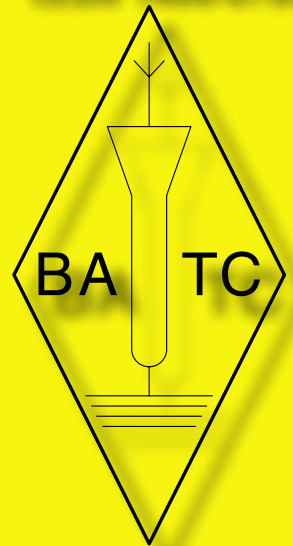# CQ-TV 208

November 2004
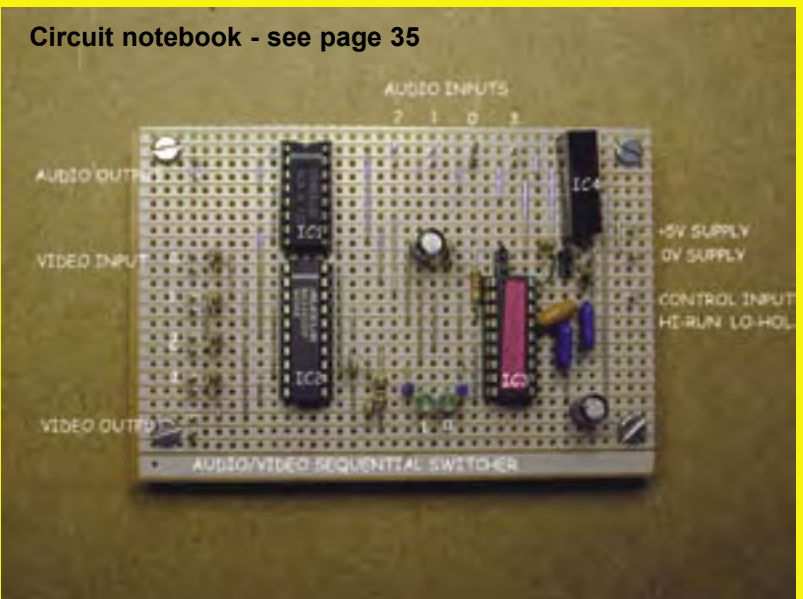
BA TC

New 10GHz ATV World record - see page 48

DATV experience so far - see page 30

Circuit notebook - see page 35

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The STVKBD unit allows control of the STV5730A's functionality from a PC keyboard. For full details of the unit's operation please see the documentation.

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►Compatible with colour and mono composite video signals. 1Vp-p. PAL or NTSC*
►Dimensions 110 x 65 x 28mm LxWxH
►Power supply 9 - 12dc via on board regulator or 9V PP3 backup battery
►Power consumption 50mA (without keyboard)

*By default the unit will be supplied compatible with the video standard of the country from which you make your order.

If you require further information please contact us: *sales@STV5730A.co.uk*

Visit our web site at - www.stv5730a.co.uk

Contents

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CQ-TV and BATC web masters
Anything to do with the CQ-TV web site Email: webmaster@cq-tv.com or for the BATCs web site. E-mail: webmaster@batc.org.uk

Chairman's Column

By Trevor Brown

Welcome to CQ-TV 208, I see the letters have now started to flow - most of them to disagree with my personal suggestion that CQ-TV may one day move from paper to virtual. I am very fortunate, in that I get an electronic copy of the magazine in advance of it going to press; all electronic copies are in colour and are a big improvement on the black and white printed versions. It is not possible to get a 1200 circulation magazine into full colour printing without occurring prohibitive costs. Let's see what happens in the next 10 years.

The CQ-TV prize for issue 207 went to John Stockley G8MNY for "What's Wrong With Analogue Satellite Receivers for ATV".

The prize for CQ-TV 206 went to Dicky Howett for "Television Cameras I Have Known"; both of you should be receiving a Black Box Camera Company character generator in the post.

Graham Shirville recently attended a meeting between the RSGB, OFCOM and the CAA - who are the primary user of the 23cms band. The purpose of the meeting was to identify possible routes to facilitate the clearance of future and currently outstanding ATV, and NBFM voice repeaters.

It was agreed that four existing ATV applications should be resubmitted, so that they could be re-considered by the CAA, in the light of further information that was provided by the RSGB. These are GB3PT - Hampshire, GB3FY - Lancashire, GB3OT- Ayr, GB3TT - South Yorkshire. New forms for these projects are being produced and will be signed off by the NOV applicants shortly.

Mike Cox announced at the BGM that he is standing down as BATC President. If you know of someone you think would be suitable to fill this prestigious position then the committee would like to hear about it. It's going to be difficult filling Mike's shoes, and we need all the help we can get.

Ian Pawson, although not standing down from committee, will have been in hospital for an eye operation by the time you read this. I am sure we all wish him well. This may cast doubts on his ability to edit the next or future editions of CQ-TV magazines. I hope that this is not the case, but if Ian is unable to continue, I am not sure at this moment how we will cope, but I am convinced the process will involve many phone calls to Ian. Brian Kelly has already volunteered to run the ever expanding website in the short term.

We have produced a DVD containing electronic versions of CQ-TV and the CQ-TV articles index. Also included are electronic versions of our three most recent handbooks, 'Slow Scan Television Explained', 'Amateur Television Handbook' and 'An Introduction to Amateur Television'.

The archive is constantly being updated as more of the old paper issues are converted to electronic format. Currently issues 1 to 97 and 161 to 207 are included along with a few odd ones.

This DVD is updated 4 times a year, to include the current issue of CQ-TV.

Version 6 viewer (Windows 32bit) for the Acrobat (.PDF) files is included.

Two web browsers and two (free) DVD players (for 32bit Windows) are included (other formats downloadable from the web)

The DVD is playable in a standard (domestic) DVD player (and on a PC with a DVD player) and the data files will 'auto-run' when the DVD is put into a PC.

The video section was prepared by Brian Kelly and contains videos from Bletchley Park 1999, one from Shuttleworth 2002 and one from 2004.

A word search index is provided that covers ALL the supplied PDF files. It also contains a complete copy of the CQ-TV and BATC web sites. The cost for this DVD is £5.00 for current members and £10.00 for non-members.

Note: This DVD is supplied on +R media only.

The CQ-TV DVD from the BATC

£5

The CQ-TV magazine archive and videos

Version 1.3, August 2004

Acobat 6 for the ZX81 required

From: Kevin Ravenhill
[knr@fireflyuk.net]
Sent: 30 July 2004 14:48
To: chairman@batc.org.uk
Cc: editor@cq-tv.com
Subject: Cyber-membership

Hi Trevor

Nice to see from CQ-TV 207 that the suggestion of a "non-paper-CQTV" membership option has been adopted, even if only available outside the UK at present.

However, I feel it's time to repeat & reinforce a plea which I originally expressed after I bought a CQ-TV CD-ROM recently. This was/is for all Acrobat files - both on the CD-ROM and as part of any cyber-membership scheme - to be in BACKWARDS-COMPATIBLE Acrobat 4/5 format i.e. not in "new" Acrobat format and restricted to Acrobat 6 or above. I assume there must be a valid reason for choosing to produce the files in Acrobat 6 proprietary format, other than just because it's there?

The machine I currently have at home is relatively old by PC standards and for various reasons it simply won't take an Acrobat 6 installation. Neither do I have reasonable access to a PC that will. So I'm currently unable to read the CQ-TV files on the last CD I bought.

Neither would I be able to take advantage of any cyber-membership as/when it might become available. In other words, I would have to upgrade my PC just to remain a BATC member - not an option, I'm afraid! If BATC membership were to become internet-only I would have to terminate my membership under such conditions.

In the course of my job as a professional engineer I routinely download Acrobat format files from the web on a daily basis. I think it is significant that ALL such files are still in backwards-compatible (Acrobat 4/5) format - apart from CQ-TV I have not yet come across a single instance where I needed Acrobat 6 to view a file. Not one. Ever.

By no means everyone has fast, up-to-date PCs and/or wishes to "upgrade" to Acrobat 6, which in my experience has more than its fair share of usability issues (as with most modern "bloatware", unfortunately). So please, please reconsider the format in which you produce CQ-TV files. Otherwise I'm pretty sure there will be a fair number of potential cyber-members who will be put off joining simply because of this issue.

I feel quite strongly about this, as you can probably tell!

Best regards

Kevin Ravenhill

From: Ian Pawson
Sent: 30 July 2004 15:32
To: 'Kevin Ravenhill'
Subject: RE: Cyber-membership

Thank you for your comments. There were several reasons for using the new Acrobat format, the main one being the smaller files that it creates (for easier web download). This version also handles pictures and word searching much better. The file security is also much improved.

The reason that most documents that you get from the web are still not in version 6 format is not for backwards compatibility, but because they are produced by programs other than Acrobat and are not able to write version 6 format.

At what point do you stop backward compatibility? Why not insist that we use the Acrobat 1 format?. If your argument was applied to cars for example, we would still have to have a man with a red flag walking in front of every car!

A decision was made that we would only support 32bit versions of Windows (NT4/2000/XP/2003) for both the web and CD files. This covers over 90% of users This is bound to leave a few, like yourself, who are left out in the cold.

The main problem that I find with the Acrobat 6 viewer is that it uses the IE6 engine for screen rendering and thus will not work if you don't have IE6 installed.

Cheers, Ian.

Editor of CQ-TV magazine, Webmaster of the BATC sites.

From: Kevin Ravenhill
[knr@fireflyuk.net]
Sent: 30 July 2004 16:56
To: editor@cq-tv.com
Subject: RE: Cyber-membership

Thanks Ian for your comments. Yes, IE6 is one of the reasons I wouldn't want to use Acrobat 6 even if I could (I've been bitten badly more than once by security vulnerabilities with IE and these days I steer well clear of it).

Unfortunately if you are indeed going to only go for compatibility with Windows 2k/XP etc. and are going to insist on proprietary formats to boot (and it seems we agree that Acrobat 6 is proprietary because, as you say, no other software can produce or read files in that format), then I have to say that I think this is both short-sighted and counterproductive. I would also disagree with your assertion that this covers over 90% of users (even if it is 90% that's still 10% of potential new members we could be chucking away).

It's not a question of Luddism or a desire to stick with obsolete software, I'm trying to be practical here in suggesting that we allow for everyone rather than exclude some unnecessarily. I appreciate there are some advantages to Acrobat 6 such as smaller file size, but I would ask the opposite question: Just because something new is available and gives advantages in some minor respects, does that mean we should necessarily adopt it and in doing so throw the baby out with the bathwater?

As I said, I feel very strongly about this. I regret to say that in my case, unless the situation changes I won't be renewing my BATC subscription in November. Sorry, but you have probably just lost another member.

Regards

Kevin

From: Trevor Brown
Sent: 30 July 2004 17:17
To: Kevin Ravenhill
Subject: Re: Cyber-membership

Hi Kevin

Thanks for your input, I will give it some thought.

As a rule I try not to interfere with the individual sections of the club, everyone is a an unpaid volunteer and deserves as much administrative freedom as possible.

Ian looks after all the I.T. of the club i.e. electronic archive and website as well as editing the magazine.

I know he thinks long and hard before making any decisions. Adoption of the Acrobat 6 format is the first complaint anyone has raised against Ian logic.

Making the archive available in electronic format to members was something I asked Ian to take on board.

Its not essential that you have the CD and I am happy to refund you cost. Its just I thought it would be nice to make this available to all members either free via the web or at cost for a CD.

The CD is now full even using the smaller Acrobat 6 files and we may have to move to a DVD.

I did review the costs of the equipment necessary to download or subscribe to cyber membership, the slowest PC I could find 400 MHz running win 2k the files were downloadable once the free Acrobat reader was installed.

I did not want a system that required flashy hardware as the Cyber option was aimed at places in the world where BATC membership costs more than a weeks salary. I had hope to charge considerably less for this option and not restrict it to overseas.

I was overruled by committee. Lets run your letter in the next mag and see

if we can get some input and then evaluate the size of the problem

Trevor Brown

BATC Chairman

International ATV contest Sat/Sun 11/12.

I was determined to be on-air for the international ATV contest, even if only to get a perception of what activity was about. Without a 'day job' at the moment, I was able to devote the previous week to preparation. The time was mainly spent in constructing a free-standing - stable - mast structure, cleaning the caravan (which has been in store for a year), preparing Tx, Rx, ident, captions, contest number etc.

