA5050 character generator ROM. The data being read back from an EPROM, we were still slightly before the days of the I2C controlled devices at this stage.

I do recall feeding the RGB output from this generator straight in to the back of a Microvitec CUB Monitor before then building a PAL encoder based on the Sony CXA1645 device. I read back the programmed ROM supplied by Trevor (Oops sorry) and figured out how he did certain things and then I created some different screens of my own, we would now say the hard way by manually hacking away at hex files.

I did also at the time have an EPROM emulator connected to the parallel port of my PC which made some reasonably quick screen testing possible. Certainly not as lightning fast as our USB style device programmers of today.



My original BATC teletext pattern generator project

I have supplied a few very generic Teletext pages that you may download from the software page to aid your own design process using the PC software that Peter has created and has freely downloadable from his website
http://teastop.co.uk/teletext/wxted/index.html

Thankfully we have some staunch and enthusiastic members of the Teletext Facebook group that wish to keep this technology alive now that we have all been pushed in to digital technologies either kicking or just fully screaming.

Many very interesting snippets of technical information appear on the pages and so will certainly be worth joining them to participate. Certainly if you create some designs also please consider sharing them freely to give something back

Page created within the wxTED editor

for people’s considerable engineering efforts on writing software to allow us very easy access to modern tools.

I certainly do not see this as being 1973 – 2012 RIP for teletext as originally broadcast on our mainstream terrestrial channels. We now have incredible but yet ever smaller technology on our sides to use this broadcasting technology in our own home lab or shack projects. Think back for one moment to the very start and the basic idea of using the surplus lines within the VBI to send a data cast. That is certainly very interesting technical engineering by any standard.

Web References

wxTED PC Teletext editing software wxTED PC Teletext editor software
http://teastop.co.uk/teletext/wxted/index.html

SAA5050 TROM Datasheet
www.uxsup.csx.cam.ac.uk/~bjh21/BBCdata/SAA5050.pdf

Amateur Teletext Pages
http://www.qsl.net/zl1vfo/teletext.htm

Facebook Teletext Group
https://www.facebook.com/groups/TeletextGroup/

First-Hand:My Ten Years at Ampex and the Development of the Video Recorder

By Fred Pfost

This article was first published in the
Engineering and Technology History Wiki

.....continued from CQ-DATV 37

New Signal Electronics

Now the signal electronics represented the limiting feature in our system. Right from the start of considerations of the electronics for the video signal (by Dolby in 1951), it was known that a modulation system would have to be used because of the wide frequency range in the television signal (60 Hz to at least 4 MHz). Charlie Anderson was assigned this task and he worked with the amplitude modulation system.

The signal amplitude variations off tape at the writing speed we were using (15.00 inches per second) were significant. To these variations one had to add the different outputs from the four separate heads on the head drum. These amplitude problems resulted in undesirable amplitude variations in the demodulated signal.

In late December of 1954 Anderson suggested to Ginsburg that a possible solution to this amplitude problem might be to use frequency modulation. The major difficulty one might expect to find in using FM would probably be from the restricted frequency response we were getting off tape.

The carrier frequency could not be much higher than the modulating frequencies of the TV signal but by using vestigial sideband modulation it might be successful. He was given the go ahead to do some experimenting in January of 1955.

He used a high frequency carrier and modulated that with the video signal. Then, using a heterodyning process, he was able to produce the lower frequencies that were compatible with the recording capabilities of our tape system. He had his system ready for experimenting off tape by the end of January, 1955. The results were very encouraging.

At about this time Ray Dolby returned from his 2-year tour of duty in the army. He had been drafted when he lost his student deferment after he dropped out of school to spend full time on the video project. He now returned to his studies at Stanford and again worked part time at Ampex.

He looked at Anderson's FM system and thought he could develop the frequency modulation using a simpler circuit. He took two high frequency radio tubes and connected them together as a multivibrator oscillator. This way he could run the multivibrator at a carrier frequency that was within the bandpass of our recorder and frequency modulate this carrier directly by feeding the composite video signal to the control grids of the oscillator. This scheme worked well and was considerably simpler than Anderson's circuit. By the 25th of February Ray was making better pictures than Anderson so this became the final circuit concept for the FM system.

