CQ-DATV

dotMOBI

FREE

9

March 2014

In this issue

Ofcom Update: Earth Stations on Mobile Platforms

Ofcom has today published a statement outlining its decision to authorise the use of radio equipment for Earth Stations on Mobile Platforms (ESOMPS) in the UK and the British Crown Dependencies.

Subject to certain technical and regulatory conditions, Ofcom has decided to:

- *Exempt land-based ESOMPs from the need to have a Wireless Telegraphy Act 2006 licence;*
- *Make licensing available for aircraft- and ship-mounted ESOMPs by accepting applications to vary Aircraft and Ship Radio licences respectively, with no additional fee.*

ESOMPs are devices which, when mounted on moving vehicles, can provide internet to passengers by connecting to a geostationary satellite. Today's decision means that airlines and other transport operators could in future use satellite-based technology to offer customers broadband speeds much faster than they currently experience.

A news release is available online.
http://stakeholders.ofcom.org.uk/consultations/earth-stations-mobile-platforms/statement/?utm_source=updates&utm_medium=email&utm_campaign=Boats-planes-statement

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RADIO BUSINESS: ARC TO GO MONTHLY E-PUBLICATION AND QUARTERLY PAPER

Another change in the hobby radio publishing market. This with word that Antique Radio Classified Magazine will resume publishing with the February 2014 issue but as a hybrid publication.

Spy agencies around the world use radio

Reports last week that the National Security Agency uses radio signals to collect data from tens of thousands of non-U.S. computers, some not connected to the Internet, is sure to fuel more acrimony towards the U.S. spy agency.

But observers note that the NSA is not the first of the world's spy agencies to use

such technology to surreptitiously gather classified information from other countries.

For instance, intelligence personnel in the former Soviet Union used similar tactics to secretly gather information from electric typewriters at U.S. government offices in Moscow and Leningrad more than 30 years ago. And experts say it's a near certainty that the spy agencies of other advanced nations are doing the same thing today.

"Physical compromise of a target's technology is what we expect intelligence agencies to do," said John Pescatore, director of emerging technology at the SANS Institute and a former NSA security engineer.

"The Chinese have been doing it to the laptops and smartphones of foreign executives visiting China. Years ago the French did similar things in their country and I'm sure British intelligence has done the same thing," Pescatore said. "What the NSA is doing now is what all superpower intelligence agencies have done, are doing, and will do."

The New York Times reported Tuesday that documents leaked last year by former NSA contractor Edward Snowden disclosed that the NSA has embedded software and hardware "bugs" in some 100,000 targeted systems around the world. The "bugs" allow the NSA to collect information from the systems even when they are not connected to the Internet.

Read the full Computerworld article at:
http://www.computerworld.com/s/article/9245443/Spy_agencies_around_the_world_use_radio_signals_to_tap_data_from_targeted_systems

Our thanks to Stephen G7VFY for spotting the above item.

RadCom

The April edition of RadCom contains the formal Calling Notice for the 86th Annual General Meeting of the RSGB. The AGM will take place at the Institution of Engineering and Technology at noon on Saturday 20 April. Full details of the Agenda and other relevant details have been sent to Members of the Society. Voting is now underway on the Resolutions, and Members may vote online or by post.

(CQ-DATV understands this a is Manchester location)

http://rsgb.org/main/blog/news/gb2rs/headlines/2013/03/17/rsgb-agm-announced/

CQ-TV gets a new editor

Frank Heritage M0AEU Frank 's main interest is the HF bands but he is also a Graphic designer which should come in useful

BATC will be holding their BGM later this year and are looking for a suitable venue.

ISS

ISS see

http://www.southgatearc.org/news/2014/january/iss_ham_video_commissioning.htm#.Uubg-PTFLqQ

Happy Birthday CQ-DATV

Its CQ-DATV's first birthday, CQ-DATV 1 first appeared last February and this edition CQ-DATV 9 says it all. 9 magazines in 12 months, and for 2014 we are aiming for 12 magazines making this the first every monthly ATV magazine.

ATV deserves the support of a strong magazine, it is the main artery of any hobby. Amateur Radio has long had this level of support, but at a price. ATV now has it and at no cost.

Does this formula work well our downloads are well in excess of 3000 for CQ-DATV 7. When I produced CQ-TV for the BATC we published around 2000 issues 4 times a year, but by the time I left the BATC committee they had declined to around the 700 mark. So I hope we are revitalising the hobby and providing a platform to support ATV activity.

In this issue Trevor has written up the work he did putting GB3ET the Emley Moor ATV repeater together, I think developing a micro controller and writing the software without an assembler and getting it to work on an untested hardware design, is a story with a lesson for us all living in the PIC world, you do not realise how far we have come in such a short time. I know Trevor was pleased to be able to show it off to the late Grant Dixon G8CGK the first ever BATC chairman and his role model.

Congratulations to Ken and the DATV express team, they have brought this project from the drawing board to a final product in the market place. This is a substantial benefit to all ATV enthusiasts, and shows just what we are capable of, all of us at CQ-DATV take our hats off to the whole team.

John Hudson is also back with a filter for computer generated Morse code, simple things like this often get omitted from repeater logic designs and it's good to see it has not been omitted from GB3FY, we are all just waiting for a break in the winter weather for John to get this welcome addition to the ATV repeater network in place.

Tom Medlin W5KUB has also written for us on the work he has been doing streaming live events. I always like watching him in action and at times we forget there is streaming activity outside the BATC streamer.

Richard Carden is back with his regular column Digital World and this time he is looking at CCTV camera lenses, adapting and pressing them into use for ATV.

Roberto Zech Dg0ve has come up with a new FM ATV transmitter and he is marketing the design as a complete ready built units for those of us that maybe getting a little too old in the tooth for SMD construction.

Trevor as been looking at adding camera Tally lights on the Vmix software only to find that the latest revision of the software has already implemented them and remote operation too, all done on a smart phone.

Peter J Stonard is looking back on the work of Philo T. Farnsworth‘s and his contribution to Television I think his opening line of "how quickly people forget" says it all.

Deain Lazarov, has sent in his work on a PIC on screen

display, it's a more complex design than the previously featured by Bruno Gavin in CQ-DATV 8, where would we be today without the PIC controller.

Please keep the copy coming and don't forget to support the caption contest with your humour or any pictures you think suitable for this section.

Please enjoy CQ-DATV 9 I hope there is something for everyone in this packed edition.

Ian Pawson CQ-DATV Editor

TX factor
amateur radio explored

TX Factor is a brand new series of high definition TV shows covering all aspects of the hobby which is amateur radio.

Our presenters explore the history of amateur radio, rigs, antennas, operating modes, propagation, sport radio, training, club news, RSGB news, world news - in fact, anything and everything!

TX Factor is a professionally produced programme presented by radio amateurs for radio amateurs - so watch our latest episodes and find out what the TX Factor has to offer.

After 21st February, click on the links to the various episodes to watch via our own viewer or via our YouTube channel.

A Winter's Tale (The story of GB3ET)

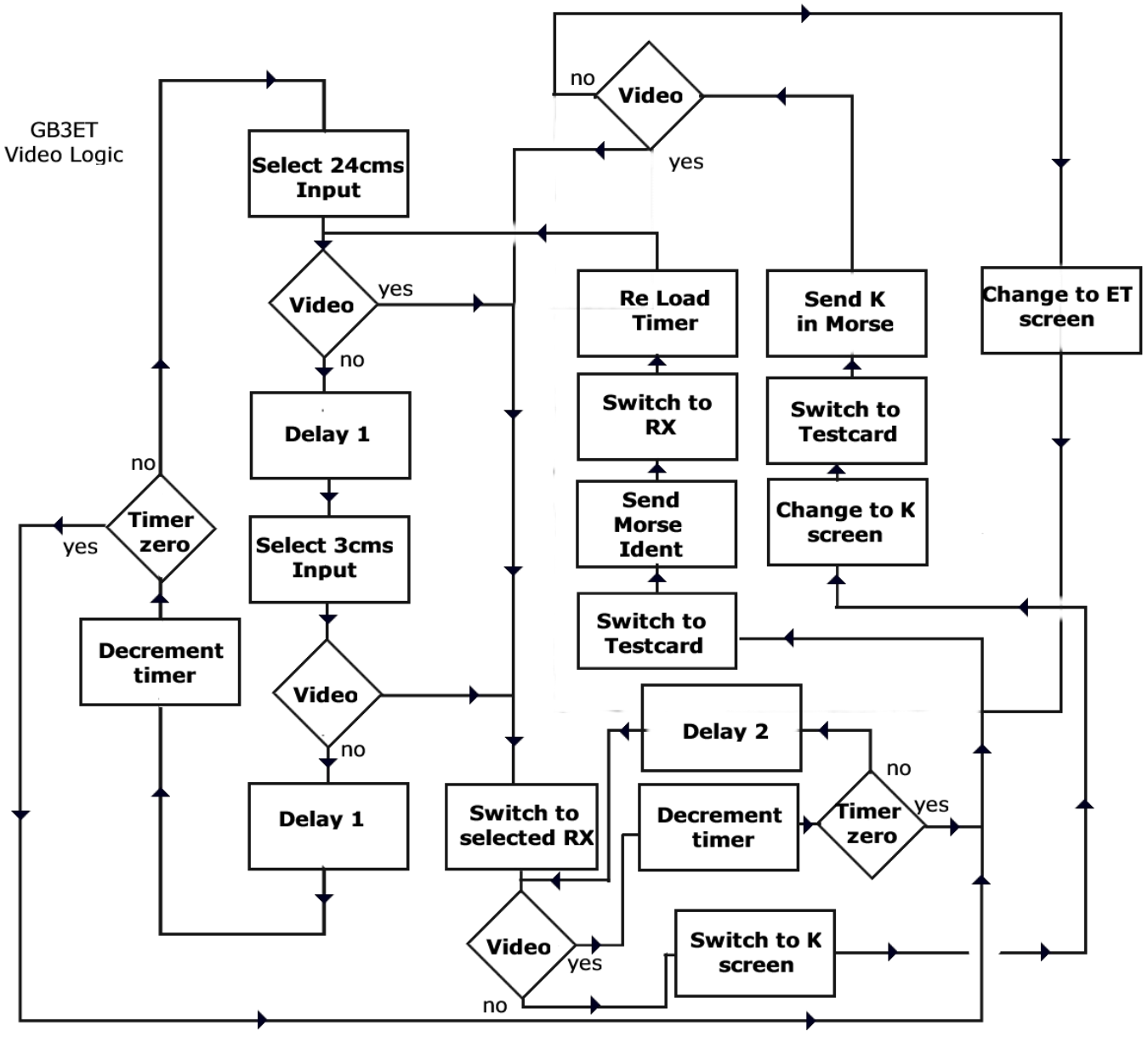
This is not a constructional item, it is the story behind the designing, constructing and installing of the now defunct 24cms ATV repeater GB3ET. The control module was made available as a PCB and was used in lots of other ATV repeaters including GB3TM.

For those of you that do not know ET stands for Emley Television, which is the main Television Transmitter for Yorkshire and uses a 900ft transmitting tower it can be seen from the northern section of the M1 motorway. Being a tower rather than a mast it has an equipment room at the top called the Turret room which has lift access and was to be the designated home of the hardware for this proposed repeater.

The original concept for a 24 cms ATV repeater and was the brain child of David Long G3PTU who was at the time (early 80's) an Engineer working for the then IBA (Independent Broadcasting Authority) and employed at the Emley Moor Site. David drafted and submitted the application for the repeater and the NOV (the license) came through rather unexpectedly IE no hardware existed at all, David rang and asked if BATC could help. We had the old members services shop back then but not much in the shop that could be used to build a repeater, all that was about to change. 24cms ATV transmitters and satellite receivers were around but not PCB's that could be populated up to control an ATV repeater. Time to design a repeater logic, and ET was going to be the test bed.

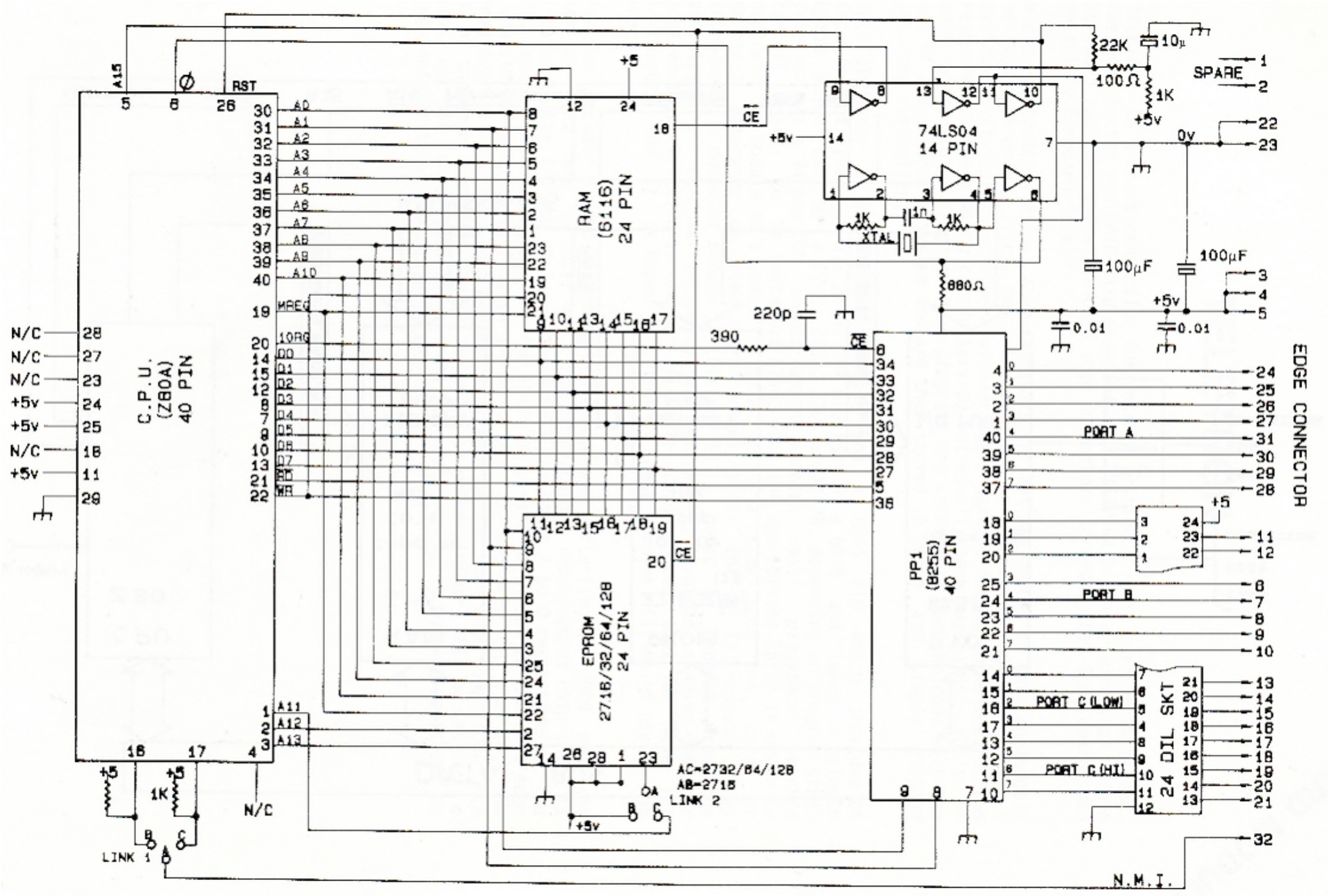
My first thought was the logic and after a couple of attempts I came up with the following flow chart, which not only fitted the bill but also had provision for a second three 3cms TV input and was such that if we could obtain permission for the second receiver it could just be added without any logic changes, remember this was not just about ET it was about finding a universal solution to ATV repeater logic.

It also became obvious that to make this flow chart work out of TTL logic was going to require a considerable amount of logic, but if we used a microprocessor it could be reduced to 5 chips. The microprocessor was the obvious route but the technology was going to be a challenge particularly the programming as I had never done any before.



I went for modular construction using Euro cards and a rack frame, the first card the Z80 micro controller was made using wire wrap and went together in a couple of lunch times. Wire wrap is ideal for developing circuits with lots of wires and chips but not many capacitors resistors or transistors as these need mounting on headers so they can be plugged into a DIL socket and wired. The CPU had few of these and was ideal. Simple hand wire wrap tools require the special wire to be cut to length and stripped, the power version of this hand tool speeds thing up by also doing the stripping. It's important to put number tags on the DIL sockets and to tick each connection on the circuit diagram so as to keep track. Once the wire wrap was complete and checked out with a simple continuity checker, the chips were fitted and the CPU was powered up, but alas did not work or did it. Having never designed a circuit which uses a micro, or programmed one before, this was all a first in fact I had never written an EPROM for a micro and it was difficult to work out if it was my programming, my hardware design, my wire wrap prototype or both that was at fault.

I should explain the programming was done by looking up the Z80 instructions in a book, converting the instructions to HEX and typing them into a keyboard EPROM programmer. I was an engineer in Yorkshire Television (ITV Company) that made the TV programmes that were transmitted by the Emley Moor transmitter and the keyboard driven programmer was all they owned to deal with this sort of technology. Working this way is a little like creating a book on a typewriter, but with no way of making corrections. Any changes or corrections required the book to be re typed from scratch. This works for small programmes, but the larger the


C.P.U.
(Z80A)
40 PIN
RAM
(6116)
24 PIN
EPROM
2716/32/64/128
24 PIN
PPI
(8255)
40 PIN
74LS04
14 PIN
24 DIL SKT
EDGE CONNECTOR
PORT A
PORT B
PORT C (LOW)
PORT C (HI)
SPARE
XTAL
LINK 1
LINK 2
AC=2732/64/128
AB=2716
N.M.I.
N/C
+5v
0v
RST
22K
100Ω
1K
10µ
100µF
220p
390
680Ω
0.01

programme the more the changes hurt. What was needed was an assembler coupled to an EPROM programmer. This would up rate the typewriter to a word processor, so changes could be made without a retype. I did get to implement this technology onto a Spectrum Computer, but not until GB3ET was built, programmed and running, and it proved a very useful tool for refining later software revisions. The Spectrum EPROM Programmer was just one of the projects in the Micro and Television Handbook, (now out of print).

The problem was the 8255 PIO (the chip that would provide the input output) would not initialise and stubbornly remained in tri state. I wrote several other small routines that terminated in Halt, which pulls down the halt pin and stops the programme and they worked, so perhaps the micro board was part working.