The contest timing - 7pm Saturday to 1pm Sunday - has always been a source of curiosity to me, as this assumes significant contacts overnight. Why does the activity period not include all Saturday morning to Sunday afternoon? If you (have to) go portable, as many ATV contest stations do, overnight presents problems; you have to have either a caravan or a tent, and get permission for overnight camping.

At 226 metres asl, Barr Beacon is the highest accessible point in this area (West Midlands), with clear views in most directions. I arrived with the caravan, kit, etc around 7am on the Sunday. For a contest you really do need to be able to rotate the antenna - often! The 'Armstrong' method is very inconvenient, but a rotator needs a 240V mains supply. A new rotator had been bought at Telford (for £35!) Fortunately, I had an invertor and a fully-charged caravan leisure battery. The antenna mast, rotator and 2m plus 24cm beams were mounted and rotated well. I then listened on 2m, on the ATV calling channel at 144.750. Nothing was heard. Eventually, Viv Green and the Severnside group (in the Mendips) were heard on 2m. Contact was made

and the chat on 2m was fine, but on trying to trying to receive pictures, nothing was seen. During the rest of the morning, I frequently rotated the antennas, listening on and around 144.750 - but no other contest stations were heard. Some familiar calls were heard in Wolverhampton and Telford, and pictures sent to them, but these were not logged as formal contest contacts. The tuner on the Bob Platts 'Dove' receiver then started to feel warm - and I discovered that it had no tuning voltage. The receiver had been working well earlier, but that was the end of this expedition.

So, from a good high location, I heard just one contest station, worked no contest stations in vision, and didn't even see the Stoke repeater (GB3UD) , although I was assured it was fine - maybe it was the trees on the west side of the road crossing the Beacon? Never

Portable Antenna support tower. 10ft lattice tower cut down to be manageable. Wooden extension 'legs' to ensure stability, attached by bolts and wingnuts for speed of assembly on site.

mind, I will repair the receiver and go up there soon to try again.

Graham (undeterred) Hankins G8EMX.

From: Richard Giles [richard@giles20.fsnet.co.uk]
Sent: 16 August 2004 19:47
To: editor@cq-tv.com
Subject: Letter to the Editor

Dear Sir

Re: Chairman's Column, CQ-TV 207

Well, not for the first time do I find myself writing a controversial letter to the Editor.

Our Chairman expressed his opinion regarding the club's future – that the membership cost should be around £2 per annum and that CQ-TV should be delivered in colour via the internet.

Personally, I cannot think of a worse recipe for the future of the Club. Such a move is likely to ensure the certain demise of the Club, not prolong its existence! Has Trevor really thought this through? Do our readers know of many people who are prepared to accept a 'virtual' magazine? Not many I would venture. Overseas members perhaps and some here may like the option, but not for it to be forced upon us.

I belong to a Rotary Club that tried publishing its monthly magazine in PDF format, sending it by email. It did not work because members not only could not be bothered to save and open the attachment but they also wanted a hard copy for future reference. I would suggest that an emailed copy of CQ-TV would be regarded in exactly the same way by our members, and lead to a rapid cancellation of existing memberships. Is this what the Club really wants?

Yes, there must be change, but that change must be managed. There is absolutely no need to throw in the towel and precipitate the demise of the club.

Firstly, the level of the current membership subscription is reasonable and could be justified if the magazine continues to be published in hard copy.

Secondly, consideration should be given to downsizing the magazine to provide articles of genuine interest with further cost reductions being made by dropping colour. News and reports could be circulated by email and/or web posting.

Lastly, although nothing to do with the magazine, but a lot to do with club membership retention – may I respectfully suggest that the committee tries to avoid having either a rally or BGM local to and held on the same weekend as another major event. This year it was held on the same weekend and close to the Car Boot Sale organized by the Dunstable Downs Club (which runs GB3TV and GB3TZ) at Stockwood Park. Not only is this a major radio amateur event, but also the majority of the local ATVers were tied up in its organization and so could not attend Shuttleworth.

In the football pitch on which the BATC plays, when will the club cease to score own goals and think of the punters rather than the players?

Yours sincerely, Dick Giles, G4LBH

From: ian waters
To: Trevor Brown
Sent: Tuesday, August 17, 2004 10:24 AM
Subject: CQ-TV
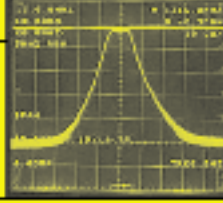
Hello again Trevor! I read your bit in the latest CQ-TV suggesting that the club may not in future be able to circulate the magazine in printed form with some disquiet. As I see it to many people CQ-TV IS the club. If it did not arrive regularly they would forget about the club and membership would really crash. While many people these days live on their computers, on continuously and with broadband access, others do not. They, if they knew that CQ-TV was in the offing, would have to switch on, log on and wait for ages for it to down load. Then spend time to read off the screen not in my experience all that easy to do. No light reading in bed, in the train or on the loo. To print out is not an option for time and ink cost reasons. I have an archive of CQ-TV almost from the year dot. I research this regularly especially if I am planning some project. I can say that without it I could not do what I do. While I think our editor does an absolutely superb job, I have to ask if we really need a glossy, colour, A4 publication? Many other special interest groups put out their essential info in a rather more modest form. Another thought if we do have to circulate electronically. As much of the content is read once only, could the hard core of technical articles be circulated to those who really need them in hard copy? I for one would pay more for this. While I can see where you are coming from overcosts, I do urge the committee to think long and hard over this one.

Changing the subject. You should have been receiving (as requested) copies of e-mails between Uwe and I which seem to indicate that QPSK DATV on 70 cm using the AGAF boards is not quite as easy as we hoped. I will keep on to it, although in the end we may have to use GMSK. As will be seen in an article in the next CQ-TV I am getting excellent results on 23 cm. 73 Ian G3KKD.

In the Edit Suite - part 2

By Trevor Brown

The problem with linear editing is the number of VT decks and ancillary mixers and digital video effects units required. It also requires that the editing is started at the beginning and built up to the end. Production staff already familiar with film editing were rather reluctant to accept this restriction, as they were used to being able to cut film in any order i.e. start in the middle and add the other bits as and when they arrived in the cutting room. Manufacturers, always looking for a problem to solve, came up with non-linear editing. The initial systems were called off line.

The camera rushes were digitised at a reduced resolution image and stored on a computer hard disc. The software then enabled the operator to assemble and edit the clips on a time line display; they could be assembled and manipulated in any order rather like film. When the final edit was complete, the software would produce a time code list called an EDL (edit decision list) that could be used in a conventional linear edit suite to recreate the programme using full resolution pictures. The reason for reduced resolution pictures was the size

of hard discs - 9 GB being the industry standard.

The use of a linear edit suite to overcome the reduced resolution was a requirement until second-generation equipment online/offline came along. 9 GB drives required reduced resolution pictures because of the cutting ratio i.e. total material filmed verses final cut. Once the final cut and EDL had been produced, just the required material could be re-digitised using a higher resolution, as the software would ignore any material not in the EDL. This enabled a high-resolution capture and replay on to VT without the online linear edit.

Technology marched on and with the improvements in hard disc size and CPU speeds, full resolution capture, manipulation and replay became the order of the day, adding mixes DVE's (Digital Video Effects) and graphics. This brought along another problem; if the material was to be processed outside the non-linear suite for any reason, the simple EDL could only list cuts and mixes and not convey the more complex information generated by this new generation of equipment. More complex files started to appear, hence

the OMFI (open media file interchange) soon to be replaced by the AAF (advanced authoring files) or XML. These lists are essential for distributed production work, where animation, graphics and sound dubbing take place in different areas of the building.

Putting this into context and applying it to a Mk4 edit suite is interesting. Construction should be easier than the previous linear suites. All I had to do was choose the system, fit the capture card to the PC, load the software and connect a suitable VT. It was the beginning of an entirely new learning curve, as all the hardware effects would be replaced by software. A new edit suite management plan needed to be thought out. Previously, I had rushes on tape, the final edit on tape and the EDL on disc. If something crashed, the tape was usually intact up to the edit point, so a repair or reboot and the edit session was back in play, although now and again my MII would eat a tape and I would have to auto compile from the EDL to assemble rushes onto a new tape.

Let's work our way through some of the non-linear systems and explore the options.

Capture cards start at around £10 and are fire wire only - fine if you only want to use DV, but I have an archive full of material I still use on composite and component formats. You can add composite and YC capture for about £200 or less, but if you want component then the price goes up. SDI may stretch your budget further, but not as much as you might expect. Black Magic produce a budget SDI capture only card for £199+VAT. If only everything was SDI.

Avid, Adobe, Ulead, Pinnacle, Newtek, Sony Vagas and Apple are the market leaders in this technology and now Quantel are looking to introduce Q edit to the arena.

Let's start with Avid, one of the best names in the industry, with credits on films like Gladiator. The entry level package is Express DV at around £500 (software only), it comes without Russell Crowe, and is designed for firewire captured DV only; it is a software only package. The tools change dynamically as you work on the time line. It will export EDL's and OMFI files and has one of the best colour balance control panels I have seen. If you want more than DV capture, then you need a MOJO (obviously fans of Austin Powers). This is an external hardware unit that connects to your PC via the firewire connector. It takes in YC, composite or component, but not SDI. It needs the next level software, Avid Express Pro - around £1200 for the software and the same again for a MOJO, but still no SDI. I suspect you need to make another jump to the Media Composer; how much? - don't ask. Is that the end

of the line? No. You can keep moving through Adrenaline onto Nitres, and no budget left for Mr Crowe. On the plus side, you can download a free demo from the Avid site and give it a try - and they have reduced prices for students too if that helps. Three major advantages of Avid Express Pro and the MOJO: -

1 The MOJO is an external unit and so will work with a laptop.

2 The Software is written for Apple Mac or PC, it comes in two versions with a single USB dongle that works on either machine.

3 The MOJO has an accelerator chip in it, which talks to Avid Express Pro and speeds up the operation, so always keep the MOJO connected.

The next package I looked at was Adobe (software only); it's been around a long time and is now up to version 7, aka Premiere Pro now at version 1.5. I have used version 6.5 several times in the past. It does what it says on the tin. It has a Toolbox and you have to keep visiting it for the correct tool for attacking the time line. Once you learn the tools, it's fine. The timeline has audio level manipulation, which enables the sound levels to be set for a smooth mix, and for music to be easily dipped under voice over. It has an MPEG2 software compiler (at an extra cost), so you can get part way to DVD compilation (more on that in the next issue) without leaving the package.

Surround Panner

Center: 0.0 dB
Smoothness: 100 %

Premier Pro 1.5 will even work with HDTV. It is software only, so if you want more than DV you are going to have to think what hardware to use with it. Adobe produce a plug in for Black Magic capture cards (written by Black Magic), which create the required AVI files for the Adobe time line, as opposed to QuickTime with the Black Magic software (more on this later). The Problem with Adobe was limitation in the lists it created. It was usually restricted to EDL only. They seem to have fixed this problem according to the publicity on their website in Adobe Pro 1.5, they now offer EDL, OMFI, AAF and XML. You can download a free demo from the Adobe web site.

Newtek is an interesting hardware and software package. It started

off called Flyer and then had a name change to Video Toaster. It ran on the Amiga platform, and four years ago was re-engineered for the PC. It has had another name change and is now called VT3. It's more than a capture card and edit software as it comes with a graphics programme called Aura and a 3D animation package Lightwave 7.0C. It will capture composite, YC, and component, and has a very pleasant editor, (more on this later). It also has a software vision mixer and virtual VT that enables you to mix a live camera with previously acquired clips stored in a virtual VT. The camera can be composite, component, or YC and can free run (no genlock required). A second camera is possible through the PC's firewire input and again you can mix between clips and camera; note there is significant latency due to DV decoding. By mix I also mean wipe or tumble (there are a number of these effects onboard). If you want to expand this, then you can add a SX8 break out box and have up to 8-camera inputs in component mode and up to 24 in composite mode, again free running and mixable between any camera and clip. If you think this is a little too much on a computer keyboard, they produce a very nice control panel, the RS8 - again an extra. Two other extras available are genlock, so the video output can be synchronised with an external source, and SDI so you can capture, mix and replay SDI signals.