On March 2, 1955 we gave a very convincing demonstration to the Ampex Board of Directors. We indicated that we could be ready for a public demonstration within a year. We had to repackage all the electronics. We also had to tie down the head drum, the transducers, and the whole video head assembly to manufacturable designs. Also we had to design an attractive package for this machine that was going to sell for a lot of money.

Anderson set about designing the new console that would contain all of the signal electronics, motor drive amplifiers, tape control servo electronics, power supplies, control panels, meters and the tape deck.

The electronics were mounted on the inside of four large doors that could swing open for maintenance work.
The dimensions were approximately five feet long by four feet high and three feet front to back and weighed somewhere over 1000 pounds when fully loaded. (Remember, this was the age of vacuum tubes and large transformers.) The whole cabinet was painted a beautiful white. When finished this design was dubbed Mark IV. (See Fig. 1)

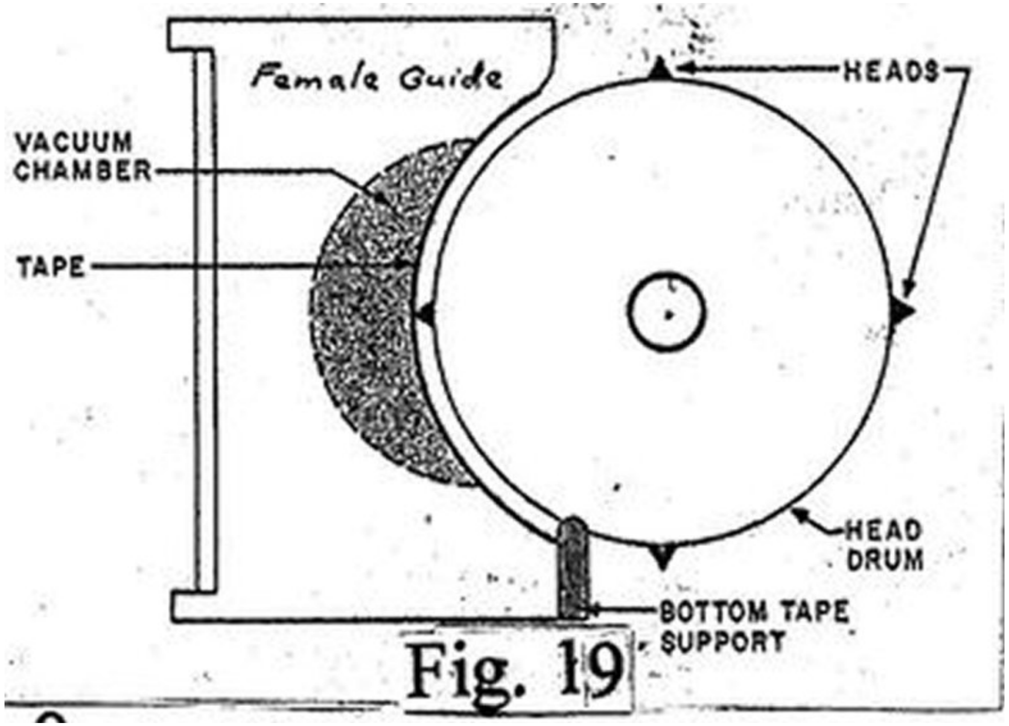


Fig. 19

Maxey did some important experimenting with tape tension and female guide position to control the picture distortion and timing. (Fig. 19)

At about this time, Maxey started to design and build what were to be Ampex's first efforts at moving from the quadrature configuration to a helical scan configuration for video recorders.

