CQ-DATV

dotMOBI

ePUB

8

February 2014

In this issue

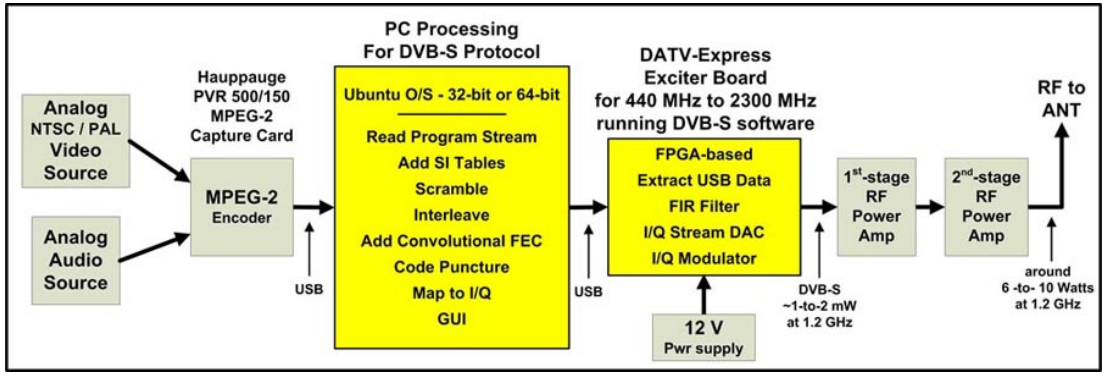
SOMETIMES the Project Team runs too fast!

Art WA8RMC went to retest the production boards at a friend with a very fancy Agilent EXA Signal Analyzer (also very very expensive). The previously reported 17.5 dBm (about 55 mW) RF power was measuring the CW carrier coming out of the DATV-Express board. It was expected that the DVB-S/QPSK power-out strength would be around 20-25 mW, enough to drive directly into the 30W RF amplifier. But the accurate Agilent EXA Signal Analyzer showed that in QPSK modulation CHANNEL POWER was down around 0 dBm or so (1 or 2 mW). Part of the reason for the smaller power out is that some spectral-regrowth (aka "haystack" shoulders....or distortion) occurs when the DATV-Express power is cranked up above a power-setting of 35 (out of a max of 47).If you try to amplify a distorted signal...only more distortion occurs.

So if you are planning to have 6 to 8 watts of RF output...you need to plan on two stages of external RF amplifiers as shown in the block diagram below.

The team is sorry about creating some un-achievable expectations in the earlier November Project Report!! Charles G4GUO points out that John G4BAO will be producing a kit that he believes is based on a PD85004 device which looks ideal as a low power driver amp with 15 db gain and 2.5W output (FM rating) on 1.3 GHz (see article in BATC CQ-TV 242)

"moderate speed ahead!!"...de Ken W6HHC



Typical System Block Diagram running DVB-S on 1.2 GHz using two stages of external RF amplifiers

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ALL of the old UK Independent Broadcasting Authority's Technical Reviews have been scanned by Gordon Drury and made available on the NTL Pension Association website http://www.ntlpa.org.uk/memorabilia. A few (DMAC, DICE, teletext) are dated and will be of interest most to history buffs, but others (Technical Reference, Vade Mecum) are still chock full of useful information.

Australian analogue TV closed on December the 10th 2013. Here is a You Tube link to someone who did record all channels....very good stuff...Channel 7 was the only station it seems that paid homage!

http://www.youtube.com/watch?v=i67143umcuU

Tom W5kub was live on the internet over the weekend (14-15 December). His site http://w5kub.com/ is always worth a visit.

This time he was video streaming from R and L Electronics in Ohio, to mark their customer appreciation day.

Ham Nation http://twit.tv/hn is another site to watch, this time George Thomas W5JDX of Amateur Logic fame is in the above shot, he was keyed over the TWiT production studio

which is rarely seen. The programme goes out live on the internet each week, but can also be downloaded in various resolutions, a day after the live broadcast, and are a must for all radio Hams to download and view. They show the power and potential of the internet, and the imagination and skill of the pioneers that are using it to bring you this sort of programming. Can we at CQ-DATV, thank both programme makers and offer our support for the work they are doing.

ISS ham video commissioning

As announced August 21, 2013 the Ham Video transmitter is onboard the International Space Station and stored in the Columbus module.

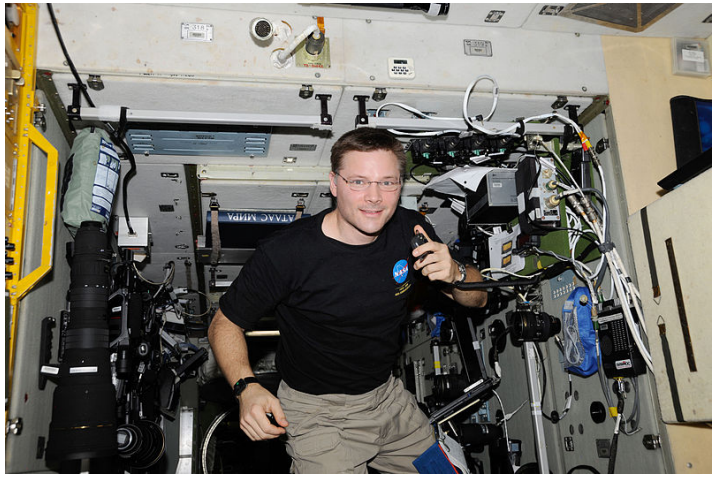
September 10, 2013 we informed about the Experiment Sequences Test (EST) and the Simulations performed by the European Space Agency in collaboration with ARISS.

September 20, 2013 we announced the Ham Video Launch Campaign and described a simple station for Ham Video reception.

The Commissioning of the Ham Video transmitter needs to cover different configurations involving 2 antennas, 4 frequencies and 2 symbol rates. As announced earlier, the signals transmitted during the Commissioning steps will be received by the Matera ground station, located in south Italy (see HamTV Bulletin #2).

Moreover, during the Commissioning period, the Ham Video transmitter will transmit permanently for several days (weeks). This will allow ground stations to test their equipment and to provide useful information concerning the efficiency of the transmitter.

For these transmissions, no camera will be used. The so-called "blank" transmissions will nevertheless provide a complete DVB-S signal, as described hereafter.



NASA astronaut Col. Doug Wheelock, KF5BOC, Expedition 24 flight engineer, operates the NA1SS ham radio station in the Zvezda Service Module of the International Space Station. Equipment is a Kenwood TM-D700E transceiver.

We hoped that the Commissioning of the Ham Video transmitter would be planned October 2013. It appeared that the "Flight Rules" regarding ARISS activities, which cover VHF and UHF transmissions, needed to be updated for S-band. Writing Flight Rules and having them verified, accepted and signed by all parties involved is a process that takes time. ARISS matters have low priority among the countless activities that populate the International Space Station. Unforeseen events, such as the recent failing of a cooling system, evidently cause further delay.

Finally, the January - February 2014 time frame seems a reasonable guess for the Ham Video Commissioning.

Source http://www.southgatearc.org/

A record

A record TV transmission via laserbeam over 118,4km. It is the actual long distance record for terrestrial TV transmissions via laserbeam through the atmosphere. The old record covered 101km. The laser path started at Brocken mountain (1141m high) and ended nearby Eilvese, a small village north west of Hannover city. The atmospheric transmission was not very good during that time and became worse during the night. Brocken mountain could not be seen from Eilvese at the day of transmission. The transmission took place at 0.57 MESZ on July 23rd 2013. Summer time is not the best choice for long distance transmissions via laser, because there is a massive scintillation caused by the higher temperatures decreasing the signal quality. The Video was filmed with a mobile phone from the TV display, so the audio and video quality is not very good. There can be seen some signal breakdowns caused by the changing atmospheric attenuation. A broadband TV signal requires a much higher signal level than a narrow band signal. Even if the atmospheric circumstances were not optimal, we succeeded in establishing an additional laser link from Eilvese to Brocken mountain one hour after the first successful transmission. So we did not only increase the maximum distance more than 17km, we also made an additional record in establishing the very first optical full duplex laser broadband connection over more than 100km.The laser TX power was around 80mW, 650nm on both sides.

The signal was picked up at the location of Eilvese by a photomultiplier tube and a concave mirror, and with a photomultiplier tube and a fresnel lens at the location Brocken. This is the uncut video to keep the authentic feeling even if the quality is low.
http://www.youtube.com/watch?v=Evk7JBs0mk8

German AR/ATV News (1/2014)

In January 2014 DARC head of division VHF/UHF/SHF Joachim Berns, DL1YBL, will transfer his function to his successor Jann Traschewski, DG8NGN, from Nuremberg. By this change we hope to achive a more balanced principle of operation. Our sincere thanks are given to DL1YBL for his years long work as head of division. He had an important role with introducing D-Star and DMR in Germany and Europe. Also the revision of bandplans and projects like "Initiative pro Repeaters" were highlights of his term. The official acknowledgement and discharge will take place at the general meeting in May.

Christian Entsfellner, DL3MBG - committee member of DARC e.V. www.darc.de

The first german HD ATV repeater with DVB-S2 and H.264 output is DB0KO near Cologne. On 1291 MHz the traditional DVB-S SD channel with a Quadruplex composition of inputs (SID1) is accompanied by a DVB-S2 HD channel in H.264 (SID2) with HD tower camera video showing the distant Cologne skyline and possibly more HD inputs. To receive the second channel you need a DVB-S2 sat receiver (HD ready) which is able to decode the first channel as well. First HD test transmissions were performed already on the 3 cm DVB-T output end of 2013. http://www.db0ko.de/dvb_s2.html

The first european HD ATV repeater ON0SNW near Antwerp (Belgium) was launched on 28.9.2013 with 10 W output on 10330 MHz, DVB-S2, SR 4500 ksymb/s, 8psk, FEC 3/4. One HD channel in Full-HD (1920x1080x50i) on TX, one HD channel on 23 cm with similar specs on RX. This way Arthur, ON4FIN, succeeded in transmitting the first european 3D HD ATV video on 18.11.2013, see the half-side-by-side 3D picture from the original m2ts video file (spatial view of leaves possible with a stereoscope). (See photo below - Ed)

http://www.on0snw.tv

Klaus, DL4KCK www.agaf.de

Blood Sweat and Tears

Welcome to CQ-DATV 8, the second magazine we have published in 2014. We are on target to produce not only an electronic ATV magazine, but we have also added another format. This format is PDF and was first introduced to DATV 7, but it was a rather unpolished PDF that was generated automatically by converting the ePub file. This time we have produced a more stylish PDF and hope that those of you who prefer PDF files find this one to have a more attractive layout than the DATV 7 PDF.

Add the new format to our aim of producing CQ-DATV monthly and well, let's just say the editors workload has jumped somewhat. The change in pace also means that the next magazine has to be in production before the previous issue has been made available for download. Hence the quote from Winston Churchill for the title. I am sure once I get a work flow established and working that I will be able to devote a few less hours to the production process. Please keep the copy coming, and please try to avoid sending copy followed by corrections. Also now that we have a PDF version it is not possible to extract pictures from within a word document at the required resolution. So please accompany any word documents with separate pictures in either JPG or better still PNG and if they are diagrams, then try for PNG with a transparent background. It does make life easier.

The downloads are continuing to increase and with the increase in readership we are seeing an increase in copy, but we still need more, if we are to publish monthly. ATV is growing in popularity and we hope that here at DATV that we are supporting that growth. The articles have been selected not only to promote the broad church approach for ATV and DATV, but also to cover other aspects of video from production for the semi-professional down to amateur level where we may have just got pressed into service to produce a video of a family event. I think we have all been there.

Enough of me so please sit back and enjoy CQ-DATV 8, our February 2014 issue, and be assured DATV 9, our March issue, is in production and will follow next month.

Ian Pawson - CQ-DATV Editor

The team

- *Ian Pawson - G8IQU*
- *John Hudson - G3RFL*
- *Mike Stevens - G7GTN*
- *Ken Konechy - W6HHC*
- *Paul Wade - W1GHZ*
- *John Lukey - VK2ZUH*
- *Clive Reynolds G3GJA / G8EQZ*
- *Richard Carden - VK4XRL*
- *Trevor Brown - G8CJS*
- *Mike Berry - G1LWX*
- *Klaus Kramer - DL4KCK*

By Mike G7GTN

Introduction

Following on from CQ-DATV edition 6 where we built our basic 8 channel video switcher I present a few small and simple to implement hardware and firmware upgrades to the project you may wish to investigate further.

Previously we could control this either from Sony IR remote control or by using a PS/2 mouse and computer VGA display to make use of visual on screen selection buttons.

When we decode the IR or press a button we can have an audio acknowledgement tone generated within the control firmware to indicate that the hardware has detected our switching command.

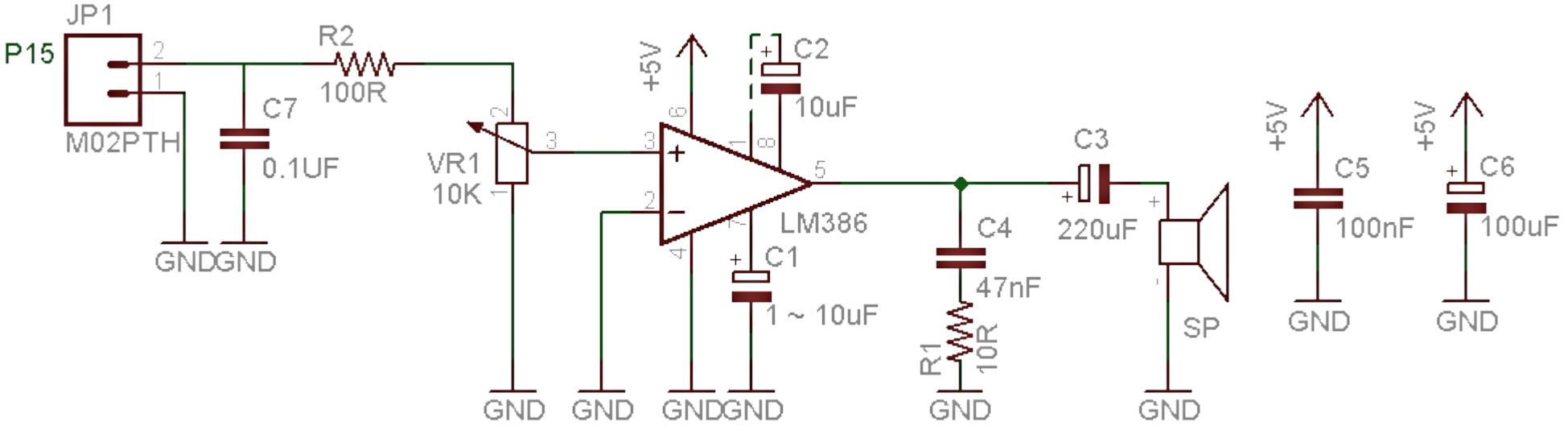
LM386 Audio Amplifier

To amplify the software generated tones we require a simple audio amplifier circuit. Audio from the Propeller Micro I/O Pin P15 enters via C7 & R2 which combined makes a simple low pass filter.

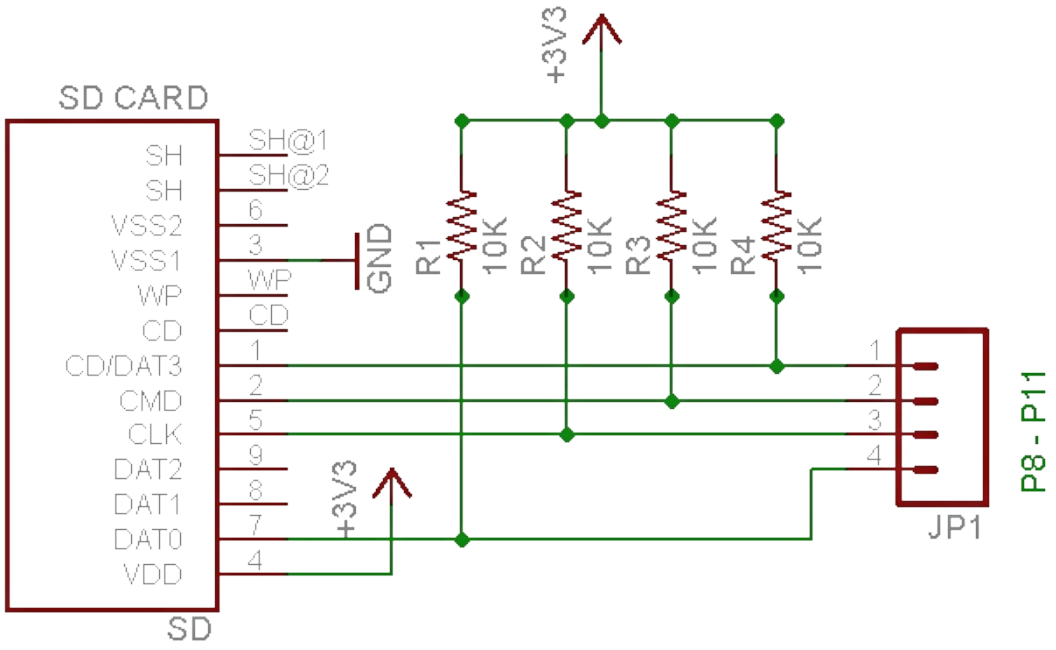
The Volume control VR1 10K Pot can be realised as either a Panel mounted pot or a normal pre-set type. Screened audio cable should be used to connect the Audio I/O Pin P15 to the connector JP1. A well decoupled power supply source should be used to stop any howling and comical hooting that the LM386 can easily produce when not well decoupled.

Adding an SD Memory Card Interface

I also added an SD Memory card to enable firmware updates

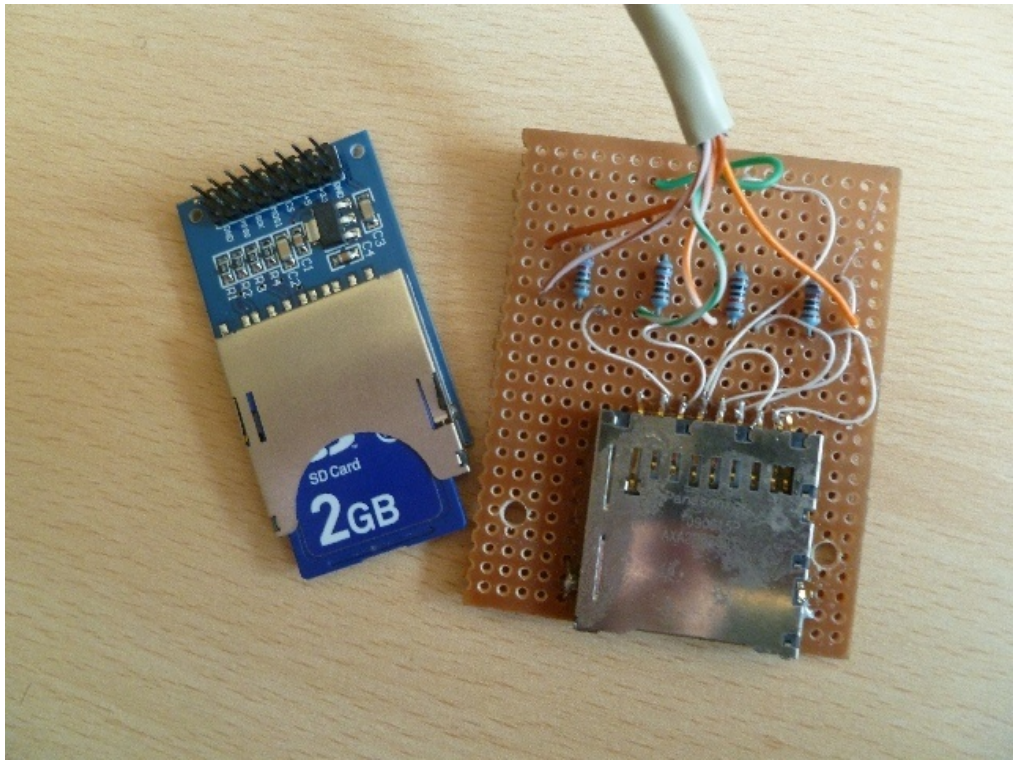


to be done using a FAT formatted SD memory card. The hardware for this is very simple as shown. The 10K pull-up resistors are used to get the card in to a fully known I/O state. Make sure that a regulated 3V3 supply is used as indicated on the circuit diagram since the SD Memory cards will not tolerate +5V and will be totally destroyed by the use of over voltage.