Lets return to the basic editor, with it's capture of everything except SDI, which is a $750 add on.

As you manipulate the time line you have a broadcast quality video output (component, YC or composite) and you can see the result of your manipulation as you work on an (optional) monitor. This is ideal if you have a client sat at the side of you. You can open a monitor on the VDU if you prefer, along with a waveform monitor, vectorscope (NTSC only) and sound level meters (but again not PPM). The software is friendly, has lots of useful effects and a good 3D image manipulator that works on key frames. There is also a very nice caption generator and some very pleasant award winning templates that can easily be customised to suit your requirements. I have been driving one now for over month - I have not seen a book, so you must credit it with being intuitive.

The down side is audio input to the card is via mini jacks (unbalanced). The audio input level is fine but the output is about -8 dBm, presumably a limit of
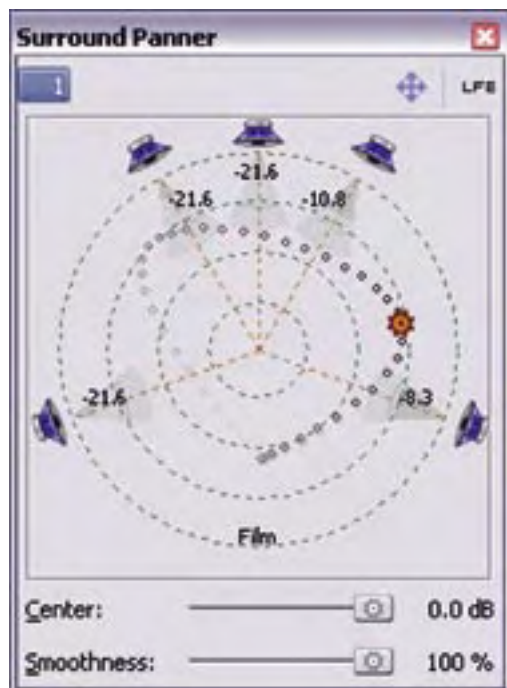
working off 5 volt rails. This is corrected and made available as balanced with the SX8. The other problem is no export other than EDL. How much? Well for $4000 you can have VT 3 software, capture card, genlock and breakout box for multi camera work. This is an offer price at the time of writing. Newtek is an American company and I have deliberately quoted all prices in dollars. We still live on Treasure Island in the UK and the prices in the shops have little to do with the dollar exchange rate and, sorry, there is no demo to download for this product.

Apple produce Final Cut Pro which has a very strong following. It is software only and is around the £800 mark, it runs on an Apple as you would expect. Yes, there are add-on's to increase the cost, but there is a cut down version called Final Cut Express. Cold Mountain had some of it's editing done on Apple - this does not mean Nicole Kidman will pop in to see your rushes, but I live in hope. The G5 is the recommended platform and comes in at around £2300 - again outside BATC budget to buy and review. It does enable a nice mix and match arrangement of hardware.

Again, 'Black Magic' is my favourite player for the hardware. Their prices are very competitive and keep falling all the time and they are very helpful - all my emails have been answered and I am not a customer. Sorry, I could not find a demo version for you to try.

If you go for a software only package then you will require a firewire card. Some motherboards incorporate firewire ports, on some you will have to add a firewire capture card; they start at £10. If you want more than DV then have a look at the Black Magic range of capture cards. They start at £200 +VAT for the SDI only card with embedded audio, and move on up to HD in reasonably priced steps. They come with software that generates Quicktime files that should integrate very nicely with Apple-based technology. Quicktime files cannot be put on the time line of VT3 or I would have bought one by now, but its worth thinking about if you go down the Apple route. If you remain with a PC platform then - with Premier Pro - capture via these cards is also possible and will produce 8/10 bit uncompressed

AVI, which can then be used in Premier Pro or VT3.

Ulead Inc. have many years experience in the PC NLE market and claim a similar share of the market to that of Adobe's Premier products. Their products start at a base level intended for home users and are often bundled with camcorders and other consumer items but extend up to a highly regarded professional editing package called 'Media Studio Pro'. This is actually a suite of four programs, 'Video Editor' which is a time-line based AV 'cut and paste' clip editor that supports up to 99 audio and 99 video tracks; 'Audio Editor' which as it's name implies is the audio track editor, incorporating numerous clean-up and effects tools; 'CG Infinity', a tool for creating and manipulating text and graphics prior to overlaying and 'Video Paint' which is a rotoscoping utility. All Ulead products, including their photography and 3D graphics applications can import and export into each other, extending the usefulness of individual programs. Ulead also market 'DVD Workshop' - which at the time of writing is one of very few programs capable of adding AC-3 sound tracks,

multiple language tracks and subtitles to DVD productions. It also exports in DLT format for mastering houses and can add both Macrovision and CSS copy protection systems to the final production. A plug-in is available to add HDTV capability to all Ulead video products.

More on this next time.

'Edition' by Pinnacle Systems is derived from the highly regarded Fast Products which were acquired by Pinnacle some years ago. Following this, various other products were initially tacked onto the Fast product and in later versions more fully integrated. The current incarnation of Edition (5) - now known as Liquid Edition - comes in 2 flavours, software only for DV based editing and a hardware version which supports S and composite video in and out. Widescreen and 4:3 are supported. If you do go down the Edition route and register the product, Pinnacle offer very reasonable upgrades - usually around £35 or so a time (at least that is what they have done in the past). Pinnacle offer a demonstration of what it can do and, to be honest, it's very impressive.

The time line follows the usual practice of stacking up overlays, transtions etc, one above the other, but that is where the similarities end. The main screen, which can be set for dual head use, has the preview and main screens at the top, with the timeline below and to the left are "file/project bins", plus DVEs etc. The rest of the interface is all icon based, but if you hover the mouse over the icon it does tell you what they do. Keyboard shortcuts may be brought up on screen (a keyboard pops up). Effects are easily applied, and batch capture works well in the DV mode (the only one I have used). Edition also supports realtime 2D and 3D DVE, but only to the VGA screen - in other words it makes use of the GPU

Video Event FX

2   **Video Event FX:** Surf_Dawn

☑ Color Corrector (Secondary) — ☑ Color Corrector   ?

Preset: Blue Midtones

Color Corrector   About ?

Low:	Mid:	High:

	Low	Mid	High
Angle:	0.0	347.1	0.0
Magnitude:	0.000	0.500	0.000

Saturation: 1.000   Gain: 1.000

Gamma: 1.000   Offset: 0.0

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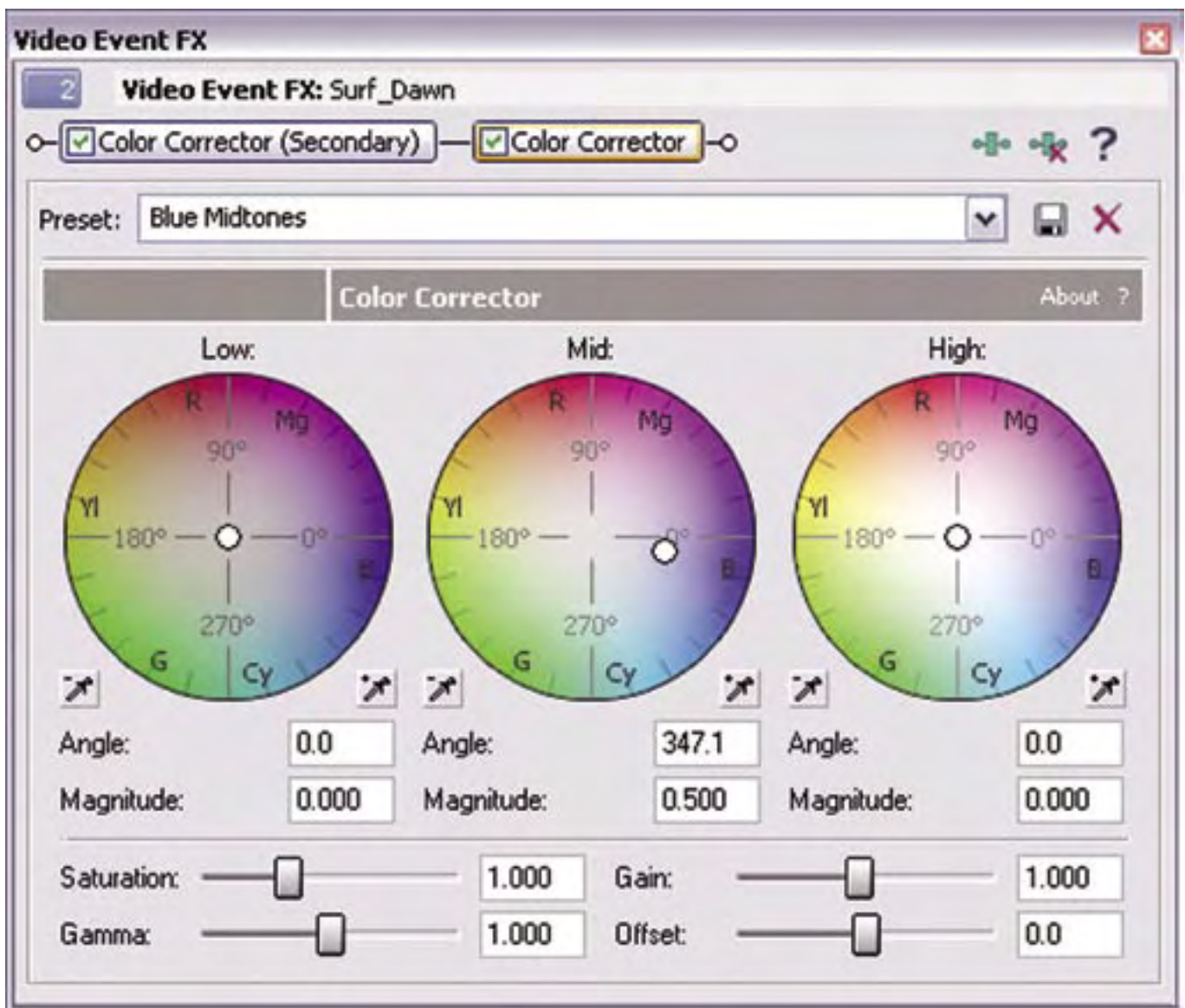
as opposed to CPU for these effects, and as a result requires a suggested x8 AGP card with 128MB of RAM. These effects can be key framed and there is some adjustment to the trajectory of the effect (i.e it does not follow a straight line graph). When you invoke the additional editing functions over and above the time line, a window with the associated function pops up; when you exit, it disappears, leading to an uncluttered feel to the desktop. Edition also has colour correction, blacks, mid and highs, and a basic caption generator in addition to the features mentioned above.

One particular feature which this has - which actually works - is a background renderer. This runs during idle periods of the CPU, and its function is shown by a pulsating 'epsilon' in the bottom RHS of the task bar. If you go away and come back and play the timeline, play it will. Premiere Pro is supposed to have background rendering, but I still need to hit enter to render parts of the timeline; no such problem in Edition. Hollywood Effects is also included, which has a range of preset DVE`s, tumbles etc - most of which are over the top. Packages can be added to by purchasing at the Pinnacle site (well you already have them you just need an unlock key, as they are watermarked).

Liquid Edition includes simplified DVD creation direct from the timeline. Edit points can be used as chapter points and there is an integrated MPEG2 encoder, which you don't have to pay extra for. There is a good selection of menu template items and good quality DVD`s can be produced. If your DVD burner is too new, then ISO images can be produced and burnt through Nero; if you have one of the older common types, then it is possible to burn to DVD directly. AC3 files (Dolby) are not supported. There are also vector, waveform, parade and histogram displays of somewhat limited use. Finally, if this were not enough, there is the ability to export OMFI files type 1 and 2 and AAF. All in all, Liquid Edition is a competent package that offers more than enough facilities for the beginner to the advanced editor. I believe there is also limited support for HD. Not bad for a package around £550-£600.