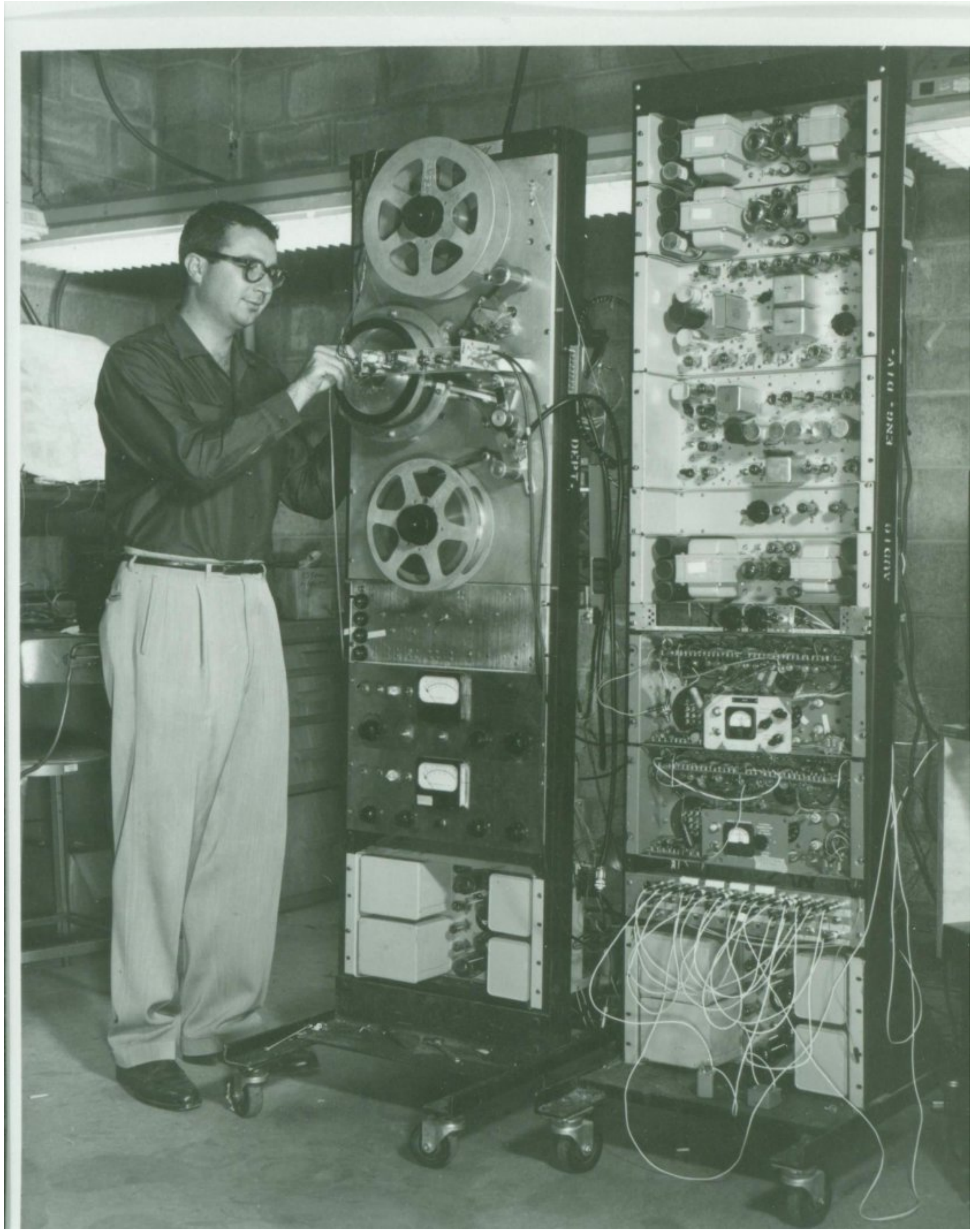


Fig. 20

Alex was quite successful with his efforts and within a little over a year he was ready to show what was deemed the Model VRX8000. This was shown to a few potential buyers and put into limited production. (Fig. 20)

Dolby worked on the modulation system by moving the FM carrier frequency to six MHz in order to increase the video frequency response. Ray also changed the head switching circuitry from a two-channel system to a four-channel system compatible with the new, separate, four head outputs from my video head assembly. He also modified the head-switching circuit to place the head-switching transients in the horizontal blanking interval.

It was not until after the Chicago showing in April 1956 that he designed and built the processing amplifier for the recorder. He and Ginsburg got together with Bill Lodge of CBS to work out the requirements for this processor. Its purpose was to massage the video and audio signals from our electronics to make them compatible with all the broadcast standards of the day.

On April 16, 1956 (a Monday) we demonstrated the Mark IV recorder at an NARTB convention (National Association of Radio and Television Broadcasters), today renamed the NAB (National Association of Broadcasters), at the Conrad Hilton Hotel in Chicago.

On the Saturday before the convention started (April 14) we demonstrated the recorder for about 300 CBS affiliates meeting at the Conrad Hilton Hotel. I recorded (from behind a curtain) the opening speech of Bill Lodge, V.P. of CBS, who described all the activities that CBS had been involved in during the past year and that he had a big surprise to announce.