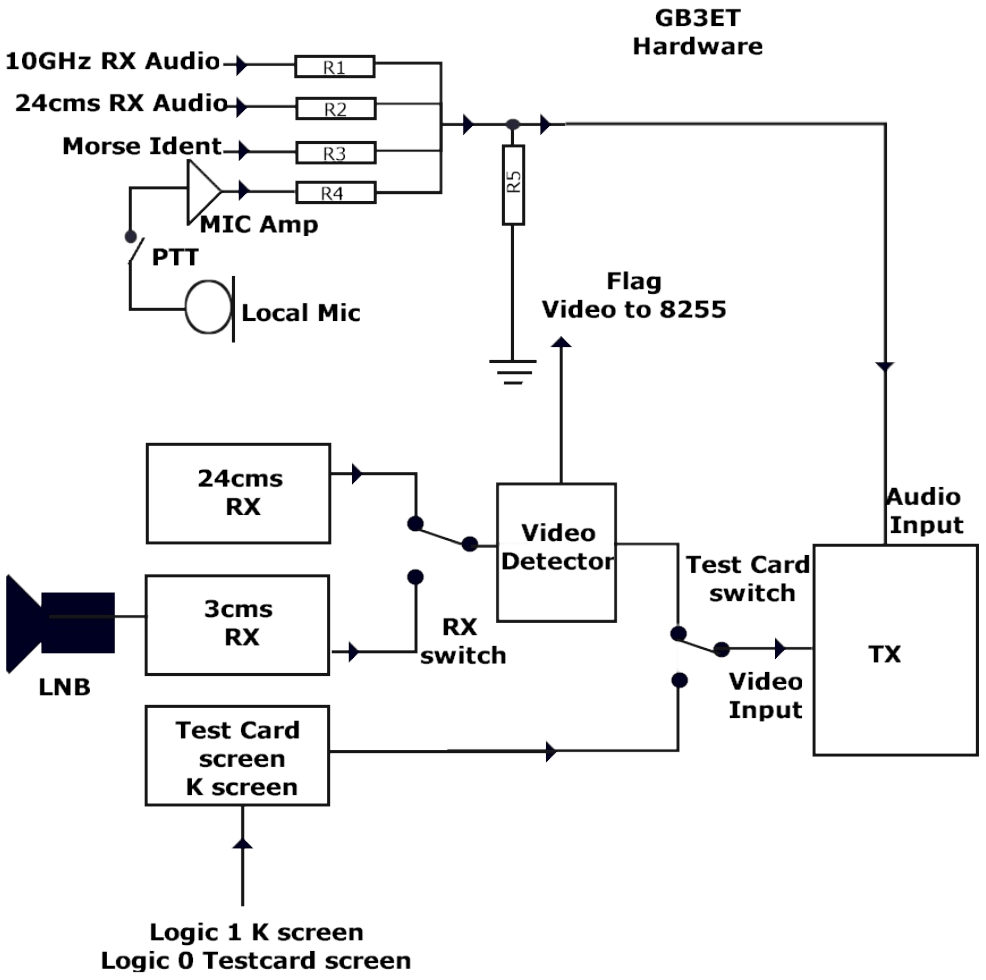
Checking and rechecking the data books on Z80 and the 8255 did not produce the answer, the 8255 is a brilliant chip but was designed to work with the 8080 CPU not the Z80 and I was starting to worry about that part of the design when I finally solved the puzzle. The hardware reset resets both the 8255 and the Z80 at the same time, but there was no data written in either book about recovering from a reset and the unpublished fact is the Z80 recovers first and starts running instructions that the 8255 is not ready to receive and as every program I had written started talking to the 8255 immediately after reset, it was ignoring the instructions until it had recovered from its own reset long after the Z80 had pushed the instructions to it. A quick revision of the software to include a delay routine before 8255 initialisation and the problem was solved. One week into the ET build we had logic running, not bad, well it would have been quicker if it had not been for a procession of people banging on the workshop door because there VT machine was broken. Just because I was the on duty VTR fixer was no excuse it was quite obvious I was busy.

The software needed lots of work to set up the time out loops and generate readable morse, being a G8 (B class license) Morse code was beyond me, but there were several G3's (A class license), on the telephone who would listen and comment, eventually we had working software and pleasant Morse code identification (so I am informed).

The next stage was board 2 where we could interface video detectors and switching to the micro. Initially the video switching was relays that chattered and would probably have a short life but modular construction meant better more advanced, modules could be constructed and the present modules relegated to the spares box for emergency fixing and diagnosis.

The audio was mixed not switched, the idea came from a visit to Germany where I stayed at the QTH of Heinz DC6MR he used to work through a dual input ATV repeater with the logic of first person to access either input has their sound and pictures relayed, second person in, (other input) is audio only so you get duplex sound. Not only is it brilliant but it so easy to implement, I added the local PTT microphone so that anyone working on the repeater on site had one way communications and it proved very useful.

The video detector was the standard sync separator and tone decode PLL that nearly every repeater used at the time, the diagrams have long since gone but this diagram that appeared much later in the Dutch ATV magazine Repeater (now also defunct) is as near as we can get to the detector used on ET. Hans Bruin (the author) also added electronic switching to his unit, which was also on the ET MK2 switching card. By the end of the second week and ET was making progress. The next problem was the Electronic Test Card and like all good ideas the solution came from an unlikely source, this one was the company skip.



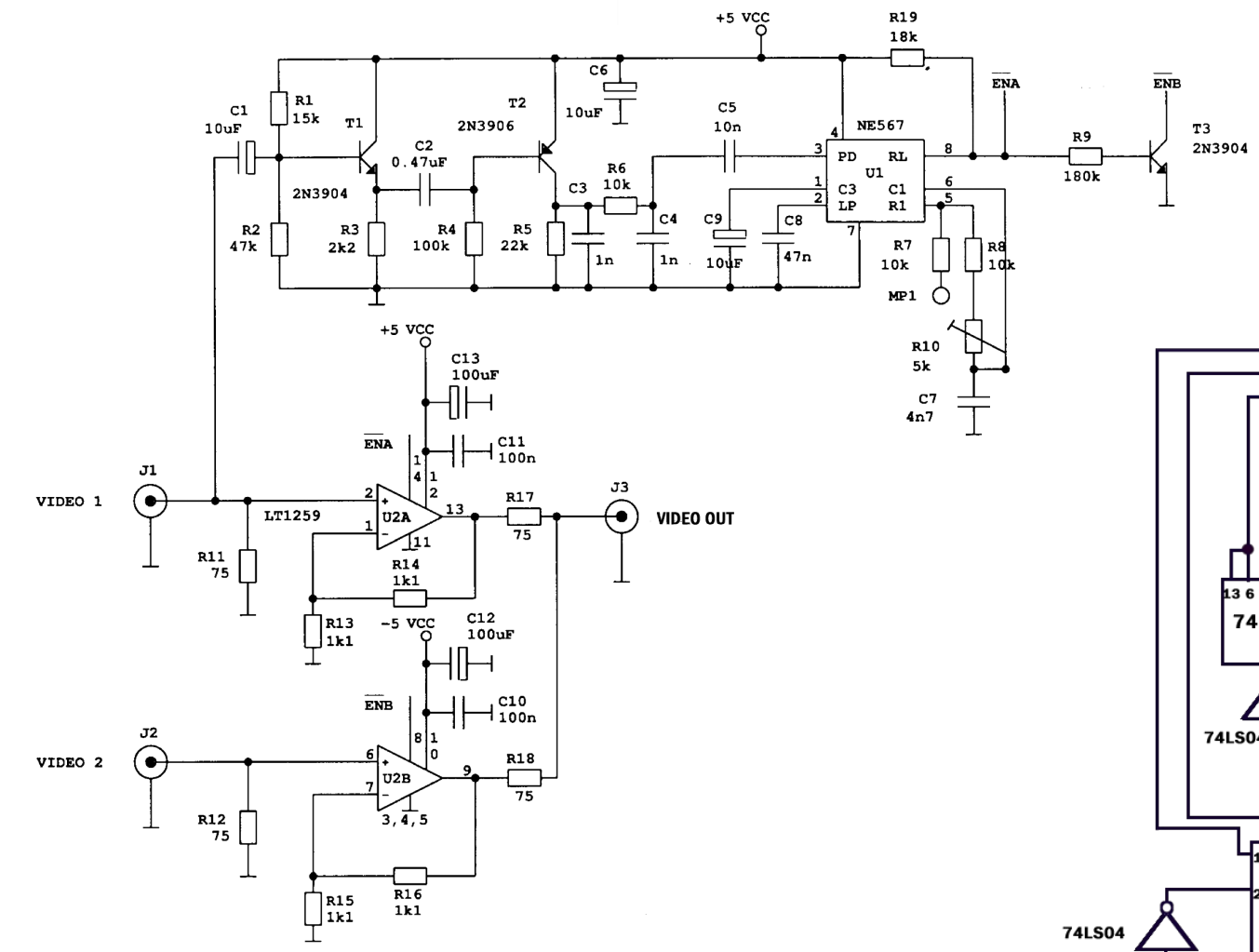
A damaged TV receiver had been placed there, just outside the office door, the TV set was beyond repair, but it had a salvageable Teletext decoder. Teletext, also a defunct system, is a stream of data transmitted by the broadcasters in the vertical interval, the selected page can be stored in RAM memory and displayed on the screen. Replace the RAM memory with an EPROM and you can programme up well not only a test card but a screen display that will fill nearly all the TV screen with rather chunky graphic blocks or text. The salvaged decoder would not fit the card frame, but it yielded the idea and the chip set. It meant writing another EPROM and designing the unit and wire wrapping it up. I added page switching to the EPROM, so we had the ET screen and the time out K. This design was later reproduced in the ATV compendium (Now out of print) and proved very popular with other repeaters right down to the test card display. It was RGB out and required a PAL coder but I think we initially used the TEA 2000 which was popular in TV games consuls. The end of week three and we had the time out screen and K screen.

I was at the time undecided about the Teletext pattern for time out, I had envisaged a test card, but it turned out to be a good decision and in the MK2 Logic the EPROM pages we supplemented by a RAM page that could be updated over the air via remote keyboard access. The data was pure ASCII text and was sent as a dual data tone on the ET audio Channel. This made possible a news screen for the area, explaining any changes to ET, promoting local amateur events, and apologising for any ET outages of which there were some in the early days, due to CPU crashes, but by then crashes were a thing of the past, but on the first logic they meant a round trip for me of several hours to visit the site, log in with IBA staff and ascend the tower, just to press the reset button.

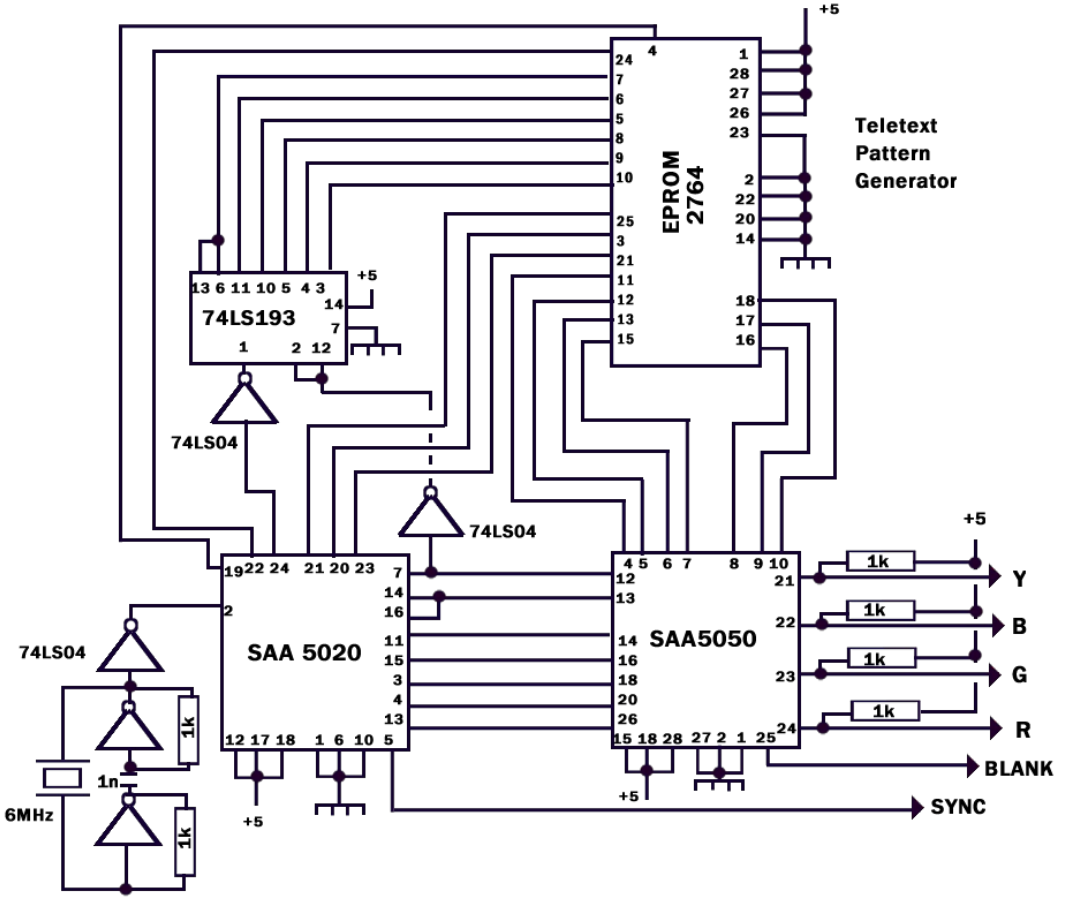
I did find an alternative and that was to use the Yorkshire TV Outside Broadcast Links department, let me explain. The Turret room was used to relay live TV programming such as horse racing and other numerous live sporting events back to base via point to point microwave links. The last link in the chain was to set up a manned dish in the Turret room that would be the final link and could send the broadcast back via land cable from the Turret room to the studio. So if ET crashed and horse racing from Redcar was imminent, I could ring the Turret room crew on the direct phone line and ask them to press the reset button. The room was only crewed

during live sporting events, but these were fairly frequent in the 80's.

of 40KW of RF, remember the Turret room is just below the main TV transmitting aerial.



The fix was twofold. First replace the CPU card with a PCB designed one and secondly add a watch dog, this is a simple timer that periodically generates a CPU reset pulse, the pulse is never delivered because the CPU keeps resetting the timer via a PIN on the 8255, so if the computer crashes then no reset pulses, the timer completes its cycle and the CPU is reset. Both solutions the PCB CPU, the watch dog, and the



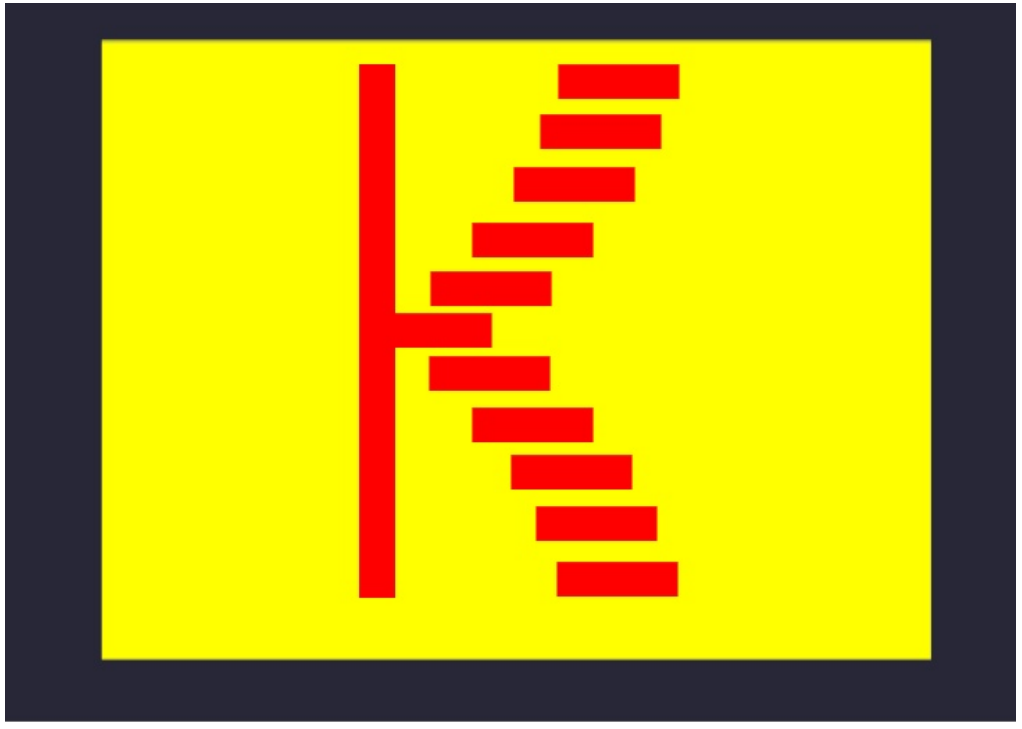
I tried several fixes for the crashes. The first one was to write a new EPROM to deliver the same software but by avoiding instructions that used RAM memory, push and pop commands etc, this did not have any effect. I suspect using wire wrap for the CPU construction to be the culprit, it never crashed in the workshop, but it was not subject to exposure

revised software to deliver watch dog pulses were all fitted in one master fix and the crashes were no more, and the Outside Broadcast links team could be relieved of one of their tasks on their frequent visits to the Turret room.

Week four was equally hectic there was an number of outstanding VTR problems to sort which had been sadly neglected over the last few weeks, but ET only required a TX, RX and aerials. The RX was a modified satellite receiver, which I unashamedly obtained by writing a begging letter to PACE the large satellite receiver manufacturer in Bradford and was pleasantly surprised by a phone call from their MD and invite along to their R&D department.

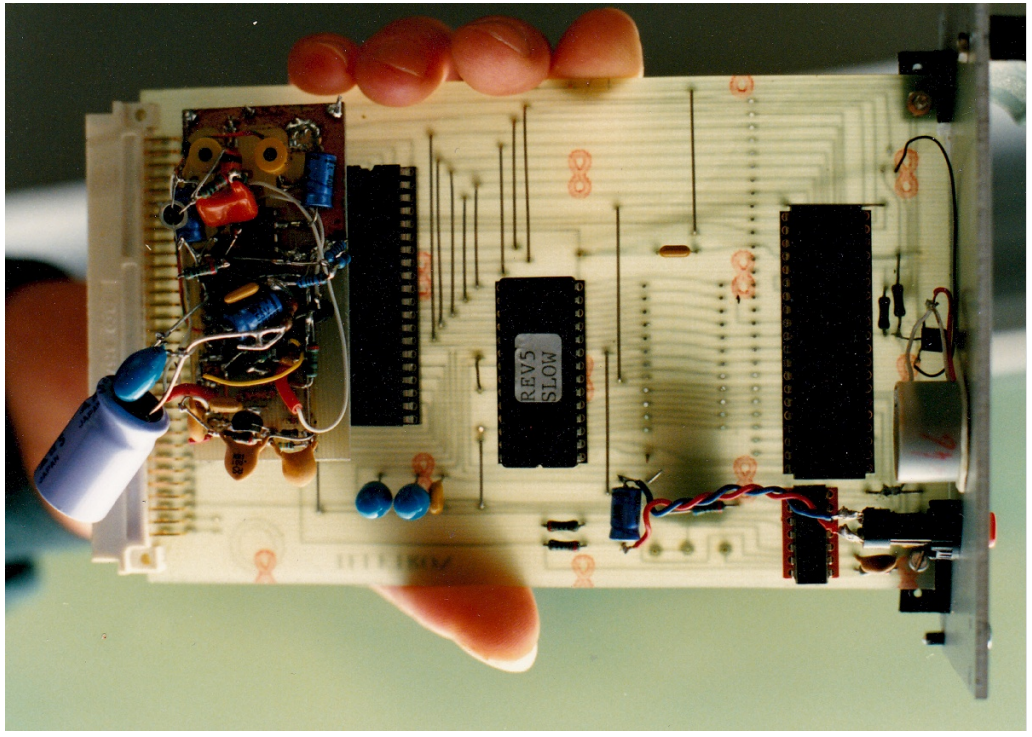
The design team were very helpful and I left with several early PCB's and diagrams that would enable me to harvest front end modules and design a Euro Card RX receiver utilising one of the modules. Week 4 and Card 4 was in the rack and working. I had help from two other amateurs. The first was the late Barry Keedy G6LIC and Ken Roberts. They had organised some liaison meetings at local clubs, which had raised interest and resulted in one or two donations, which we used to purchase a 24cms TV TX only 200 mW and I cannot remember the model but it could be grafted to a Euro Card module and the RX antenna a JVL Alford slot. The TX aerial was a custom designed curved reflector aerial designed and donated by ANT a local aerial manufacturer. Week 5 and we had a repeater, only 200 mw, but a PA would follow.

Week 6 was the install. It started with the largest scrounge, a 6ft 19" rack, which came out of the Yorkshire TV engineering department, a rather helpful ham Peter Blakeborough G3PYB worked there and not only passed the rack along to this worthy cause, he also helped with its install, the difficult part was getting him and me and the rack into the tower lift, but we did it. Although the ET project only occupied a small part



of the rack, we wanted to provide space of other Turret room projects, a microwave beacon and a proposed packet repeater.

Peter also fitted the Alford slot some 80 ft above the Turret room, but left me to bolt the TX antenna in place on the Turret roof, 1200ft above ground and on a windy day, was the most scary thing I have ever done in the name of ATV.



Early draft PCB with switcher and video detector on a DIL Header Plug

I had hoped for a grand switch on and I had in mind Grant Dixon G8CGK one of the founder members of BATC, alas he was not available, but some years later he visited Yorkshire and ascended the mast to approve of our work and see the fully populated rack, that Peter and I had put in place some years earlier.