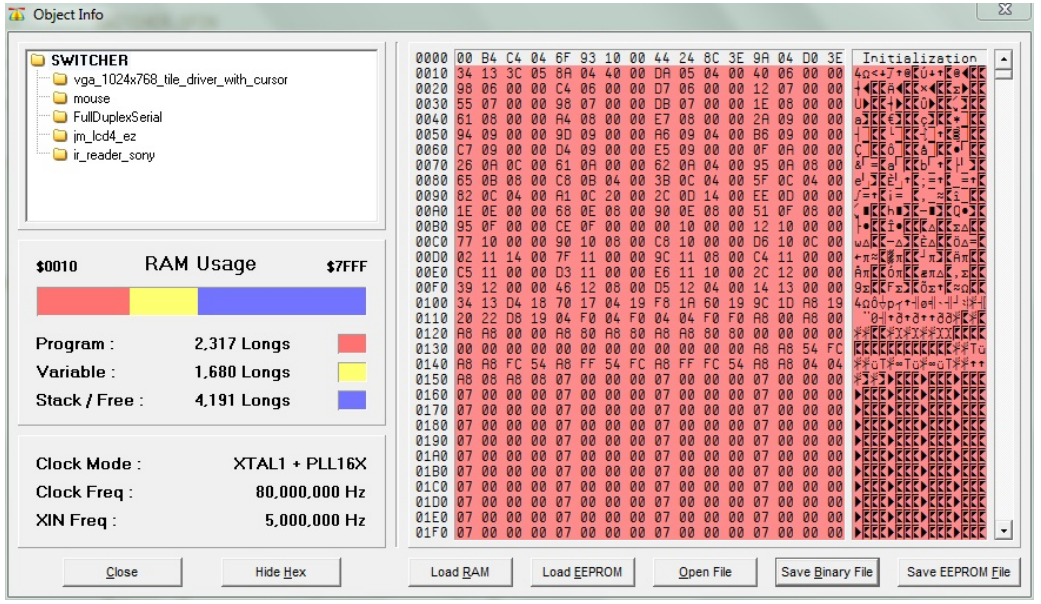


I used an eBay SD Card module, but this proved to be faulty and not fixable. I believe there was a short between both layers. I decided in the end to make my own using a freely available SD to USB card adaptor which I took apart. You will find that the end connectors are very fine as these are all surface mounted parts. I had to make use of some Kylar (Wire Wrapping Wire) to make the connections to these. Certainly was not my finest hour in home construction.

Once you have installed an SD card and powered on the switcher the firmware will look for a file named "FLASH.BIN"



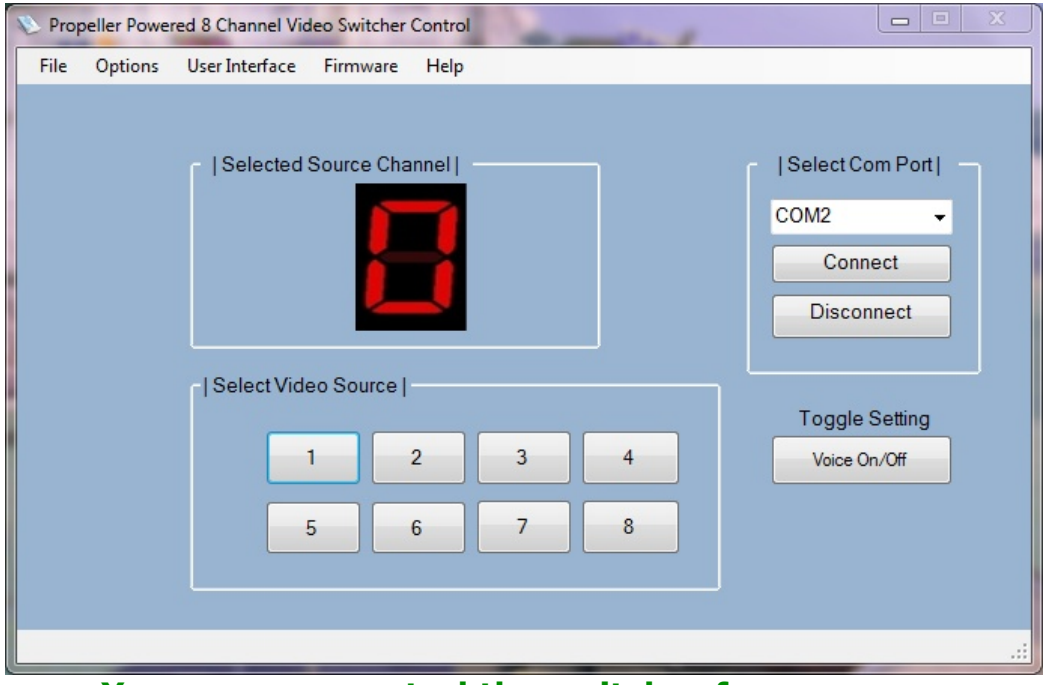
The Faulty Module & Homemade Creation.



if found this file will be used to flash the Eeprom and once finished the hardware will re boot. This file will also be deleted just before the re boot process to stop the issue of continuous looping. To create the Binary Image file to place on the pre-formatted SD Card instead of downloading to Eeprom from the Propeller Tool software we can select Run Compile Current and use the Save Binary file button. Place this file on to your memory card.

Serial Interface & Computer Control

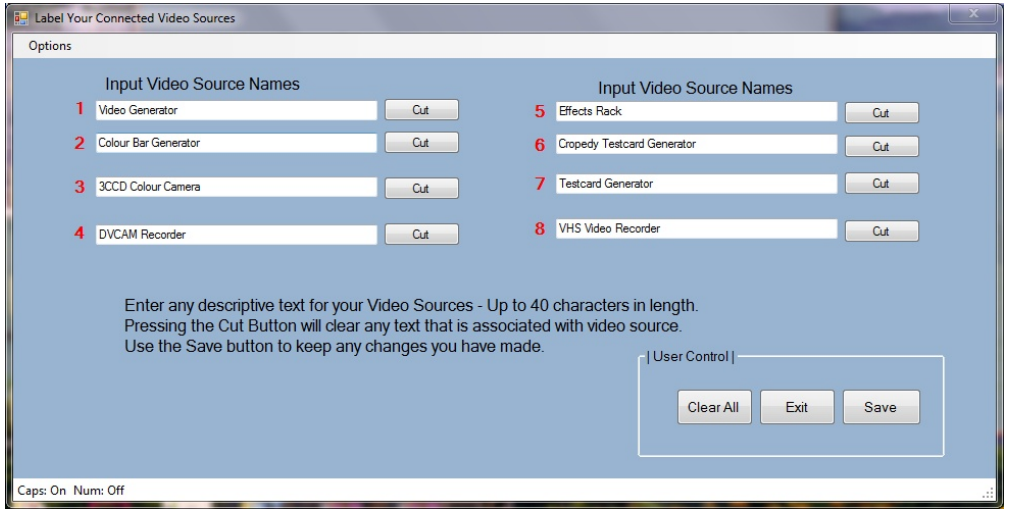
Since our Propeller Quickstart board has a full USB interface it seemed a quite natural upgrade to also add full serial control to the project. I elected to use a somewhat slow baud rate of 9600 mainly to allow people that wish to use a Bare Propeller chip and the RS232 serial route. This also allows the use of a standard terminal application with ease if you are not using a Windows based system.



You can now control the switcher from your on screen video source buttons.

To this end, and being a Windows user still I developed a simple control interface for the project.

In use you just need to select the Communications port that the switcher is physically attached to and press the Connect Button.



Serial Protocol

As mentioned the protocol is serial based and uses a fixed baud rate of 9600 No Parity, 1 stop bit and 8 data bits. Each video channel has a number associated with switching. This becomes 1 to 8 for our eight available channels. So you may also quite easily make use of your serial terminal instead if that suits your needs. Simply using the Baud and Parity settings connect and then issue the single number of the video channel you wish.

To help you keep track of what you have connected to each input channel you may wish to use the following screen to enter details of the device that is connected.

This saves your information in an XML format file called Sources.xml in the directory you installed the software in. To see these on the status bar of the switching component go in to the User Interface Menu and enable the show sources option. Now as you switch through channels the text that you have entered here will be shown.

Resources

The Switcher requires a new firmware file to be loaded on to the Eeprom, this can be done by using the Propeller Programming Tool in the normal way or you may also use the PC Switching Software and the Firmware menu option to download UPDATE.BIN which is pre compiled for you and available within UPDATE.ZIP

The PC Software is available in the file PCCONTROL.ZIP and once unzipped has a full Windows installer.

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/

Content headlines for issue 171:-

- *DVB-S2 HD in H.264 coding on DB0KO*
- *10 GHz-PA for all modes*
- *DVB-T news by OE7DBH*
- *DX Spot - more than an ATV repeater map*
- *ATV meeting 2014 in Gloevzin*
- *Multi-band FM-ATV TX from 1,2 to 3,5 GHz*

By Richard VK4XRL

In the last issue of CQ-DATV we looked at ways to keep the signal in the digital domain throughout the process including repeater operation. In this issue we will look at some simple repeater controllers, setting up a repeater using the SR-System boards to allow digital and analogue FM to pass through.

Over the years I have seen many ATV repeater controllers ranging from the more complex type with some having up to three micro processors to control it. Trevor Brown even devised one using a Z80. However my approach has been to use the KISS principle and not have everything in the one unit unless you have a hot backup unit available. Having said that, when I did start looking at repeater controllers I did include the video and audio switchers. But that was short lived when I managed to secure separate switchers and the like. When a repeater system could be some Kms/Miles away a working system is a must. Having one allows software changes and any bugs associated with it to be addressed in your own environment.

My first repeater controller was based on the BS2 Stamp and while this worked well the BS2 Stamp became quite expensive compared to other arrangements. The first board (Figure 1) contained the video switcher and also a sync detector. A LM1881 sync separator IC is used and a simple low pass filter is formed and is used to filter any noise and chroma information that may otherwise may affect the NE567 operation. The sync detector for the DATV signal is fitted in the DATV receiver and fed to this board. A 7 segment read out is provided for maintenance as are LED's for showing switching functions. The video switcher, uses a

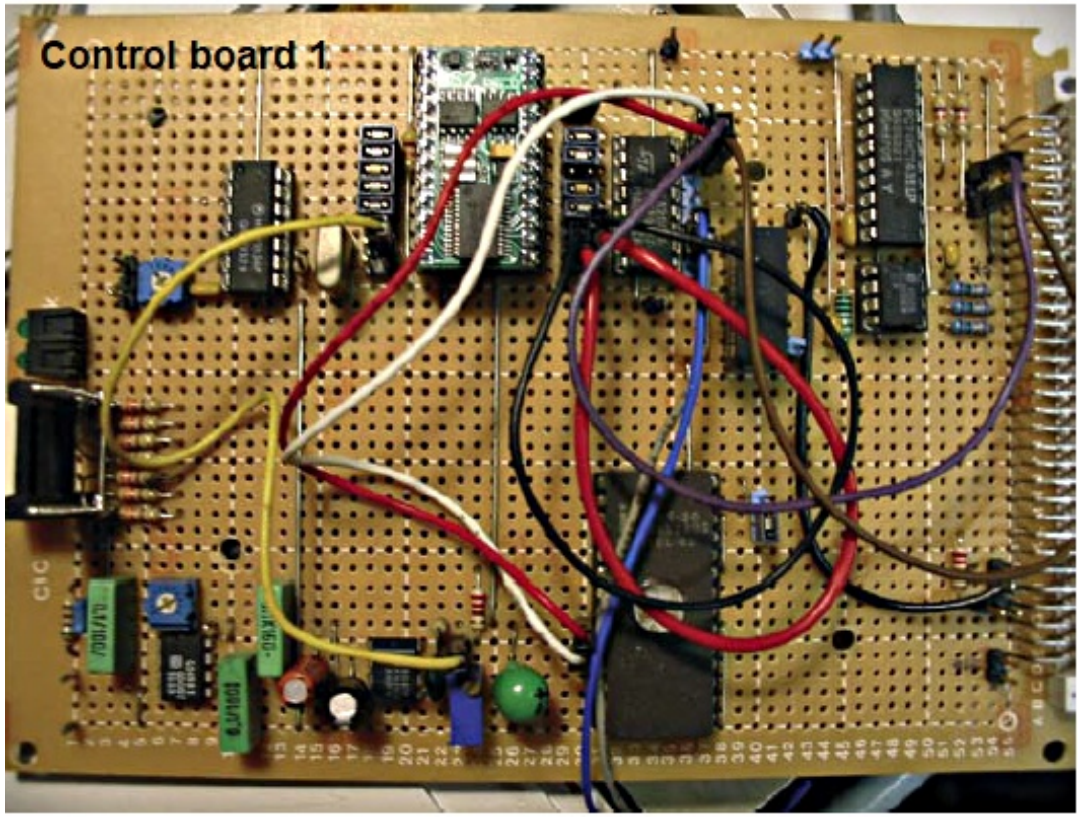


Figure 1. Controller Board with BS2 stamp and video switcher

74HC4351 feeding a 2030 or equivalent OP amplifier providing 3 outputs. The select inputs are held high and require the reverse logic from the micro to control it.

The second board (Figure 2) contains the stereo audio switcher, Tone oscillator and stereo ident generator. Space has been left to include a headphone amplifier and Microphone for maintenance testing from the remote site. Two audio switchers are required for Left and Right audio channels. Each switcher uses a 74HC4351 and an OP

amplifier feeding three outputs. Dual supply rails have been provided at -5 and +5v, with decoupling on all IC's. Control switching is via A and B select pins, C is not used and is grounded as we are only switching four channels. These controls are fed in parallel from the video card.

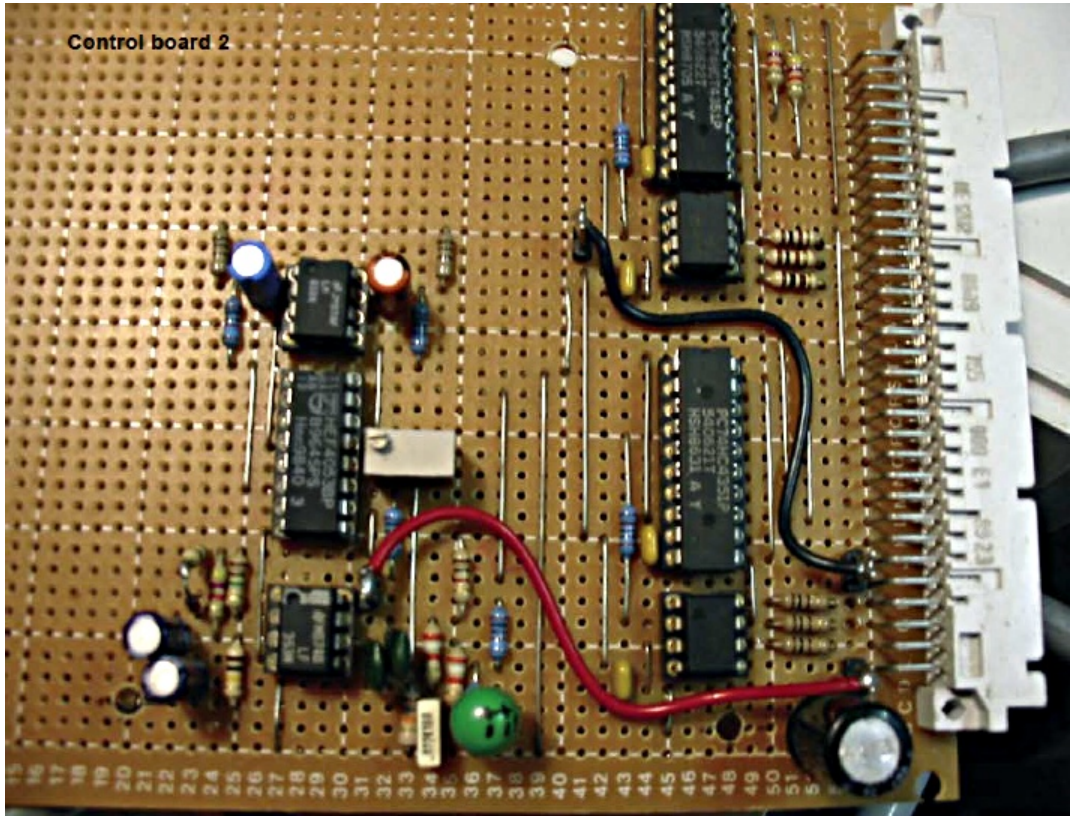


Figure 2. Controller Board 2 with tone generator and dual audio switcher

While all this worked I started to look at a new controller for our new repeater based on the KISS principle. For this I used a PICAXE 28X1 which gave similar inputs and outputs. The software needed only slight changes to make it work. An external SONY video and audio switcher was used and had been working for well over two years without any problem. The new controller board is shown in figure 5. I have also

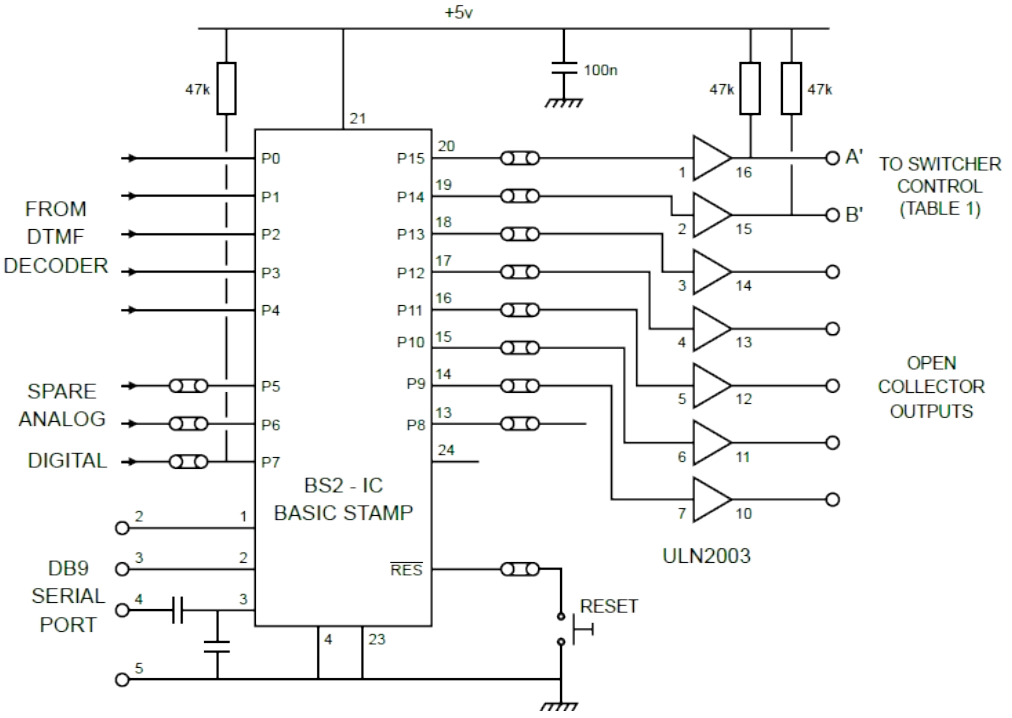


Figure 3. Stamp Controller

included the block diagram of the controller for completeness, see figure 6.

The next requirement that we faced was that we wanted to provide similar system equipment and setup to a number of repeaters, some with not to much space to fit a full blown system. We turned again to our controller above and decided to make it contain;

- *1. Picaxe controller based on the 28X1*
- *2. Audio and video switcher*
- *3. Audio and video DA's*
- *4. And sync detectors*

We decided to look at a video/audio switcher from Sanyo (LA7958) and after some testing of the switcher IC we

decided it was Ok and fitted our Picaxe controller. The next problem was the sync detector for FM inputs, up to now we mounded them in the receivers. Looking around I stumbled on an IC from Maxim MAX7461. The only problem using this was its output went positive and we required a negative signal for the Picaxe, either a relay or inverter would be required. The audio output consisted of a dual LM883 while the video used a MAX497. So far testing has indicated no problems with the design.