One package that does not get a lot of airing in the UK is Sonic (now Sony software) Vagas, which is quite impressive (Sony Vagas have a demo on their site at http://mediasoftware. sonypictures.com/products/ showproduct.asp?PID=914&FeatureID =7548). The sepia, old film and dodgy TV filters are excellent and these can be "chained" to give multiple effects to the clip. The sound support is very good, (well what would you expect from Sonic). You position in a 5:1 field and you can mute both audio and video clips on a temporary basis. This is software based DV only and - with the Vagas+DVD package and the AC3 encoder - fully supports the production of Dolby 5:1 DVD`s. I think the base

price is around £450 and the bolt-ons, including the 5:1 AC3 encoder, come as extras. If you have Sonic's Sound Forge on your system, you can open the sound files in it as an option. It calls up Sound Forge and automatically loads the sound you are dealing with. Apply the changes you need to make and then when you close, it goes back to Vagas with the sound duly "adjusted". Very nice. In fact it might be worth considering this combination for your audio post production, as you could load a DV video file and the associated wave audio files to build up a 5:1 sound image. The resulting AC3 file may then be used for your DVD, even if the video came from another package. If you have the chance, do give this one a test drive - it is remarkably good and in my opinion underrated.

Let's start by looking at a PC to edit with.

The first choice is CPU and although AMD reigns in the games world, Pentium has advantages outside games and in the case of Video Toaster - sorry, VT3 - it is their recommendation. Twin CPUs can have advantages, if you get it right. The video information, called streams, communicate via the PCI bus, as does the hard drive on a single CPU system, often clogging the bus. The standard PCI bus has a maximum throughput of 133MB/sec. Twin Xeons can have multiple PCI buses; thus if the card is on the PCI bus and the disc array on the 64-bit bus, the PCI bus traffic is reduced. The processor speed needs to be over 2GHz, although I have used Adobe 6.5 on a 1.2GHz AMD with no problems it must be said.

Hard drive speed is essential and 30 MB/sec is a minimum. IDE drives struggle to achieve this but two IDE drives used as a RAID 0 array can just about make it around 40 to 50 MB/sec for the two discs. SATA drives can achieve this and in a RAID array reach the 80 to 90 MB/second for two drives. SCSI drives are the best. We put a RAID 0 array of 6 SCSI discs together using 2 controller cards and achieved 250MB/sec. These are expensive discs and - as Mike Cox will tell you - they get hot and fail frequently

For the best results drives should be striped in software as a RAID 0. This gives the best performance, but there is no data protection. Hardware RAIDs are best avoided as they are good at bursting data but not good for sustained transfers that video requires to avoid stuttering. The good news is that controller cards (as opposed to RAID cards) are usually cheaper.

Uncompressed video requires 93GB per hour for 10-bit encoding storage, DV requires 18GB per hour. HDTV for the format 1080 line interlaced requires 463GB per hour. Remember, never fill a hard drive more than 80 to 90%.

After all this though, I chose VT3 for the Mk4 edit suite - just the bare card and no breakout box. I used a Pentium 2.8 GHz CPU with FSB and 1 GB of PC 333 MHz memory. I already owned two 80GB Maxtor's that I put into a RAID 0 array and a 150GB SATA drive which I intend to duplicate and run the pair as a RAID. The system disc is 40MB, which is more than adequate.

I am still making rules for managing the suite. For DV acquisition, time code is an integral part of the system but for any other format it is important to install RS422 deck control via an RS422 to RS232 converter; this will ensure that the clips are loaded onto the hard drive along with their time code.

As the time line is manipulated, it is important to periodically save your work. The clips remain on the hard disc and a cutting list is generated, which should be saved on another drive. If you lose the clips through drive failure and still have the list you can replace the drive and reload the clips. As they bring their time code along via the RS422 all should be well. If you have not got the RS422 connection local time code will be generated, making the list of little use. The final safety measure is to render a full copy of your work at the end of each day to another drive. Again if you lose a drive you will still have your work as say an AVI. It won't have all the cutting marks but it's better than nothing.

Why worry so much? Well, video editing is hard on drives and they do die. It's bad enough replacing them from a cost point of view; it's even worse if you lose several days work. I often edit with clients sat at the side of me. To switch on in the morning and announce that all yesterdays work has gone - "let's start again" does not go down too well!

On the Mk4 suite, I am going to make the SATA RAID into a the video drive and store the clips here. I will set it to drive V in Windows. The IDE RAID will be used to store rendered programmes as AVI or RTV files (Toaster's preferred format), temporarily storing projects at the end of each day and - when the project is complete - as a library copy. I will set this drive to R in Windows. The cutting list will be stored on the system drive. When an edit is complete and exported to DVD, CD or whatever, I can wipe the V drive for the next job. If I need to remake the programme, I can either use the render file or put the rushes back on the V drive and use the stored list on the system drive to recall the time codes and recreate the programme in the time line, along with all its cutting marks. I hope this will give me options in the event of a disc failure.

My thanks to Brian Kelly and Mark Bloor for their help in compiling this edition of "In The Edit Suite".

At the time of writing, it's five days to IBC where any new product changes will be announced. It is interesting to think what will be unveiled. I suspect HDTV will be one of the major topics as will editing compressed formats, particularly in MPEG2. The next generation of cameras is around the corner and for ENG there are definite advantages to MPEG2. They already use DSL lines to move the pictures from some of their outposts to the studio for editing. At the moment it takes about 5 minutes to send 1 minute's worth back to the studio, so editing still takes place at these outposts outside the main news studio. If MPEG was used on the shots then perhaps this would be abandoned in favour of sending compressed rushes back to the studio. There will be definite moves away from tape; already disc and flash memory are in use.

Next issue we will cover getting your work on to DVD and digging a little further into HDTV

Video Capture Cards http://www. blackmagic-design.com/

RS 232 to RS422 converter http:// chaokhun.kmitl.ac.th/~kswichit/Pc_ Rs422_web/PC_Rs422.html

Useful bits and bats http://www.bpr. org.uk

Avid free download http://www.avid. com/forms/freeDVRegDownload.asp

Adobe free download http://www. adobe.com/products/tryadobe/main. jsp#product=98

Ulead demo downloads http://www. ulead.co.uk

Turning Back the Pages

By Peter Delaney

A dip into the archives of CQ-TV, looking at the issue of 50 years ago.

CQ-TV 22 - October 1954

The "News and Gossip" began with "May we remind you that there is a great demand for old copies of CQ-TV, --- wanted Nos 5, 6 and 8 to complete set." Other news included the latest on the transmitting licence - "the welcome announcement that holders of a vision only licence are to be permitted a sound channel, on the understanding that sound messages transmitted shall relate solely to the vision signals being transmitted. In addition, the callsign need only be transmitted by cw or phone on the vision channel every 30 minutes, instead of every 10 minutes as before"

On a more 'technical' topic - "The Committee have recently reviewed the position with regard to Club standards, and have some recommendations .... all units loaned by the Club for exhibition purposes will conform to these standards.

(a) Electrical. All outputs 1 volt peak-to-peak across 75 ohms. Composite signals to have white positive, sync negative. Syncs on their own to be negative going. Normally, only frame and line sync, separate or mixed, video and composite feeds will be used.

(b) Sound. Studio sound equipment will normally be provided in toto ...... Intercommunication facilities: a Central Battery system will be used, so that operators will only require a headset and carbon microphone each .... 6 volt cue lamps should be used ..... For call back, a shorting key across the speech lines may be used.

(c) Mechanical. Either standard GPO 19" racks, or 15" racks to be used (the latter will go in a car).

Belling-Lee standard 1/4" co-ax plugs and sockets for all video equipment

HT will be supplied at +250V regulated and bias at -150V. 6.3V AC will also be available."

(The 'Belling-Lee' connector is the 'normal' domestic tv aerial plug and socket The 'electrical' standard still applies, but not many members use 19" racks now, and even fewer the Belling-Lee connector !).

"Arthur Critchley reports that some CRTs will operate as staticons (ie like a vidicon camera tube). Focus a scene onto the raster, and put a load resistor in series with the beam current circuit. Signal to noise ratio is poor, but 1Mc has been resolved ....." (Arthur was also noted in that issue as a 'new member' - many members will remember his series on the - then new - 'integrated circuits that ran from CQTV 71 - 86 from 1970 - 1974, and a triple standard genlockable sync pulse generator using 74 series logic in CQ-TV 75 - 77)

Spot Wobble Circuit - from Mullard 'Outlook'

Spot wobble is a device - the magazine told us - for rendering the line structure of a television picture less noticeable, by causing the spot to move not only horizontally across the screen, but also to vibrate vertically at a comparatively high frequency. A set of 'saddle shaped windings around the tube neck were fed with a 12.5 Mcs signal to achieve this.

A different technique was used by Tony Sale to enable him to use a 5527 type camera with only 100 watts of lighting in the 'studio'. The 5527 tube normally suffered badly from 'tilt and bend', and increasing the video gain would cause the blacks and whites into saturation. By placing a magnet on the lens housing, it could be moved to correct most of the 'bend', and allow the gain to be turned up. Tony thought the effect was due to charge redistribution across the mosaic. With the normal direction of the scan there is a diagonal force acting on the scanning spot and its secondary electrons due to the area already scanned, The magnet counteracts this force, so that the secondaries can distribute themselves naturally". (Club members did a lot of such experimentation in the early days - the modern ccd arays do not respond to - or need - such magnetic manipulation!)
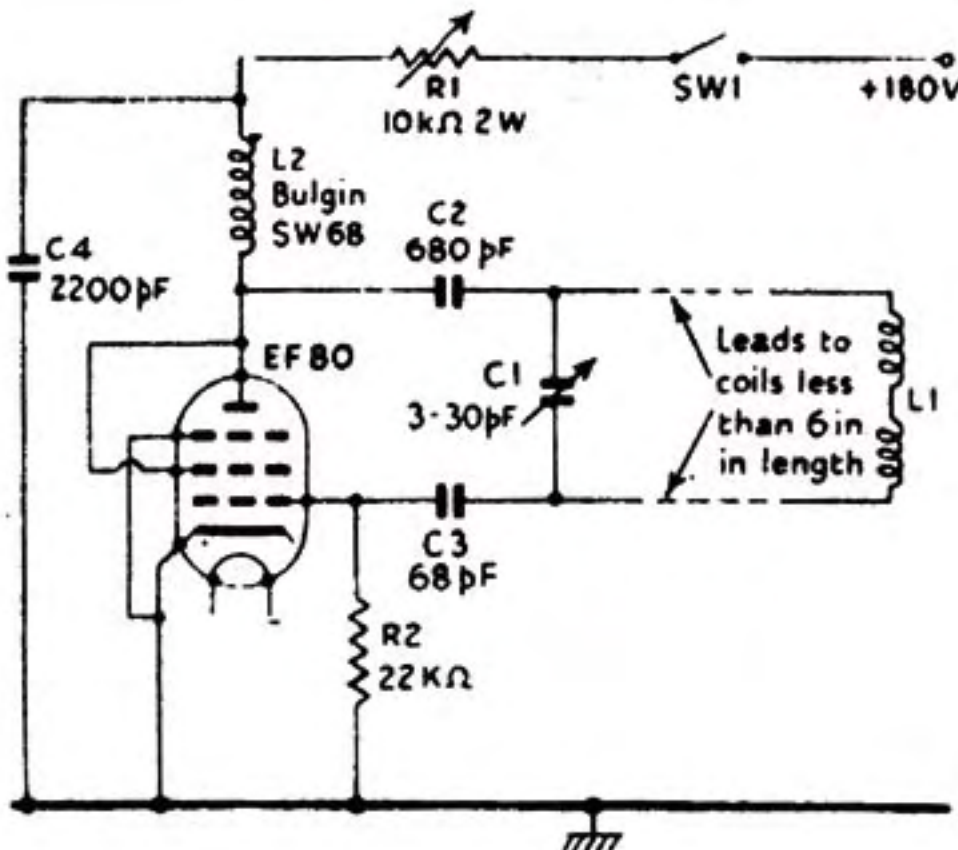
ITS Generator

By Richard Carden VK4XRL

Would you believe this project started out as a simple audio/video distribution system? I was approached to provide some extra outputs for VK4TVD's ATV system and then while I was at it I thought what about providing a suitable insertion test signal for setting video levels. Searching back through CQ-TV I came across an article by D.J. Long G3PTU in CQ-TV No.97 called "An ITS Generator". Not many articles have been produced on this subject so I thought this may fill the void.