By the end of week 6 I could ring Dave Long G3PTU and announce GB3ET was built fitted and working, his idea was now a reality. It was only 200mw, but a PA, which then flagged up the requirement for RF filters soon followed, but the Acorn was up and running 6 weeks from drawing the flow chart to powering up the unit on site.

Sadly the IBA became NTL some years later, and the peppercorn rent on the rack shared by all the amateurs with projects in situ was revised to unaffordable figures and the relationship ended and GB3ET along with the other amateur projects was switched off, I have never been back to the Turret Room since I took the photo of the late Grant Dixon. The hardware was not wasted it was relocated to Bradford and given the new call sign GB3YT.

Emley Moor Tower Lift, try getting a 19" rack and two people in at once

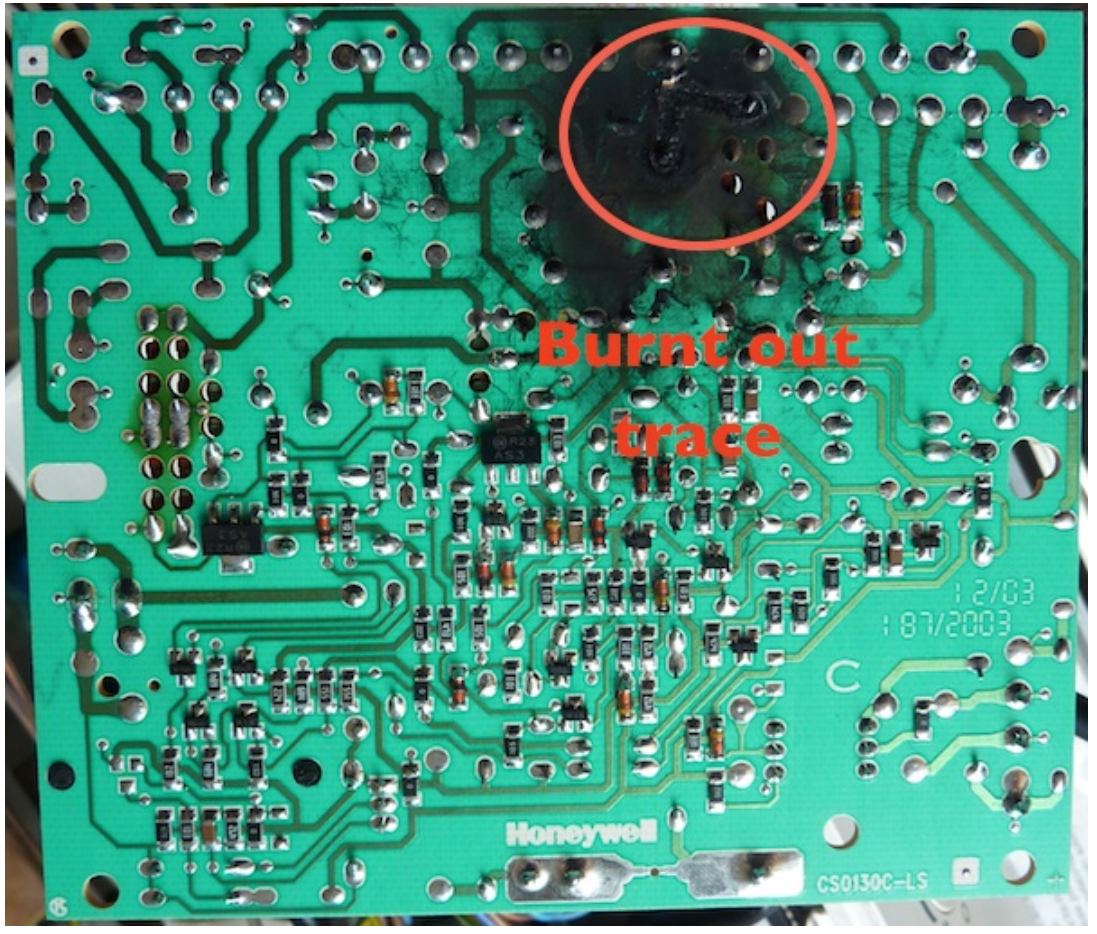
Development still went on. I bought a Spectrum computer and learned how to assemble and test Z80 code on it and designed an EPROM programmer, that interfaced to the Spectrum rear connector, so code could be revised and developed, without the difficult task of re typing EPROM from scratch, every time a software revision was required.

My book Micro and Television Projects was published in the spring of 1985 and included the Teletron micro board, which was supported by a PCB available through the Members services shop. (Micro and Television Projects is now out of print and not available as a download).

The Teletron PCB was used in other repeaters, and I received lots of requests for customised software which was now not such the arduous task to develop thanks to the Spectrum EPROM programmer. I also custom programmed numerous

EPROMS for the teletext pattern generator which appeared in the ATV compendium (again not available as a download), but the familiar graphic of three overlapping blocks in Yellow Blue and Green can often be seen on other projects, so some of the engineering ideas and designs live on. Happy days particularly being able to show GB3ET off to Grant Dixon.

http://www.ntlpa.org.uk/memorabilia volume 20 explains Teletext



Oops!!

DATV-Express can be ORDERED!!

It's been a long, slow 3 year process developing a quality state-of-the-art digital ATV transmitter board. The DATV-Express project team is pleased to announce that the software is now ready for production release and the boards can now be ordered via PayPal on the PURCHASE page of our project web site at www.DATV-Express.com. (Please note that you need to be logged in to the web site in order to see the PURCHASE page.) The boards are shipped fully-assembled and fully-tested.

Charles G4GUO worked throughout January trying to refine the "PCR jitter" design work-around that had stopped the start of sales at the beginning of January. In December the

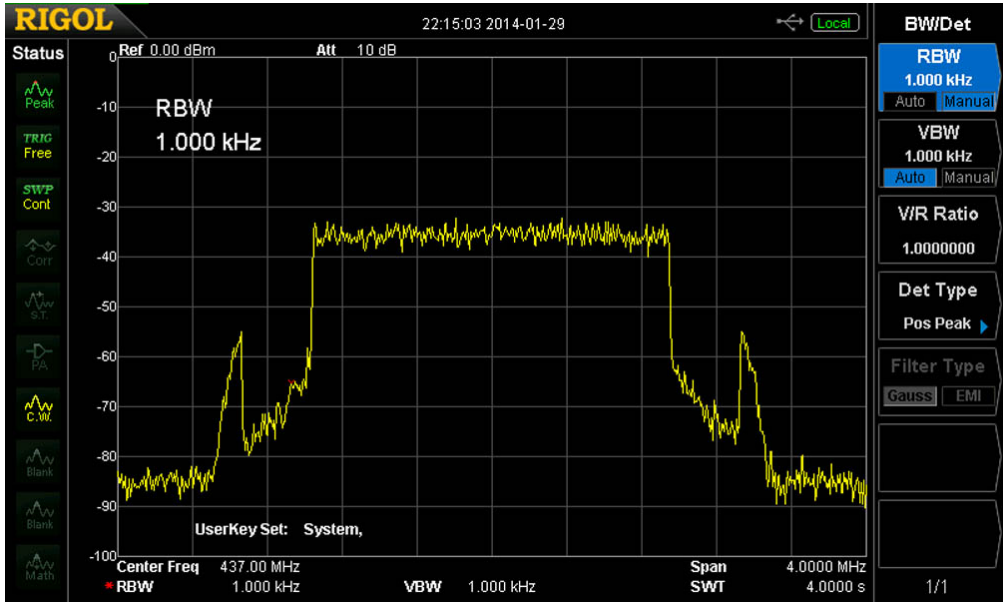


Figure 1 - DVB-T 2k mode using 2048 iFFT with aliases

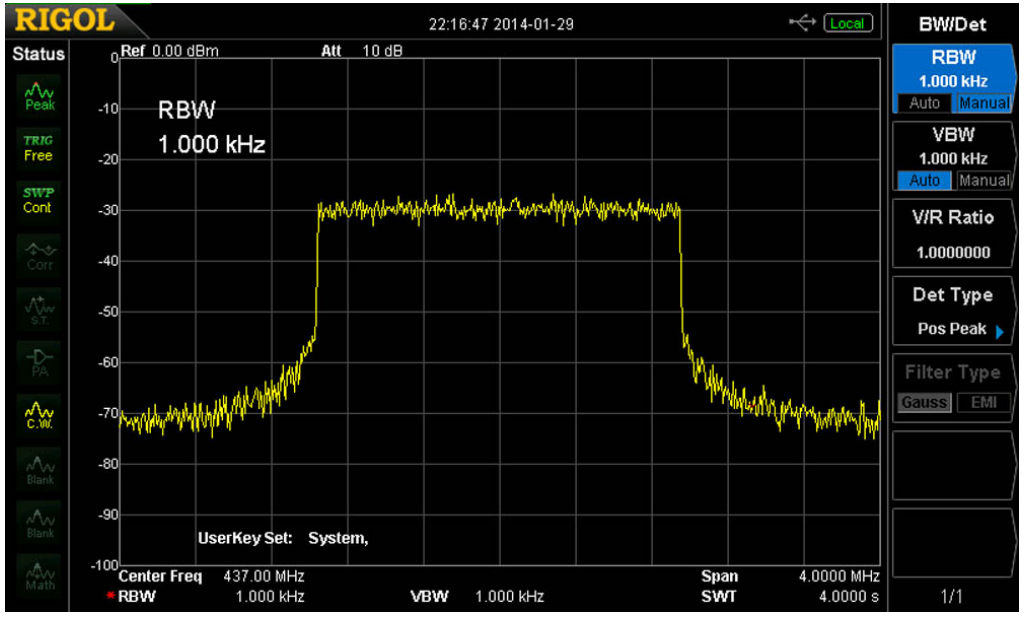


Figure 2 – DVB-T 2k mode using 4086 iFFT with no aliases

video was freezing after a few minutes because the video-time-stamps were arriving after the presentation-time-stamps. Slowly, but surely, the timing design was improved and Transport Stream analyzers now say the TS quality is good. Ken W6HHC ran a 12 hour transmission test without any interruptions. DVB-S now works very well.

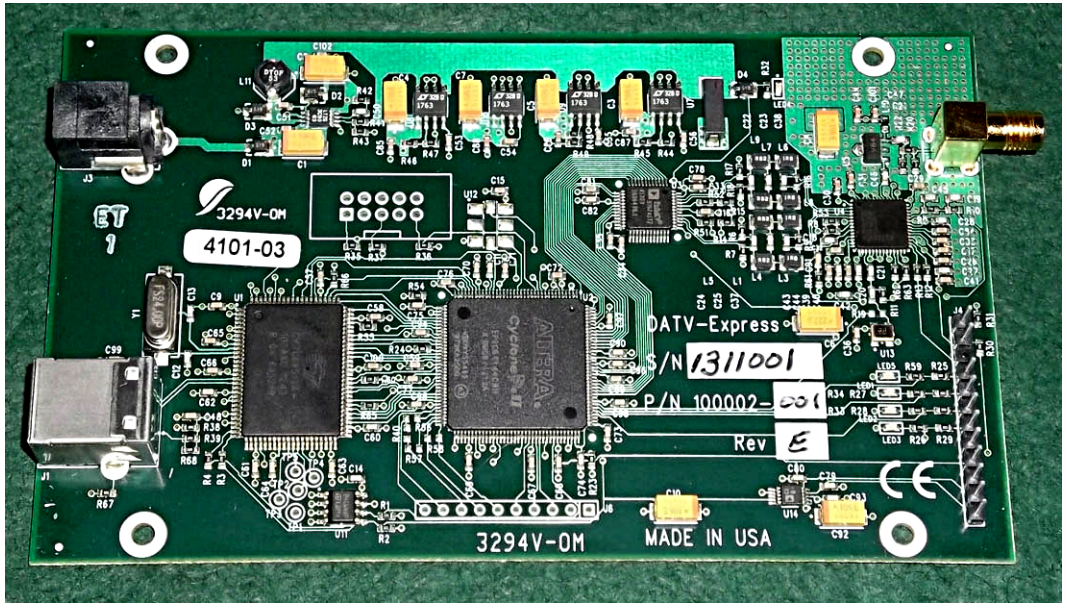
Charles, G4GUO also discovered a programming math mistake that had broken the DVB-T protocol back in November when some functionality was moved into the FPGA. The bug was fixed and now DVB-T is working again. For DVB-T protocol, at this point 6-7-8 MHz configurations of bandwidth have been reasonably tested. Testing has started on the new ham 2-3-4 MHz bandwidths of DVB-T, but this testing is not completed at this point.

Charles also tried to mathematically improve the nearby alias spurs that occur with DVB-T signals using his original "x1 iFFT math" (spurs shown in Fig 1 using 2 MHz bandwidth).

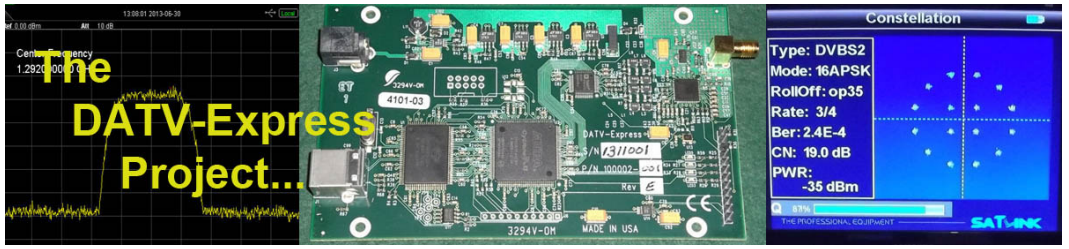
With a little mathematical and DSP magic, using 4096 point iFFT and using only the centre DSP bins, the others bins filled with zeros….the spurs have disappeared. See Fig 2. The main problem with the "x2 iFFT math" is that it doubles the USB2 traffic/load for IQ stream. This "x2 iFFT math" will work OK for a DVB-T 2 MHz bandwidth signal. But at DVB-T 7 MHz bandwidth….the IQ stream will exceed the capacity of the USB2 interface.

The main priorities of the project team for the next month will be to focus on the initial sales process, respond to the inevitable tech support e-mails that will come in, and finish building the next batch of production hardware boards.

"full speed ahead"….de Ken W6HHC

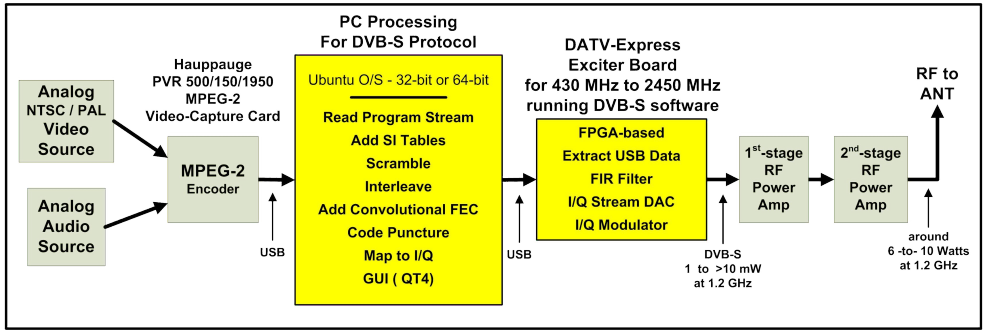


Commercially assembled PCBA



System Block Diagram for DATV-Express

The most important concept about the DATV-Express board is that it is software-based SDR radio. While the system block diagram for a typical Digital-ATV DVB-S transmitter using the DATV-Express board is shown below, the modulator chip and software can also produce several other types of modulations and protocols, such as COFDM for DVB-T and 32APSK for DVB-S2.



System Block Diagram of typical DATV-Express transmitter set-up for DVB-S

And what does the board look like? (<--- See image left.)

This is just the beginning. Keep watching as these pages are updated.

by John Hudson G3RFL

Interesting to read Trevor's story of GB3ET and how it was developed using Z80 logic, (Yes I see a copy in advance of publication). GB3FY uses a PIC micro controller which was not around when Trevor was putting GB3ET together. The PIC has a built in I/O port, RAM and Programme storage memory so it does not need the 8255, the 6116 or the EPROM. This makes for a much smaller control logic and considerably simplifies the construction of this part of the repeater.

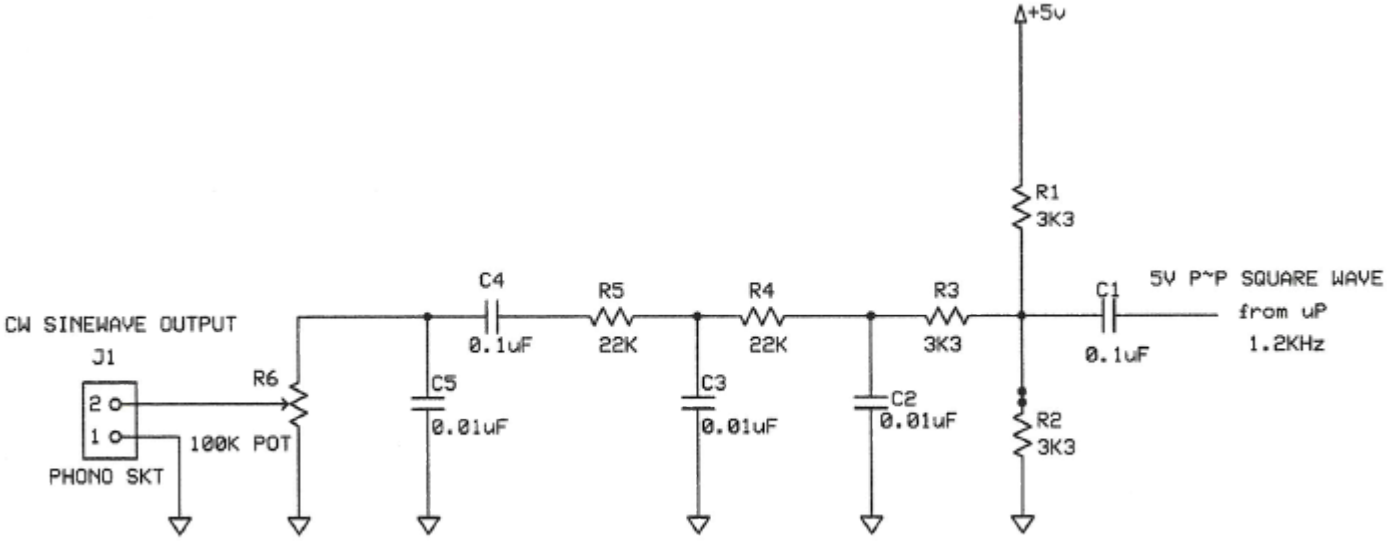
One problem both logics have in common is that they generate the Morse code identification for the ATV for the repeater. The I/O pin that delivers this signal, delivers a series of dots and dashes using a 1.2KHz tone at 12 WPM, this is all produced by the repeater software.

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

First the plop R1 and R2 put the DC level at half the supply (2.5V). The DC blocking cap C1 is also required to isolate the 2.5V from the I/O pin which has been declared as an output.

Next we roll off some of the higher frequencies with a few RC filters R3-C2, R4-C3,R5-C4=C5-R6 POT….

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



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

Tom Medlin, W5KUB, at Dayton 2013

Have you ever wanted to go to a Ham radio event such as Hamvention but you were not able to for a number of reasons?

Well, with just a computer and internet connection you can now attend these events. W5KUB.Com has been webcasting hamfests for over 11 years. The broadcast has viewers in over 150 countries, and pulls an audience of approx. 50,000 viewers during the Dayton Hamvention.

The W5KUB Helmet CAM

Every year W5KUB.COM has been webcasting we have been making improvements to the equipment and the technology.