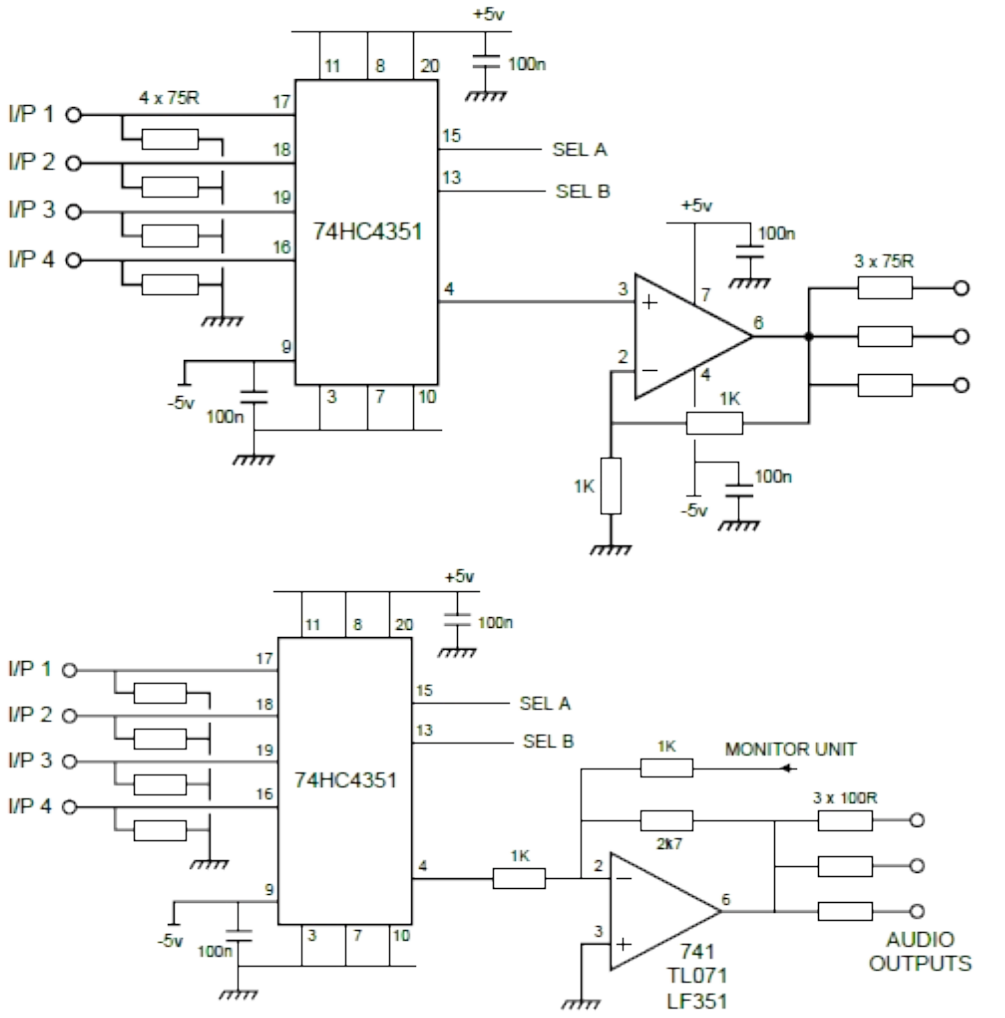


Figure 4. Video and Audio switchers.

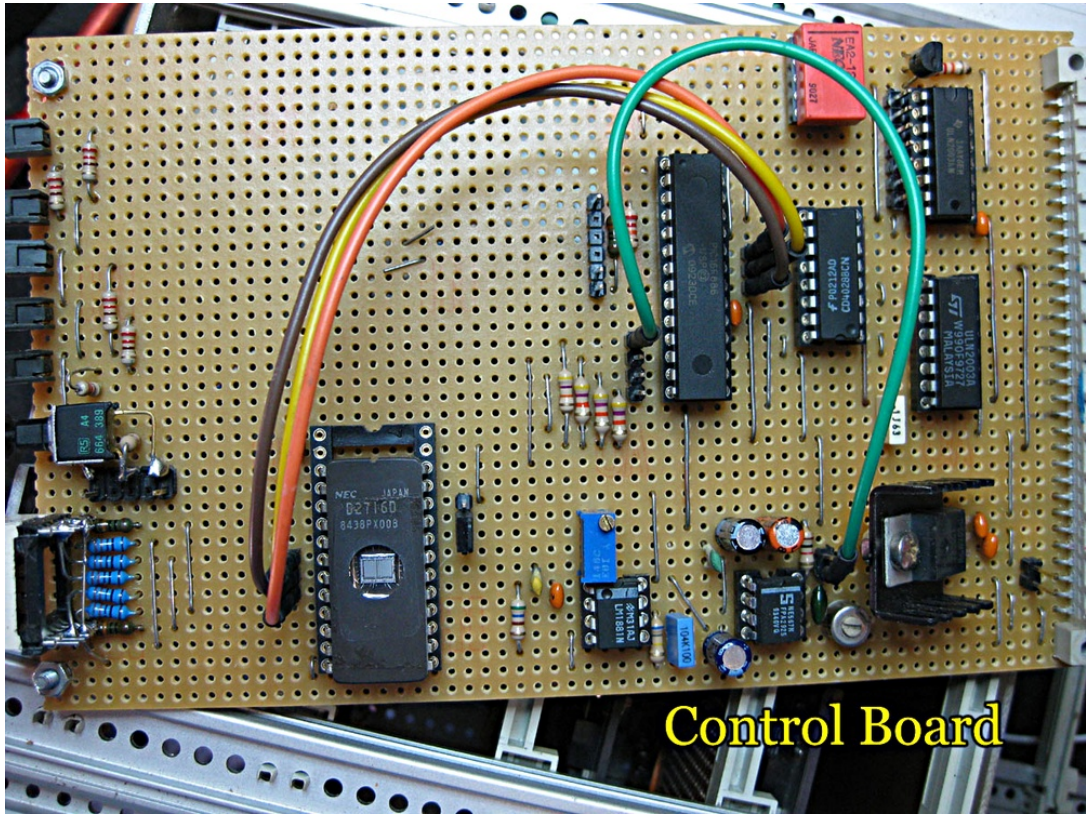


Figure 5. Picaxe controller.

Let us now turn our attention to provide a repeater using the SR-System boards. We will use the MidiMod which has two inputs available and can tune from 70 to just over 2000MHz. It can have software that will allow DVB-S, DVB-T and others. In our case we are using DVB-T as the output on 446.5 MHz and using the QPSK setting with FEC set to 2/3 and Guard band at 1/8. These parameters are the same as the community TV station here in Brisbane. It gives a video bit rate of around 5.3Mpps.

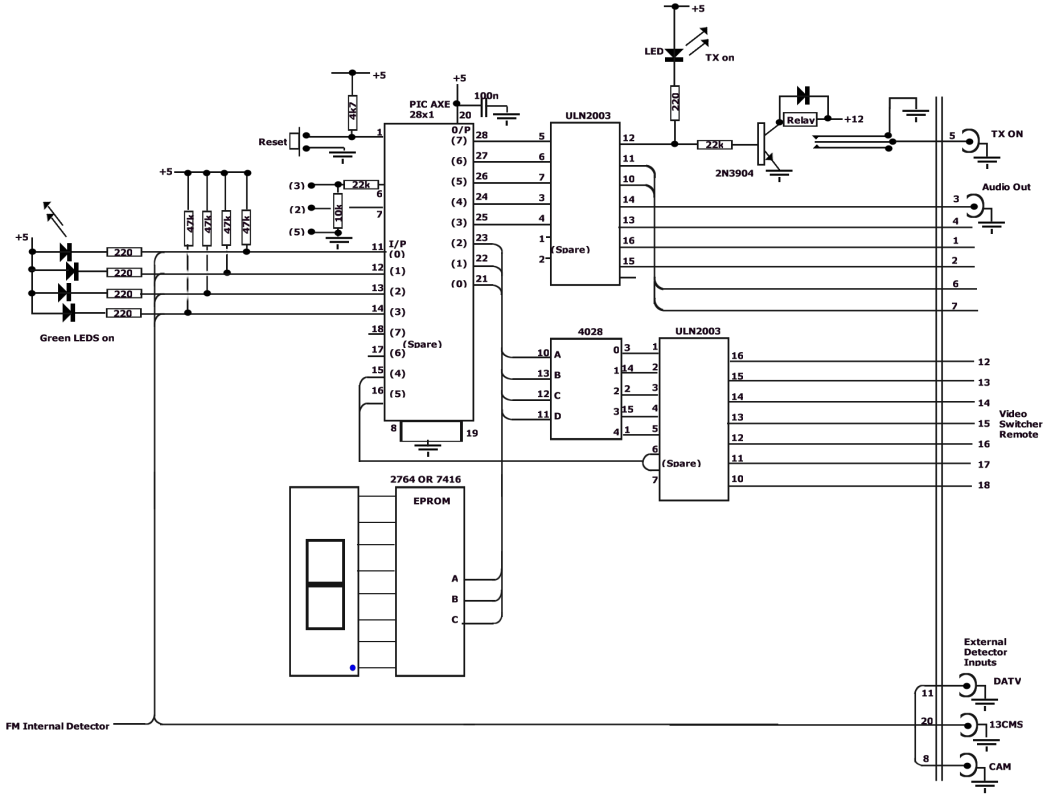


Figure 6. Block Diagram of Picaxe Controller

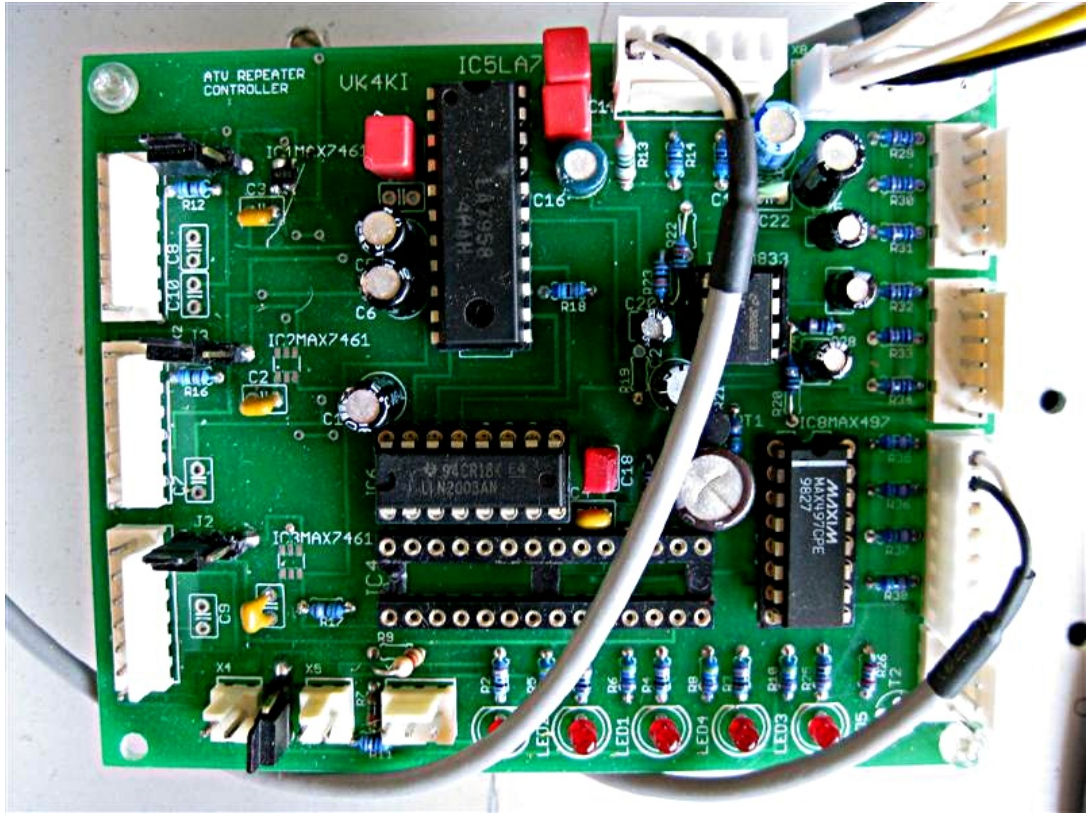


Figure 7. The new Picaxe controller shown under testing. The missing IC is the Picaxe 28X1.

The digital receiver is a NIM-s unit tuned in our case to 1287 MHz. The Nim has also a lock indicator and therefore we can use that with a on-board interface to control the controller if required. In our case we as we wanted it to turn on the main transmitter. The NIM is connected to the second input TS2 while a normal encoder is fitted to input TS1. The software allows you to set up the system so when the NIM is locked it will switch it to the output. Normally I would have a slight delay in doing that where the ident would switch on first allowing you to know that a digital signal has been received (see figure 8 Block Diagrtam). The FM and Ident/testcard is feed via the normal encoder and video switcher. So far it's only on the test bench but works very well. The analogue switch could be just relays switching between FM and Ident or anyone of the others that I have mentioned. The controller in this case is another Picaxe a 08M2, outputs are feed via a UL2003. Also if you

wanted to switch up to four analogue signals then a 4028 could be interfaced to achieve that (figure 9. Mini Repeater Controller).

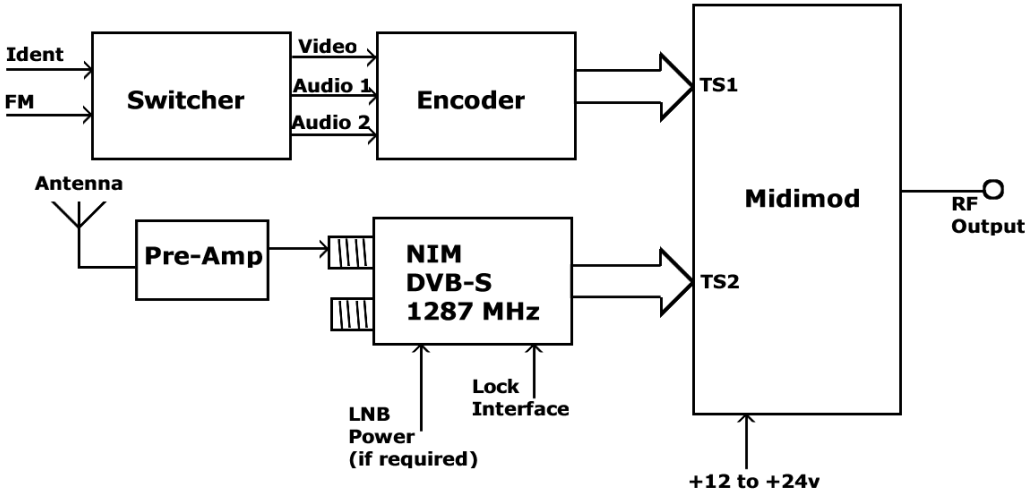


Figure 8. Block Diagram of Repeater using SR-System Boards

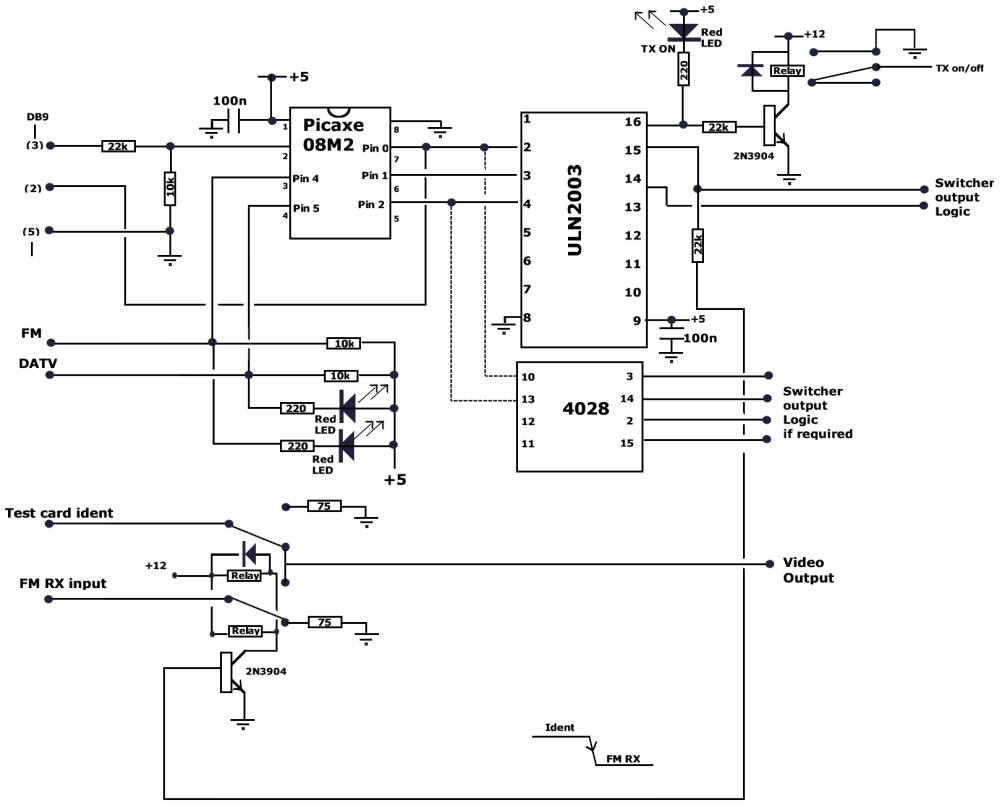


Figure 9 Mini Repeater Controller

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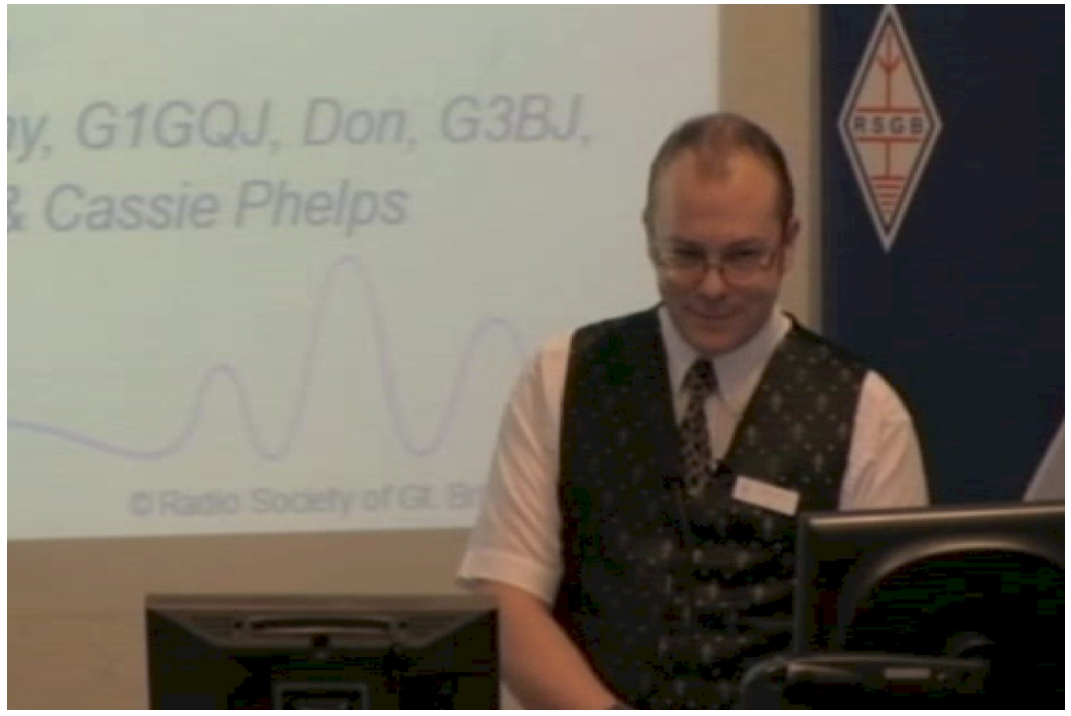
Trevor Brown reports

On December the 5th just before we all heard of the death of Nelson Mandela, the BATC streamer was in action from the IET.

Peter E Chadwich G3RZP



Lee Hudson M0LMH

The first lecture was Peter E Chadwick G3RZP and was full of nostalgia from the G2DAF receiver I almost built, through to the HRO with it famous dial, no it won't do what a mobile phone will do but they were fun days.

The second lecture was Lee Hudson M0LMH. If the name sound familiar it should. He is the son of John Hudson, one of the CQ-DATV production team.