After I rewound the tape and pushed the play button for this group of executives they saw the instantaneous replay of the speech. There were about ten seconds of total silence until they suddenly realized just what they were seeing on the twenty video monitors located around the room.

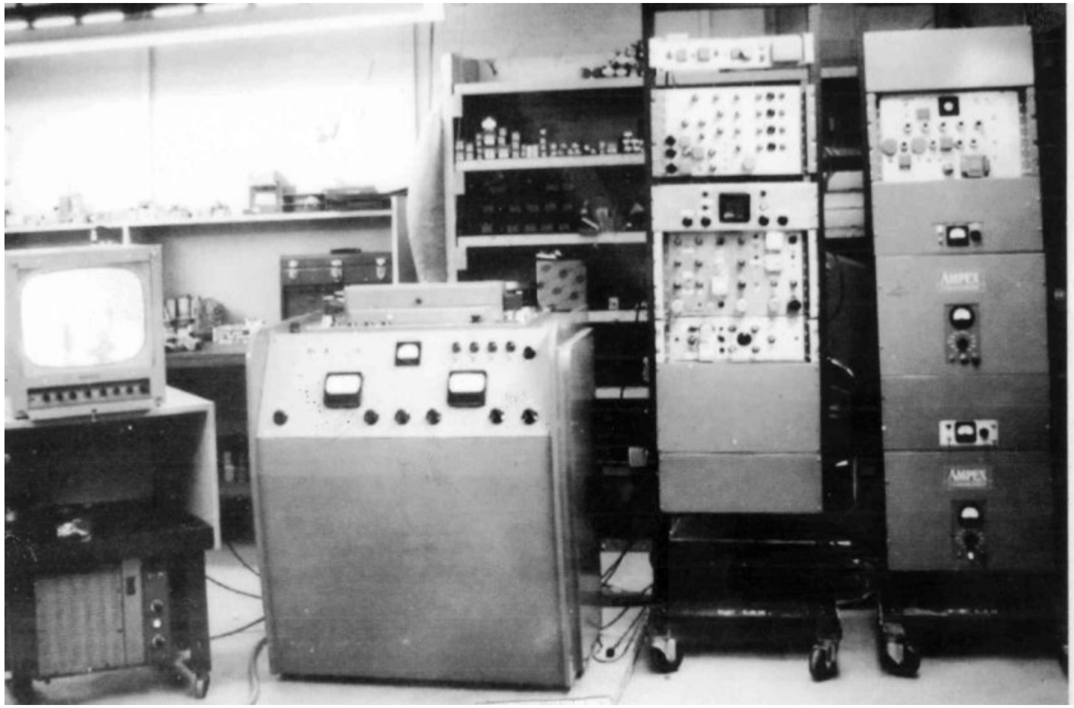


Fig. 21

Pandemonium broke out with wild clapping and cheering for five full minutes. This was the first time in history that a large group (outside of Ampex) had ever seen a high quality, instantaneous replay of any event.

My wife, JoAnn, who had accompanied us to Chicago (as a reward from Ampex for her patience during my long overtime hours pursuing this development) and I consider this demonstration one of the most exciting experiences of our lives.

The experience still brings tears to my eyes when I recall this event.

Fig. 22

The predecessor of Mark IV, named Mark III, (Fig. 21) was prepared for a press demonstration in Redwood City at the same time as the Chicago event. This presentation was also a huge success. The Mark IV recorder was moved to a second floor room in the Hilton Hotel and continued to operate flawlessly to a packed room for the entire following week. (Fig. 22)

Orders were signed for about 100 recorders at $50,000 each during that week. This represented an amount almost as great as a year's gross income for Ampex. It was decided to make the first 16 recorders in the engineering division while the manufacturing division geared up for the long run to come.

The first unit to go on the air was from CBS Television in Hollywood, California on November 30, 1956. The program was "Douglas Edwards and the News" and as far as we know, this was the first time in history that any videotaped program had been broadcast, nationally, any place in the world.

By the end of 1956 the 16 hand built units were nearing completion and the manufacturing division was pretty well tooled up for the long run to come. I helped them develop some of the tools and fixtures for the video heads and the head assembly.

This precision part of the recorder was very difficult to manufacture and there were many "rejects" in the final checkout of head assemblies.