I started of using the ideas based on the circuit supplied in CQ-TV 97, however I wanted to use CMOS devices. For some reason I was unable to obtain the same results and also a equivalent for the 7413 was not available. Also the shift register circuit using a 74HC74 and 74HC164 wouldn't work unless you used a normal 7474. The ideas used in this circuit arrangement weren't lost though, so armed with this a new circuit was developed.

Test Signal Generation

The block diagram shows the basic requirements and is drawn as such, as this was how I approached it. The OP amps were already available on a PCB using a MAX 497. The circuit is drawn with different OP amps as a complete unit.
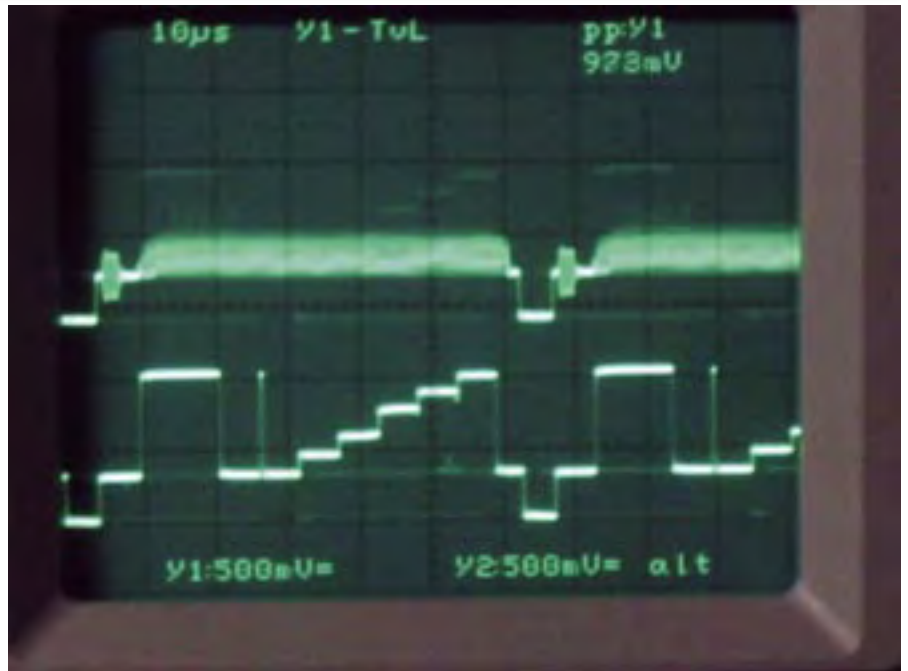

Figure 1 - Video output with ITS & ITS test signal

Figure 2 - Video Input & Clock Output

Incoming program video is feed via two paths, one to the video inserter and the other to the sync separator to provide the required digital pulses. The sync separator is the now familiar LM1881, this produces MS, VS and Burst as required by the rest of the circuit. The first pulse required is horiz Blanking. I tried a couple of simple non-retriggerable monostables consisting of a flip-flop formed by two cross-coupled NAND gates. While these worked it was decided to try a 4098 IC monostable which has two per package. This would reduce the overall component count and would be much simpler to implement. Looking at the circuit -ve MS sync is fed from LM1881 (pin 1) to the 4098. The timing components are selected for a pulse duration of approx 10.5us. The +ve pulse from pin 6 is then fed to pin 11, where the –ve edge triggers the second monastable producing a –ve pulse at pin 10. The duration of this pulse is around 52us, the duration of the active line period. At this stage pins 3 and 13 are tied to +5V.
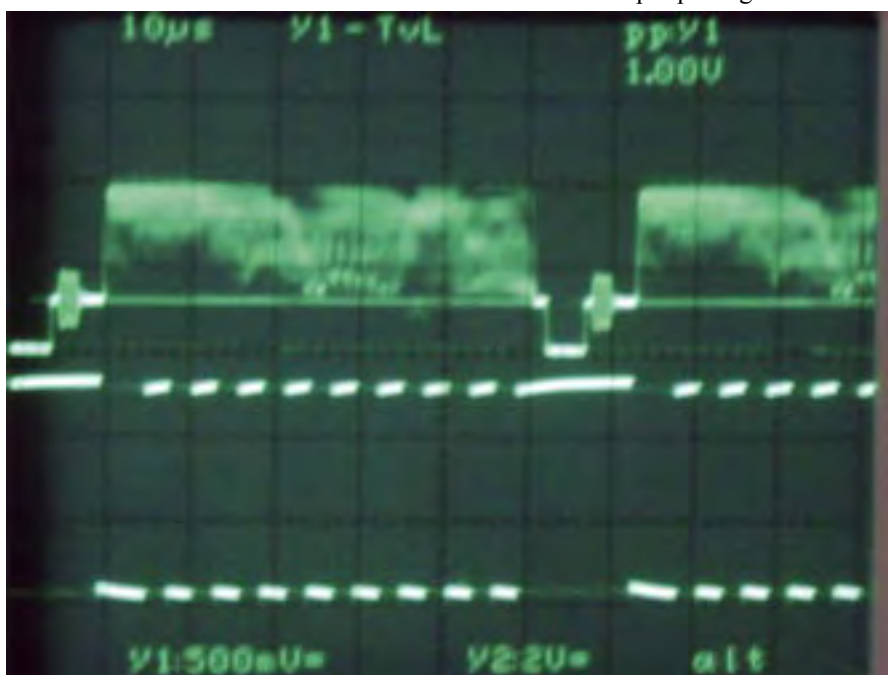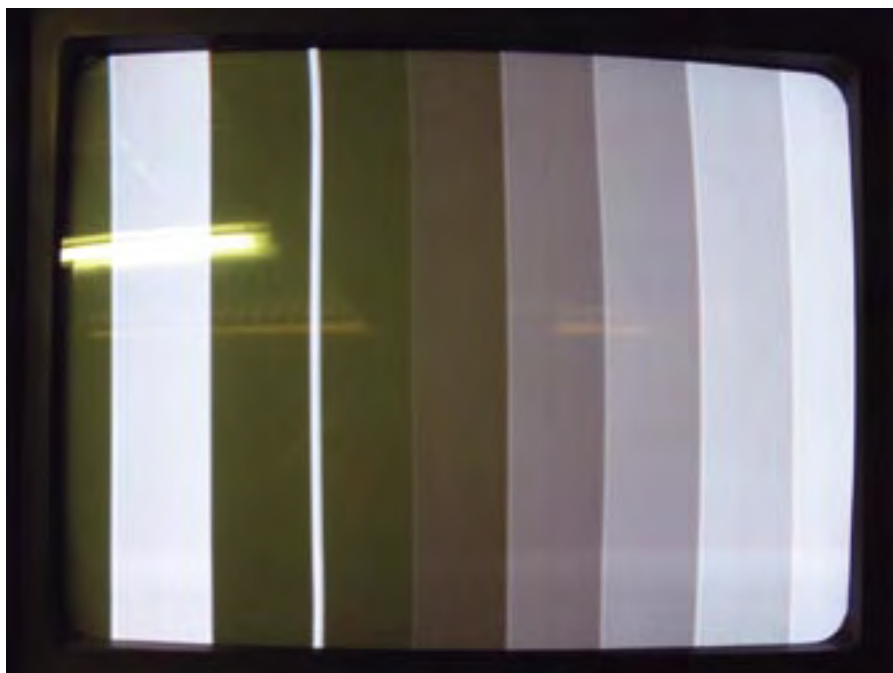
The next part of the circuit is the clock oscillator using a 74HC132. The clock oscillator is switched on and off from the above horizontal BLK signal, the frequency being adjusted so the last stairstep is completed before the start of H.BLK. The shift register is made up from a 4015 and is clocked from the above oscillator. The data input is fed from a separate 4098 to produce a pulse approx 5.8us wide while the reset is fed from pin 9 –ve H.BLK. The data is then clocked at intervals along the line. Each output is fed via a diode and resistor network before being summed across the 1k resistor to provide the basic test signal. Because the data from 4015 (pin5) has been clocked it starts approx 5.8us after H.BLK. Therefore to provide a more standard bar output the –ve data pulse output is gated with the output from 4015 (pin5) via an inverter to produce the bar output. Also the pulse waveform is produced from the differentiator formed by the 27p and

Figure 3 - ITS Test signal

10k resistor and feed via Schmitt gates to the summing network.

This combined output is then fed to a video OP amplifier where its level can be adjusted. Its output is then fed via a Gaussian Filter to the inserter. Because sync has been added to the test signal H.BLK now sits at +0.3V, therefore a –ve offset is required to set the test signal blanking to the incoming program blanking. This is provided by the fixed 15K and 5K pot connected to the -5V rail.

Inserter

The incoming program video needs to be clamped before the test signal can be added to the signal. I was unable to obtain a EL4089 but had some EL4090 IC's left from another project, either one will work. Program video is now clamped with blanking at 0V. Burst pulse from the LM1881 is used as the clamp pulse feed to 4090 (pin 7). PGM video level can also be adjusted at this point. Clamped video is now fed to a 4053 (pin12) a triple two channel analogue multiplexer IC. Pin 13 is the test signal feed from another OP amplifier which also provides a separate test signal output. The output from the analogue switch (pin 14) feeds another video OP amplifier providing four separate outputs. Unused inputs and address lines being grounded. The switching signal (pin 11) is derived from ITS BLK and H. BLK.

ITS Switching

While investigating this part of the circuit I came across an article on descrambling related to encoded satellite signals (Ref.4). Suitable gating can also produce the required switching signal, however the approach using an EPROM was cleaner and simple. I have never used this method although I have seen it done before (Ref.5). Unfortunately the EPROM character generator chart in the above article had a few errors, also I wasn't sure how to go about providing the data to program the EPROM. A cry of help to Mike Cox provided me with the answers I needed and I greatly appreciate the help given. Since this was new to me I have covered the requirements below.

A 4040 counter was used, clocked by –ve sync (pin 10) and reset (pin 11) from +ve VS via an inverter from the LM1881 (pin 3). Since we require the decimal 313 which is 10101001, which means we need a counter/decoder that can handle nine lines. The 4040 can output the correct count, but the decoder must be able to 'watch' nine lines. The EPROM is an elegant one chip solution to the problem. Unused address lines of the EPROM are grounded. The EPROM used was a 27c64, however

a 2716 could do the job as well. D0 (pin 11) is the ITS BLK. Signal and is fed to one input of a 74hc00 gate while the other input is fed by H.BLK. The output is five lines of H.BLK (i.e. lines 17 to 21). Five lines were used to provide easier reading of the test signal with program video. The output from this gate is inverted in another 74hc00 gate while the other input is tied high. Grounding this produces the full field test signal.

Power Supply

The power supply requirements are easily met by a 7805 regulator to provide the +5v supply. The -5v is derived from a DC-DC converter feed from the +5v supply via a filter to remove high frequency switching being feed back to the +5v supply line.

EPROM Programming

EPROM's can be used in two ways:-

They can be followed by a DAC, in which case the hex value programmed in to a specific location will give the output dc for that location. Example:- a location programmed with a hex value of 80 will give an output of ½ the DAC reference voltage.

An 8 bit EPROM can be used so that each location acts as a store of 8 individual bits of information. Each bit can be programmed to be 0 or 1; however the location must be programmed as an 8-bit word. Thus at each location, the 0s or 1s must be translated into a hexadecimal number for the benefit of the programmer.

The following table may help.