Lee's lecture was forward looking and complimented Peters lecture with where the new technology is coming from and where it is leading us.

Present were around 80 people in the audience all but 5 were Radio Amateurs. The streaming went off without a hitch. The 500Mb/sec data rate delivered pictures that could be watched full screen without looking pixelated. The picture coverage was on two camera's and it is always a pity to see a camera without an operator particularly when it's mounted on a fluid head, it was just screaming out for an operator.

The Q and A pictures worked well with the new XA10 camera being able to zoom in on most of the questioners, but alas the sound from the audience was just not there and it was back to the moderator summing up the questions for the online audience which peaked at 25.

I am sure the both lectures were recorded and should by now be in the streamer film library - happy viewing.

By Ken Konechy W6HHC and Robbie Robinson KB6CJZ

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

[Please Note – This is the fourth article in a series of DATVtalk articles to introduce Digital-ATV to hams for this new area of ham radio. The article was originally written in 2010 for the OCARC newsletter. Since, 2010, there have been changes and improvements in technology and products…but there is still a basic problem (most severe in US) that too few hams are using digital-ATV. This article has been now updated to reflect new knowledge about DATV that we have learned and reflect the most significant changes since 2010.]

In the CQ-DATV5 issue, the DATVtalk02 article presented an introduction to Digital-ATV. In the CQ-DATV7 issue, Robbie-KB6CJZ and I teamed-up in the DATVtalk04 article to present a test report for a DATV transmitter exciter, using the SR-Systems product from Germany. Now in DATVtalk05 article, Robbie and I team up again to continue our bench-testing of a DATV station with RF power amplifiers and share the test results.

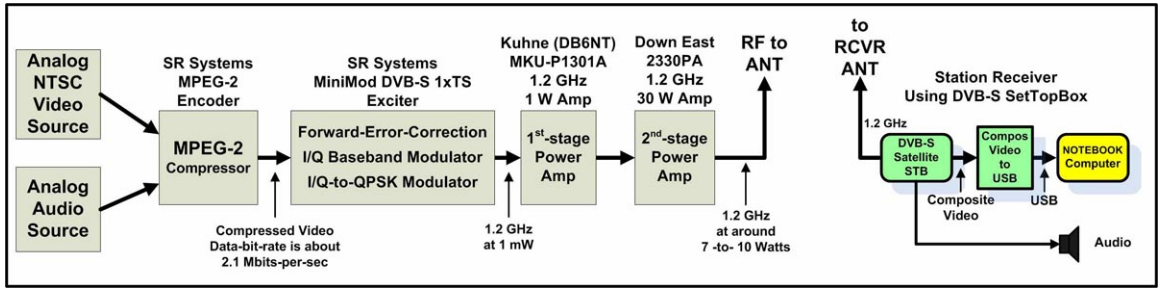


Figure 1 Test Set-up for DVB-S Exciter Bench Tests with RF PA's First-Stage Power Amp

If you look at the block diagram in Fig 1, you will see that the first-stage 1.2 GHz PA chosen was the Kuhne model MKU-P1301A unit. We knew we wanted to use the Down East unit for stage-two...and we knew that Down East specified that their PA needed no more than about 25 mW to drive to full linear output levels. But, the SR-Systems MiniMod-S exciter output was only around 1 mW. So the 1 W (FM rating) Kuhne MKU-P1301A PA turned out to be a good choice. A little expensive, this 1W PA costs more than the Down East 30W unit, but it is a well-engineered PA for our purposes.

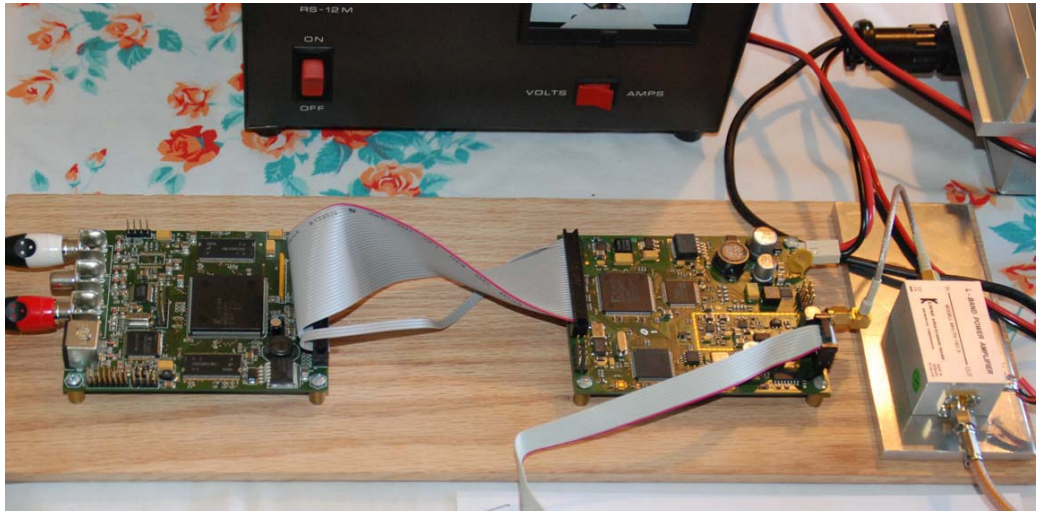


Figure 2 – Breadboard of MPEG-2 Board and MiniMod Exciter Board and Kuhne 1st-Stage PA

Fig 2 shows a photo of the exciter connected to the first-stage Power Amp on our "bread board" set-up. Notice that the Kuhne 1 W PA (on the far-right) is mounted on a thick aluminum plate that serves as a heat-spreader (aka "heatsink"). The Kuhne PA contains two internal voltage regulators to provide correct voltage to the power amp circuitry from the big 12V external power supply. These

internal regulators draw a standby power of about 6 W.

When tested with an HP Model 432A microwave power meter, the Kuhne delivered plenty of power for our needs. Table 1 shows that we could get "measured average power" of over 300 mW output when driven hard by the exciter. Fig 3 shows that the output signal of the Kuhne Power Amp was very clean (without spectral regrowth "shoulders") even when being driven to the maximum by the exciter RF output settings.

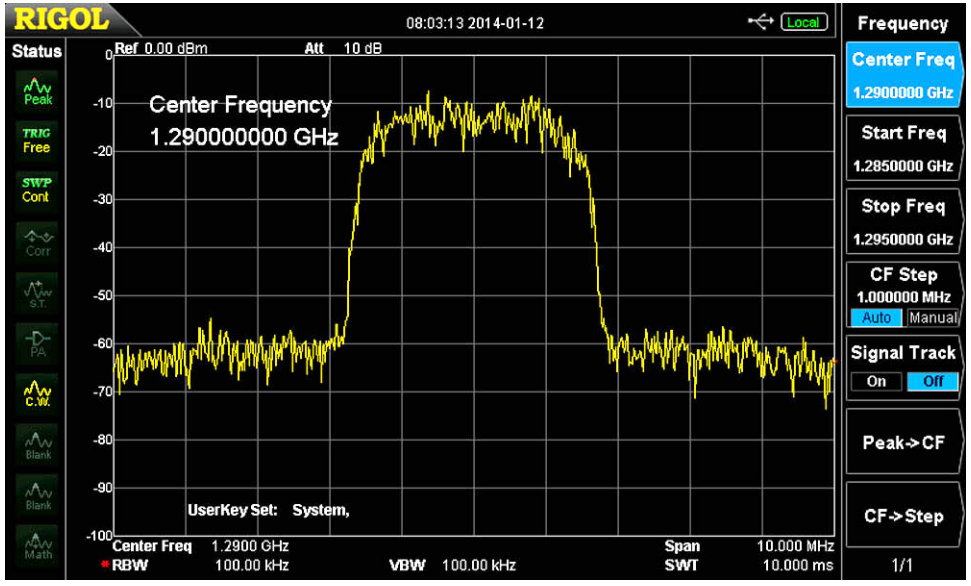


Figure 3 – Rigol Model DSA800-TG Spectrum Analyzer Inspects the Kuhne first-stage PA output

Second-Stage Power Amp

The block diagram in Fig 1 shows that the final-stage 1.2 GHz PA is a model 2330PA 30W (FM rating) unit from Down East Microwave (in Florida USA). Fig 4 shows the rugged well-cooled construction of the Down East Power Amp.

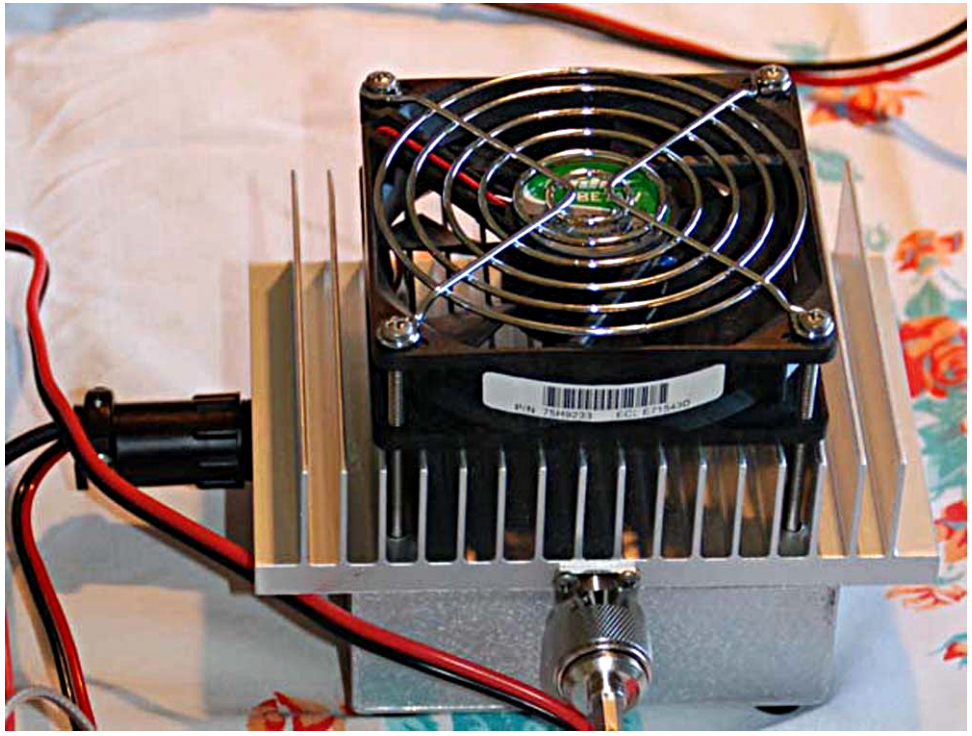


Figure 4 – Construction of Down East Model 2330PA Power Amplifier

Fig 5 shows the quality of the Down East PA output signal at about 13 W. The spectral regrowth shoulders are down about 28 dB from the main carrier signals. Fig 6 shows the HP Model 432A Power Meter (a bolometer type) that was used for power measurements. Note the stack of precision

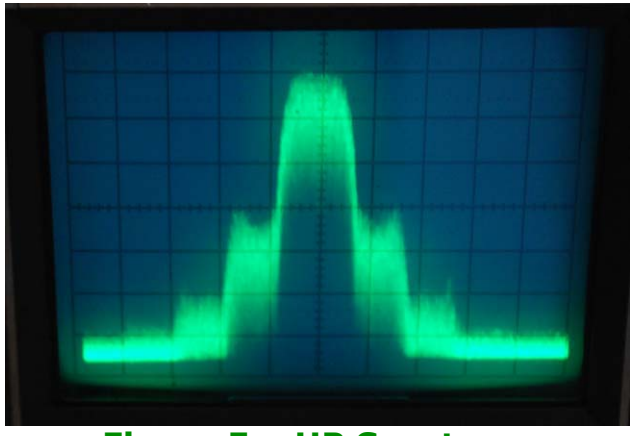


Figure 5 – HP Spectrum Model 8559A Analyzer looks at Down East output signal (the "shoulders" are about 28 dB down)

attenuators at the top of Fig 6 that are used to drop the power down close to 0 dBm for meter readings. Power measurements are shown in Table 1.

Figure 6 – HP Model 432A Power Meter Note attenuator-stack at the top of the photo

Table 1 – Power Measurements taken during the DVB-S Station Testing

MiniMod-S exciter menu power setting	Measured MiniMod Output mW	Measured Kuhne 1st-amp Output mW	Measured Down East 2nd-amp Output dBm	Measured Down East 2nd-amp Output W	"shoulder" below main carrier
1	0.0661 mw	N/A	N/A	N/A	N/A
2	0.158 mw	N/A	37.6 dBm	5.75 W	35 dB
3	0.302 mw	N/A	39.7 dBm	9.33 W	32 dB
4	0.490 mw	N/A	41.8 dBm	15.1 W	29 dB
(Note: the readings below are with 5 dB attenuator between the first-PA and the second-PA					
5	0.724 mw	N/A	38.0 dBm	6.31 W	34 dB
6	1.00 mw	N/A	39.3 dBm	8.51 W	32 dB
7	1.32 mw	N/A	40.3 dBm	10.7 W	31 dB
8	**1.74 mw**	**115 mW**	**41.1 dBm**	**12.9 W**	**28 dB**
9	2.24 mw	N/A	41.8 dBm	15.1 W	27 dB
10	2.63 mw	158 mW	42.3 dBm	17.0 W	25 dB

Choices of Video Resolution

The User Documentation manual (English) that we had found on the SR-Systems web site for the Mini-Mod-S exciter did not go into depth concerning the configurations for video resolution that can be selected. The manual clearly shows that there are three choices for the transmitted DATV video:.

- *D1*
- *HD1*
- *SIF*

But, what do these choices really mean? It took some Google searches to begin sorting out the puzzle and then finally found a very good article by DJ1CU (called "The DVB-S 70 cm sender" in German) is up on the www.DATV.de web site (under Projekte). Let's look at each of these three resolutions.

D1 Resolution

D1 is the normal resolution that is shown on a normal Standard-Definition Digital television (DVD quality).

D1 = 720 x 576 Pixel for PAL
D1 = 720 x 480 Pixel for NTSC

HD1 Resolution

The HD1 resolution does NOT mean "High Definition".

It turns out that HD1 really means "Half of D1".

HD1 = 352 x 576 pixels for PAL
HD1 = 352 x 480 pixels for NTSC

Volker-DJ1CU states that in his opinion HD1 resolution is perfectly acceptable for DATV.

SIF Resolution

SIF stands for "Standard Input Format". It is related closely to CIF ("Common Interchange Format")

SIF = 352 x 288 pixels for PAL
SIF = 352 x 240 pixels for NTSC
CIF = 352 x 288 pixels for PAL and for NTSC

DJ1CU states that in his opinion SIF is unacceptable for ordinary video transmission. Ken and Robbie used SIF for many tests. The main problem is observed while displaying full screen video. Since you only have one-fourth of the video pixels...the display graphics needs to generate three more "phantom" pixels for every "real" pixel. What we could see in a full-screen video were…that some pixels in the background appeared to "flicker". The picture was clear...but the "phantom pixel flicker" was distracting.

Another impact of choosing the video resolution is that it determines the Net-Data-Bit-Rate (NDBR) coming out of the MPEG-2 encoder, and therefore affects the RF Bandwidth. A higher NDBR typically means a larger RF Bandwidth. DJ1CU reports:

Resolution	Video NDBR
D1	~2.0 Mbps
HD1	~1.1 Mbps
SIF	~0.5 Mbps

We are currently using the D1 video resolution for our DATV DATVtalk05 testing.

Digital-ATV "Latency"

During our first table-top tests in DATVtalk04, we described that we had seen a latency (delay) of about 1 sec and that the video motion really got "jerky" (lost frames) if we displayed at full-screen on the notebook display. We needed to dig onto what were the causes. We have determined that there are at least four primary potential-sources of latency involved with digital transmission/reception:

- *MPEG-2 Encoder*
- *SetTopBox Receiver*
- *USB2 Video-Capture Board*
- *Graphics Processing in Notebook Display*

After finishing the DATVtalk04 tests (in CQ-DATV7 issue), Ken W6HHC was concerned that he was display-processing-limited with his 6-year-old entry-level Dell notebook. There were also concerns that the low-end video-capture USB adapter could also be the source of delays. So, it seemed like a good time to buy a new Dell notebook computer (Precision model M4400) configured with a good graphics-processor for the notebook display.

At the same time, Ken had read an internet DATV article that introduced him to new Hauppauge WinTV-HVR-1950 USB-based ATSC/NTSC/video-capture adapter. It had an external AC power adapter, so it had plenty of power for fast-processing. A series of tests were conducted to measure the DVB-S real-time delays from camera-to-display. The latency results are shown in Table 2 on next page. Let's look at each of these four areas of potential delays.

MPEG-2 Encoder delays

There is a lot of processing that goes on during the MPEG-2 encoding (compressing data) processing. While discussing

latency with Stefan-DG8FAC of SR-Systems, Stefan explained that typically 90% of the latency that I was seeing going to an analog TV (Test #1 in Table 2) was occurring inside the MPEG-2 board. Stefan stated "....The delays have nothing to do with the DVB-S Modulator/exciter, the delay is only generated by the MPEG-2 Chip on the Encoder board and the MPEG-2 Decoder that is in your SetTopBox...." We will see later when we discuss the SetTopBox, the SR-System MPEG-2 encoder board is generating about 1 second delay. Stefan explained that there is a "LowDelay Solution" for the encoder, but this encoder is very expensive, about 2500 Euro.

SetTopBox Receiver delays

Each frame of video requires 33 msec in NTSC. A quality STB will lag by about four frames (0.13 seconds) for the MPEG-2 decoding. A lot of inexpensive STBs have a delay of around 5-8 frames. The ViewSat VS2000 Xtreme STB is reported to be an excellent STB and we are inclined to believe it fits into the group of STBs with a four frame delay. That means that the MPEG-2 Encoder board in Test #1 (see Table 2) has about a delay of ~1 second.

USB2 Video-Capture delays

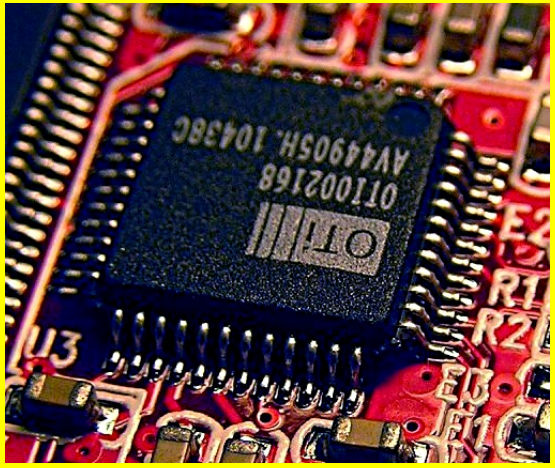
The low-cost StarTech.com USB2 video-capture adapter steals its power from the USB port on the computer. So, we knew that StarTech does not have a lot of power for fast processing, a potential concern. But, Table 2 clearly shows a measureable delay of about only 0.1 second being introduced by the StarTech.com USB2 unit. On the other hand, the newer Hauppauge WinTV-HVR-1950, with its external power source, introduced a delay of 1.37 second using Ver 6 of WinTV display software. With the newer (Win7 certified) Ver 7 WinTV display software and device driver, an internal delay of 1.7 seconds was measured....for a total latency of 2.8 seconds.

Some Discussion on hand-soldering SMT Amplifier Kits

A funny thing happened while trying to select the first-stage PA for the W6HHC DATV station. The first choice was not the Kuhne. Our first-choice was a very low-cost kit for a 1 Watt 1.2 GHz model using an ATF50189 PHEMT from MiniKits in Australia. The kit was only about US$50, but offered a big challenge...it was a Surface Mount Technology (SMT) kit.

Now, Ken W6HHC has built more than his fair share of building the famous Heathkit ham gear. Including the really terrific SB-301/SB-401 SSB station. But, Ken was no match for hand-soldering SMT components.

The first trick learned for easy hand-soldering was to buy a tube of solder-paste (used by automated SMT soldering).



This works very well. It is very easy to control the amount of solder. Normal solder-wire tended to melt too much solder on the board for Ken. Solder-paste also nicely keeps the part in position on the board while you get ready to use solder iron.

The big SMT problem was losing parts while trying to get them onto the PCB. These SMT parts are small.

1) Tweezers could shoot an SMT part half-way across the lab. Sometimes Ken searched the lab floor on "all fours" for a half-hour without success.