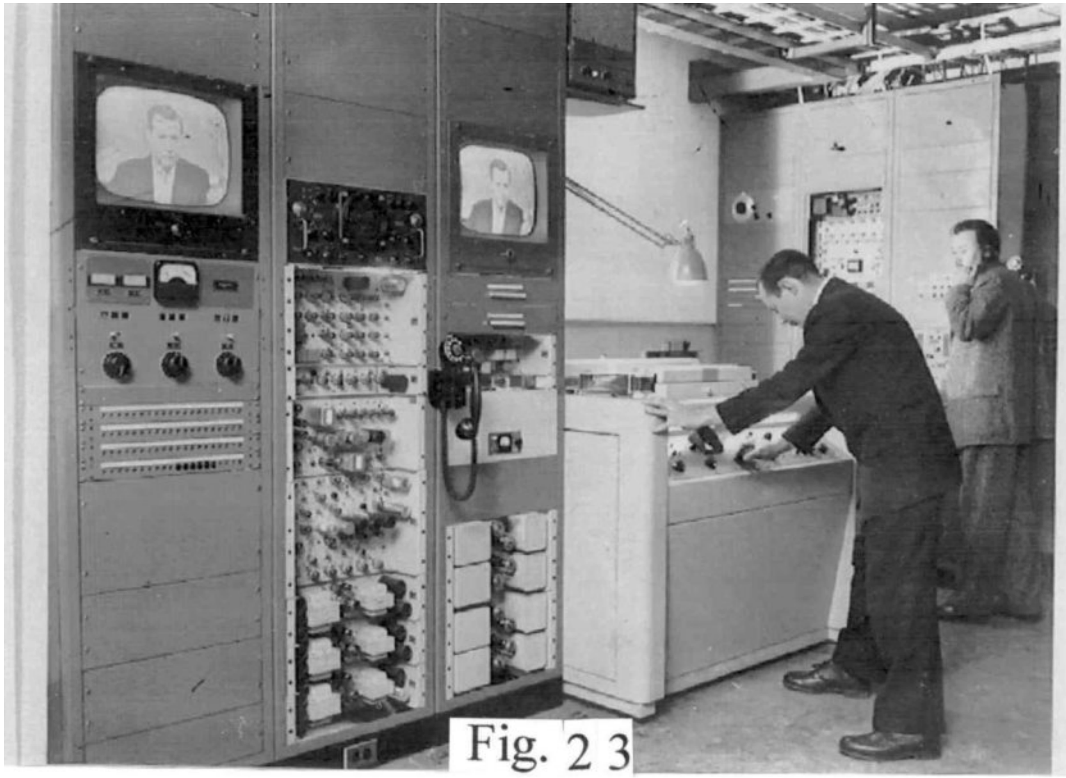


Fig. 23 - "Douglass Edwards and the News" - CBS, November 1956. The first program

It was difficult for manufacturing to keep up with the required inventory of head assemblies for new recorders being shipped let alone the requirements for renovating worn out assemblies as they would come back from the field. (Remember it took three video head assemblies for each machine shipped.)

At about this time the instrumentation division of Ampex (The video recorder development was done under the auspices of the audio division.) was starting to respond to requests from the field for wide band instrumentation recorders.

This higher frequency range (1 to 10 MHz) was beyond the high frequency capabilities of the instrumentation recorders being manufactured at that time. The logical solution was to utilize this capability of the video recorder.

A major problem arose when it was realized, as mentioned above, that the audio division could hardly keep up with building the required number of head assemblies for the video recorders they were producing, let alone the increased number that would be required if wideband instrumentation recorders were to use the same head assembly design.

A management team of about five members including the V.P. of research, Walt Selsted, and V.P. Harold Lindsey was assembled to find a solution to this problem. It was decided to put a new head development group together to design a completely new head assembly for instrumentation. It was also decided, initially, to use my head drum and head assembly design and just design a new video transducer.

Bill Frost was brought in from England to head up this new group. He had been instrumental in the development of the BBC recorder named "Vera." Two other engineers were chosen from the instrumentation division along with a machinist and I was contributed to the group from the audio division.

Frost decided that initially, for three weeks, each engineer should lay out three designs for the transducer (for a total of twelve designs). Then the management team would chose the best three designs (#1, #2, and #3).