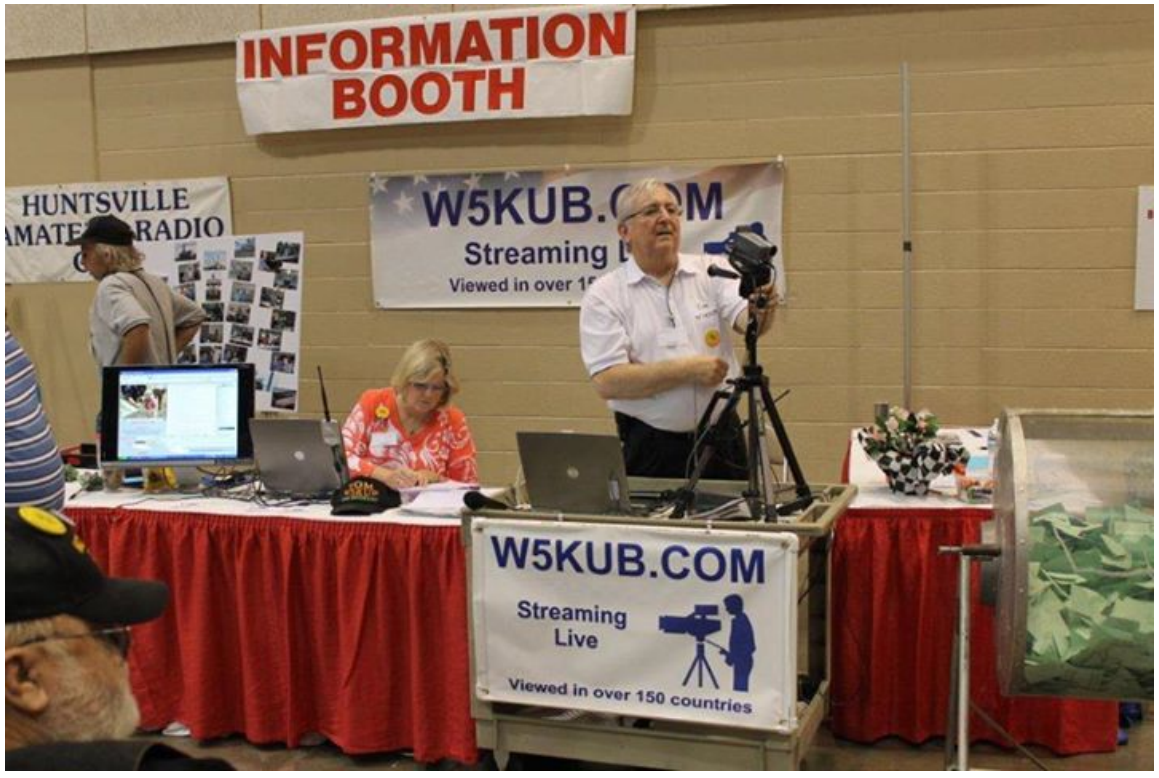
Today you can watch near HD quality video of these events in full screen on your computer.

There are several different aspects which make our webcast enjoyable.

First our webcast page has a chatroom where hams around the world can log in and chat directly with the W5KUB.COM group at the event. In addition to being able to ask real time questions and receive answers from vendors such as MFJ, ICOM, Yaesu and more, you are able to chat with other hams some of who are located on the opposite side of the world.

Secondly, and this is the fun part, W5KUB.COM gives out prizes to their viewers. There is no cost to anyone. You just have to be logged in to the chatroom and we randomly pick names from the list of those logged in. If you claim your prize in the allotted timeframe, you win it. Prizes are then normally shipped out to the winners within 3-4 days after the event. Prizes vary from magazine subscriptions to high end equipment such as DSTAR radios, Wattmeters, HTs, Dual Band radios, antenna tuners, microphones , and more. In all, over $26,000 in prizes has been awarded to viewers in the past 2 years. This is more prizes than many hamfests give out.

And thirdly, the viewers get to virtually make the trip and ride along during the drive to and from the hamfest. The webcast usually starts one or two days before the ham event. You are 'virtually' in the passenger seat and experience the entire drive even when we get pulled over by the police! You also get to see the scenery. APRS on the W5KUB.COM page will show you exactly our position and speed.



Tom W5KUB at the Huntsville Hamfest 2013

W5KUB.COM plan to expand the next Hamvention show with new and special guests in addition to regular interviews with manufacturers. To insure the best quality video, we will have a dedicated Ka band satellite uplink installed for our internet connection.

The 2014 Dayton Hamvention webcast schedule is as follows:-

Wed. May 14th 1400 UTC go live as we begin the drive from Memphis, Tn To Dayton, OHIO 550 Miles and 10 Hours of driving

Thurs May 15th 1500 UTC begin the set up of the broadcast booth at hamvention. During this time you will also see many people you recognize.

Friday May 16th 1400 UTC Hamvention webcast begins

Saturday May 17th 1400 UTC Second day of webcast

Sunday May 18th 1400 UTC 3rd day of Hamvention webcast.

Sunday May 18th approx. 1900 UTC begin the webcast of the drive back to Memphis, TN

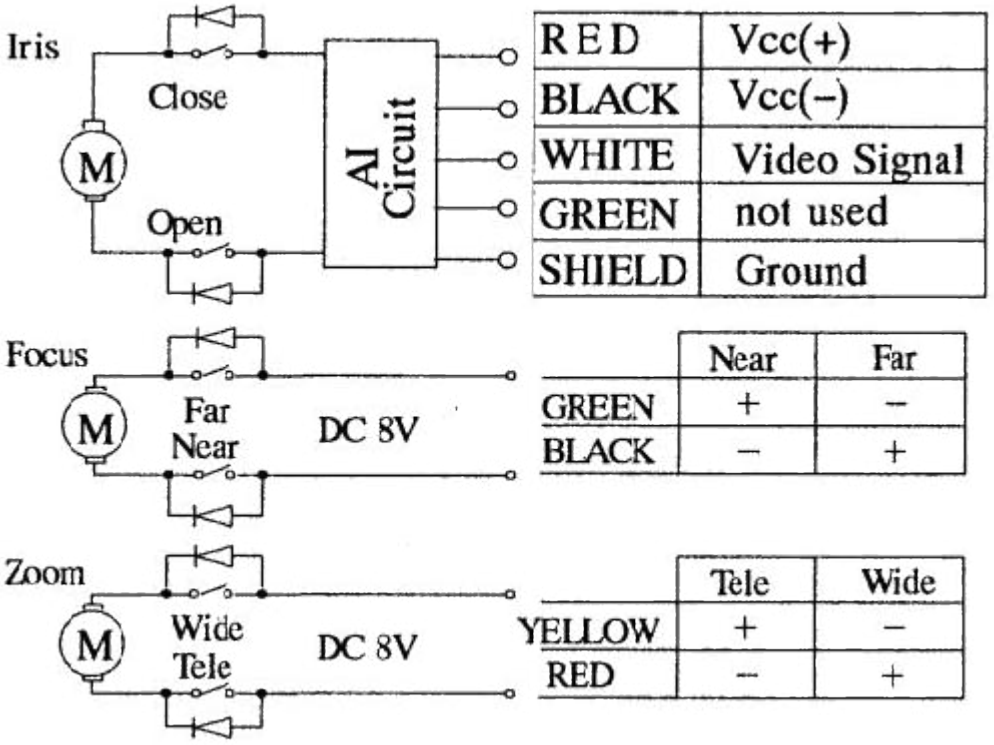
W5KUB.COM has a facebook group for people to follow the broadcast and to give suggestions throughout the year and also talk about all aspects of ham radio. Our facebook group is https://www.facebook.com/groups/w5kub/

By Richard VK4XRL

In the last issue of CQ-DATV we looked at ways to control repeaters either analogue or digital, this part we will be looking at lens control.

During the past few months I have received a couple of cameras with lens with however only one control unit. The cameras are Panasonic model type WV-CL352. The operational manual can be found here http://www.manualslib.com/manual/305907/Panasonic-Wv-Cl350.html#manual

The lenses fitted to these two cameras are from Computar TV zoom lens Model M10Z1118AMS and information can be



	RED	Vcc(+)
	BLACK	Vcc(–)
	WHITE	Video Signal
	GREEN	not used
	SHIELD	Ground

	Near	Far
GREEN	+	–
BLACK	–	+

	Tele	Wide
YELLOW	+	–
RED	–	+

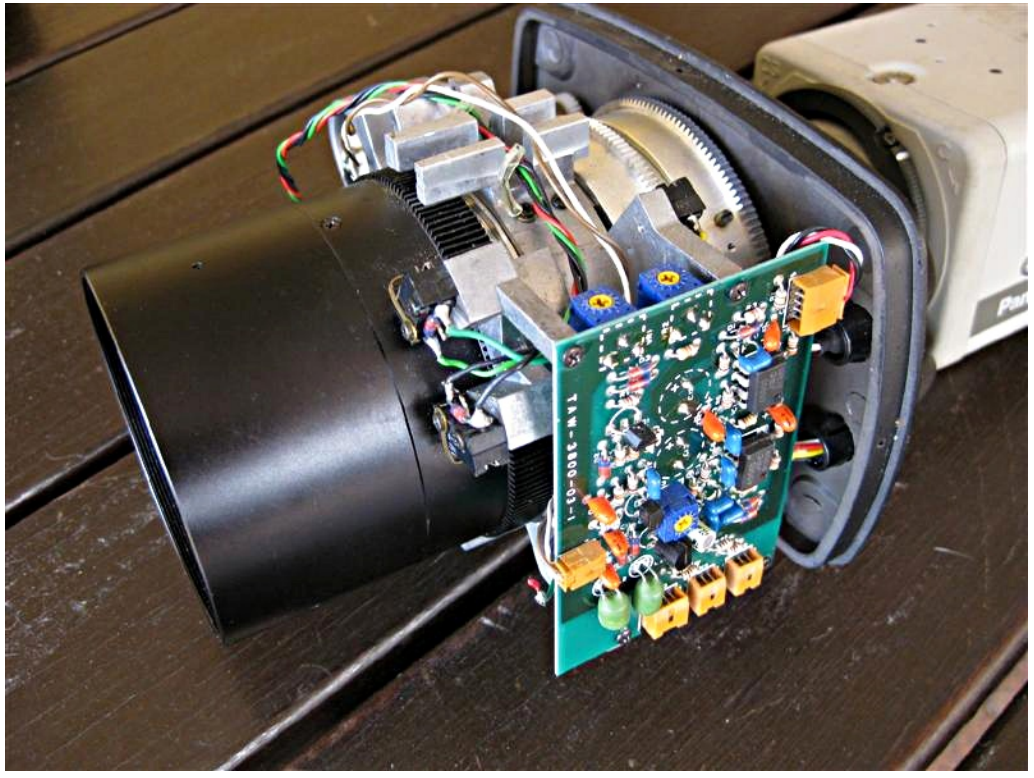
Remarks: Connect together with Black (Focus) and Red (Zoom) for common system when necessary.

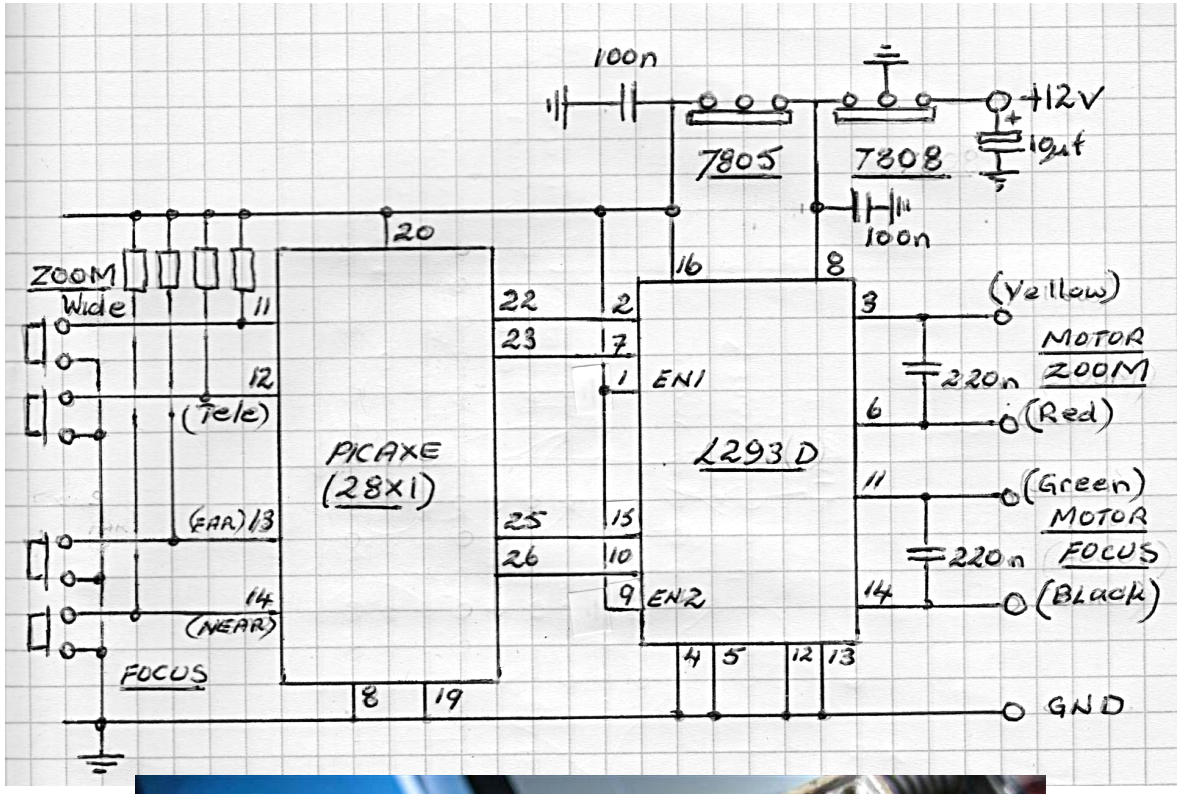
obtained here and includes a wiring diagram as shown: http://computarganz.com/misc/Computar_Lens_Tech_0208.pdf and http://computarganz.com/misc/Computar2012.pdf

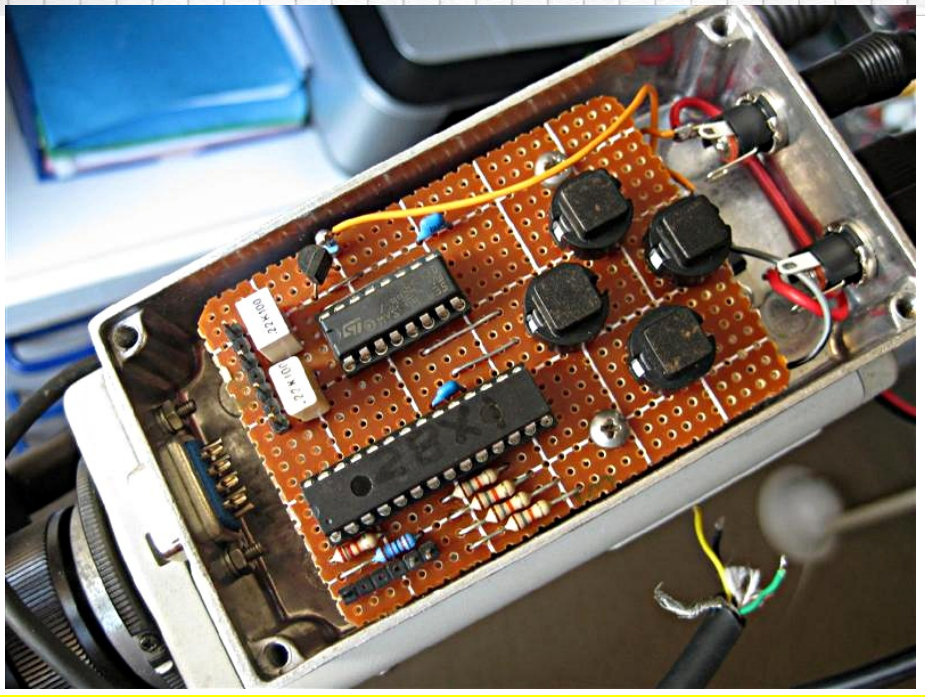
Unfortunately one of the motor gears had a missing tooth which needs to be fixed. The control unit that came with the units had separate switchers for Zoom and Focus. As the wiring was a bit of a mess I set about to see if I could come up with something a little better. I am sure others could see different ways to control the lens but I took the kiss principle and tried to keep it as simple as I could. My first thought was to use the Picaxe, I had a couple of spare 28X1's which I know are an over kill in this situation but could be placed at a

later stage. The Picaxe controls a L293D or equivalent motor driver IC (http://www.engineersgarage.com/sites/default/files/L293D.pdf). The circuit is shown below. Note that no serial interface or reset are shown, however these can be added and the 28X1 replaced with a Picaxe 14m2 with the required pin changes and software should do the trick.

This last picture shows the completed prototype. Where do

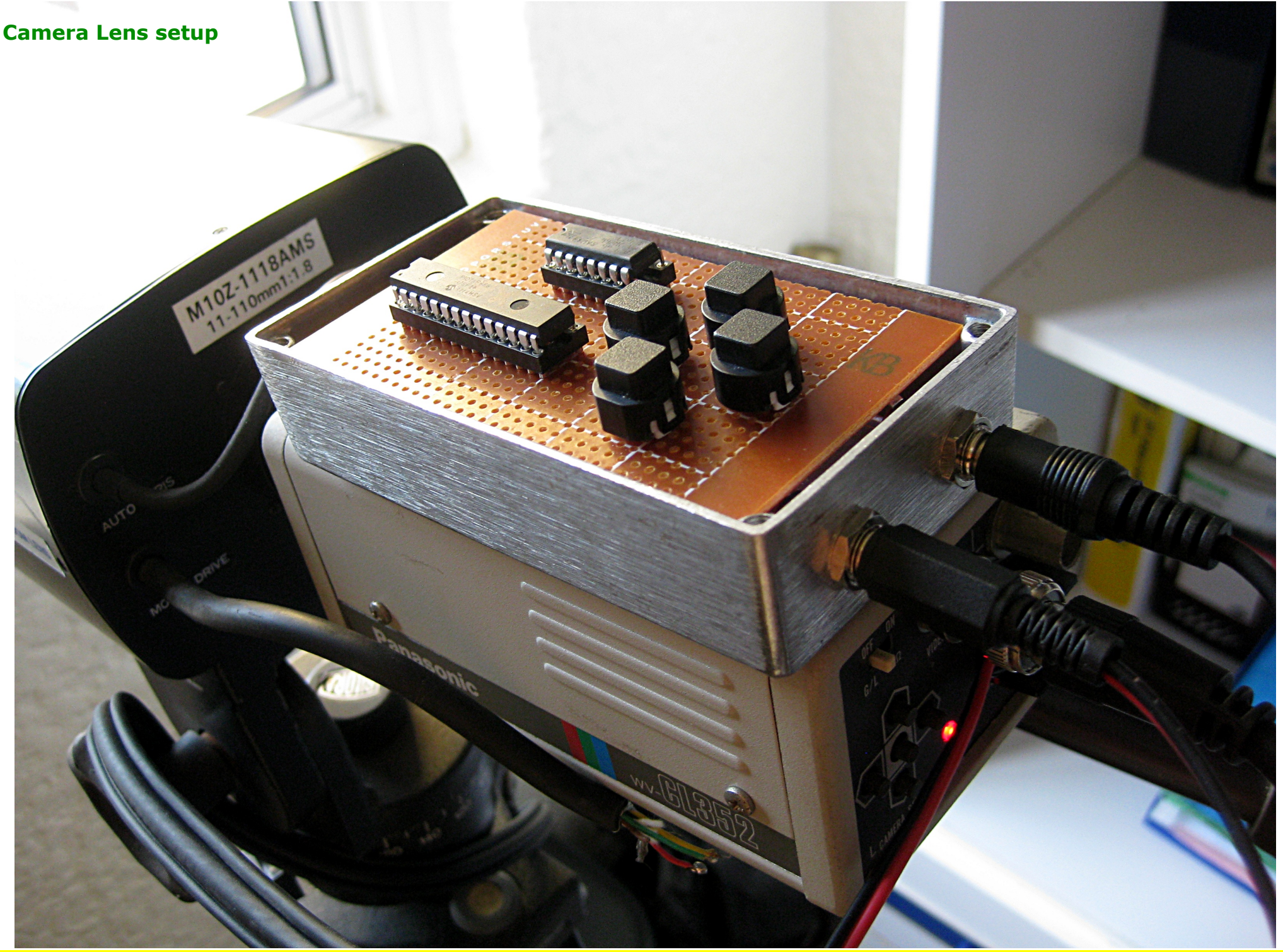






we go from here? I am looking at now providing wireless control of the unit with video TX included back to the control point. If anyone has some ideas please feel free to add them.