2) Pressing an SMT part into the finger-tip and lifting it into position seemed to work better. But, parts still "disappeared" before they reached the magnifying glass view of the PCB.

3) Dipping a toothpick in solder rosin worked even better for picking up and placing SMT components.

Finally, purchasing an assembled-and-tested 1 Watt amplifier from Kuhne Electronics was the very best solution.

Table 2 – Measured DATV Latency Delays

Test	STB w/ NTSC Analog TV	STB w/ Dell Inspiron 1150 Notebook Intel 2.4 GHz CPU WinXP Pro	STB w/ Dell Precision M4400 Notebook Intel 3.1 GHz Core2 Win7 Pro	USB2 Video Capture board	NOTE
1	1.1 sec			(none used)	
2		1.2 sec	1.2 sec	Startech.com USB2	StarTech GrabBee lite display SW
3			2.47 sec	Hauppauge WinTV-HVR-1950	WinTV Ver 6 display software
4			2.8 sec	Hauppauge WinTV-HVR-1950	WinTV Ver 7 display software

To Ken, this Hauppauge HVR product was quite a disappointment for my DATV receiver application because of the extra delays it introduced, but OK for recording off-the-air commercial TV broadcasts.

Display Graphics Processing delays

The old entry-level Dell notebook had simple graphics processing....just a "vanilla" Intel 82852/82855 Graphics Controller. The new Dell M4400 notebook has a powerful NVIDIA Quadro FX 370M6 Graphics Controller. The video "jerking" I had described on the older Dell notebook computer, when displaying quarter-size SIF resolution to full-display-size, completely disappeared.

First Cross-Town Tests

Bench testing is important. But we get excited about seeing "proof of concept". So, we tried to send a 1.2 GHz test signal from Ken's home (using a 3-ft vertical) to the roof of the Orange PD where Robbie KB6CJZ set up a 24-element loop-Yagi.

The FEC was set to 1/2 and the RF bandwidth was 3 MHz

Figure 7 – Robbie KB6CJZ set up a 24-ele Loop-Yagi on the OPD roof and received perfect DATV pictures

(Symbol Rate = 2.2 MSymbol/sec). The distance is about 3 miles at roof-top heights, with plenty of tree-lined streets, two-story houses, back-yard trees, commercial buildings, and through one elevated-freeway. The DATV pictures were perfect!

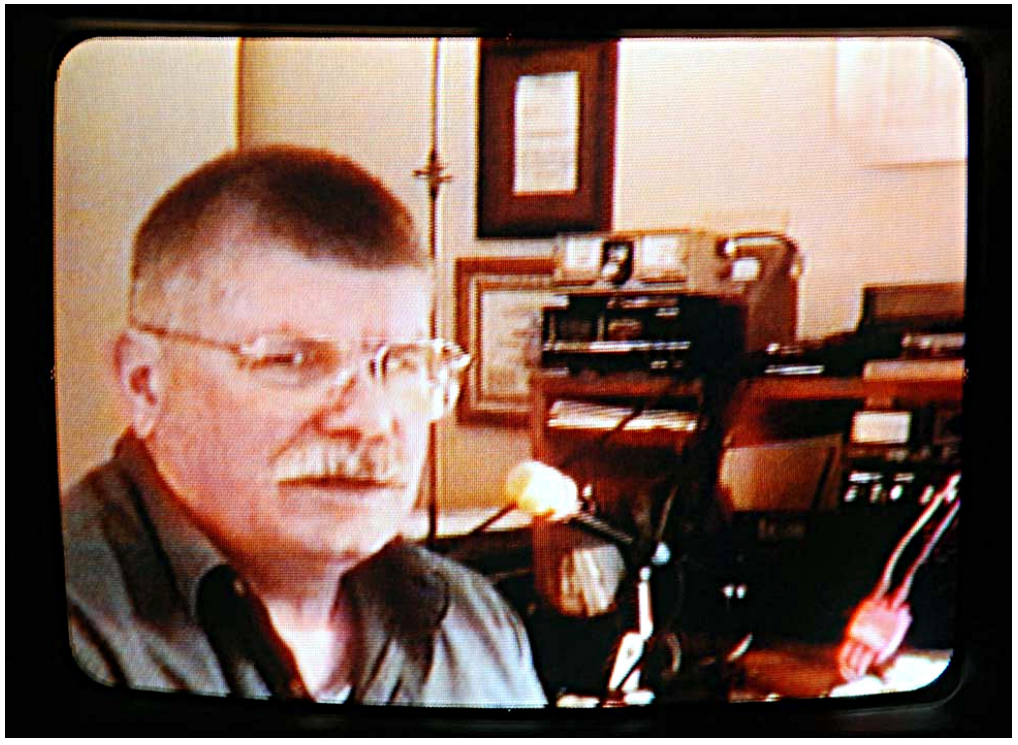


Figure 8 – First cross-town DATV Transmission received at Orange Police Department building (3 miles)

The use of a 24-element Yagi at the OPD was probably not required. The signal was clear D5 (P5?) whenever the antenna was pointed within about 30 degrees of Ken's QTH.

More field testing is planned.

Contact Info

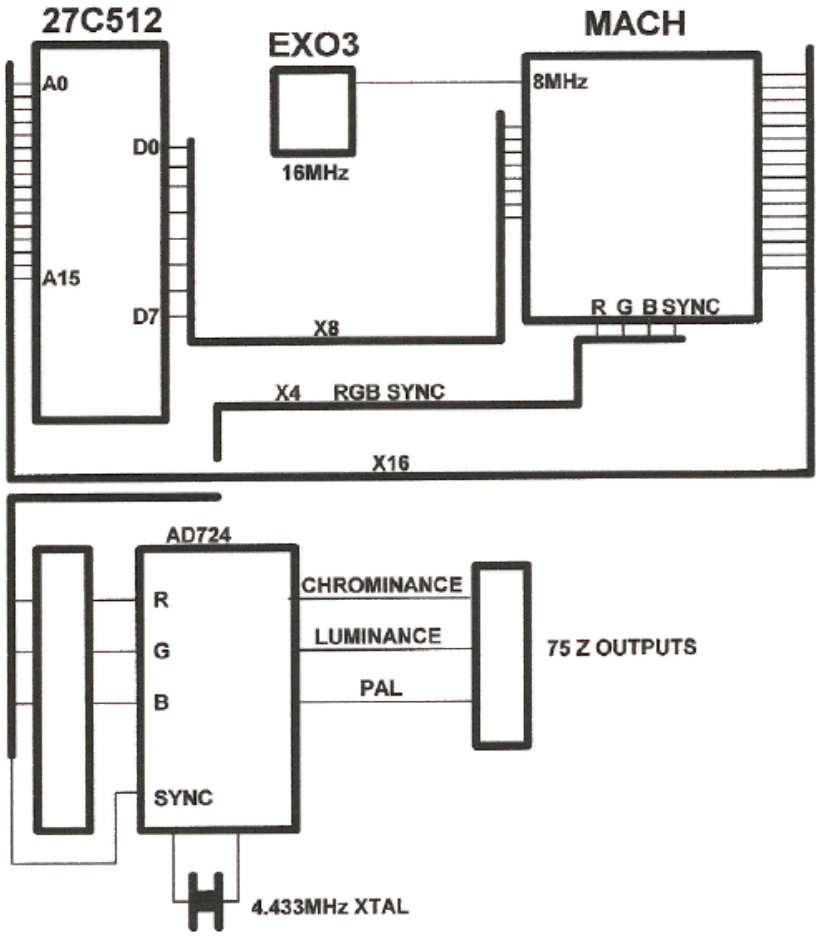
The authors may be contacted at KB6CJZ@ARRL.net and W6HHC@ARRL.net

Useful D-ATV Links

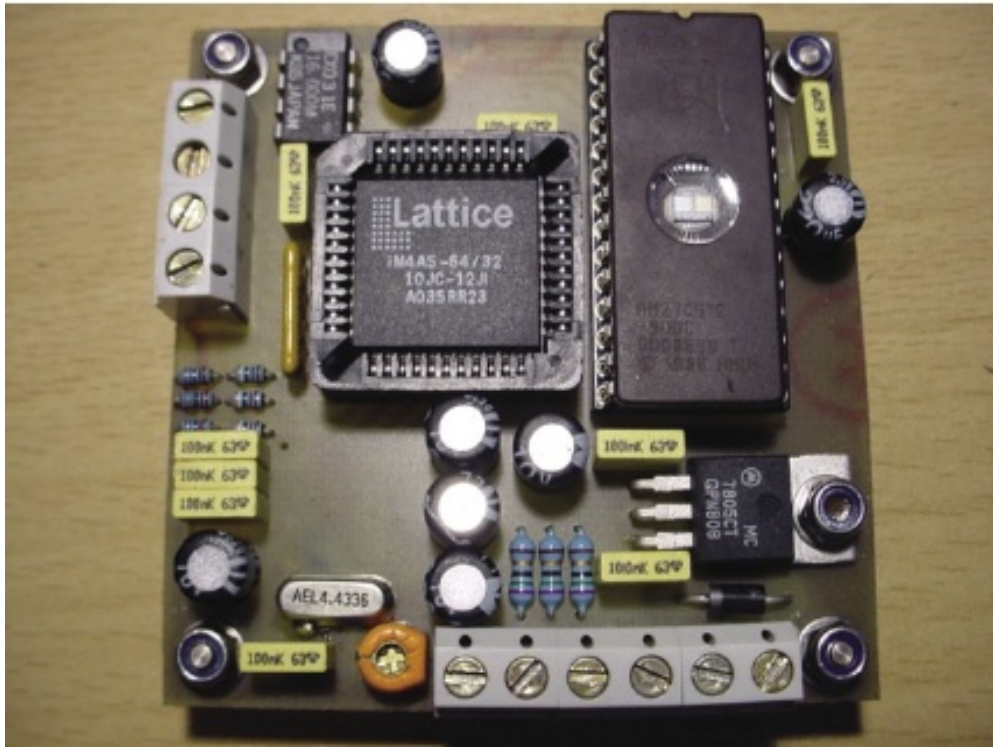
BATC info site for DTX1 exciter – see www.DTX1.info
British ATV Club – Digital/DigiLite/DTX1 forums – see www.BATC.org.UK/forum/
DATV-Express Project web site (SDR-based exciter) – see www.DATV-Express.com
Down East Microwave RF amplifiers – see www.DownEastMicrowave.com
Kuhne Electronics (DB6NT) RF Amplifiers – see www.Kuhne-Electronic.de
MiniKits (SMT kits for RF amplifiers) – see www.MiniKits.com.au
SR-Systems D-ATV components (Boards) – see www.SR-systems.de
Amateur Television of Central Ohio – see www.ATCO.TV
British ATV Club - Digital Forum – see www.BATC.org.UK/forum/
British ATV Club – select from about 25 streaming repeaters – see www.BATC.TV/
Orange County ARC entire series of newsletter DATV articles – see www.W6ZE.org/DATV/
TAPR Digital Communications Conference free proceedings papers – see www.TAPR.org/pub_dcc.html
Volker Broszeit DJ1CU article for "The DVB-S 70 cm Sender" (in German) – see www.DATV.de/Projekte/projekte.html
Yahoo Group for Digital ATV - see groups.yahoo.com/group/DigitalATV/

By John Hudson G3RFL

In CQ-DATV1 and CQ-DATV2 I went through some of the building blocks for the new 10GHz FM ATV repeater for Fleetwood Lancashire. The transmitter used a YIG which was purchased from eBay and pressed into service as the transmitter. What I did not explain was the overall diagram of how all the blocks would be put together, this is shown on the next page.



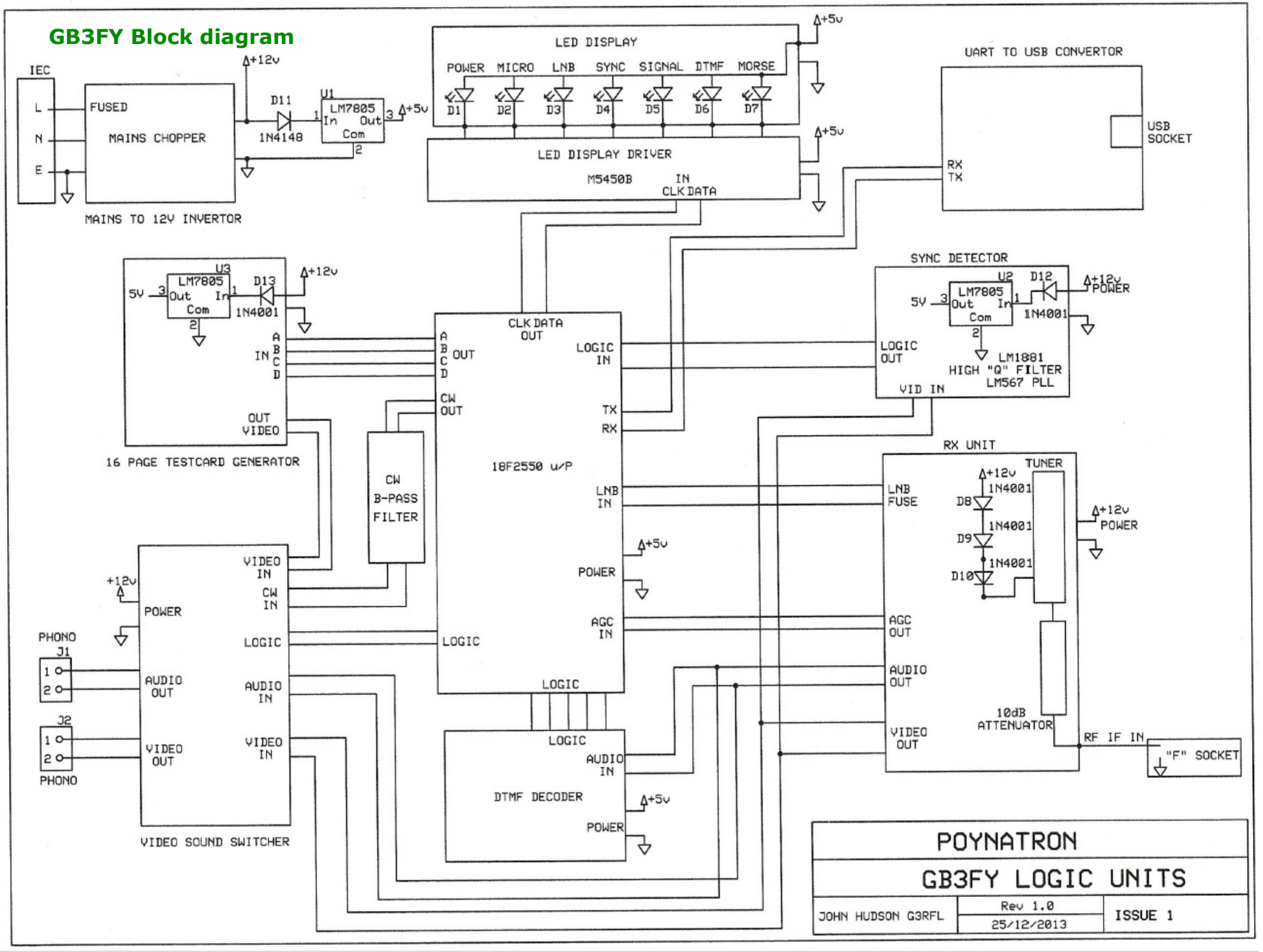
The 16 page test card was not covered in CQ-DATV so I will run through it here. It uses which uses two pre programmed chips so as to keep construction to a minimum. The logic has been programmed into a 44 pin lattice array and has been produced as a block diagram rather than the more conventional circuit diagram which would show all the TTL gates.



The final module assembled and tested, the AD724 PAL coder is on the underside

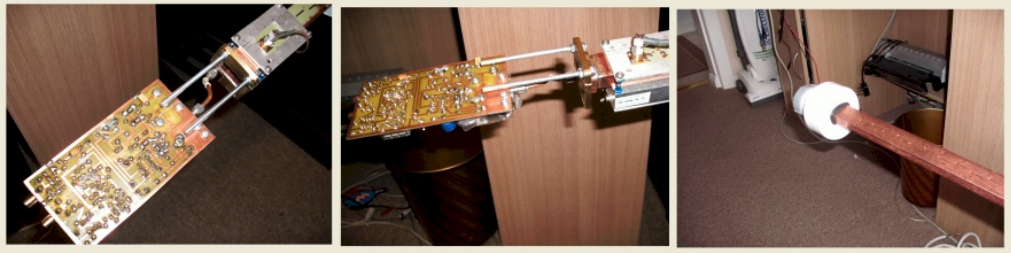
The lattice array is a ispMach44 pin PLD 44pin IC. This has several counters such as Pixel, Character Column, Sub Character, Line and Character Row. The main clock is at 8MHz and sub divided down to 4, 2 and 1 MHz. The next section is the EPROM multiplexer unit containing a latch and 11 x 4

GB3FY Block diagram



multiplexer that controls the Column, Line, Row Character and Palette. Also in the Mach is the bit pattern generator that contains an 8 x 2 multiplexer, 4 D type latches a further 8 way multiplexer and a 250 nano second digital delay line. The final part of the Mach is a Colour/ Control latch which switches between the background/Foreground Palettes, this contains another 6 x 2 way multiplexer and 6 D type latches with extra logic for control, plus field reset with interlace. Then we come to the video output stage buffering the RGB and providing a Teletext input if

PA mounted on the TX aerial the little box is a 1W PA



YIG PCB TOTAL length is about 60" with phono plugs fitted

RX ANT to LNB then coax down to the RX in the Control Logic Box at the bottom of the mast

The end result is this very attractive test card pattern

required. There is also page selector for stepping the preset test cards on an external push button. The RGB and sync signals feed a modern AD724 surface mount RGB to PAL encoder mounted under the PCB.

We have three basic outputs, Luminance and Chrominance for "S" video out and PAL output. All outputs will drive a standard 75 ohms load. Well over 80 TTL gates are programmed into the Mach device Construction uses a single side PCB.

The repeater has now been on soak test and final adjustments have been made, but before it can be installed at Famers Parr, the mast head components need some waterproofing.

These are PA the YIG PCB and the RX LNB all need a waterproof housing which will be constructed out of Jewson's plumbing department. I did start at B&Q, but there plastic pipe performed poorly in the microwave oven test, in that it soaked up RF and became very warm. Jewson plastic pipe performed the best, but you must use the white not the black for optimum performance. The control software assembler file can be downloaded from our web site at http://cq-datv.mobi/downloads.php

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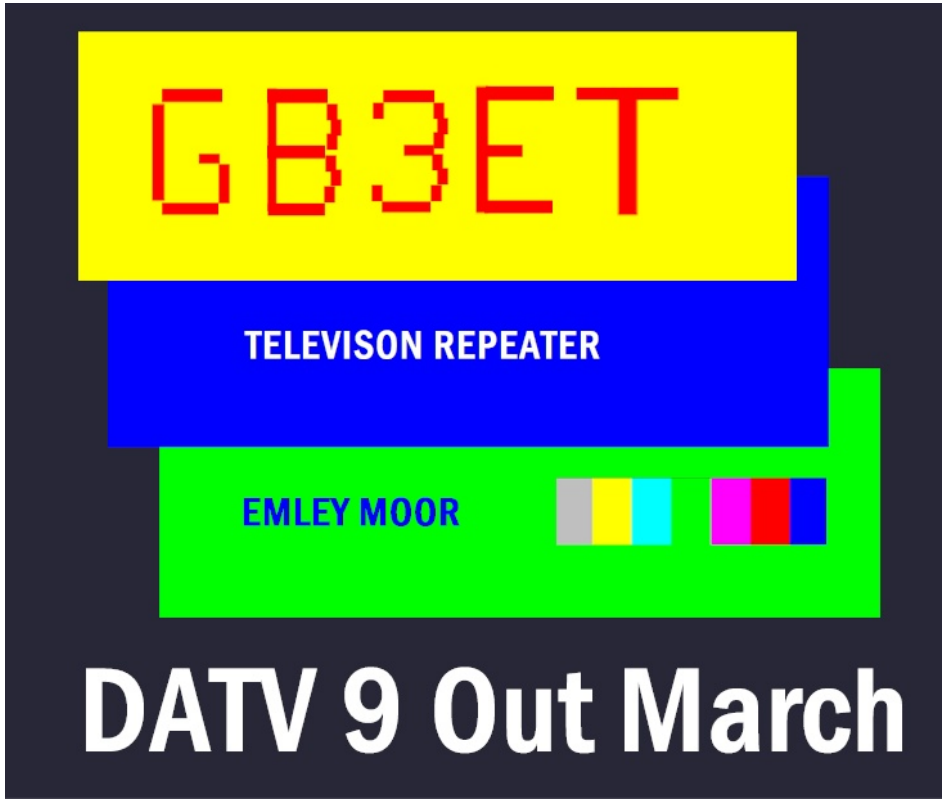
Coming up in CQ-DATV

Is this the latest issue of CQ-DATV? Click here to go to our web site to check to see if there is a later edition available.