Following that, our engineering team would work on #1 until it was finished and successful; or, if that one did not succeed we were to work on #2; and if that did not succeed we were to move on to #3.

At the end of the 3-week design period we all met with the management team and each of us engineers explained (with drawings) his designs.

As it turned out after the management team made its choices: #1 design was mine, #2 design was mine, and #3 design was also mine. Of course this made me very happy but when we returned to the lab, Frost said "Pfost, you go to work on your #1 design and the rest of you come with me and we are going to work on my design."

Of course, this was not the procedure the management team had directed us to do.

After a couple weeks or so of proceeding with this arrangement I decided to discuss this with the president of the company, George Long. He listened to my story but said he was probably too far removed from this activity to get involved but he would see what he could do.

The next day I was visited by a vice president, Harold Lindsey, who said I was to be removed from the group and sent back to the audio division where I was to continue pursuit of my three designs. The machinist Hank Miluski was also directed to accompany me back to the audio division. Hank was a great machinist and we worked together beautifully on many projects (even after we left Ampex and he opened his own machine shop in Santa Clara).

He became one of my best friends until he died some thirty years later. I really do not know what happened to the rest of that group of engineers.

By that time Charlie Ginsburg had been promoted to vice president and one, Larry Wylan (from CBS), had been made head of the "advanced video department." I was now working for Larry and he bent over backwards to give me everything I needed or wanted. He would also come to my lab every day just to be friendly and to talk about the project.

I will describe my #1 design now. I found a new extremely hard, highly permeable material (originally developed in Japan) called Sendust. It was described in a huge book on magnetics (Ferromagnetism by Richard M. Bozorth).

It was not easy to machine this material but I developed a process by which two fairly large pieces of the material (0.1 X 0.1 X 0.25 inch) could be machined to size and one surface on each of two blocks ground and polished.

With an appropriately thick shim to establish the gap (100 microinches) and while clamping the two pieces together I would braze the two together.

Thus, with this recording gap permanently established, the brazed blocks could be cut into many pieces without affecting the gap.

This Sendust transducer became the design used in production for about four years. I chose this as my #1 design because I figured it would take less time to develop it than my #2 design, which was an all-ferrite transducer with glass gaps.

I was thinking about glass-bonded ferrite heads by 1955. The January 1954 issue of the Proceedings of the IRE was totally devoted to the subject of ferrites.

This was the first time I became aware of the characteristic details (the specifications) of this material. It is a sintered, ceramic, highly permeable magnetic material. It is used in high frequency, electronic induction coils where, because of its very high resistivity, it exhibits very low internal losses due to eddy currents.

I immediately thought this might make a great material for use in magnetic recording heads, due to its hardness. Also, it would be good if the heads were to be exposed to high frequency, magnetic recording signals. Of course, at that time, there were no really "high-frequency" signals being recorded, although the high frequency bias used in metal audio recording heads creates eddy current losses.

Consequentially, when I became associated with the video project and its megahertz frequency range, ferrite recording heads became an obvious goal for future development work. Other investigators in the magnetic recording field also had these thoughts for audio recorders.

At about that time, Philips (in Holland), was trying to develop glass bonded ferrite heads. In order to bind the two-transducer pole pieces together to establish a stable gap most developers were experimenting with epoxy as the binding agent.

Since ferrite is an extremely hard, brittle material (like glass) and because of the abrasive nature of magnetic recording tape, these gaps would immediately start to crack because epoxy did not offer the same support (strength) as exhibited by the solid ferrite. One other drawback of ferrite for recording heads was the porosity of the material.

In the manufacturing process called "sintering", finely ground and mixed materials are compacted in a mold under very high pressure.

This establishes the desired shape of the part and then it is removed from the mold and baked in an extremely high temperature oven (1600 C to 2300 C) for a few hours after which it is slowly cooled over twelve to twenty-four hours.

This causes the fine particles to coalesce and become extremely hard and brittle. However, microscopically speaking, there are spaces between the finely ground particles that are comparable to the dimension of a playback head gap, i.e., in the neighborhood of a few microinches. Therefore, even if the gap problem could be solved one still had the porosity problem to contend with.

I had solutions for both of these problems. If I could find an extremely hard, strong material that maintained that strength and hardness at high temperature (2000 C) I could make a mould out of it and continue to squeeze the ferrite powder material while baking it and close up the spaces between the powder particles.