D7 [MSB]	D6	D5	D4	D3	D2	D1	D0 [LSB]	HEX	NUM.
1	1	1	1	1	1	1	1	FF	255
1	1	1	1	0	0	0	0	F0	240
0	0	0	0	1	1	1	1	0F	15
1	0	0	0	0	0	0	0	80	128
0	1	1	1	1	1	1	1	7F	127
0	0	0	0	0	0	0	0	0	0
Highest 'Nibble'				Lowest 'Nibble'					

The vertical reset pulse from the LM1881 (pin3) starts around line 4. Therefore drawing up a table as shown enables you to work out the hex code required by the EPROM. D0 is the ITS BLK pulse, D1 the inverse of the above while D3 is used as the pseudo vertical blanking. This output was added after the initial design and could have been feed to the first mono-stable 4098

ITS GENERATOR EPROM INFORMATION										
LINE	Hex	D7	D6	D5	D4	D3	D2	D1	D0	Hex
4	00h	0	0	0	0	0	0	1	0	02h
5	01h	0	0	0	0	0	0	1	0	02h
6	02h	0	0	0	0	0	0	1	0	02h
7	03h	0	0	0	0	0	0	1	0	02h
8	04h	0	0	0	0	0	0	1	0	02h
9	05h	0	0	0	0	0	0	1	0	02h
10	06h	0	0	0	0	0	0	1	0	02h
11	07h	0	0	0	0	0	0	1	0	02h
12	08h	0	0	0	0	0	0	1	0	02h
13	09h	0	0	0	0	0	0	1	0	02h
14	0Ah	0	0	0	0	0	0	1	0	02h
15	0Bh	0	0	0	0	0	0	1	0	02h
16	0Ch	0	0	0	0	0	0	1	0	02h
17	0Dh	0	0	0	0	0	1	0	1	05h
18	0Eh	0	0	0	0	0	1	0	1	05h
19	0Fh	0	0	0	0	0	1	0	1	05h
20	10h	0	0	0	0	0	1	0	1	05h
21	11h	0	0	0	0	0	1	0	1	05h
22	12h	0	0	0	0	0	0	1	0	02h
23	13h	0	0	0	0	0	1	1	0	06h
24	14h	0	0	0	0	0	1	1	0	06h
25	15h	0	0	0	0	0	1	1	0	06h
26	16h	0	0	0	0	0	1	1	0	06h
27	17h	0	0	0	0	0	1	1	0	06h
28	18h	0	0	0	0	0	1	1	0	06h
29	19h	0	0	0	0	0	1	1	0	06h
30	1Ah	0	0	0	0	0	1	1	0	06h
31	1Bh	0	0	0	0	0	1	1	0	06h
32	1Ch	0	0	0	0	0	1	1	0	06h
33	1Dh	0	0	0	0	0	1	1	0	06h
"	"	"	"	"	"	"	"	"	"	"
310	133h	0	0	0	0	0	1	1	0	06h
311	134h	0	0	0	0	0	0	1	0	02h
312	135h	0	0	0	0	0	0	1	0	02h
313	136h	0	0	0	0	0	0	1	0	02h
314	137h	0	0	0	0	0	0	1	0	02h
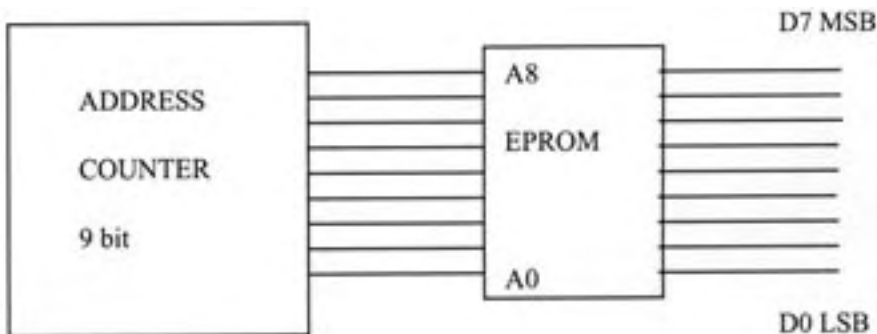
(pin3) if required. By utilizing an extra address line (A9) it would be possible by programming the EPROM so each alternate line was on and off (i.e. 1 or 0), this them makes it very easy to set-up the unit. This also can be achieved by a jumper pin to pin 9 4040 or pin 10 27c64.

Setting Up

Remove VTS BLK lead from pin 11 (27c64) to pin 9 (4040) or pin 10 (27c64). This will produce alternating program and test signals on the output.

(1) With 1V P/P program input, adjust PGM output level for 1V P/P output.

Figure 4 - vertical Blanking off Screen

(2) Set ITS test signal blanking adjustment to match program video.

(3) Set ITS test signal level for 1VP/P.

(4) Check H.BLK width and set the first M/stable AOT for correct finish of H.BLK, next set the second M/stable foe correct start of H.BLK.

(5) Set last stair-step trailing edge to finish at the start of horizontal blanking (i.e. 1.5us before start of sync. Pulse).

Conclusion

This project would not have happened if not for the help received from Mike Cox on the EPROM encoding and to Ian Capps of Ian Caps Electronics for the drawings, both were greatly appreciated.
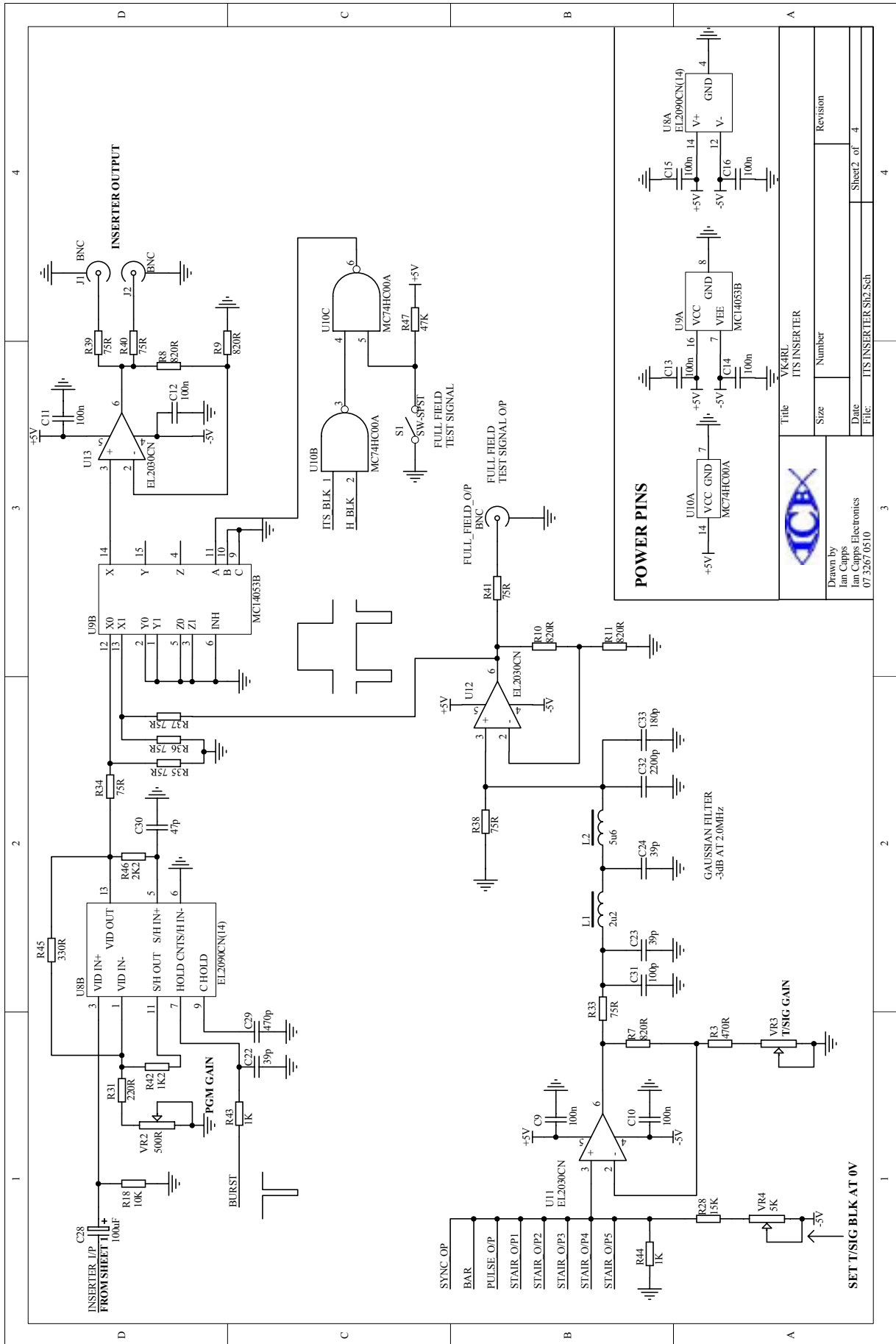
Reference

(1) CQ-TV198 Circuit Notebook No.77
(2) CQ-TV199 Teletext Encoder
(3) Elantec Application Note 3
(4) Electronics Now APRIL 1993 Video Scrambler
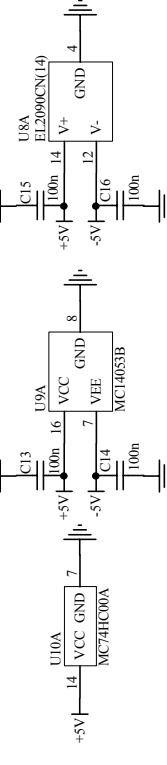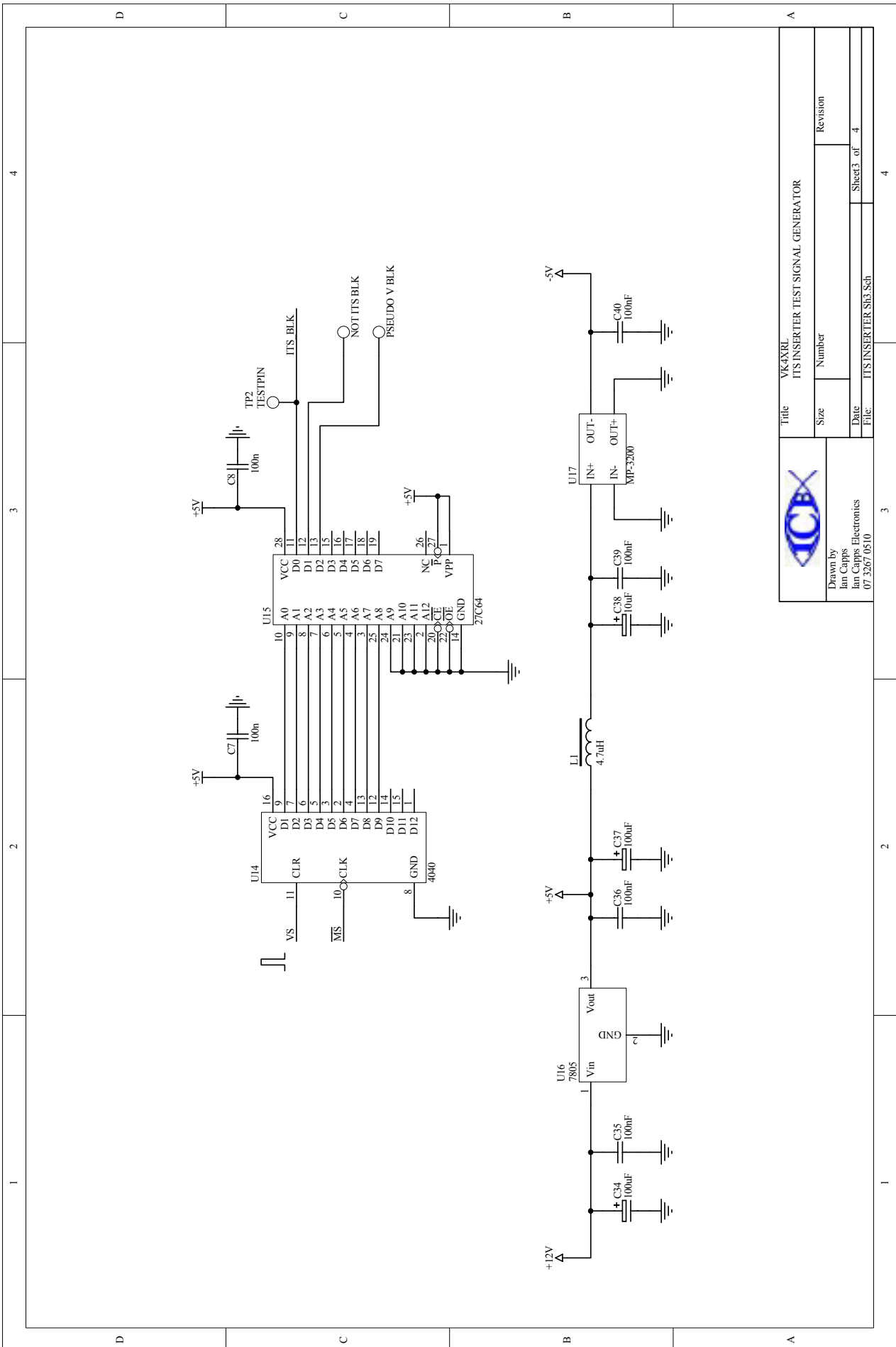(5) CQ-TV189 Burned in Monitoring
(6) CQ-TV 97 An ITS Generator