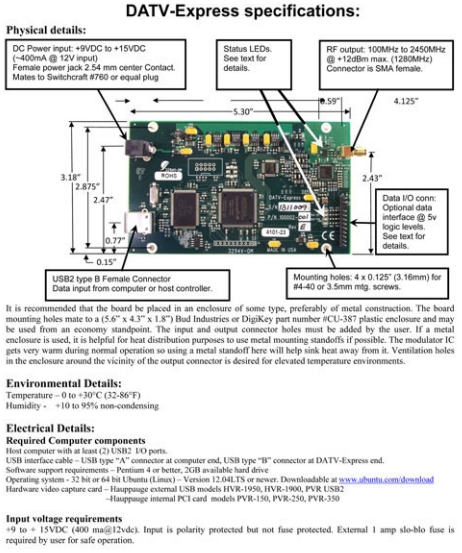
by Ken W6HHC

Writing software to run at Operating System low levels and at the FPGA coding levels is challenging, complex, and can be very frustrating. The DATV-Express Project team has made the bitter-tasting decision that the one remaining significant software bug will postpone the sale of the DATV-Express product in early January to the general ham population.

Charles G4GUO has been working diligently to resolve a list of five remaining DATV-Express software bugs that we knew about at the start of December. Four of these five problems have now been resolved. Only one software bug remains…a design flaw somewhere in our PCR redesign of the Hauppauge MPEG2 faulty (on Linux) PCR clock and packet timestamp. Ken W6HHC reports that most descriptive symptom of this bug is that "transmission video will freeze up on my STB in between 2 minutes and three minutes of PTT". Other STBs and DVB-S analyzers are more robust. But as Ken explains…the project team does NOT want the user's first experiences of our product to be "reception of my video froze up".

The project team has resolved that general sales to hams will begin as soon as this last bug is resolved. Sales to programmers who are willing to work on software development will continue. Interested and willing programmers should contact G4GUO by e-mail to obtain a "PromoCode" if they are willing to assist in working on DATV-Express software. A discounted price of US$200 (including all world-wide shipping costs) is available to programmers with a PromoCode via PayPal on the website.

The good news this month is that the DATV-Express web site is now fully functional, thanks to the efforts of Bob N8NT. Go to the web site at http://www.DATV-Express.com (You must register on the web site in order to see the full contents there).


DATV-Express specifications:

Physical details:

DC Power input: +9VDC to +15VDC (~400mA @ 12V input) Female power jack 2.54 mm center Contact. Mates to Switchcraft #760 or equal plug

Status LEDs. See text for details.

RF output: 100MHz to 2450MHz @ +12dBm max. (1280MHz) Connector is SMA female.

Data I/O conn: Optional data interface @ 5v logic levels. See text for details.

USB2 type B Female Connector Data input from computer or host controller.

Mounting holes: 4 x 0.125" (3.16mm) for #4-40 or 3.5mm mtg. screws.

It is recommended that the board be placed in an enclosure of some type, preferably of metal construction. The board mounting holes mate to a (5.6" x 4.3" x 1.8") Bud Industries or DigiKey part number #CU-387 plastic enclosure and may be used from an economy standpoint. The input and output connector holes must be added by the user. If a metal enclosure is used, it is helpful for heat distribution purposes to use metal mounting standoffs if possible. The modulator IC gets very warm during normal operation so using a metal standoff here will help sink heat away from it. Ventilation holes in the enclosure around the vicinity of the output connector is desired for elevated temperature environments.

Environmental Details:
Temperature – 0 to +30°C (32-86°F)
Humidity - +10 to 95% non-condensing

Electrical Details:
Required Computer components
Host computer with at least (2) USB2 I/O ports.
USB interface cable – USB type "A" connector at computer end, USB type "B" connector at DATV-Express end.
Software support requirements – Pentium 4 or better, 2GB available hard drive
Operating system - 32 bit or 64 bit Ubuntu (Linux) – Version 12.04LTS or newer. Downloadable at www.ubuntu.com/download
Hardware video capture card – Hauppauge external USB models HVR-1950, HVR-1900, PVR USB2
–Hauppauge internal PCI card models PVR-150, PVR-250, PVR-350

Input voltage requirements
+9 to + 15VDC (400 ma@12vdc). Input is polarity protected but not fuse protected. External 1 amp slo-blo fuse is required by user for safe operation.

1

More good news is that Art WA8RMC has completed a five-page datasheet for the DATV-Express product that can now be downloaded in PDF from the web site.

Even more good news is the latest draft of the DATV-Express Users Guide (now up to 36 pages) can also be downloaded from the web site.

The DATV-Express Project team is committed to resolve these issues and start up production sales as soon as THIS LAST SOFTWARE BUG IS RESOLVED.

73…de Ken W6HHC

The times they are a changing

By Trevor Brown

This picture turned up the other week on one of the news groups I belong to and it set me thinking. It dates back to the 70's, I think that is evident from the TV camera, it's what is on his back that is interesting. No it's not a jet pack it's a VTR machine, but you have to cast your mind back to what a VTR machine looked like in the 70's. they weren't exactly portable.

This is an RCA TR70B. It uses a format called Quadruplex where four heads lay down a single segmented track of 17 lines across the tape. It weighs nearly a ton and incidentally cost £70k (I think I lived in a house costing £4k at the time),

so the concept of shrinking a Quadruplex VTR for portable use on the camera operators back was brave.

This is the actual machine made by Ampex to record Quadruplex in the field VR3000

Ok the spools are only small and it does not have broadcast quality replay, but it was step one on the road to a portable broadcast recorder in colour, but what we really wanted was a camcorder.

The camcorder already existed but it was a film camcorder, one man could hoist it on his shoulder and pop off and film something, but based on silver not rust (iron oxide the basis of video tape) and had the problems of running cost and the contents had to go to the lab to be developed before they could be viewed, control of the film camera iris is more tolerant as modern film can store around 14 F stops of dynamic range, (F stop is a 1.4 increase of brightness so 14 F stops is 1.4 better than 13 stops) which is more than is required and that redundancy results in exposure latitude and head room for the colourist to improve the look of the pictures.

Video recording back then was an FM modulator recording a single picture track of composite encoded video (PAL NTSC SECAM)

The video system was around 10 F stops or less at times so the latitude of exposure is not available and the auto exposure electronics have to take a lot of information into account, because the recorded picture cannot be re adjusted like film.

Because of this lack of latitude in electronic cameras broadcast cameras used in the field were all connected to a tin truck where somebody had to sit and work, registering the three colour pictures, setting the colour balance and constantly adjusting the iris, particularly on a multi camera shoot where all the cameras had to match the same look, so the pictures could be cut. Change was on the way, first auto registration followed by CCD arrays which required no registration, auto white and black balance and finally auto exposure came along. We had a field camera that did not require the tin truck.

The camera op could set the white balance on a white card, and black was a simple shut the lens down and set. Registration had gone with the replacement of camera tubes with CCD arrays, and we had a reasonable auto exposure.

How good well, the proof was on multi camera shoots that were recorded on separate recorders and then cut in the edit suite, first results were not too encouraging, but they soon improved.

Sony BVH500

While the cameras were improving, video tape was also changing to a new format with the adoption of a new recording format, that used helical scan and 1" tape and was called C format, but still used composite video recorded by FM modulation. Sony delivered a portable recorder BVH 500 and Ampex delivered the VPR 20 C format field recorder.

Ampex then jointly manufactured a second generation field recorder with the Swiss company Kudelski who made the popular Nagra sound recorder, used in the film industry. This new machine C format machine was the VPR5.

The problem was, this winning machine appeared late and the writing was on the wall for C format, In 1982 Sony delivered the long awaited camcorder, called Betacam.

One of the Sony Camcorders

It used 1/2" tape in a cassette and it was component, the early non SP camcorders could not replay the tapes so camera operators had to up their game, but their film counterpart could not replay their work either. There were

Ampex VPR 20

teething problems with this new format and it was re-engineered to become Betacam SP, which used the same cassette but with metal tape. This was just what the broadcasters wanted not just for news but for mainstream programmes.

Component allowed picture grading of the recordings. It was no longer a single track recording format, it had Y R-Y and B-Y tracks although the R-Y and B-Y shared the same track by TDM (Time Division Multiplexing)

The cassette must be one of the longest lived items in broadcast.

The development went on and digital TV came along, same cassette, different stock a change of electronics and Digital Betacam was here or Digibeta as Sony called it, and then HD Digital. (The cassette disappeared from the domestic market where it was called Betamax)

Early digital recording were very data intensive and prompted the first foray into compression, Digital Betacam had light compression of around 2:1, but the codec was just about to be born with words like Mpeg2 Mpeg4 and AVHCD appeared. These all reduced the data rate of the recording until tape itself became redundant and the memory card became the recording standard.. well almost.

The problem with throwing away some of the data often as much as 80% worked for well lit factual TV programmes.. but

Canon S95

it made picture grading difficult, the ability to set mood and change dull days into sunny days. So the broadcasters used pictures compressed in a codec for news and current affairs.. but they also needed uncompressed pictures that would grade up to historical drama.

It became horse's for courses, as do the still photographers who use low data rate JPEG compression at the bottom end and high data rate RAW images for high end work where the pictures can be tweaked so much better, and the TV broadcasters have similar leanings depending on the production.

What the codec has done for those of us without broadcast budget, is to add moving pictures of extremely good quality to some very affordable stills cameras. The Canon S95 stills camera I talked about back in CQ-DATV issue 1 now succeeded by the 100, 110 and now the 120 they regularly turn up on eBay at sub £100 prices. They are a 10Mega pixel camera that will not only produce stills but will film in HD (1080i). The later models have 1080p but alas are still holding their market price, the 120 is almost £500.

Then just a few months back the goal posts were moved by black Magic, when they released version 1.5 of their of software for their pocket camera, This is now a 1080HD camera which has a dynamic range of 13 stops and records

in RAW 12bit onto a fast HD card using lossless compression which works in a similar way as a ZIP file where the RAW files are compressed during recording without the loss of any part of the image.

The Black Magic Pocket Camera

The price tag for the body only is just over £700. what is the down side well you need a lens, but they have adopted the MFT mount, so a lot of still lenses will fit direct and others by a simple adaptor. The SD card is a little fussy and the recommendation is for the SanDisk 128GB Extreme® SDXC™ UHS-I Card which is at present £135.

So yes the picture of the Jet Pack is the world's largest SD card http://vimeo.com/79373290

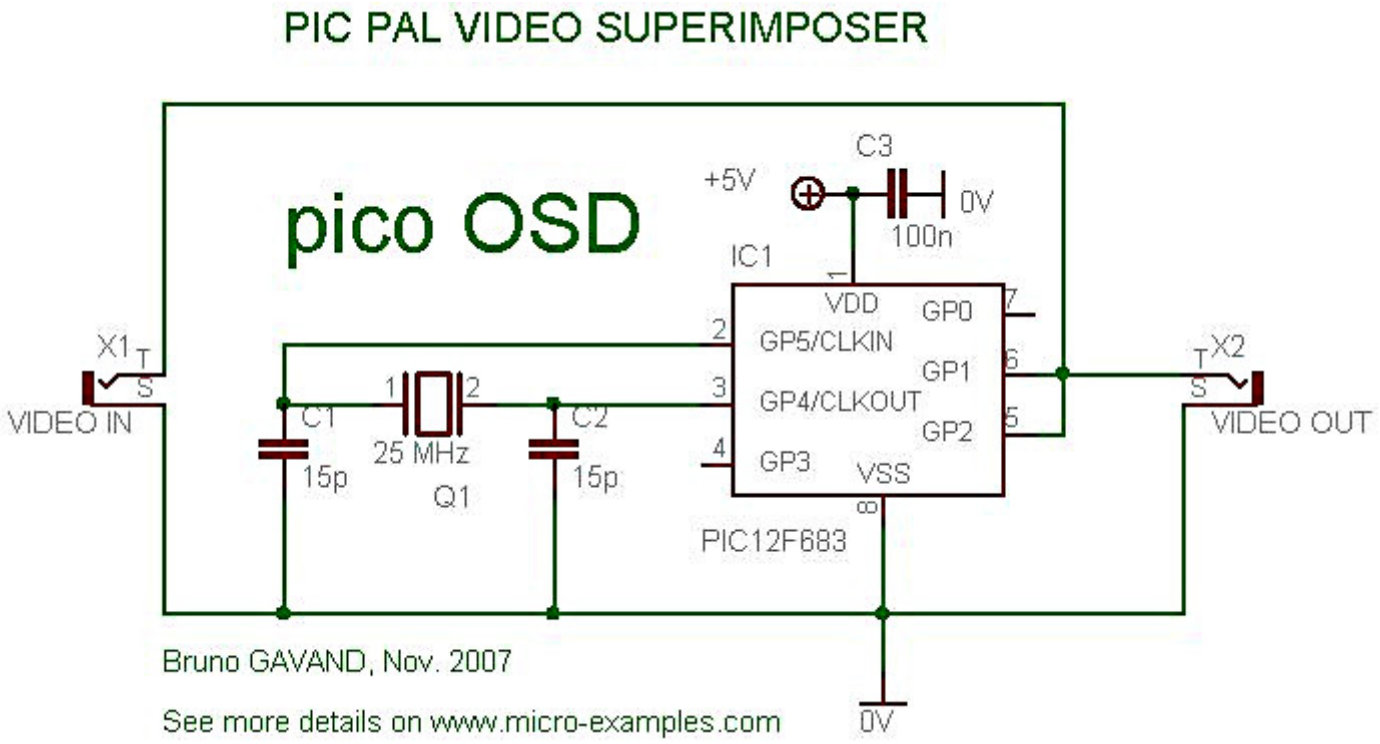
By Bruno Gavan

A PIC-based simple and cheap OSD for an On-Screen-Display with only 5 components!

The idea of this circuit is to push an 8-bit PIC to the limits to build a cheap video superimposer : MCU extracts PAL sync in real-time and overlays a line of text to the video.

The PIC12 MCU is slightly overclocked : 25 MHz instead of 20 MHz max

There is no signal mixer : output signal is directly added to input signal, not very clean but fine for the demo.



As you can see, there is no assembly in C source code but the SETPIXEL(c) macro. Video synchronization and generation is made by interrupt routine, main loop only controls shape and position of the text.

To superimpose text to a PAL video signal, we need to control timing with precision to get a stable picture. We have to deal with vertical synchronization, which tells us when a new frame starts, and with horizontal synchronization, which tells us when a new line starts.

Usually, and external circuit is used to extract both vertical and horizontal synchronization pulses from the PAL video signal, the LM1881 integrated circuit does it very well for example.

Since I wanted to have a very simple circuit, I had to find a way to make the PIC do this job.

First, we must be able to know when a video line starts : we will use the PIC internal comparator module to do it. The internal voltage reference module will be programmed with a voltage clip level, the comparator will then trigger an interrupt each time the input voltage will become lower or higher than the clip level. This will be our horizontal sync separator.

Second, we must be able to know when a frame starts do get vertical sync : PAL signal uses special sync pulses to announce a new frame. We have to detect a 28 µs low level pulse, there are five of them in the vertical sync and none elsewhere. The internal timer module of the PIC will be used to count time of low level pulses.

This done, we must be able to know what to superimpose to the video signal. A bitmap representation of the text to be displayed is built in RAM from a 5x7 fonts table. On each new line interrupt, we check if we are in display time window for adding pixels or not.

To add a pixel to the video signal, we change output pin from high Z state to output, the output then imposes +Vcc or 0V to display either a white or a black pixel. The result is a superimposed text on transparent background.

Download the project

Download PicoOSD-project.zip from our web site.

Includes:

- *mikroC PRO project files for PIC12F683, should work also with most of PIC*
- *picoOSD C source code*
- *picoOSD .HEX files*

Ron Brink PA2RF

Ron has used the above information to 'breadboard' a project and he comments:-

I wanted to be able to add information to my PAL video signals In my search I came across a simple circuit that can do just that the PicoOSD "Overlay Superimposer Device"

This circuit with only a tiny 12F683 PIC superimposes information (like text and clock info) over an existing PAL composite video picture.

I built the experimental circuit (which is only the pic, 25 MHz xtal and 2 15 pF capacitors) on a breadboard.

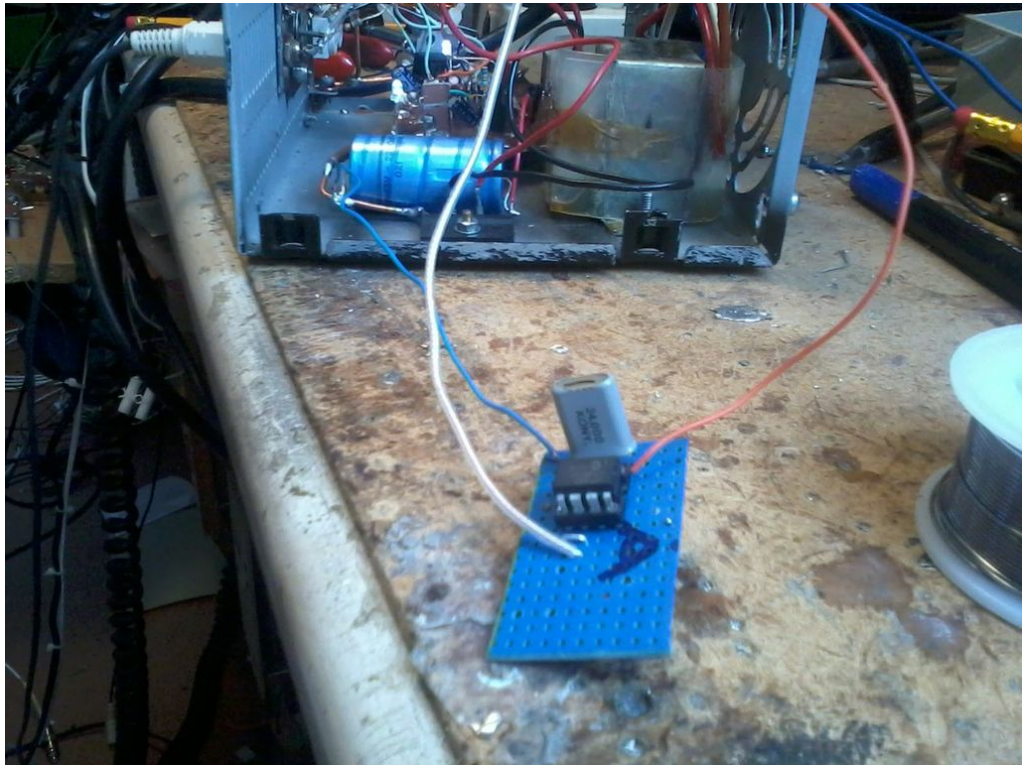
After programming the 12F683 the circuit worked immediately.

In the picture you see on top of the screen the elapsed time info. This is what the pico-osd does.