After many hours of searching I found the material. It is titanium diboride. Now, unfortunately, Ampex management decided that I was not the proper one to pursue this approach but that I should describe my idea to an established ferrite manufacturer and let them do it. (Of course, this was another dumb decision on their part.)

Two companies, Transtech and Sony, did exactly as I described and although Transtech could not retain consistency in permeability from one batch to the next in production, Sony was very successful and introduced the material (which I had previously named "hot-pressed ferrite") to the world (another "lost opportunity" for Ampex).

All the head manufacturers in the world started using hot-pressed ferrite (they bought it from Sony) after their adoption of my second idea (the glass gap).

I thought if I could use glass to bond the ferrite tips together to form the gap it would support the gap edges and wear as well as the ferrite. I first tried using thick deposits of glass in the gap area before bringing the two pieces together at a high temperature, squeezing the excess glass out, and letting the two pieces settle onto the gap spacer material. This was the same process that I had developed for the brazing material. This was successful once in a while but not often because it was not always possible to squeeze enough of the molten glass out of the gap area.

An Ampex salesman took one of the successful units on a video head assembly to the BBC in England (surreptitiously) and it didn't come back until it had 5000 hours of running time. The heads were still in excellent condition but the ball bearings were worn out. This was about ten times longer head life than we were getting with Sendust heads and these ferrite heads had at least another 5000 hours of life left on them.

We then started depositing 25 microinches of glass on each polished gap surface by means of sputtering and mating the two halves together (with no spacer shims) with great precision at a moderate pressure and about 800 C. These gaps were always perfect and when the slabs were parted and lapped to the proper track width and wound they became the most successful video transducers we had ever made.

This is the transducer design that every video recorder manufacturer in the world is using today.

I then did experimentation with "air bearings" because, even though we used the highest quality ball bearings available, they would wear out in less than 5000 hours.

I used graphite material and a self-pumping air design so they would not require an external air pump.

These showed some success but later the engineering department tried externally pumped graphite bearings with great success and that became the standard. This was especially important since ferrite heads could last for 10,000 hours before they would wear out. These air bearings would last "forever".

In about 1965 Dale Dolby, the brother of Ray, who had become part of the video project in about 1958, designed a new video recorder system to use "tape cartridges" instead of reels of tape. This cartridge recorder was totally different from the standard video recorder.

The market for this design was short television advertisements or "ads" that might last a few seconds or a few minutes where it was not practical to use a full hour or two hour real of tape. The recorder could hold a few cartridges or many cartridges and could insert "ad" material or sequential "ads" into any long program as desired.

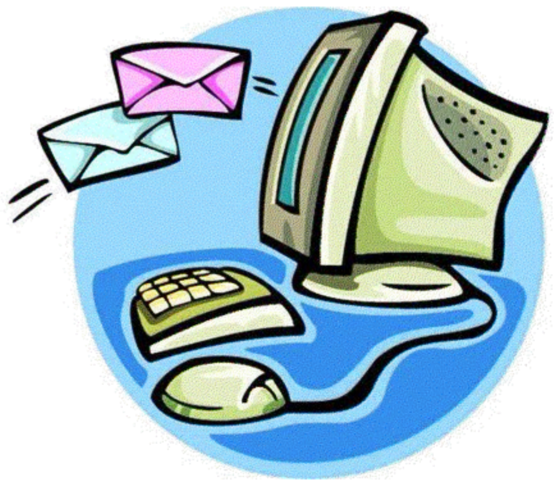
This process required the machine to be able to rapidly thread and unthread the cartridge tape around the top plate and this was not convenient with the vertically standing female guide in the way of the rotating head drum.

He modified the way the guide was mounted so it could just flop down out of the way during this part of the threading activity and then spring back vertically to hold the tape against the rotating head drum. He also developed four separate rotating transformers that were mounted on a shaft protruding from the center of the head drum. This became, essentially, the final form of the transducer and head drum assembly for the rest of the "Quad" era and was named the Mark X head assembly.

Fig. 25 depicts what the final design and placement of the VR1000 audio and video head assemblies looked like when they were mounted on the top plate.

Fig. 25 - VR1000 Top plate with video head assembly and audio, control track heads, and full track erase head assembly

to be continued.........



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