INSERTER OUTPUT

J1 BNC
J2 BNC

R39 75R
R40 75R
R8 820R
R9 820R
C11 100n
C12 100n
+5V
-5V
U13 EL2030CN

U10C MC74HC00A
U10B MC74HC00A
ITS BLK
H BLK
R47 47K
+5V
S1 SW-SPST
FULL FIELD TEST SIGNAL

FULL_FIELD O/P
FULL FIELD TEST SIGNAL O/P
BNC
R41 75R

U9B MC14053B
X0 X1 Y0 Y1 Z0 Z1 INH
X Y Z A B C

R37 75R
R36 75R
R35 75R
R34 75R
C30 47p

U12 EL2030CN
+5V
-5V
R10 820R
R11 820R

C33 180p
C32 2200p
L2 5u6
C24 39p
L1 2u2
C23 39p
C31 100p
R33 75R
R38 75R
GAUSSIAN FILTER
-3dB AT 2.0MHz

U8B EL2090CN(14)
VID IN+ VID IN- VID OUT
S/H OUT HOLD CNTS/H IN+ S/H IN- C HOLD

R45 330R
R46 2K2
R31 220R
R42 1K2
C29 470p
C22 39p
VR2 500R
PGM GAIN
R43 1K
BURST

R18 10K
C28 100uF
INSERTER I/P
FROM SHEET 1

R7 820R
R3 470R
VR3 T/SIG GAIN
C9 100n
C10 100n
+5V
-5V
U11 EL2030CN
R28 15K
VR4 5K
-5V
R44 1K
SET T/SIG BLK AT 0V

SYNC O/P
BAR
PULSE O/P
STAIR O/P1
STAIR O/P2
STAIR O/P3
STAIR O/P4
STAIR O/P5

POWER PINS

U8A EL2090CN(14)
V+ GND V-
C15 100n
C16 100n
+5V
-5V

U9A MC14053B
VCC GND VEE
C13 100n
C14 100n
+5V
-5V

U10A MC74HC00A
VCC GND
+5V

Drawn by
Ian Capps
Ian Capps Electronics
07 32670510
Title VK4RL ITS INSERTER
Size
Number
Date
File ITS INSERTER Sh2.Sch
Revision
Sheet 2 of 4

ITS INSERTER TEST SIGNAL GENERATOR

Title: ITS INSERTER TEST SIGNAL GENERATOR
VK4XRL

Size:
Number:
Revision:

Date:
File: ITS INSERTER Sh3.Sch
Sheet3 of 4

Drawn by
Ian Capps
Ian Capps Electronics
07 3267 0510

An SDI Routing Switcher - Part Two

By Mike Cox

After I had written the piece in CQ-TV 207, I realised that the operational aspects left a little to be desired. Selecting the Source and Destination is all very well, but it is helpful to have a record of each destination's source, ie a read-out.

This deficiency has now been corrected, and the following words and pictures tell you how.

In one of my drawers, I found 8 or so 7-segment displays, Kingbright SC03-11HWA.

These are common cathode devices with 10 mm character height.

Fortunately, the Source and Destination buttons were fitted on 0.6" pitch, and the case size of the displays allowed a similar pitching so that the display can sit under its destination button.

Fig. ! shows the panel with the displays installed and lit. The circuit is straightforward. The source control lines [IA0 –IA3,shown in Fig. 6, p10, CQ-TV 207] are taken in parallel to the data inputs of 8 4511 display drivers. The destination lines [OA0 – OA2] are taken to the data inputs of an 3 to

8 decoder 74HC138. The enable pin is fed from a differentiated version of the Config line from pin 8 of U4 [Fig. 6, CQ-TV 207 again].

Thus the selected source is latched into the selected destination display driver.

Fig. 2 shows the circuit. A common cathode resistor is used to limit the segment current, and is a lot simpler than using seven resistors in the anode leads.

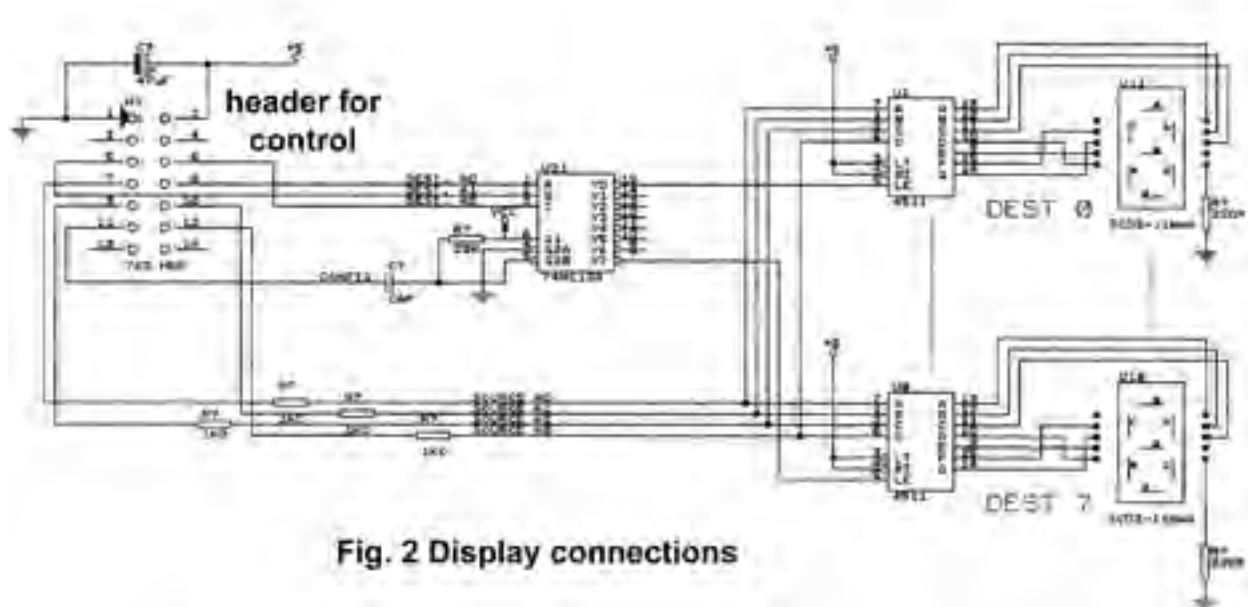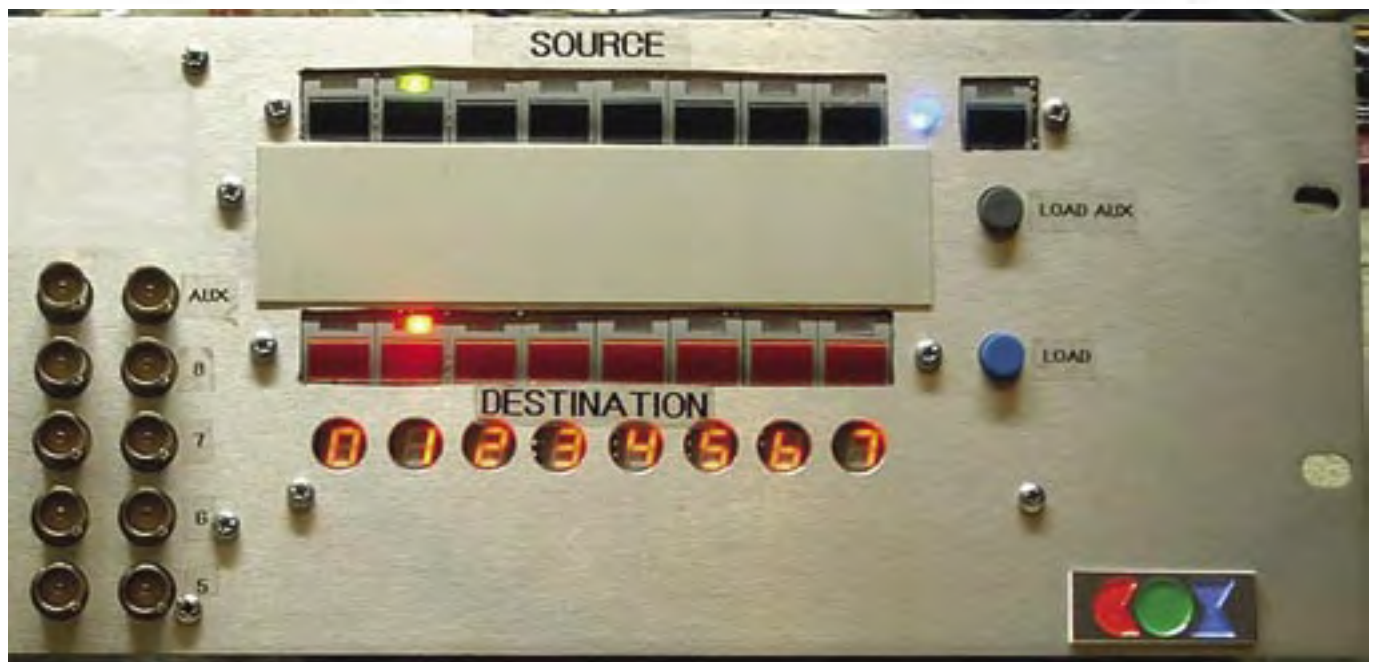The device will be in use at IBC in September, and I will report on its performance later.

Fig. 2 Display connections

10th Anniversary for GB3TM

By John Lawrence GW3JGA

GB3TM, the 23cms ATV repeater on the north coast of Anglesey, North Wales came on air in July 1994 and has been in virtually continuous operation since that time. Everything is totally original except for two cooling fans (seized) an input coupling capacitor in the Worthing box and one set of aerials. This is a good reliability record considering that the repeater is not housed in a building or someone's shack but is in a steel cabinet completely out in the open, on top of a hill 200m amsl. There are gales and rain gusting across the Irish Sea in the winter and the sun baking down in the summer (well, perhaps not this summer). The Alford slots were replaced a few years ago, the original ones developed a fracture of the internal soldering due to continuous vibration in the wind.

A 3cms Input

GB3TM now has a 3cm input which became operational on 1st August 2004. The 3cm aerial direction is due south (due north would only be of interest to MM ATV). A valid FM ATV signal on 10.340 GHz will gain access and the repeater output is on

'GW3JGA, GW8FEY, GW4KAZ 3cms Tests' by GW3JGA

1.316 GHz. Members of the GB3TM Group carried out 3cm tests in August from Penmynydd, 11 miles south of the repeater, checking access, sensitivity and band switching between 23cms and 3cms. The picture shows, left to right, John GW3JGA with a Gunn TX and PW dish, Barry GW8FEY with similar kit and Brian GW4KAZ with a converted Blue Cap LNB and an offset dish. The received signal at the repeater was two 'P' points higher from the Blue Cap than from the two Gunn systems. The Repeater Keeper of GB3TM is David GW8PBX, QTHR.

DATV in simple terms - Part 1

By Brian Kelly

In this short series of articles, I am going to try to explain digital television in layman's terms and without getting too involved in mathematics. The reasons for this are that I am a layman and I have never been any good at maths! I have however, a reasonable grasp of the techniques used in digital TV systems and plenty of experience in electronics.

Almost without exception, when I mention digital ATV people switch straight off, because they think it is too complicated for them to understand and they have a perfectly good analogue system already - so why bother changing. While it is true that digital is complicated, it is no more so than analogue, but it requires you to look at things in a different perspective. It is probably easier to visualise the effect of something you can read on a voltmeter or oscilloscope rather than a massive chain of numbers, but when it comes to a complicated video signal, the distinction starts to blur. Consider for example the problems of 'group delay response', 'chroma phase error' and 'transient overshoot'; are you well versed in their causes and prevention? Probably not, but these are likely to be the main causes of distortion in your analogue signal. The basics are straightforward, but the devil is in the detail. The good news is that digital is much simpler because none of the mentioned distortions exist and - once the first principles are understood - everything else follows the same rules. Digital is digital, there are no variations, deviations or anomalies as analogue has.

In order to make the introduction as painless as possible, I am breaking this mini tutorial into easy steps. The first step is to explain how a digital signal is produced from an analogue one. The process is called 'Analogue to Digital Conversion' or ADC for short.