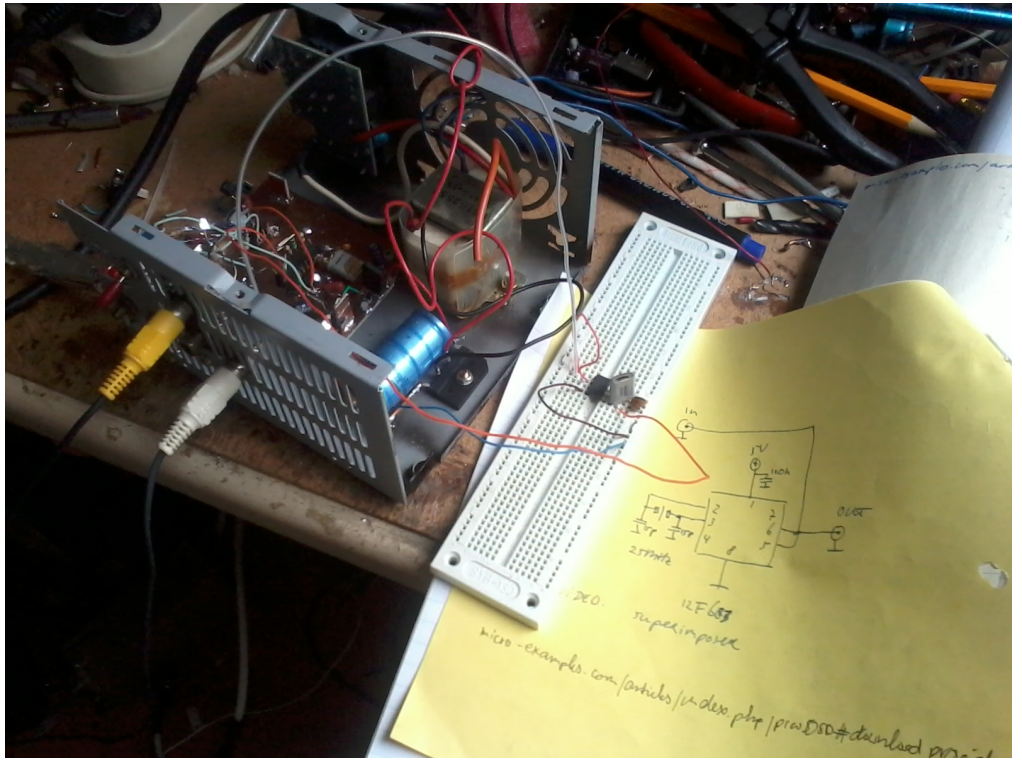
The clock info on top of the screen comes from the pico OSD. I am impressed!

Now the real challenge comes with reprogramming the source code in order to make my callsign and QTH locator visible. Not so easy since the program is written in "C".

Also have soldered the circuit on a piece of veroboard and now must integrate the small circuit into the existing video switch/pattern generator.

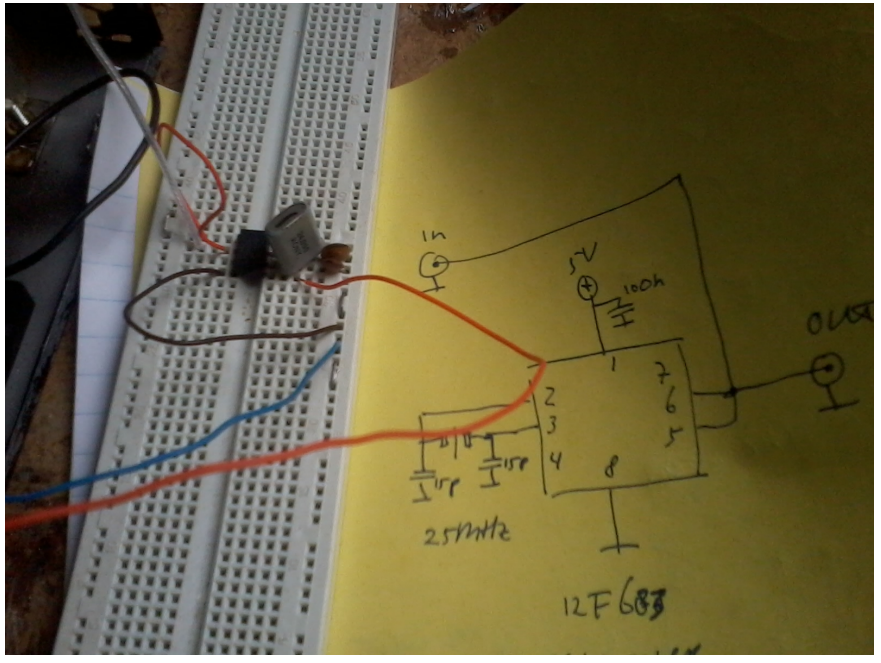


OSD on vero-board



OSD on breadboard

Call sign shown on scene of "Bladerunner" with Rutger Hauer



By Dave G8AJN

There have been a lot of video circuits using older devices in CQTV, these DIL versions are frequently used probably because of their convenient size and the fact that SMD does not allow use of the chunks of Veroboard you have in your 'bits' box. However most products are now surface mount packages and stocks of devices like the quite elderly EL2020 and CD4066 DIL versions will eventually evaporate so it might be wise to start to use or at least plan for the SMD versions wherever possible.

Thankfully there is a much simpler way to create your own pcbs these days with the help of the free CAD software and even for etching your own single-sided boards using Press-N-Peel or by photographic means. In my case. the main benefit of using SMD chips is the total lack of board drilling!

There are several SMD devices that I have used extensively in the GB3SQ repeater, particularly the FDV301N , the AD8057 and the MMBTA13 and I present them here knowing that they work reliably and consistently. They are offered as an option to help you when you need a quick and simple circuit to get some extra video or audio drive.

FDV301N

From a constructional point of view there are a number of advantages of using discrete switches instead of an IC such as the 4066. Clearly there is less risk of cross-talk but more advantageous is the fact that the switches can be placed at a more convenient and nearer point than having to run wires to and from a single quad chip. This reduces the length of tracks, reduces the likelihood of any cross-talk and rf pick-up and reduces the size of the board overall.

The ON resistance of the CD4066 can be as high as 50 ohms depending on the manufacturer. This is enough to be a problem on a 75 ohm video line.

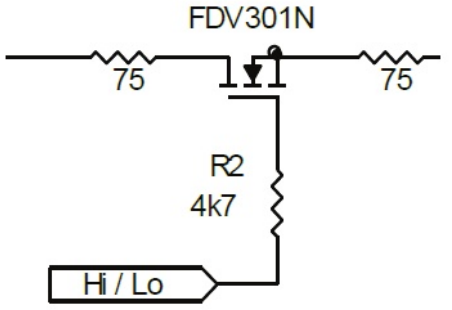


Fig. 1 Series switch.

By using a discrete FET switch such as the FDV301N from Fairchild which has an ON resistance of about 4 ohms with an OPEN resistance of many megohms and with capacitance of less then 6pF means that at 75 ohms this is an ideal device. They can be used either in line or even by dumping the signal to ground, but doing this means that there must be a series resistor to drop the signal across and to prevent any loading of the incoming line.

On our repeater I found that the input line could be dumped to ground OK on the IC input but an in-line switcher was added as well after each IC to reduce loading and avoid any crosstalk or noise where the two different video IC outputs were joined. The switches can be used as inverters too, not of course linear, but useful for inversion of logic pulses.

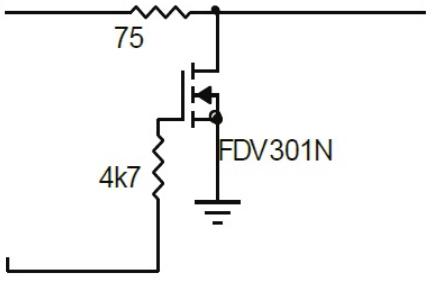


Fig.2 :Dumping switch

They can switch up to 200mA at 20v so can be used for operating small relays or lamps. They are safe to 6v on the input gate pin and are diode protected internally. No bias resistors are required. They can switch on and off at

under 8nS and they are very small, SOT23, about 3mm x 2mm.

Video amplifiers.

There are two main types of opamps used for video signals, voltage feedback amplifiers (VFA) and current feedback amplifiers (CFA).

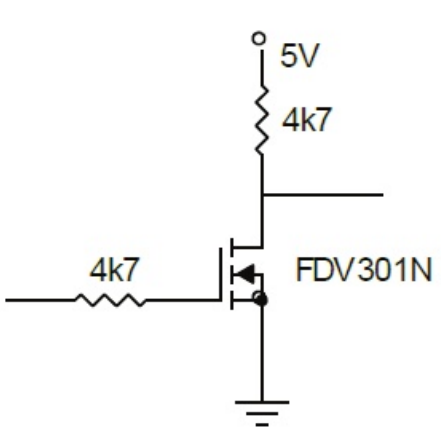


Fig.3: Logic inverter

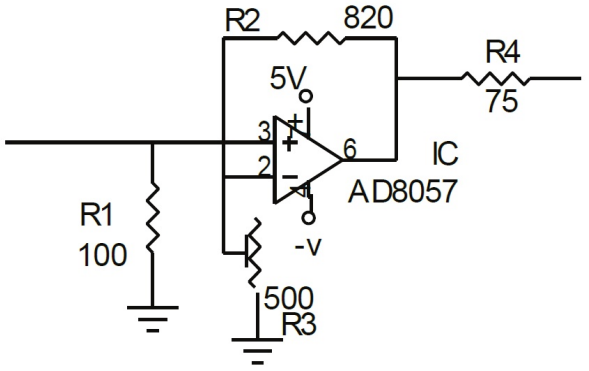
Voltage-feedback amplifiers circuit configuration uses a high-gain amplifier whose parameters are determined by external feedback components. The amplifier gain is so high that without these external feedback components, the slightest input signal would saturate the amplifier output.

SOT23 package

Stability as used in electronic circuit terminology is often defined as achieving a non-oscillatory state. Stability is a relative term, it is easy to draw the line between a circuit that oscillates and one that does not oscillate, so it is understandable why many people believe that oscillation is a natural boundary between stability and instability.

Feedback circuits exhibit poor phase response, overshoot, and ringing long before oscillation occurs, and these effects are obviously undesirable in video circuit design. Relative stability is defined in terms of performance. By definition, when designers decide what trade-offs are acceptable, they determine what the relative stability of the circuit is. A relative stability measurement is called the damping ratio.

The damping ratio is related to phase margin, hence phase margin is another measure of relative stability. As you may imagine, the most stable circuits have the longest response times, lowest bandwidth, highest accuracy, and least overshoot. The least stable circuits have the fastest response times, highest bandwidth, lowest accuracy, and some overshoot. So as with most things it is a case of trading off the various pros and cons.



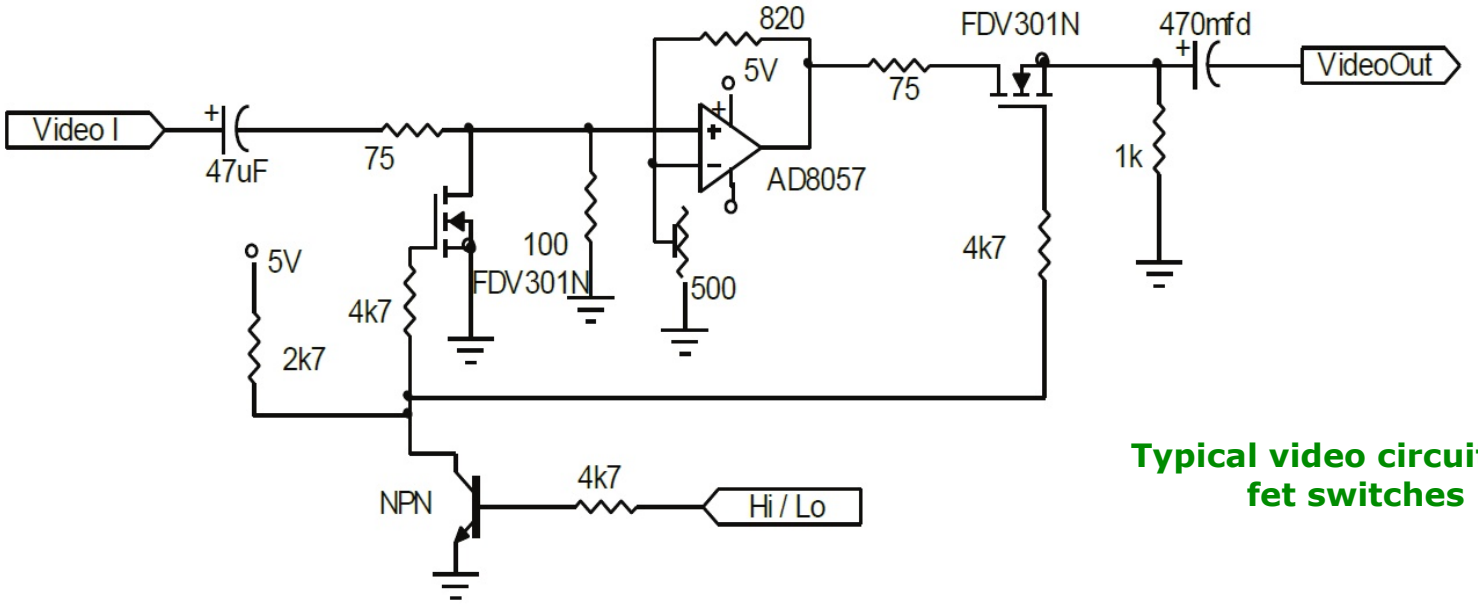
Current-feedback amplifiers (CFA) do not have the traditional differential amplifier input structure, meaning that they sacrifice the parameter matching of the VFA. The CFA circuit configuration prevents them from obtaining the precision of voltage-feedback amplifiers (VFA), but the circuit configuration that sacrifices precision results in increased bandwidth and improved slew rate.

The higher bandwidth is relatively independent of closed-loop gain, so the constant gain-bandwidth restriction applied to VFAs is removed for CFAs.

The slew rate of CFAs is much improved from their counterpart VFAs because their structure enables the output stage to supply slewing current until the output reaches its final value.

In general, VFAs are used for precision and general purpose video and non-rf applications, while CFAs are used for high frequency applications.(i.e. above 100 MHz).

Although CFAs do not have the precision of their VFA counterparts, they are precise enough to be dc-coupled in video applications where dynamic range requirements are not severe. CFAs, unlike previous generation high-frequency amplifiers, have eliminated the ac coupling requirement; they are usually dc-coupled while they operate in the GHz range. CFAs have much faster slew rates than VFAs, so they have faster rise/fall times and less intermodulation distortion.



Typical video circuit with fet switches

The AD8057 is a VFA but has managed to combine the best features of a VFA with performance comparable to CFAs. They are stable between 3v and 12v supply range with low noise and distortion figures and a x5 bandwidth of 25Mhz. By keeping the feedback resistor below the 1k ohm of other designs the stability is good with no apparent colour degradation and required gain can be preset with a pot to ground (R3) on the feedback input pin which retains the bandwidth whilst changing the gain of the stage. The value of the feedback resistor itself should not be used to alter the stage gain.

These are normally run with a dual +5 and -5v supply but at these low currents it is easy to create a dummy ground at half the supply voltage, but that means that the dc output of the IC will be at half supply instead of 0v and the output will need to be AC coupled thus risking losing any dc clamping applied.

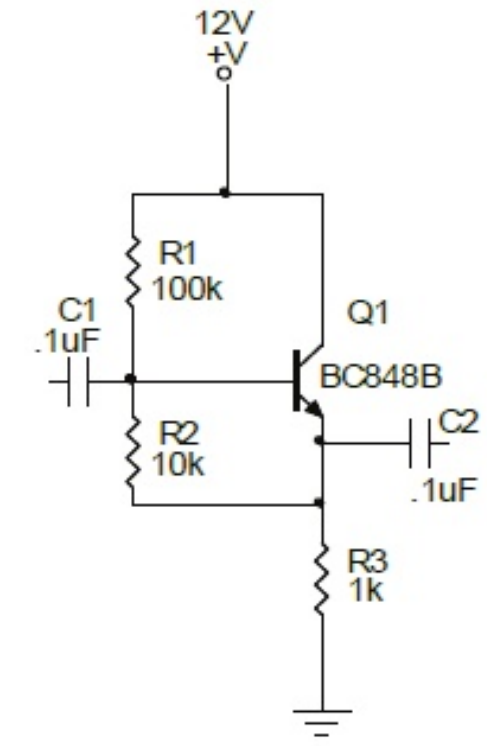
If running into a low impedance load such as 75 ohms a coupling capacitor of at least 470 mfd will be required to cope with the 50Hz field rate, 1000mfd is probably advisable. Bridging the electrolytic with a 0.1uF to preserve hf should not be necessary with modern electrolytics. Provided you have a 75 ohm resistor in series with the output of the IC they are short-circuit proof.

One of the three video channels that join across the 1k ohm in the repeater is drawn here to show how the switches were implemented. The NPN inverter could be directly substituted by a FDV301N if preferred.

Emitter followers

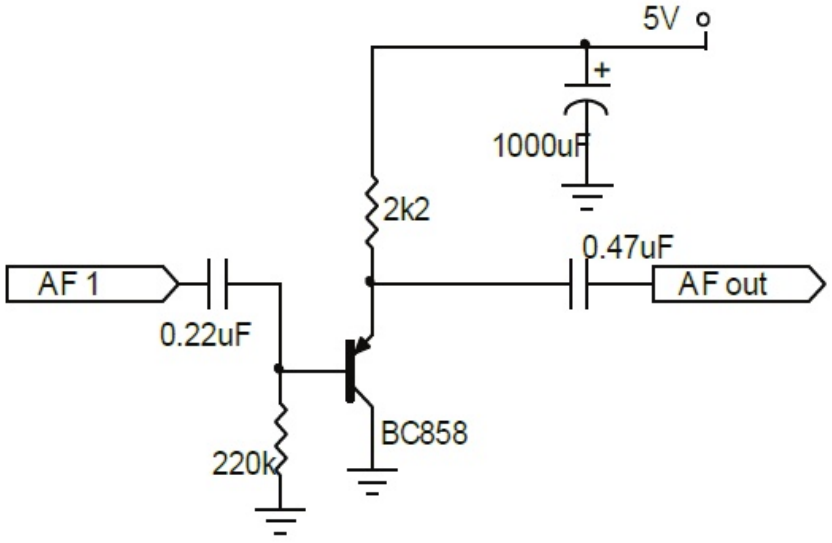
Also called common collector, the wide bandwidth and low impedance output of emitter followers make them useful in audio and video stages to give non-inverting outputs into 75

ohm.

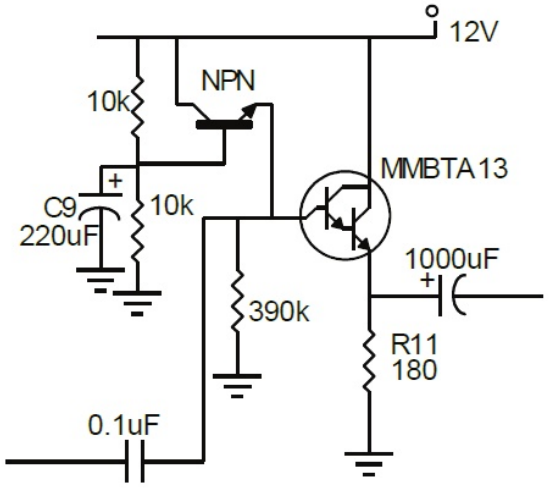


Here is a typical emitter follower with an output impedance of about 1k, ideal for audio stages. This is using an NPN transistor but a PNP can also be used.

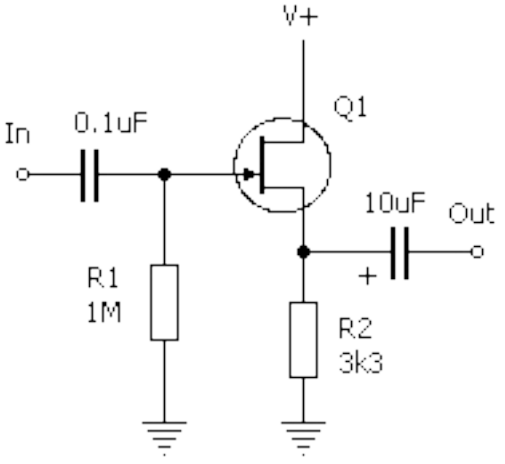
Whilst signal polarity is not usually a consideration for audio, with a video waveform it is essential to retain the correct polarity. To get a good match from a higher impedance source (>10k) into 75 ohms a Darlington device is ideal as the two transistors it contains enable a good bandwidth but with a high output current that enables a video waveform to run into 180 ohm for matching to a 75 ohm line.



Keeping the base current constant gives a better clamping by stopping the bias point being modulated by a large signal. An extra NPN transistor can be added to the circuit to achieve this effect. The 180 R resistor should be increased in value if running from over 5v.