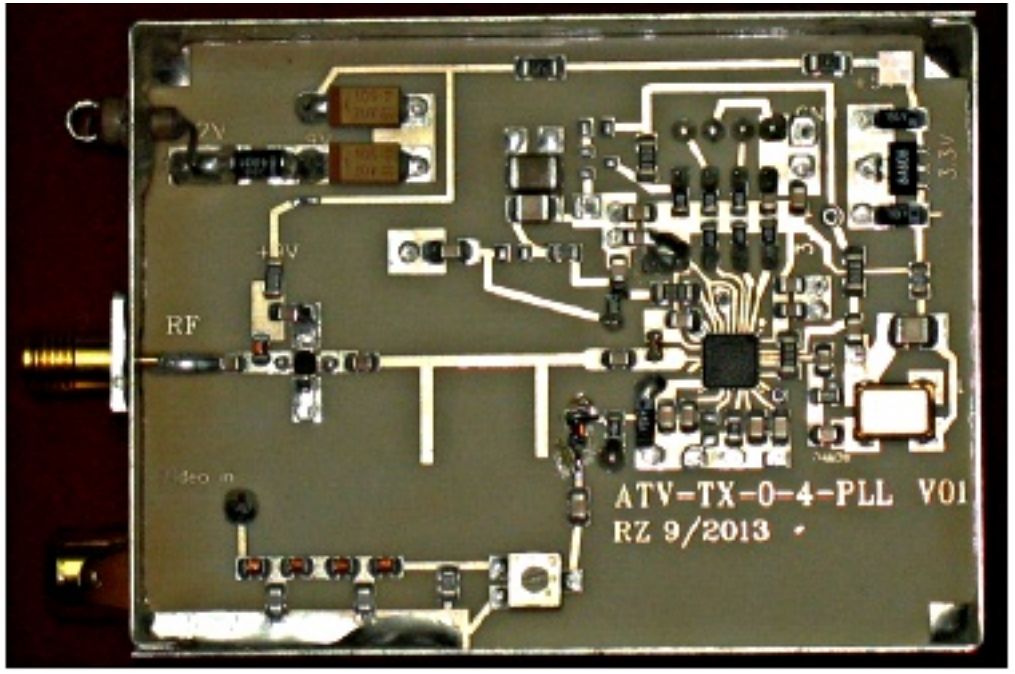
Camera Lens Controller


M10Z-1118AMS
11-110mm1:1.8
AUTO
DRIVE
Panasonic
WV-CL352

A multiband FM-ATV transmitter from 1.2 to 3.5 GHz

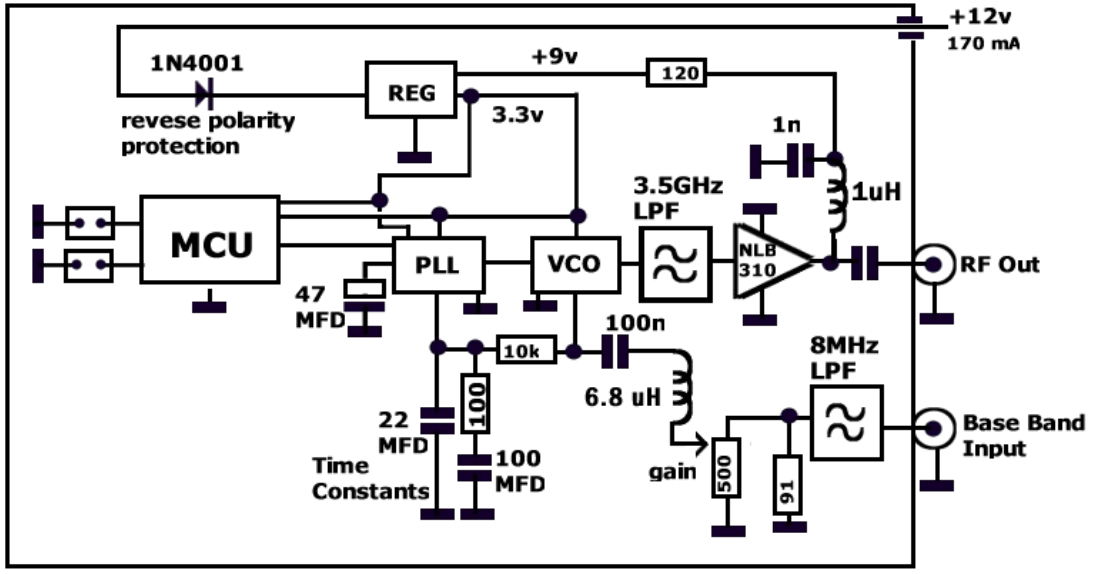
by Roberto Zech Dg0ve

Yes we are all moving towards DATV, but FM is not yet dead, when Trevor first imported FM receiver kits for the BATC online shop, he sold out in a matter of weeks and had to re-order several times, until eventually he ran out of front end modules. The front end modules were ideal for ATV but were discontinued by the manufacturer and this brought the supply of the popular receiver kits to a close.



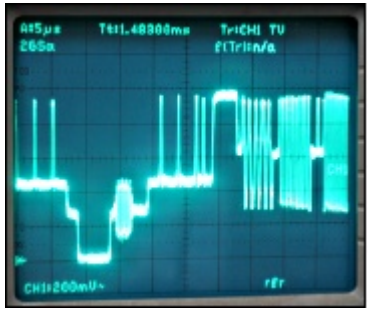
Trevor had many request to follow it up with an FM ATV transmitter and until now that has not been possible. I have now put together a modern state of the art FM ATV TX which has a frequency range of 1.2 to 3.5 GHz. This time it is not a kit it is a complete ready built unit, tested and ready to go and will deliver 25mw of RF.

I started this design with a study of the datasheet for the Analogue Devices IC ADF4350/51 This is PLL (Phase Locked Loop) that will function over the range 2.2GHz to 4.4GHz and is divided into 16 overlapping frequency ranges.

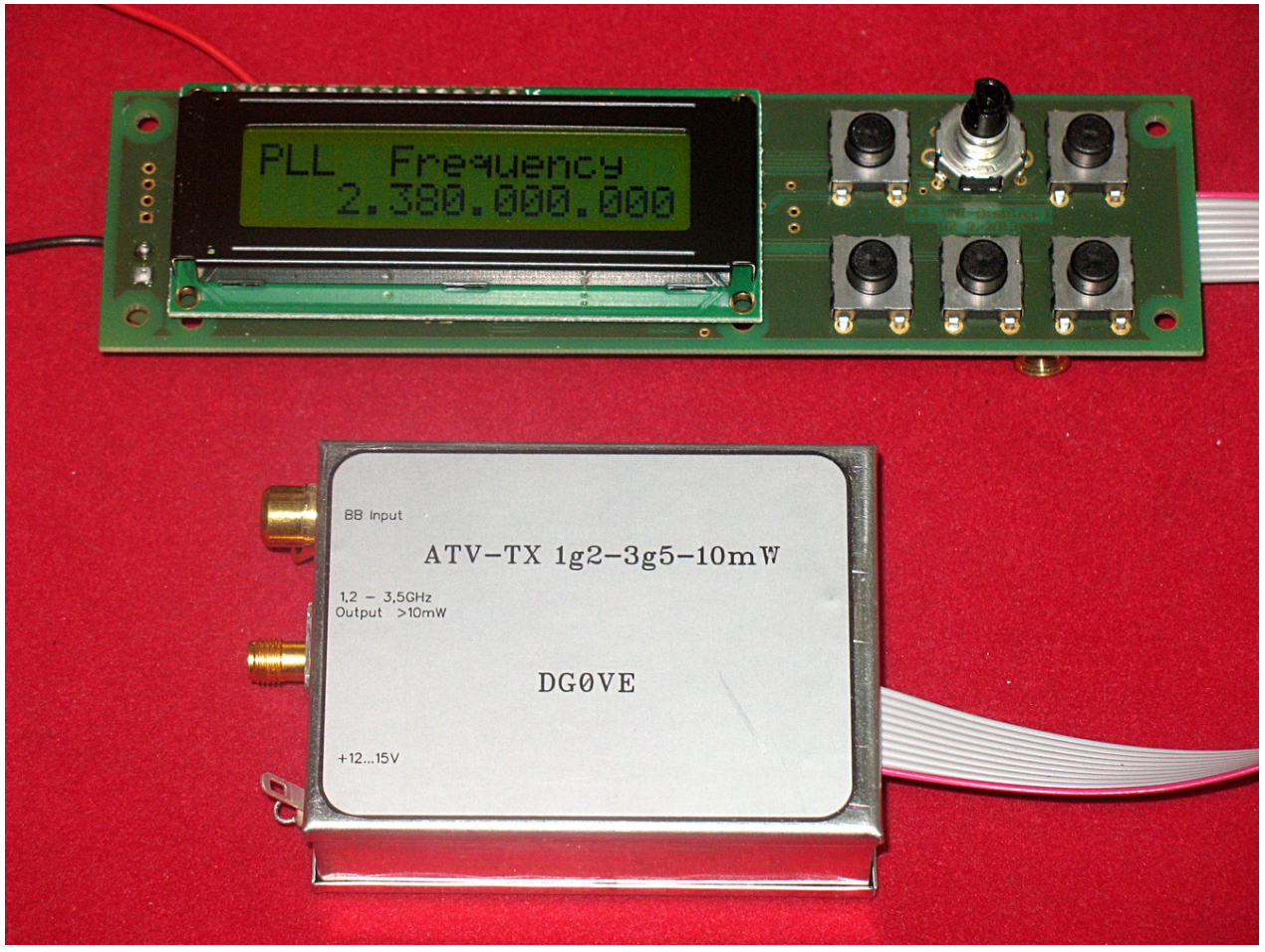


It is possible by using a divide by 2 to get the IC to cover 1.2GHz, this halves the deviation so the modulation voltage has to be increased and as a result is a little over the normal 1v, approx 1.2Volts for 23cms. The base band input is filtered to 8MHz with a combination of L C filters.

The loop filter is important for FM ATV. It must have a slow time constant so as not to compete with the video modulation and 100MFD and 100ohms with 22 MFD in parallel, was the final choice.



Demodulated output of the unit



Both units connected together

about 1 to 3 mw, by the addition of a NLB310 this is increased to 25mw , but again this is frequency dependent and the worst case was 15mw at 3.5GHz. Unfortunately, the ADF4350 also does not deliver a true sign wave signal and so some external filtering is required between the transmitter and the aerial.

There are data sheets available for the ADF4351 at:- http://www.analog.com, http:// www.Hittite.com

The NLB310 at http://www.rfmd.com/CS/Documents/NLB-310DS.pdf and the ATtiny 13 datasheet at http://www.atmel.com/images/doc2535.pdf

Rather than supplying kits I have made this transmitter available as a complete built and tested unit, as many of the components are surface mount, the control panel is supplied as a populated PCB so you can easily add both units to a case of your choice.

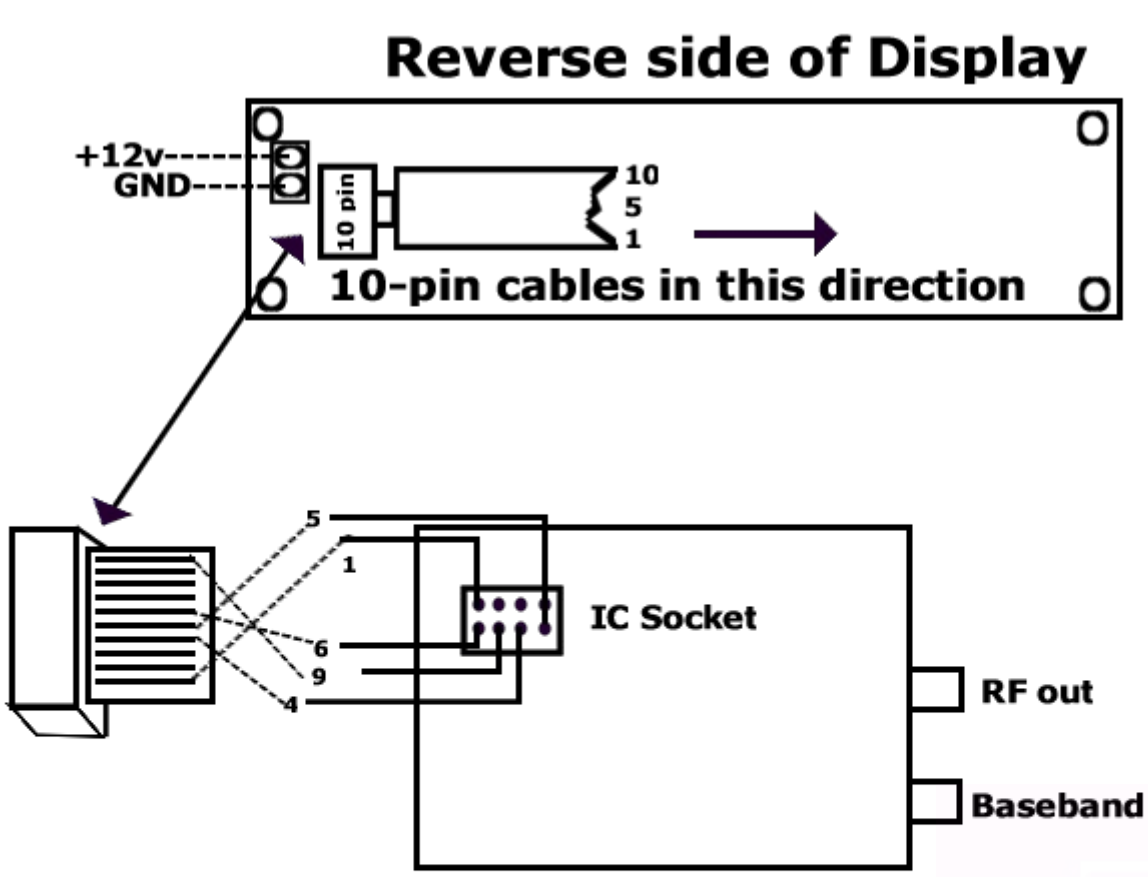
Completed units of the transmitter and control panel are 110 euro's each or 199euro's for the pair and can be obtained from Roberto Zech, DgØve, http://www.dgØve.de

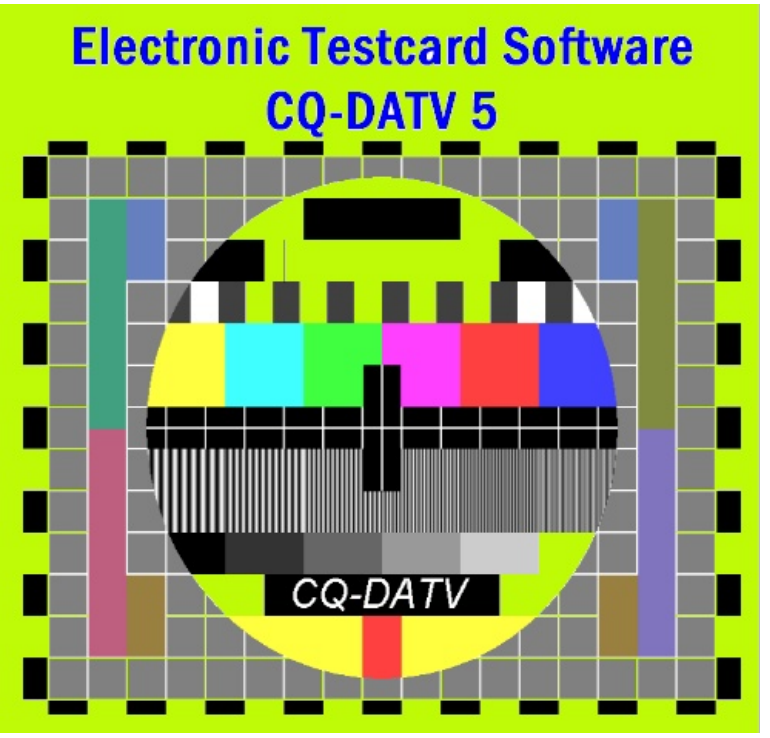
The programming of the frequencies is as per the datasheet , the processor is an ATtiny 13.You can choose up to 4 fixed frequencies or alternatively you add the display and control panel which will enable continuous tuning and a digital display of the transmitter frequency, this requires a larger processor. Although not included external multipliers can be added for 5.8GHz and 24GHz (one of the advantages of FM ATV).

The output of the ADF 4350 is frequency dependent and is

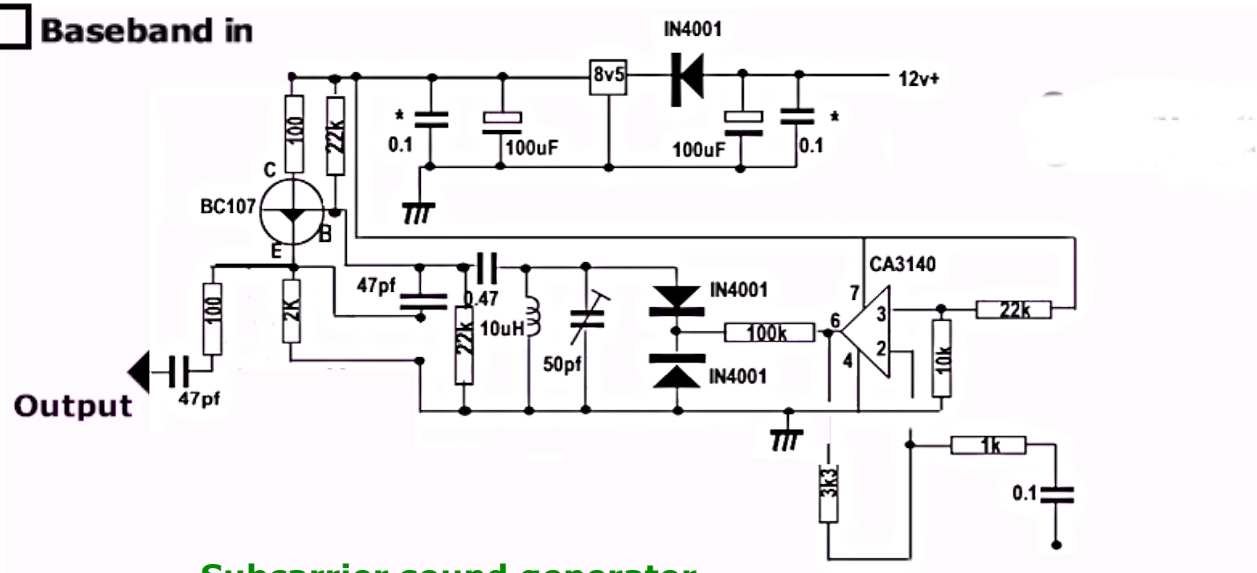
The transmitter does not have audio, but the above unit was designed by John Hudson G3RFL for just such an occasion and appeared in CQ-DATV 2.