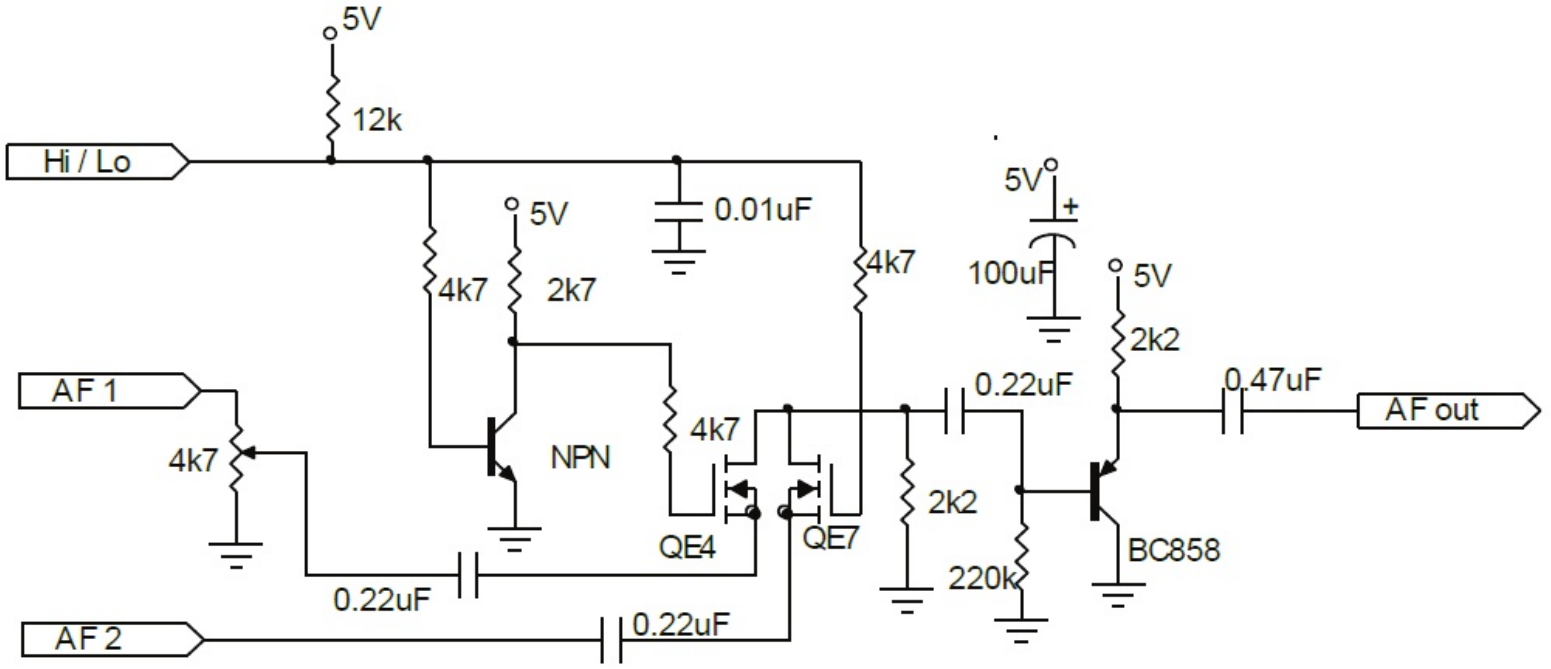
FETs also can be used too but are not called emitter followers, FET versions are called source followers. They have a much higher input impedance than a bi-polar transistor circuit so they are suitable where higher impedance inputs are involved.

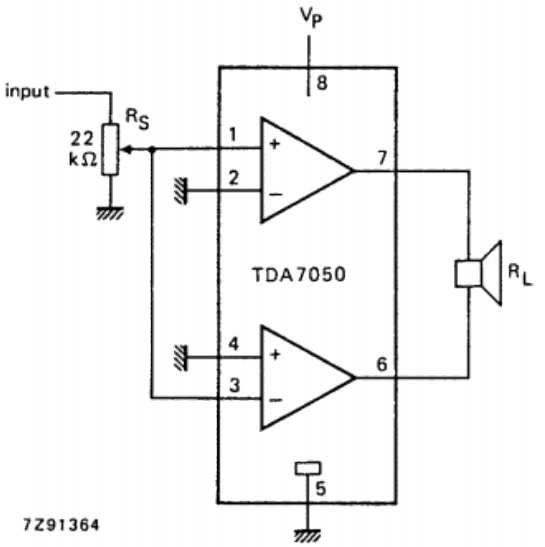


Here is a part of the audio switching circuit in the GB3SQ repeater. AF1 is the audio from the main digital receiver and the second feed from a currently unused auxiliary receiver feed is on AF2. When the Hi/Lo line goes low it switches to the AF1 feed. It defaults back to high when the incoming signal drops out.

Headphone Amplifier: TDA7050T

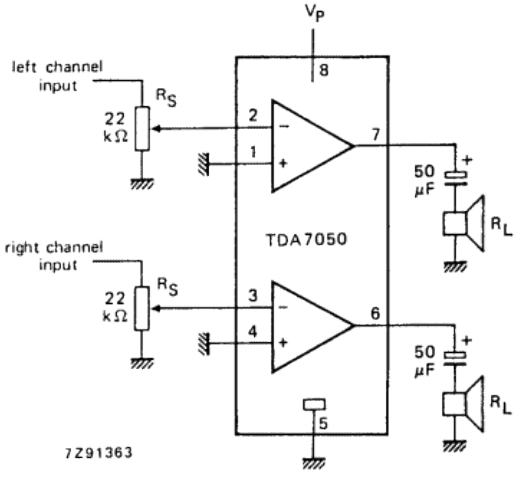
This tiny amplifier chip will drive a 8 ohm speaker or headphones if required. It is very useful to be able to add a





The package is SMD SOIC8 and is currently still available singly from RS for under £1.

headphone option to mixers etc for the purpose of setting up microphone levels or for distribution or talkback. The maximum output is around 150mW into 15 ohm speaker. Max supply volts 5v.



The TDA750 is the earlier DIL 8pin version, no longer stocked by the main suppliers but might be available elsewhere.

The twin channel option gives half the output power per channel compared to the bridge arrangement.

Microphone AVC/Compressor IC with 60dB range & adjustable noise floor.

Popularly called VOGAD this chip takes agc options to a new level. With a microphone input you can set compression , attack and noise floor points and get a couple of volts of audio out.

Setting the audio presets :

The maximum gain of the SSM2166 amplifier is set by the 20k gain control on pin 2, ranging from 0dB to around 20dB.

R23 sets the compression ratio from none (1:1) to 15:1

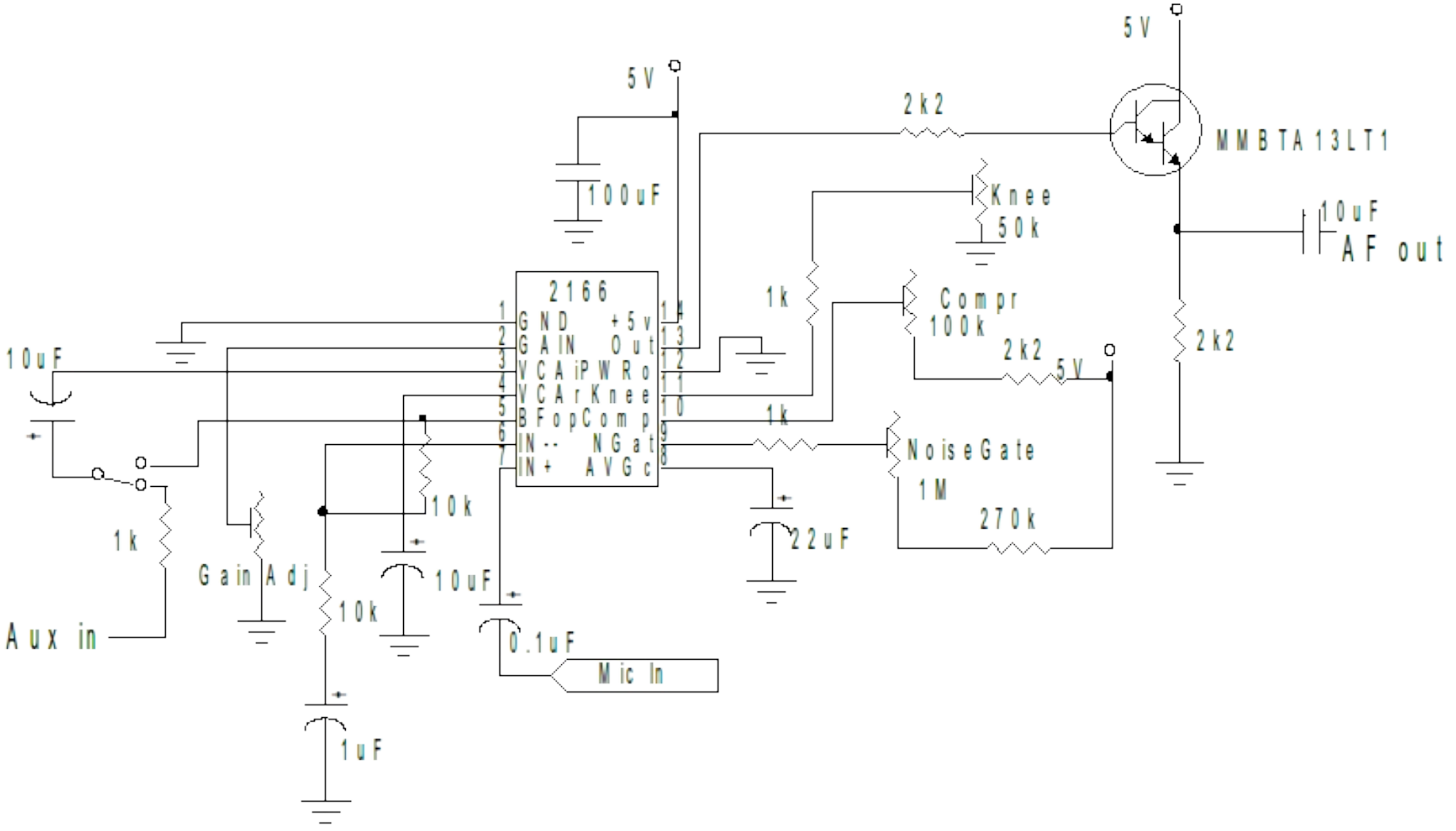
The Rotation point or the limiting threshold is where the limiting starts to come in and attenuates any transients that might exceed this point.

Noise floor is the point below which the microphone signal is muted, very useful in a noisy environment.

If using a larger audio input signal than a microphone it would be advisable to reduce the value of the 10k feedback resistor between pins 5 and 6 and adjust the input gain accordingly. The full data sheet is here:-

http://docs-europe.electrocomponents.com/webdocs/0aa7/0900766b80aa7cd0.pdf

I hope you find these circuits of interest and of some use in your future builds. If you have some useful circuit bits why not jot them down and send them to the CQ-DATV magazine and they will publish them for the benefit of others.



Details about HDMI 1.4, the current generation of connectors that are set to see the AV industry through the likes of 3D and beyond.

HDMI 1.4 - comes in five different varieties

Now the makers of HDMI 1.4 have made the details official, re-iterating the enhanced functionality that the cables will come with.

Just confuse everyone, not all the new connectors will have all the features available.

There will actually be five connectors available in the market: Standard HDMI Cable, High Speed HDMI Cable, Standard HDMI Cable with Ethernet, High Speed HDMI Cable with Ethernet and an Automotive HDMI Cable.

So, to help you out, we have added which cables will have which new functionality.

The new features include:

Ethernet channel

This brings HDMI into the web-connected world, by enabling high-speed bi-directional communication. It will also mean that web-enabled HDMI devices can share its internet connection without the need for a separate Ethernet cable.

Used for: Standard HDMI Cable with Ethernet and High Speed HDMI Cable with Ethernet

Audio Return channel

HDMI 1.4 has the added bonus of an Audio Return Channel – this again that will reduce the number of cables as it means the cable will deliver audio upstream for processing and playback. Essentially it allows your HDTV to send the audio stream to the A/V receiver over the HDMI cable, eliminating the need for an extra cable.

Used for: all new HDMI 1.4 connectors

3D connectivity

If the likes of James Cameron and Pixar are to be believed, 3D is the next big home cinema thing, so it's lucky then that HDMI 1.4 will hand 3D footage.

According to the press release 'the specification will standardise the input/output portion of the home 3D system and will specify up to dual-stream 1080p resolution.'

In short, all 1.4-enabled devices will be Full HD 3D ready.

Used for: High Speed HDMI Cable and High Speed HDMI Cable with Ethernet

4K x 2K Resolution support

And you thought Full HD was the best resolution a TV could get. Something called the RED camera is doing the rounds at the moment, which shoots footage up to 4K (4x that of 1080p), which is so clear it will make your eyes bleed.

4K sets are now available in the home market place, with some projectors already capable of showing this type of content.

HDMI 1.4 allows support for 4K x 2K. With formats supported including: 3840 x 2160 24Hz/25Hz/30Hz and 4096 x 2160 24Hz.

Used for: High Speed HDMI Cable and High Speed HDMI Cable with Ethernet

More colour

HDMI 1.4 offers more colour support than its 1.3 counterpart. This is essentially for those with fantastically specced digital cameras that handle colour spaces like sYCC601, Adobe RGB and AdobeYCC601. The new connector will add a bit more colour into your pictures.

Used for: all new HDMI 1.4 connectors

Car connectivity

There will also be car support. This means that you will now be able to pimp your ride with HDTVs, without the fear that heat, vibration and noise will stop your cables working.

Used for: Automotive HDMI Cable

Micro HDMI

Also announced is a Micro HDMI connector. This is a 19-pin connector that will support 1080p for portable devices.

As those with Full HD camcorders will know, there's already a HDMI Mini Connector on the market at the moment, but this new cable is set to 50 per cent smaller.

The HDMI specification 1.4 is available for download on the HDMI LLC website (www.hdmi.org).

Finding the Right Cable

There are five HDMI cable types to choose from, each designed to meet a particular performance standard. Here is an overview of the HDMI cable types, their capabilities, and how to tell them apart.

To help consumer and clarify cable types further, all HDMI cable products will now be required to be labelled by cable type. Look for these labels when choosing the HDMI cable that is best for your needs.

Standard HDMI Cable

The Standard HDMI cable is designed to handle most home applications, and is tested to reliably transmit 1080i or 720p video – the HD resolutions that are commonly associated with cable and satellite television, digital broadcast HD, and upscaling DVD players.

Standard HDMI Cable with Ethernet

This cable type offers the same baseline performance as the Standard HDMI Cable shown above (720p or 1080i video resolution), plus an additional, dedicated data channel, known as the HDMI Ethernet Channel, for device networking. HDMI Ethernet Channel functionality is only available if both linked devices are HDMI Ethernet Channel-enabled.

Standard Automotive HDMI Cable

Supports up to 720p/1080i (does not support HDMI Ethernet Channel). Since an automotive system may be wired with one or more internal relays that can affect signal strength, the Standard Automotive HDMI Cable needs to send a stronger signal than other cables types, so it is tested to higher performance standards.

High Speed HDMI Cable

The High Speed HDMI cable is designed and tested to handle video resolutions of 1080p and beyond, including advanced display technologies such as 4K, 3D, and Deep Color. If you are using any of these technologies, or if you are connecting your 1080p display to a 1080p content source, such as a Blu-ray Disc player, this is the recommended cable.

High Speed HDMI Cable with Ethernet

This cable type offers the same baseline performance as the High Speed HDMI Cable shown above (1080p video resolution and beyond), plus an additional, dedicated data channel, known as the HDMI Ethernet Channel, for device networking. HDMI Ethernet Channel functionality is only available if both linked devices are HDMI Ethernet Channel-enabled.

Source: http://www.hdmi.org/consumer/

By John Hudson G3RFL

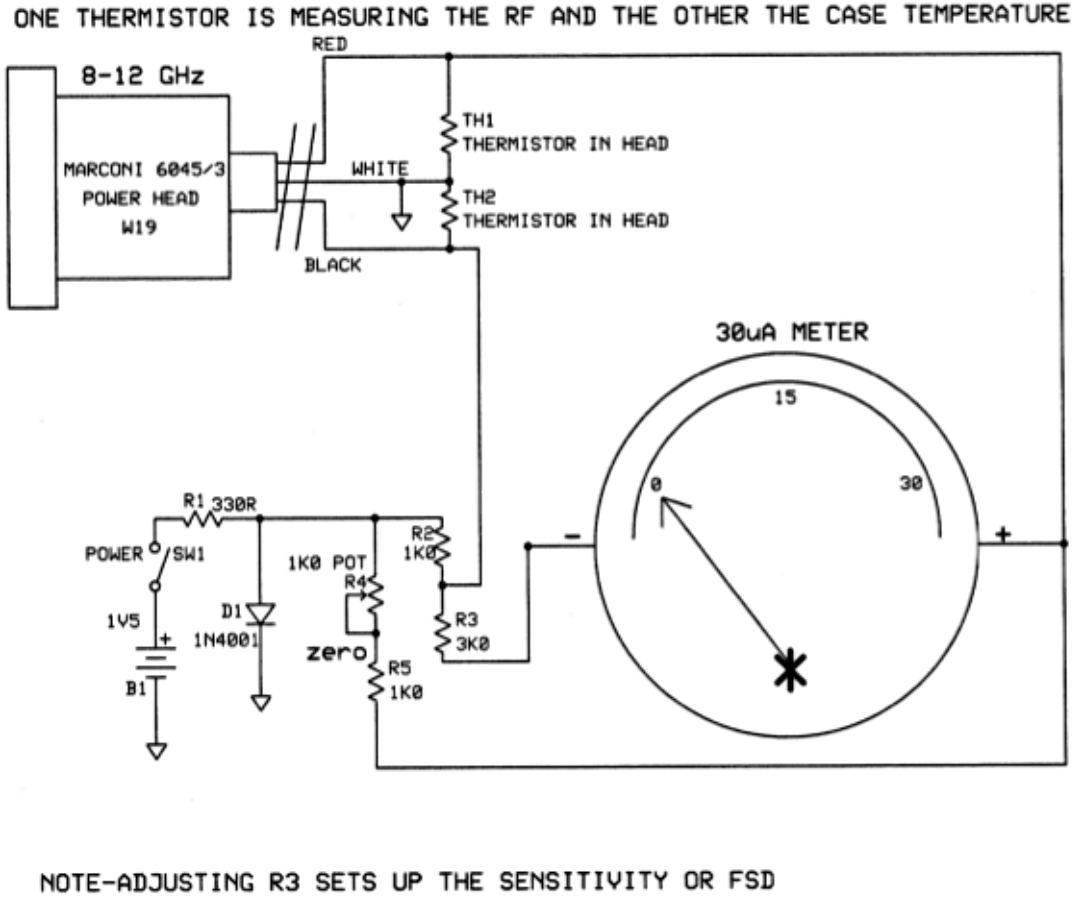
The original unit used a Marconi waveguide and transition to coax via a probe. The probe was removed and a thermistor put in its place at the focal point.

The second thermistor is mounted in the power meter case to measure the ambient air temperature. The RF will only warm the waveguide thermistor, so the resistance difference is proportional to the RF. This needs some initial calibration for the temperature offset and this is the purpose of the POT R4 which should be used to zero the 30 uA meter, before the RF is applied. R3 can be varied to set the sensitivity or FSD (full scale defection) of the meter.

Apply the RF and the head thermistor will reduce in value and produce an increased current flow and change the balance of the two thermistors and this change in balance will result in current flowing through the uA meter, current that is proportional to the amount of RF entering the waveguide.

The unit is not calibrated so it is difficult to use if for power measurements, but it is useful for tuning up 10GHz transmitters and proved valuable for setting GB3FY up.

I did try using the Wife's hair dryer and a can of freezer to check for stability in various conditions and the unit does track the temperature changes via the case mounted thermocouple which cancels out these violent temperate changes.



The station test card

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Just for fun....

Last issues picture is shown below.

"I thought the NSA had the latest in stealth technology." - John Ciperano K0EBC

"Should have stuck with my Ipad" or "I know I can see Mars with this thing, focus, focus..." - Larry Shaunce wd0akx.

"Left a bit, down a bit, left a bit more, safety specs on, FIRE." G8KZN.

"When I took on the 007 role, I never envisaged these cuts in Q's budget" - Trevor

"The result of a committee designing a new High Tec miniature camera and integrated transmitter" - J. Doe

And the winner is .....

John, K0EBC - congratulations.

This issues picture is shown below.

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