Visit our web site at http://cq-datv.mobi





MHz	J1	J2
1250	0	0
2343	0	1
2300	1	0
3450	1	1



Subcarrier sound generator

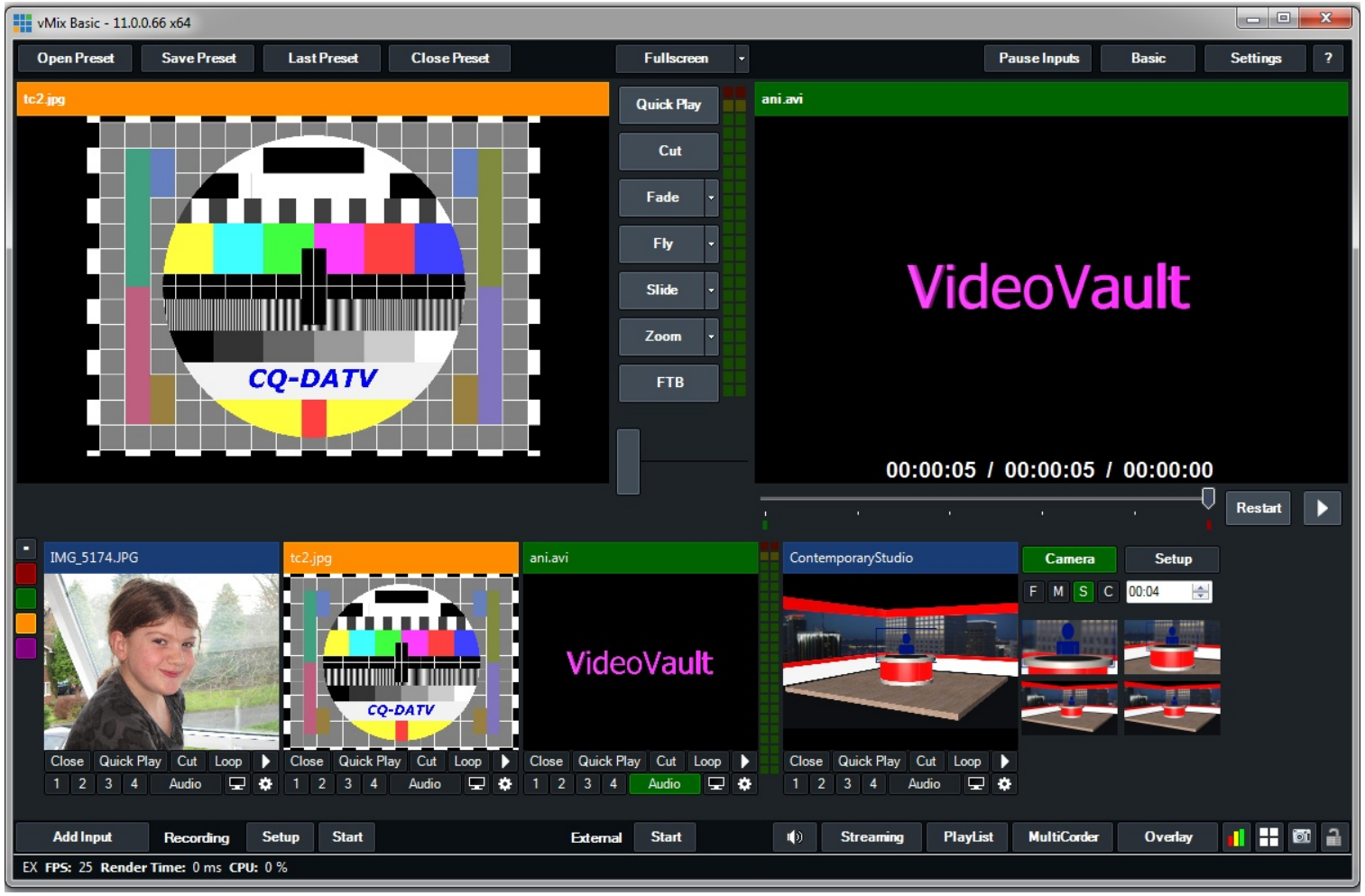
Vmix 11 Tally Lights

By Trevor Brown

Back in DATV5 I reviewed Vmix software for a multi camera shoot for either streaming or on site recording, that was version 10 and version 11 is now with us. There is still a free download of this new version http://www.vmix.com.au/ and it has grown a lot more features, but the main one is Tally Lights.

The USB control of separate Tally boxes, that can be fitted to each camera is still possible, but on version 11, they have gone one step further and added tally lights that work by Smart Phone or Android Tablets.

If you are televising an event and want to get the best shots then you need to man the cameras and each camera operator needs to know when he is on air or more important, not on air, so he can compose his next shot, and until now this has involved pulling in extra tally cables and all the associated problems, with Version 11 you can use Smart Phones or Tablets over the WI FI with one provision, the smart phones or Tablets must be on the same WI FI as the PC running the Vmix switching software. I must stress the Vmix PC must be linked via WI FI and connect by LAN to a router with WI FI is not sufficient.

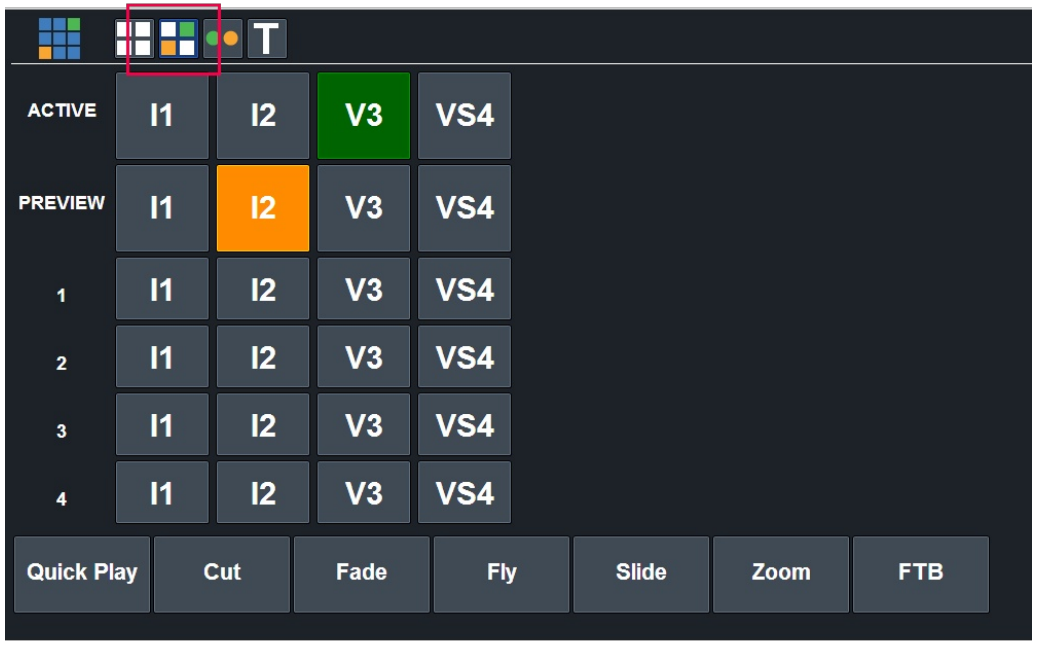


Another added feature is that any one of the Smart Phones or Tablets can also work the vision switcher which is very handy if you are short on Crew.

This would enable one man operation of both a camera and a switcher, so a wide unmanned camera could be selected while the shot is composed on the second manned camera and then switched on line by that operator.

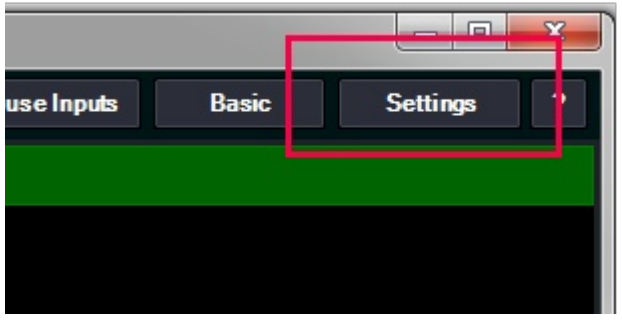
The remote screen is shown here, select the indicated icon to obtain this display. To switch a camera select it on the Yellow matrix and the select Cut or fly, (if you must) to make the cut on

the green matrix, it could not be simpler.



The green matrix shows which camera is on line so you know if it is safe to compose a camera shot. You have all the controls of the main switcher in your hand, you can even select clips on the Vmix PC's hard disc and play them in.

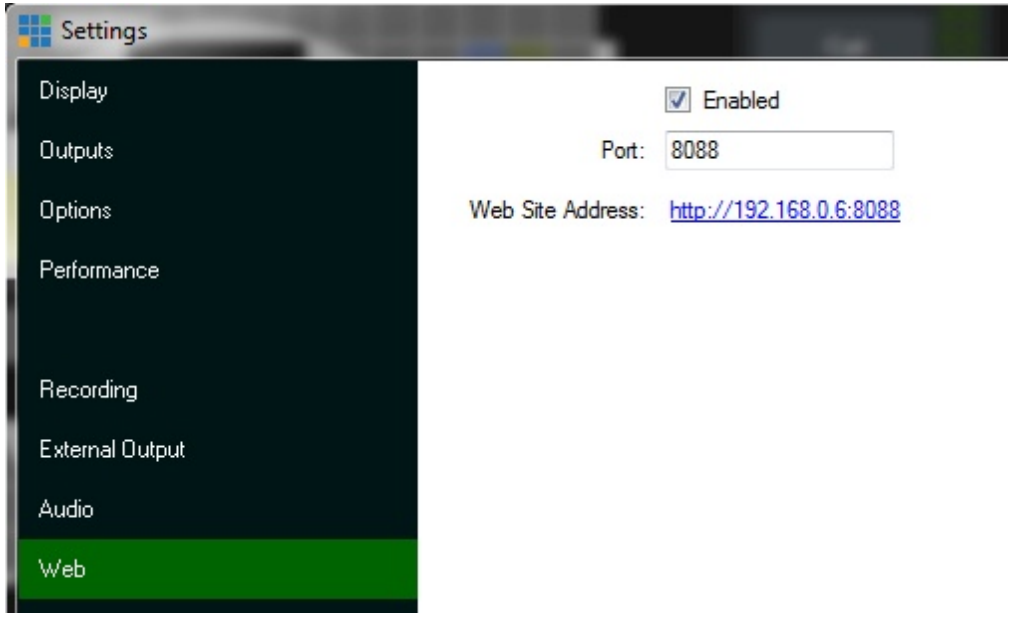
Is it difficult to set up ? well this is Vmix and I have yet to find any software as friendly to use.



Select settings (Top Right)

Enable web and browse up the address shown on your Smart Phone or Tablet any problems visit http://www.vmix.com.au/help11/

This really has to be the best addition to some already winning software, that is available free with a limited range of inputs and standard definition, no watermarks and with reasonably priced upgrades that allows more sources. It works well with, Adobe live stream for Internet streaming and it really comes highly recommended for any live multi camera event and now with the Smart Phone hook up it just got better.



Tab down to Web and select web

So far I have tried it with an old iPhone and an iPad sorry I did not have an Android tablet to hand to test it, but I have no reason to doubt it will not work.

All we need now is a DATV transmitter that will interface to Vmix particularly the ones that use in computer Mpeg compression, surly the Vmix stream can be intercepted and connected to the coder input.

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 fifth article in a series of DATVtalk articles to introduce Digital-ATV to hams and to learn new aspects of this new area of ham radio. The article was originally written in 2010/2011 for the OCARC newsletter. Since, 2011, there have been changes and improvements in DATV technology and products…but there is still a basic problem (most severe in US) that too few hams are using digital-ATV.]

In the CQ-DATV5 issue, the DATVtalk02 article presented an introduction to Digital-ATV. In the CQ-DATV8 issue, Robbie-KB6CJZ and I teamed-up in the DATVtalk05 article to present a test report for bench-testing a DATV DVB-S transmitter exciter and Power Amplifiers, using the SR-Systems product from Germany. Now in DATVtalk06 article, Robbie and I team up again to continue our DATV testing of a DVB-S station in the field and we report on the results we obtained in field testing of a Digital-ATV portable unit in the City of Orange, here in Southern California.

Some Background

The authors are both members of the OCARC, but they are also members of the RACES emergency communications group for the City of Orange, called COAR (City of Orange Amateur Radio). For years, the COAR group had equipped itself with analog-ATV equipment intended to send field video to the city Emergency Operation Center (EOC) located inside the Orange Police Department building. But for years, COAR has been frustrated by the quality of the analog-ATV pictures being received by the EOC. The 440 MHz analog-ATV quality was degraded because the signal path typically included elevated-freeways, 2-story residential homes, 1-to-3-story commercial buildings and a "forest" of backyard trees and tree-lined streets. The only good transmissions for analog-ATV occurred if we parked the portable ATV transmitter on a hilltop with a clear signal path back to the Orange PD building.

Members of the COAR RACES team had speculated that perhaps Digital-ATV might provide the solution to improving the quality of our field video transmissions.

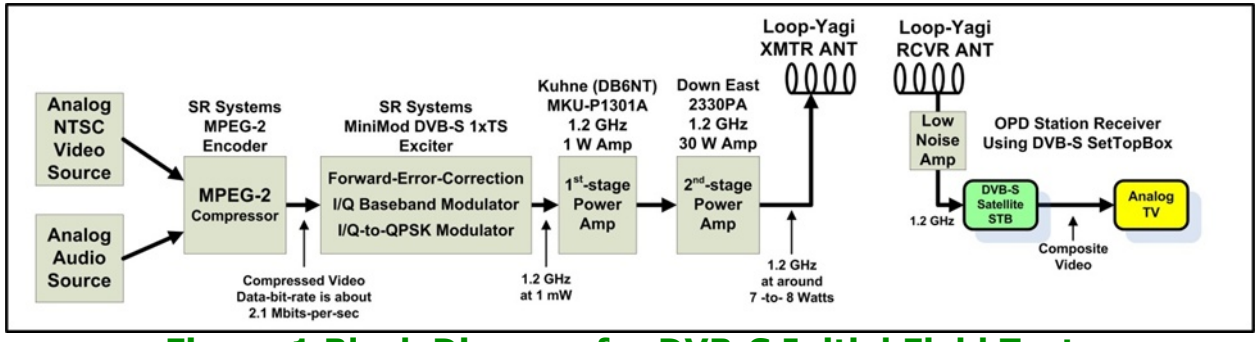


Figure 1 Block Diagram for DVB-S Initial Field Tests

The DATV Equipment

Fig 1 is a block diagram of the set-up used during the first set of field tests of DATV. The transmitter, and power amplifiers and SetTopBox (STB) receiver have all been described in more detail in an earlier DATVtalk05 testing report.

Another ViewSat VS2000 DVB-S STB was purchased on eBay for installation inside the EOC Radio Room for the purpose of conducting these DATV field Tests. The eBay cost of this FTA STB unit was less than US$60 including shipping. Fig 2 shows

the new STB (bottom unit) being tested side-by-side with the personal STB receiver of Ken W6HHC before the field tests began.

Figure 2 – Bench testing the new ViewSat STB to be used at OPD

The frequency used for the field tests was 1.292 GHz. Ken W6HHC had planned to set up the test frequency on 1.2915 GHz, but discovered that the STB menu would NOT allow him to enter 0.5 MHz digits. The Symbol-Rate was set to 2.2 MS/sec...producing an DVB-S RF BWallocated of 3 MHz. The Forward Error Correction (FEC) was configured to 1/2.

The receiving 1.2 GHz antenna (Fig 3) was a 24-element loop-Yagi antenna mounted 3-stories high on top of the Orange PD building. The loop-Yagi antenna is made by Directive Systems (in Maine US). A Down East Microwave LNA for 1.2 GHz was installed for the field tests to drive the received DATV signal down 250+ feet of coax to the EOC Radio Room receiver.

Figure 3 – a 1.2 GHz Loop-Yagi on roof of OPD

The SWR of the new DATV field antenna for COAR RACES was tested successfully in Fig 4. The SWR at 1.292 GHz was about 1.5:1 using a Bird Watt meter. The center-mounted loop yagi beam antenna is the Model 2325LY from Directive Systems, located in Maine USA, has somewhere between 23 and 25 elements The beam weighs only 3 pounds (1.4 KG)!! This is essentially the same antenna that is used at the Orange PD building for receiving DATV.

Figure 4 – COAR RACES Member KB6CJZ measures SWR on the new DATV 1.2 GHz "Elephant Gun" Loop-Yagi

First Field Test – El Modena High School

The first DATV test site we chose, the parking lot of the El Modena High School in the City of Orange, was picked because COAR RACES had tried analog-ATV tests on 440 MHz from this location two years earlier with extremely poor video quality...producing only P1 or P2 at best. But P1 or P2 was NOT the video quality that COAR RACES wanted to show to the Police or Fire Chiefs or to the Mayor of the city in the Emergency Operation Center (EOC) room. The test distance is only 3.2 miles, but includes one elevated freeway, three-story apartment buildings, homes, 2-and-3-story commercial buildings, and plenty of trees.

While Robbie KB6CJZ and Steve KI6DDE manned the OPD

Figure 5 – Bruce KC6DLA adjusts direction of the 1.2 GHz Loop-Yagi at the Field set-up site

Figure 6 – Mast-brace attaches to roof-rack

Figure 7 – The car tire secures the support base and prevents antenna mast from slipping

receiving station, Ken W6HHC and Bruce KC6DLA set up the DATV transmitting station in the back of his mini-van. Just to be prepared, Ken also set up a STB receiver with a "sniffer" antenna and a notebook computer display in the field to confirm that a video picture was actually being transmitted...in case there was a lack of picture at the OPD. Fig 5 shows Bruce KC8DLA adjusting direction after the field antenna has been set up.

The field antenna mast was constructed from Radio Shack 5-foot stacking mast sections and totaled 25-feet tall. Details for support the field antenna mast are shown in Fig 6 and Fig 7.

Steve KI6DDE reported seeing a picture at the Police station from El Modena High School, even before Ken could finish setting up his "sniffer" receiver. The received picture was perfect! Robbie KB6CJZ reported that the QUALITY monitor on the STB menu displayed 100%.

Second Field Test – City "Mock EOC Drill"

The Police Department conducted the planned "mock EOC" drill for the City of Orange in order to test the abilities and training of Police Department volunteers, including COAR RACES communications volunteers to provide support for city EOC

Fig 8 - Robbie KB6CJZ views received DATV Video Inside the EOC Radio Room

officials and staff and to provide communications from the field in a simulated train wreck incident. As expected, COAR was directed to provide DATV video from the simulated medical triage area in the parking lot of the Amtrak train station. Ken led the field team and a perfect DATV picture was being received at the EOC with only 10 minutes of travel time and 10 minutes to set-up the portable DATV equipment.

Figure 9 – This close-up of a large-screen display in EOC Room show the clarity of received DATV.

The test distance is only 1.8 miles, but includes, 2-story commercial buildings, 3-story University buildings, homes, and plenty of trees. We had to aim the 1.2 GHz antenna right into a pair of large leafy trees, about 75 feet away. As with the earlier test site, this location in down town Orange had failed terribly earlier when analog-ATV was used because of "ghost" multipath reflections fr0m the commercial buildings and weak signals.

The received DATV signal was first displayed in the EOC Radio Room. The video was then distributed to many large screen LCD displays inside the EOC room itself, as shown in Fig 9. A picture was reported at the EOC Radio Room as soon as the transmitter switch was turned on. Again Robbie reported the DATV picture was perfect and the SetTopBox QUALITY meter read 100%.

Third Field Test – Up in the Hills

Figure 10 – Members of COAR RACES and other OPD Volunteers gathered in the EOC room after the drill to begin a debrief session

Figure 11 – View of KomplettSender DVB-S transmitter from SR-Systems with top cover removed

Based on the success and demonstration of the two previous DATV tests, the COAR RACES group in the city of Orange was very fortunate to obtain funding to purchase new Digital-ATV equipment to create a portable field station (instead of borrowing equipment from Ken W6HHC and Robbie KB6CJZ). This section

Figure 12 – Front panel of KomplettSender with LCD Display and Menu Controls

describes the testing of the new DATV equipment that includes a KomplettSender DVB-S transmitter (from SR-Systems in Germany) and then reports the results of field testing from a more difficult location with this new portable DATV equipment.

Fig13 shows the Block Diagram of how the new equipment was used in this third in a series of field tests. As we have said before, bench-testing is important …but results from the DATV field tests are exciting! The location chosen was a ridge up in the foot-hills of eastern part of the City of Orange that had been tried three years ago using 440 MHz analog-ATV.

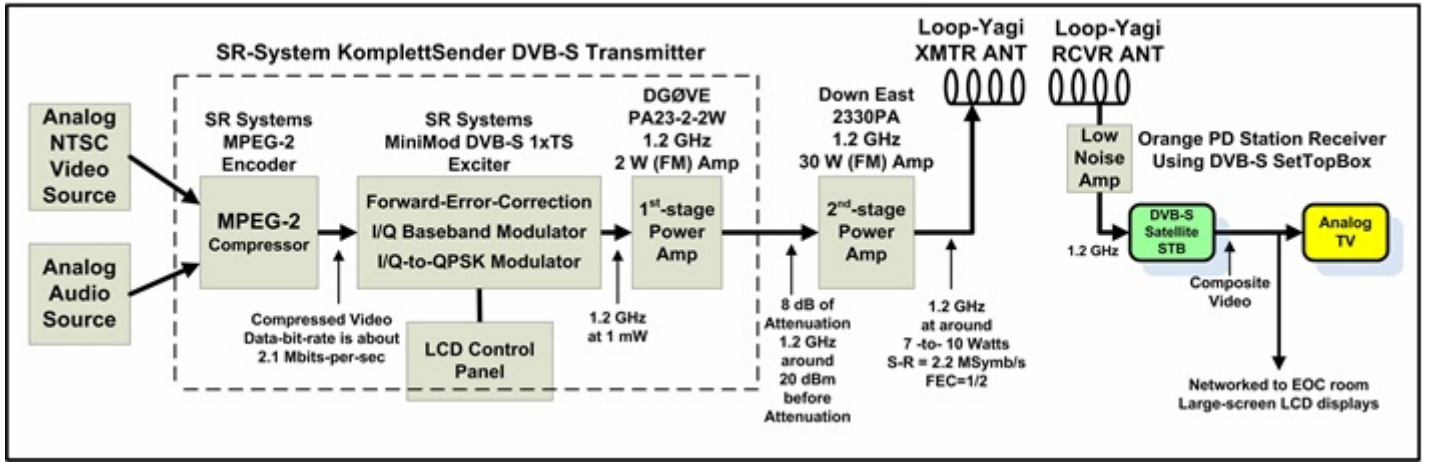


Figure 13 – Block Diagram Showing New W6OPD DATV Field Station being Tested

No video signals could be received from this ridge at the Orange PD building during the earlier analog-ATV field tests.

The tests were conducted from near the QTH of Kathleen K6IBH (up on a ridge across Jamboree Road to the West from Loma Ridge) and great pictures were sent back to the Orange PD EOC Room. This ridge allows camera video to the East of the ridge toward Sierra Peak, Irvine Park, Loma Ridge, and Saddleback Peak. East is the direction that wild grass fires normally approach our city. The DATV signals were fairly weak (see Fig14) because a hill was sloping down into and blocking the "line-of-sight" transmission path…and we probably had to "knife-edge" around the sloping hill side to reach the OPD EOC.

Figure 14 – The weak DVB-S DATV signals received at EOC produced perfect DATV pictures with 100% QUALITY

The critical DATV settings selected for DVB-S during these COAR field tests are listed below:

- *Frequency - 1.292 GHz (center freq)*
- *FEC - 1/2*
- *Symbol-Rate - 2.2 MSymbols/sec*
- *RF BW(allocated) - 3.0 MHz*
- *Camera - NTSC*
- *Video Resolution - D1*
- *MPEG-2 GOP Mode - IBBP*

Conclusion

The chosen DVB-S field equipment COAR worked very well. COAR's DATV field testing results have exceeded our expectations and has produced useful video from many difficult field locations. During the DATV planning efforts for COAR, we had many concerns whether DVB-S could handle the multi-path ghosts that had plagued earlier analog-ATV field tests. We were worried that DVB-T technology (with it very robust multi-path protection) might be the only useful DATV technology for COAR RACES.

The digital-ATV DVB-S video quality from the field is much improved over the older analog-ATV technology. This improvement is achieved because DATV technology uses Forward-Error-Correction (FEC) to overcome the "ghosts" and weak-signal conditions caused by elevated-freeways, buildings in the downtown area and the hills on the outskirts of our city.

Contact Info

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

Useful D-ATV Links

BATC info site for DTX1 DVB-S 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

DGØVE microwave RF amps, up-converters, down-converters – see www.DG0VE.de

Kuhne Electronics (DB6NT) RF Amplifiers – see www.Kuhne-Electronic.de

Directive Systems – loop YAGI antennas – see www.directivesystems.com

SR-Systems D-ATV components (Boards) – see www.SR-systems.de

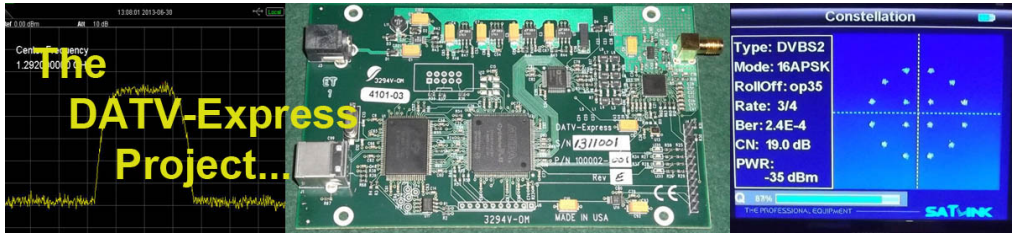
Amateur Television of Central Ohio – see www.ATCO.TV

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

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

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



TV Amateur

Artilcles include:-

- *A 10-GHz PA for all modes by H.-M. Fruits, DF9CR*
- *DVB-T News from OE7DBH by Darko Banko, OE7DBH*
- *A multi-band FM ATV transmitter 1.2 to 3.5 GHz by Roberto Zech, DG0VE*
- *Considerations for DVB-T at 70 cm by Hans-Karl Sturm, HB9CSU*
- *PGA103 + - a 50-mW broadband amplifier by G4DDK and WA5VJB*
- *Hamnet ATV relay for less than 50 euros by Frank, DL3DCW*

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/

Farnsworth

By Peter J. Stonard

Philo T. Farnsworth's invention of all electronic television: 7th September 2002.

How Quickly People Forget

A couple of days ago my wife Judy's cell phone stopped working. It was transformed from her "communication lifeline to the world" into an inert lump of plastic. Cellular phone technology is taken for granted, right?

I noticed odd aerials spouting from a few passenger cars while visiting Chicago in the late 1970s. Motorola, headquartered nearby, was conducting field trials of AMPS (Analogue Mobile Phone Service) the first use of radio "cells" to conserve the available radio spectrum.

That was twenty years ago, and the world has quickly come to depend upon cellular radio technology.

Parallel Inventions

The history of television is not so clear, and certainly not the result of one unified effort. In fact, a lot of controversy still surrounds the early television pioneers, who collectively invented —something" which today we call television.

During the first half of the 20th century many of the fundamental things that shape society were invented, developed, or legislated into existence.

Often similar ideas or needs occurred about the same time in both Europe and the USA. Without consultation the ideas followed separate paths to practicality. Sadly, we spent the second half of the 20th century suffering from these early decisions. For example: AC power line frequency: 60Hz in America, and 50Hz in Europe. Power line voltages: 120V in America and 220 to 240V, (depending on region) in Europe. Television transmission technical standards: 525/60 verses 625/50, NTSC verses PAL, etc. Even choosing which side of the road to drive our cars on.

Inventing Research labs

Early inventions were often the result of a single contributor, who had a dream to do something. Apart from mastering the technology they also had to find financial backers, and then publicise their efforts if they were to succeed. Those few that were successful often sold their invention to a corporation for a personal fortune. On the other hand, large corporations that sprang up around key inventions of the previous century wanted to control their future, and avoid unpleasant surprises that might topple their empires.

The invention process changed when Thomas Alva Edison, a self-taught lone inventor, invented the research lab. The organisation of a team, with a common purpose, and relief from the worries of everyday life (such as paying the bills and finding materials supplies), had a drastic effect on invention productivity. Edison patented anything and everything, hoping to generate royalty licence fees later on.

The industrial giants such as General Electric, DuPont, Eastman Kodak, EMI, GEC, and Marconi quickly adopted Edison's model. These new research labs were staffed with hundreds of trained scientists and engineers, who gave up their individual claims (Patents were assigned to the company) in exchange for steady pay and needed support staff, materials, and the well being of a corporate sponsor. Perhaps the biggest of these was the Radio Corporation of

America (RCA).

Mechanical Verses Electronic TV

Early television pioneers Baird and Jenkins chose mechanical systems based on Nipkow's spinning disc, while Zworykin and Farnsworth applied all electronic techniques œ the latter technology winning easily in the early side-by-side demonstrations.

David and Goliath

The story of electronic television pits a corporation, one that used the new model of research labs, against a lone inventor. The battle lines were drawn early as both parties filed US Patents in the 1920s each claiming an all-electronic television system.

Philo T. Farnsworth (1906 – 1971)

Figure 1 Philo T. Farnsworth (Photo cuortesy of MZTV)

Farnsworth is credited with the idea of scanning the image sequentially, an inspiration he got as a teenage boy while ploughing the fields of the family farm. He developed the idea into a system with a sending and a receiving end, and at age fifteen disclosed it to his high school science teacher.

By age nineteen he had seed money to start building the system, and in 1926, at age 20, he had filed two US Patents, one for the camera and another for the viewer.

With financial backing from San Francisco bankers, Farnsworth moved his family to San Francisco, and rented the loft at 202 Green Street, on 22nd September 1926. The roughly 7 by 10m (20 x 30ft.) space was turned into a lab, including apparatus to make radio valves (tubes) by hand.

Figure 2 202 Green Street, S.F. 7th September 1927

Every effort had been made to build both the receiver (even the hand made CRT) and a transmitter, which used Farnsworth's newly invented Image Dissector tube. The pioneers were ready for a test, and it was done on 7th Wednesday, September 1927.

Apparently they only had one axis of scanning built, and the experiment involved sending signals to light up a line on the CRT, by illuminating the camera. Most likely the transmitter and receiver were linked by wires, and not by radio waves. The equipment was placed in two rooms and was very crude; high voltage came from "a rotary static machine' charging a capacitor, and scanning from a "ten-cycle-per-second sine-wave (motor) generator'.

The team consisted of Philo; Elma "Pem' (his wife and office manager); Cliff (Pem's brother, and the glassblower); Carl Christensen (hired as an engineer); and George Everson (a professional fundraiser) who arrived later. Everyone stood around the receiver - Philo called instructions to Cliff at the camera. —Put in the slide" —Okay it's in. Can you see it?" Turn the slide a quarter turn, Cliff" The receiver line also turned 90 degrees. —That's it folks! We've done it!" (The author transcribed these words from Pem's book, Distant Vision, but it's not clear if this is accurate, as they only had one axis scanning, a 90-degree turn seems unlikely).

The demonstration was repeated for George, and Philo then sent a wire (telegram) to George's partner, Les Gorrell, in Los Angeles, which simply read, "THE DAMN THING WORKS!"

David Sarnoff (1891 – 1971)

Figure 3 David Sarnoff (Photo cuortesy of MZTV)

While the lone inventor made steady progress with his invention during the 1920s, David Sarnoff, the new head of RCA, unleashed his energy to dominate television. NBC, the broadcaster and wholly owned subsidiary of RCA, was formed in 1926, and began mechanical television broadcasts in 1928.

No one could build a radio without a licence from RCA, and each and every radio sale generated a royalty fee back to RCA. Sarnoff worried that new technology could disrupt the market. He learned of a very young inventor working in California, from a San Francisco Chronicle newspaper article, dated 3rd September 1928.

Sarnoff issued an essay that was published in the New York Times, on 18th November, 1928, titled —Forging an electric eye to scan the word", the message was clear: Television was still a long way off, and when it did arrive it would be at the hand of RCA. A month later he struck again with a New York Times article on 16th December; —Leaders Dispel Television Fears" noting that the latest radio sets would not become obsolete. He took the opportunity to urge everyone to buy a new radio for Christmas.

Figure 4 Vladimir K. Zworykin (Photo cuortesy of MZTV)

Sarnoff secretly hired Vladimir K. Zworykin, head of television research at Westinghouse, who had filed (but did not receive) an electronic television patent in 1923. Sarnoff sent Zworykin to see Farnsworth at the 202 Green Street lab in San Francisco, in April 1930, and he was welcomed as a Westinghouse representative, to whom Farnsworth wanted to licence his patents. It's likely that Farnsworth did not know that Zworykin was working for Sarnoff.

Figure 5 Image Dissector (Photo by the author)

Zworykin stayed for three days and was shown how to make a camera tube. Farnsworth's Image Dissector tube was hand made by his small staff, which had to invent most of the equipment too. By trial and error they also learned how to process the tube. This involved construction of electrodes, glass blowing to form the envelope, pumping to remove the air, and finally, introduction of purified potassium vapour to form a photocathode.

Upon his return to RCA in Camden New Jersey, Zworykin was given a $100k budget and a one-year deadline to develop electronic television. So he set about trying to duplicate Farnsworth's tube, from his notes and memory.

RCA Goes to War

Sarnoff was angered by the lack of progress on electronic television, and RCA was in a tight business jam. Radio and phonograph sales had plummeted due to the great depression, and competition had driven the unit price of a radio down to around ten dollars. RCA stock lost 90% of value, after the US government forced RCA to slash its licensing fees.

So Sarnoff decided to pay a surprise visit to Green Street, in April 1931, and attempt to buy out Farnsworth.

Unfortunately for Sarnoff, Farnsworth was out of town, but Sarnoff made an offer of $100k for the patents, and Farnsworth and his backers agreed this was an insult. Again, Sarnoff was furious and brought the full weight of RCA lawyers to battle Farnsworth.

No doubt this slowed the development of electronic television for years, as the legal battles raged on. Farnsworth was driven to drink (he was a Mormon and a teetotaller), and then suffered a bleeding ulcer. Farnsworth licenced his patents to Philco and to Baird Television in the UK, to stay afloat financially, until the Farnsworth patent was finally issued in 1935.

Sarnoff's RCA spent over thirteen million dollars from 1930 to 1939 to develop electronic television. This was a staggering sum of money, during the Great Depression.

1939 World's Fair

Sarnoff pulled a public relations coup at the 1939 World's Fair held in New York City, with a project called —The RCA Television Pavilion", and also by securing the rights to broadcast the opening ceremony on both radio and television. Local department stores offered new RCA television receiver sets for $600 each.

"It is with a feeling of humbleness, that I come to this moment of announcing the birth in this country of a new art so important in its implications that it is bound to affect all society. Now, ladies and gentlemen, we add sight to sound!" Sarnoff said at the press conference before going on to announce that NBC would begin regular television broadcasts. Several days later, at the opening ceremony, Franklin D. Roosevelt became the first US president to be televised.

RCA Pays Out

Such blatant infringement of Farnsworth's patents would be grounds for a lawsuit, but instead Farnsworth sold RCA a non-exclusive licence for one million dollars. This was the first time that RCA had paid a licence fee to obtain a non-RCA invention.

America Goes To War

When the USA entered WW-II all development on television, including early broadcasts, was stopped. After the war about 6,000 TV sets existed in the USA, and this grew to some tens of millions by the mid 1950s.

Alas, Farnsworth's original patents expired in 1947, just months before the post war boom, in which RCA captured some 80% of the market. Farnsworth was forced to sell his assets to ITT, who decided to exit the television business.

Fast Forward to September 2002

To mark the seventy-fifth anniversary of the first all electronic television experiments, a small event was held at the 202 Green Street building. Actually, it was held outside, as the current owner of the building decided not to participate. Sadly the world did not acknowledge this

important event, having taken television for granted and let Philo T. Farnsworth drift in to obscurity. It was covered briefly in the local press and on a local magazine TV show that aired the next day. About one hundred people attended, including a couple of generations of Philo T. Farnsworth's family. In 1981 a State of California historical marker was erected.

Also present was television collector Jerry Grulke, who brought with him a couple of historically significant television artefacts, and was dressed as a young Farnsworth. He wore a very nice brown suit of the era with matching brown shoes and fedora.

Mr. Grulke also had a Farnsworth brand 10" television receiver from 1948 and the actual Nipkow disc used to scan the "Felix the Cat" figurine used by Bell Labs in the 1920s.

Pending Honours

As of this writing, it is expected that Farnsworth will be honoured at the 2002 Emmy telecast hosted by the Television Academy.

Historical Marker Number 941

In a simple laboratory on this site, 202 Green Street, Philo Taylor Farnsworth, U.S. pioneer in electronics, invented and patented the first operational all-electronic "television system" on September 7, 1927. The 21-year-old inventor and several dedicated assistants successfully transmitted the first all-electronic television image, the major breakthrough that brought the practical form of this invention to mankind. Further patents formulated here covered the basic concepts essential to modern television. The genius of Green Street, as he was known, died in 1971.

It's For You!

Remember Judy's cell phone crisis? It appears that she put the phone on a wet counter top, and water caused the phone to die. When it dried out the phone returned to life. Whew, can you imagine life without that cell phone?

Figure 6 & 7 TV Historian and collector Jerry Grulke

Acknowledgements

Thanks to Rich Diehl, for his photographs of the 75th Celebration. He is a Silicon Valley collector of early videotape machines and other TV artefacts. Visit his collection here: www.labguysworld.com/index.html

Also to Alex Magoun, curator of the David Sarnoff Collection in Princeton, New Jersey. He graciously hosted Judy and I on a visit to the collection. It's not everyday that one is granted hands on access to RCA historical artefacts!

Photos of the pioneers appear here with permission from MZTV Museum: www.mztv.com/

For an interesting account of Farnsworth's life, read the book Distant Vision by Elma —Pem" Farnsworth. ISBN: 0962327603

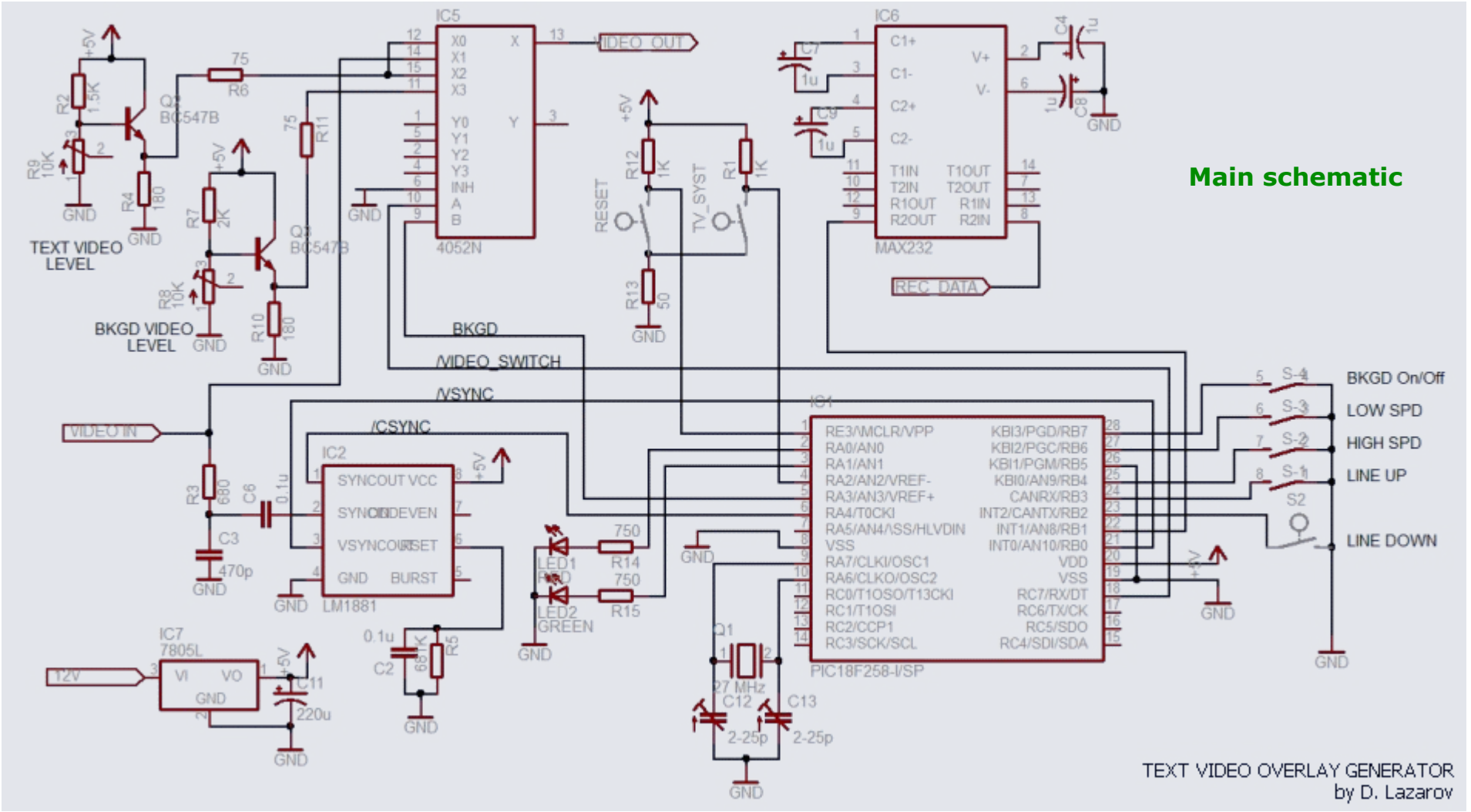
Video Overlay Circuit with PIC 18F258

By Deian

This project is based on Microchip's PIC 18F258 microcontroller and was built using only conventional (THT) parts.

1. Main features :

- *static text display: 14 rows in 525-line systems / 16 rows in 625-line systems (max. 35 characters each)*
- *smooth scrolling text display: 1 row of 40 characters*
- *8*16 pixel monospaced VGA fonts*
- *over 200 selectable fonts (via PC)*
- *3 selectable speeds in the scrolling text mode*
- *changeable vertical text position on the screen*



Main schematic

The circuit uses as input a composite/RGB video signal. The font and the scrolling text for displaying are sent by a small PC app. (tvo_v3.exe) to the PIC and stored somewhere in its code memory area. This way there is no need to send data after every power-up of the circuit (last sent data will be available). In the scrolling text mode up to 24KB

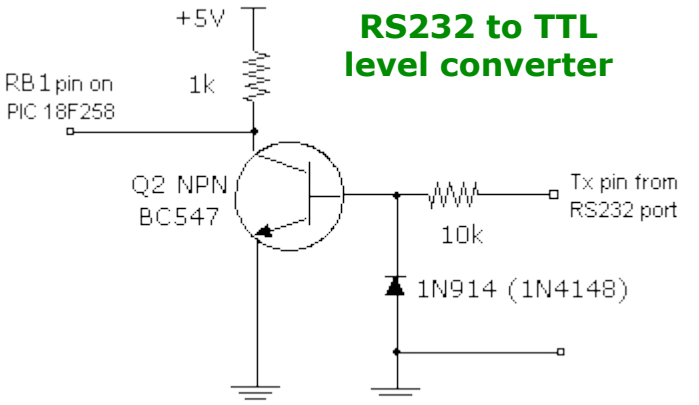
of data can be sent (or equivalent of a maximum 1h 10min duration can be displayed at default speed). Because the static text will be much more often changed than the scrolling one, it is saved in PIC's RAM. If you want to keep the same text position on the screen on every power-up or save the static text - do a master clear reset (reset on PIC pin 1).

2. Functional description

The microcontroller receives font and text data from the computer's COM port over the MAX232 at RB1 pin at 4800 bps (asynchronous reception emulated in assembly code for this pin). The PIC must also be synchronized to the incoming video. This is done over LM1881 - /VSYNC is needed to refresh some internal register values and horizontal sync pulses (taken from /CSYNC) needed to know when to drive the 4052 analog switch over the PIC's internal synchronous serial port.

The PIC is driven by a 27 MHz crystal clock source (an exact multiple of PAL and NTSC line frequency). Despite that, a jagged text on the video screen is displayed because this frequency is not fully synchronized to the incoming video line frequency (there is no genlock). You can use a programmable clock IC to improve that, but such chips are manufactured only using SMD technology - my search on the internet yielded dissapointing results, unfortunately. My idea was to build the entire project with conventional parts still available on the market (i hope !) and an easy design for a home purpose. Keep in mind that the PIC must work at 27 MHz in order to accomplish its tasks properly. Some assembly routines are heavily dependent on this clock rate, and if your video source is not a standard or a good quality one, you may encounter problems. I have tested it on my satellite receiver with PAL and NTSC signals and it worked well.

Instead of MAX232 you can use a simple RS232 to TTL level converter like this one instead of MAX232 (i've found it on the internet). I think using other common NPN transistor or diode should work. In my design i've used a 100k resistor instead of the 10k one (the transistor is less saturated when on). The circuitry (in the main schematic) built around the 2 BC547B transistors act as low voltage regulators aimed to ensure constant levels on variable output loads (the 4052 inputs on/off). The 4052 switch has to "see" also 75 Ohm impedances on its inputs when switching between input video and inserted text and vice-versa. The output levels of the regulators must be adjusted in order to get proper video voltage levels, otherwise problems with the video may occur.

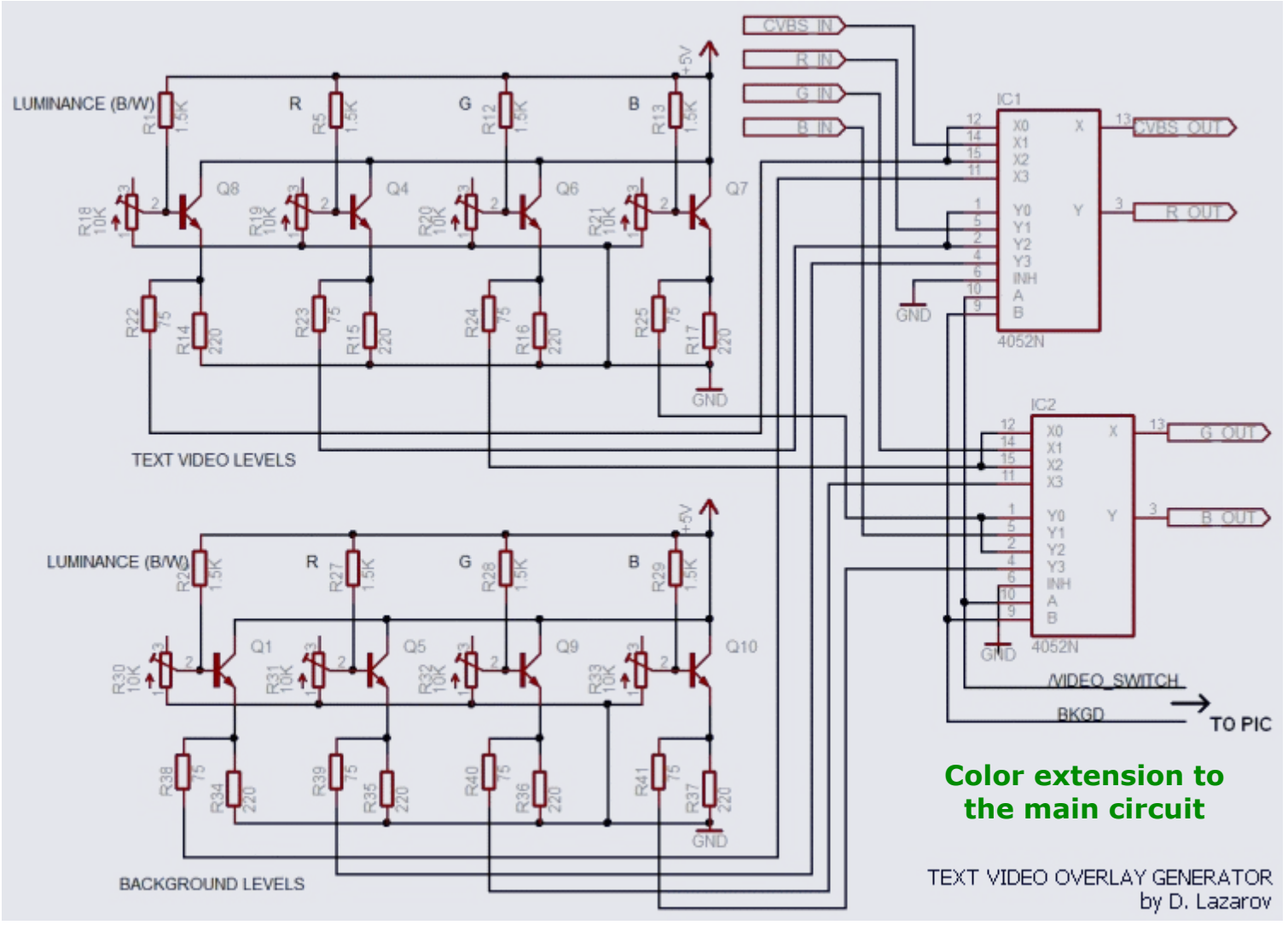


There are also switches at PIC pins available to perform other functions:

- *BKGD on/off - switches the background stripe on and off*
- *HIGH/LOW SPEED - speed adjustment available only in scrolling text mode. If both switches are off the text will scroll at default speed*
- *LINE UP/DOWN - changes the text position on the video screen*
- *525/625 (or TV) syst. - important for the static text mode. If connected to GND 16 rows of text will be displayed (for 625-line systems), otherwise 14 when connected to Vcc*

(for 525-line systems). Don't let this pin unconnected !

If you live in Europe and have a SCART connection (or whatever connection where the R, G, B components are available as standalone signals), you can use the circuit to display color characters and background, but you have to add some extra hardware to it. In principle, an extra switch and a voltage level regulator for every component (R, G, B) is needed. A part of the circuit is already used in the main schematic (the CVBS part). It should look like this:



The transistors are common NPNs (prefferably with a high DC gain factor, 200 or above). Instead of normal resistors, series and parallel R networks can be used. The transistors can be replaced by an integrated array (like CA3082).

Please consider that some equipments which output signals over the SCART do not provide video components (R, G, B), only the composite signal. Even if they do, the input/display device may not accept them.

3. Demo clips

Here is a demo video of what the circuit can do:
http://www.youtube.com/embed/i-7CzQ2L17M?rel=0

4. How to use it within your project

If you want to use this circuit as display module the static text mode can be relatively easyly implemented. I have decided to simplify the static text transmission making it more suitable to the practical use.

Do as follows:

- *transmission parameters: 4800 bps, 8 data bits, no parity, 1 stop bit*
- *send BYTE1 + BYTE2 + your data (max. 35 chars) for every row*
- *BYTE1 must not be 0x01 or 0x02 (used for other purposes)*

- you don't have to send all bytes of a

row. In this case after a time of aprox. 2 RS232 packets length the PIC reception goes in time-out and the transmission will be considered terminated

BYTE1 should be either CR (CARRIAGE RETURN) or NL (NEWLINE) (0D or 0A hex). This signals to the PIC that new line of text is comming and the old lines will scroll up by 1 position. If you don't send it the lowest text row on the screen will be written, but if the text is longer that 35 bytes, the remaining bytes will overwrite the row from left to right untill the end of the sent text is reached. The value of BYTE2 doesn't matter, but it has to be transmitted always when other bytes follow quickly after that. During that time the PIC does some internal processings. If you send some relevant data during this byte it will be ignored. Let me give you some examples:

Ex. 1.:

CR + NL + your text (max. 35 chars)
NL + CR + your text (max. 35 chars)
CR + NL + your text (max. 35 chars)
CR + NL + your text (max. 35 chars)
.....
CR + NL
(empty line)
.....

Ex. 2:

your text (max. 35 chars) + NL + CR
your text (max. 35 chars) + CR + NL
your text (max. 35 chars) + CR + NL
NL+XX (doesn't matter) (empty line)
CR+XX (doesn't matter) (empty line)
.....

It runs much like the text of an PC OS terminal window.

If you want to delete the whole screen send 16 times BYTE1+BYTE2. If you use the tvo_v3.exe chose "Enter static text (16 rows mode)" option, type ENTER key 16 times and chose "Send text" from the menu.

If you want to keep some rows empty just send BYTE1+BYTE2. If you use the tvo_v3.exe just press ENTER key as many times as you want to make room between rows like in any other text editor. In 525-line systems only 14 rows are visibile. Because the rows 1 and 2 are not, when using the "16 rows static text" options of tvo_v3.exe you should press the ENTER key twice before every 14 rows for your complete text to be displayed continuously on your next transmision.

5. How to use it on the USB port

This solution is suitable for PCs with no serial port. The direct connection of the circuit to the USB port is not possible. An USB to RS232 adapter/converter has to be used. Such hardware can be found on the market and is relatively cheap (for ex. chipsets based on versions of FTDI FT232 IC). You have to install a driver first (from the chipset's manufacturer or FTDI site). This driver will allow you to acces the USB+adapter pair as a virtual serial interface (you can check the Device Manager to find out which COM port is assigned to the adapter - it should be a new one). Then you have to set the communication parameters of the driver (the same as those for normal serial transmission described above). Your application should use the new port or you can use the tvo_v3.exe, but select the new port first.

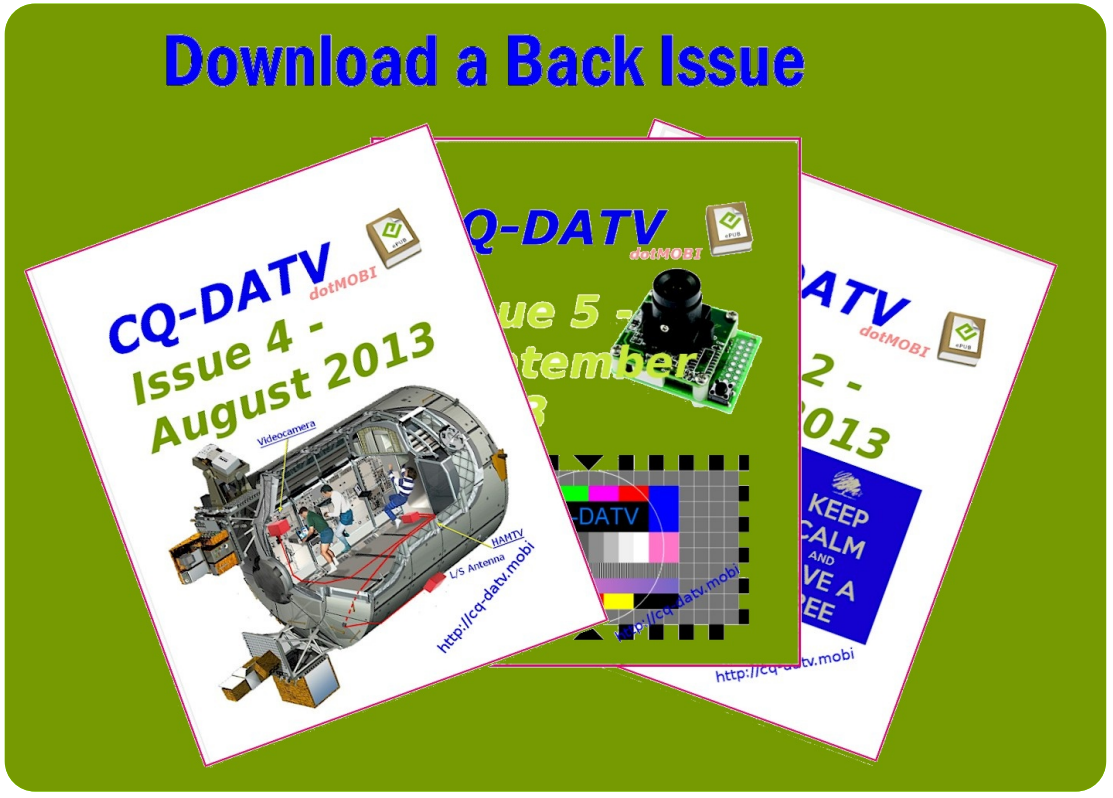
I have a DELOCK 61460 chipset which works flawlessly on Windows Vista, but i would like to make it work on Linux (Mint). Untill now i managed to make tvo_v3.exe work only

on the serial port using Wine 1.3. I would be grateful if someone could help me !

6. Changelog to the tvo v.2

- *525/625-line system pin*
- *PIC pins' assignement changed. Please take care (see the main schematic above) !*
- *new and simpler way of sending static text data (less data/separately for every row)*
- *no "complement" option anymore*

If you have already downloaded and designed the circuit from the previous version, you have to change the PIC pins' connections. You have to reprogram the PIC and use the tvo_v3.exe from the package below (these 2 parts work only together - you can't use any old ones with any new ones).

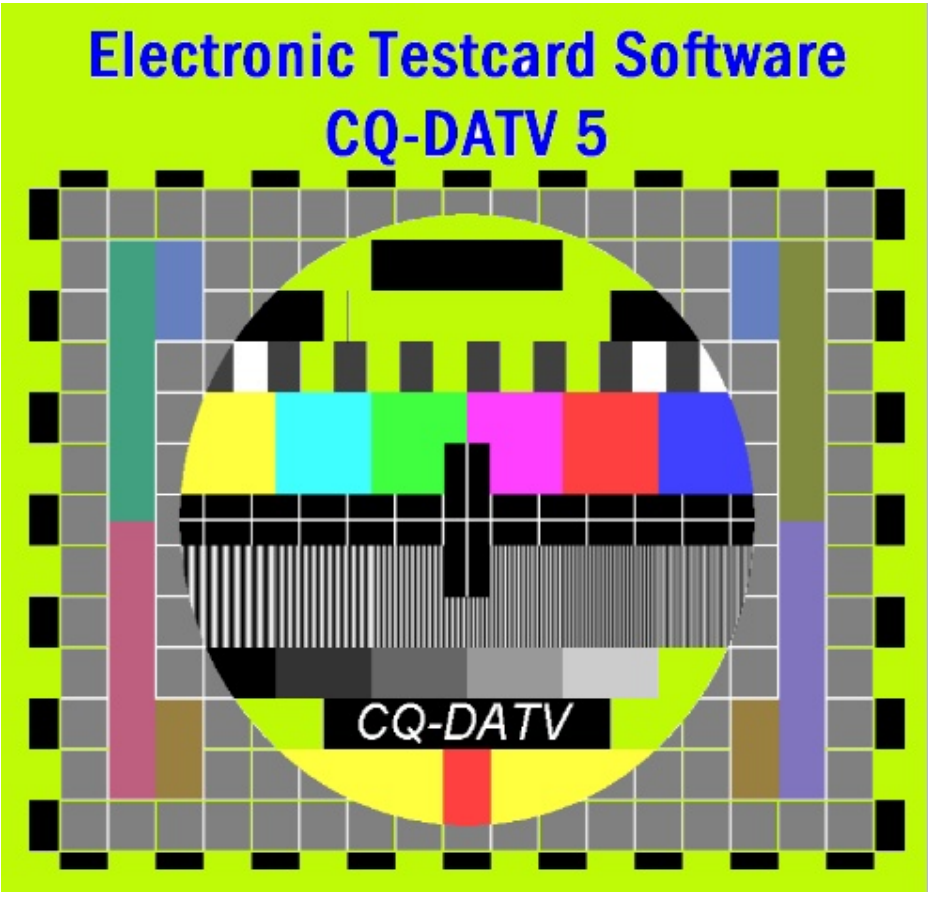


Important notice!

This is a low resolution text overlay circuit and not a high resolution graphic overlay generator ! It doesn't make any kind of ASCII control character interpretation (except CR & NL) or special streams rendering (for ex. GPS) . You should use your own interface hardware and/or software to do that.

For troubleshooting please check the README file in the downloaded package.

A zip file containing all the project files can be downloaded from the authors web site at http://electronics-home-projects.tripod.com/



Just for fun....

Last issues picture is shown below.

"Can you spot the muppet?" - G8IQU

SORRY LADS, CANT SEEM TO FOCUS, MY LEGS ARE MISSING - Peter EI4HX

"My usual Smurf in a supermarket shot please" - Trevor

"Here we are doing a rare interview with the alien Cromakee from the planet Greenscreen." - Don Hill, KE6BXT

And the winner is .....

Don Hull, congratulations.

This issues picture is shown below.

Please send your entries to caption@cq-datv.mobi

External links

If you have an eBook reader that does not have WiFi then you will not be able to use the hyper-links in this publication.

If you have an eBook reader that has WiFi then you will be able too providing you are in a WiFi zone.

But if you have a Kindle 3G then yes, but only to Amazon, and there is not a lot of ATV material on their site.

Smart phone reading apps are ok providing that you have a 3G data connection.

Note: These links will fire up your devices browser and if you are using 3G/4G then you will incur data usages charges.

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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*
- *Peter Stonard*
- *Mike Berry - G1LWX*
- *Klaus Kramer - DL4KCK*