ADC has been around for as long as numbers. That may seem a strange statement but if you recall your earliest memories as a child when asked how old you were, you probably said 'four and a half' or something like that. You mentally converted an analogue quantity, your age, into a numeric value. I am sure you will immediately recognise many more examples that you, and generations before you, have made without even realising it. All an electronic ADC does is convert an amount of something, usually a voltage, into a number representing that amount.

Before delving into measurement techniques, we need to define a few terms which will be used later. The first is 'resolution'; this is the size of the number (not its actual value) which will hold the measurement. If you prefer, you can regard it as the amount of accuracy that it is possible to measure to. A higher resolution means the analogue quantity can be represented more accurately. Because digital systems work in binary, the resolution is usually a multiple of two, for example 2, 4, 8 or 16 bits are common. Each bit that is added doubles the resolution. You might like to think of resolution as the number of markings along a ruler; the more there are, the easier it is to take an exact reading from it.

The other important term is 'conversion time'. This is a measure of how long it takes to produce the digital value when an analogue input is presented. Different types of ADC take significantly different times to complete their tasks. A longer conversion time means it takes longer to take the measurement and produce the result. The longer it takes to return a value, the fewer values can be returned in a given time period. This pace is generally referred to as the number of 'samples per second'. If for example you were measuring tide height at the seaside, taking one sample per hour would give a set of figures that nicely demonstrate the rise and fall of the water height. If you changed to sampling once per minute, the readings would show more clearly where the highest and lowest tides occurred; they may have been missed before if they fell between the hourly readings. If the samples were taken still more frequently, say once per second, the individual waves would start to show as well as the background increase and decrease of the tide. As you see, the more rapidly the samples are taken, the more detail can be extracted from the measurements.

Back to talking electronics; if a signal is sampled frequently enough; the samples can be converted back to a close approximation of their origin. Because modern ADC devices can convert extremely quickly, it is not only possible to convert fast enough to show the outline of a signal, it is possible to take samples within a single cycle of a signal. For reasons deeply buried in mathematics, (and therefore not to be explained in detail here) it is necessary to take at least two samples of a signal to be able to recover anything meaningful from it. Digitising a 2MHz signal would for example require sampling at a rate of at least 4MHz and preferably more.

Digital TV signals are actually a stream of numbers read out of an ADC circuit. After processing, transmitting, receiving and a bit more processing the numbers are recovered in their original form and fed to a device that does the opposite of the ADC. This is perhaps confusingly called a DAC or Digital to Analogue Converter. It takes numbers in and produces a voltage out. (fig.1) Like their ADC counterparts, they also have a resolution and a conversion time and these factors also have to be taken into account when conveying signals.
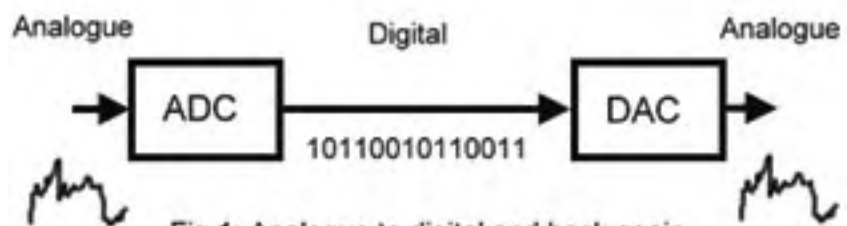

Fig 1: Analogue to digital and back again

It is difficult to demonstrate the effects of different resolutions and sampling rates in a printed form like this, but in a live picture it is very obvious. I have used a computer graphics package to manipulate the same image and try to show the effect each has, so you can see the resulting pictures in print. (fig. 2) Note that the different resolutions have no effect on the sharpness of the picture, they only show as a limited number of shades while the sampling doesn't affect the shades (except that they can't be seen so well when the detail is lost) but it does affect the sharpness.

Fig 2 Top: L to R resolution halves each time, Bottom: L to R sampling halves each time

As the resolution increases or the sampling rate increases, the quantity of numeric measurements also increases. The actual rates used depend on how many measurements can be stored or sent to their destination, given the practical problems arising from a limited transmission bandwidth. There is a trade-off between quality and quantity which is decided by the needs of the broadcaster.

There are many ways to measure a voltage and return a digital value from it. Let's look at a few of the common ones and see if they are suitable for use in a video application. Note that any of these methods could be used but some would require circuits running so fast or components of unwieldy values that they would be impractical to utilise.

1. Dual slope integrators.

I'm sure we have all measured the voltage across a charged capacitor at some time and see it gradually fall as the charge leaks away. What we saw was a voltage falling as time passed by. If we timed how long it took for the voltage to reach zero and knew how fast the charge was leaking away, we could work out how much was there to start with. That's the principle of a dual-slope integrator. A timer operates while a series of switches route the voltage to charge a capacitor, then isolate it and then remove the charge. The timer period is a numerical representation of the amount of the original charge. The higher the voltage, the longer the period and hence the larger the count is. The count is used as the ADC digital data output.

2. Flash converters.

These are named because of their speed, not because of any optical phenomenon! They use a bank of comparators to compare the input with a pre-determined list of voltages. The voltages generally come from taps along chain of series resistors. A reference voltage is applied to the top and bottom (often zero at the bottom) of the chain so at each resistor

junction there is a voltage proportional to its place along the chain. As the resistors are normally of equal value, the voltage steps are all the same size. Each of these voltage references is connected to one input of a comparator and the voltage being measured is applied to all the other comparator inputs in parallel. Any comparator seeing more on its measurement input than its reference input will switch output state, the others won't. All the comparators seeing more on the input than from the divider chain will switch one way, the remainder the other way. By looking at all the comparator outputs to see which is in each state it is possible to derive a number equivalent to the input voltage.

3. Successive approximation converters.

These are similar to flash converters in some ways but use a different method to decide the output measurement. Instead of using lots of comparators each connected to a tap along the resistor chain, these use a single comparator and a series of switches to connect it to different taps. The switches are cleverly arranged to minimise how many are needed and in general these ADC use much less silicon area. To be efficient with only one comparator, the switches have to be operated in such a sequence that they find the voltage in the minimum number of tries. Starting at the bottom tap and working up is not an option, especially when there may be several hundred taps to try. The method they use is rather like a number guessing game, they start by connecting to the tap half way down the chain and the comparator says 'more than' or 'less than' when it compares the tap with the input voltage. The next step depends on the outcome of the first 'guess'. If it decided the voltage was below half way, it next tries the mid-point between zero and half way tap, in other words the quarter way up tap. The comparator again decides whether the voltage is above or below that tap. If below it again compares half way between that tap and zero, if above it compares with

that tap and the mid-chain tap. Each time a decision is made and each time a new half-way is decided until the numbers of bits of resolution are used up. Each time a switch is operated, the difference between the voltage on the resistor chain and the one being measured is halved, hence the name 'successive approximation'. The way the digital output is created is very simple; if the input was higher than the guess, a '1' is output, if lower a '0' is output. When all the guesses are used up the ones and zeroes make up the digital output data. As a bonus, as the bits are guessed one at a time, the output can be read serially while the conversion is in progress.

4. Ramp and compare converters.

These are very simple in operation and actually use a DAC, a counter and a comparator to perform the ADC function. The idea is to start with a small but known voltage from the DAC and compare it to the one being measured. The voltage is then gradually increased by incrementing (adding one to) the number fed to the DAC. When it reaches or just exceeds the unknown one, the comparator tells us to stop and the number fed to the DAC at that point is used as the output. Although it's a measure of the voltage being created, we know from the comparator that it must match the one we are measuring. You might think of it as a pair of weighing scales, the unknown on one side and the known on the other. When the scales balance, the known side matches the unknown one.

Those are the four most common ADC types. There are many more, including ones that use the voltage to tune an oscillator then measure its frequency and ones that use pulse width techniques, but these are well outside the scope of this article.

Each type has its good and bad features; finding the best compromise, especially when dealing with TV signals is all-

Type	Good points	Bad points
Dual-slope integrator	Very accurate. Simple to build. No critical components	Very slow. Speed depends on voltage being measured.
Flash converter	Very fast	Complicated to build. Precision parts needed. Fixed speed.
Successive approximation	Medium speed. Serial output available	Complicated to build. Fixed speed.
Ramp and compare	Simple to build	Speed depends on voltage being measured.

important. Let's investigate the features of each type:

For slow-scan applications, the speed probably isn't that important, although it's worth mentioning that some dual-slope integrators on the market will struggle to achieve five samples a second. Generally, though, the sampling rate will be fast enough to exceed that needed for transmission.

As the scan rate increases, so does the need for faster sampling rates and the slower converters start to fall out of the race. Another important factor is how constant the sampling rate is. Take for example the ramp and compare type; if the DAC gave outputs in steps of 1mV and the voltage being measured was 2mV, the conversion would stop at a count of two. If we are increasing the DAC count at fixed intervals, two intervals will have elapsed. On the other hand, if the voltage being measured was 250mV the count would have to reach 250 so that many of the intervals would be taken. For a standard 8-bit ADC the range of conversion times can be as much as 255 cycles and as little as one cycle. With a range so wide it can be difficult to maintain the timing restrictions placed on a digital transmission.

In practice, the flash and successive approximation types are most used and with the high integration of modern integrated circuits it is possible to fabricate all the component parts of these, including the resistor chain on one chip.

The speed needed for TV depends upon the highest frequency in the video waveform, in other words, the video bandwidth. Given that a minimum of two samples are needed per cycle, the sample rate must be greater than 2 times that frequency. If we assume a 5.5MHz bandwidth, (for PAL, a bit less for NTSC) the sampling must take place at no less than an 11MHz rate. Bear in mind that each sample is more than one bit wide, in most cases 8-bit resolution is used, so if sent serially an 11MHz sampling rate becomes an 88MHz bit-rate. Successive approximation ADCs conveniently give a serial output, for the other types an additional shift-register is needed to convert the parallel data into serial format.

That concludes the first part. We have seen that any voltage can be converted to a numerical value and that the sampling rate determines how closely the voltage is tracked, while the resolution determines how accurately it is measured. We have looked at a few methods of doing the conversion and discussed the speeds we need to use in order to convey a quality picture. In the next article, we will look at the clever tricks we can do with numbers and why they are more versatile than their analogue equivalents.

TV pictures from the PC.

Watching TV on the computer is becoming popular, with TV tuner cards and the like, but I wanted to do it the other way round - watch my computer on the TV! I needed a composite PAL version of whatever was on my monitor, to feed to an ATV transmitter, of course, or to record onto a vcr.

Now there are video cards with 'TV Out' but I didn't really want to choose and purchase a plug-in board, as previous encounters with 'TV Out' options had been tricky. Then I spotted a little device in the Maplin catalogue. It is powered from a usb slot and is 'Plug and Play', with vga in, and both composite and s-video out. It sounded just the thing, and it was!

Not a lot more to say really, it 'does what it says on the tin'; the computer image appears on the monitor and the TV simultaneously.

PC to TV converter. Unplug monitor from PC, and connect to VGA Out socket. Plug VGA In port on device to outlet on PC. Connect usb for power. Composite video produced at phono plug!

Narrow Band Television Demonstration

By John Lawrence GW3JGA

A full house of members and guests of the Conway Valley Amateur Radio Club were treated to a demonstration of NBTV when John GW3JGA showed various methods of generating and displaying 32 line NBTV pictures.

The main Televisor was a Baird type Nipkow disc system using a bank of 35 LEDs as the light source. A modified oscilloscope was also used to display NBTV pictures (see Circuit Notebook 82).

The picture sources included a CMOS pattern generator, images from the NBTV Association CD and live pictures from a 625 line-to-NBTV converter. A special NBTV CD had been recorded by Frank GW0VUP showing historic pictures and sound downloaded from the Web and converted to NBTV.

Members of the CVARC were able to see themselves on the 32 line mechanical televisor.

The pictures were taken on a conventional camcorder and digitally converted to 32 line NBTV. The mechanical televisor picture of 2cm x 3cm was 'enlarged' by viewing it with a Pye 'Lynx' tube camera, making use of its Vidicon storage characteristic to remove the flicker and then displaying it on a conventional 625 line monitor. The results were surprisingly good.
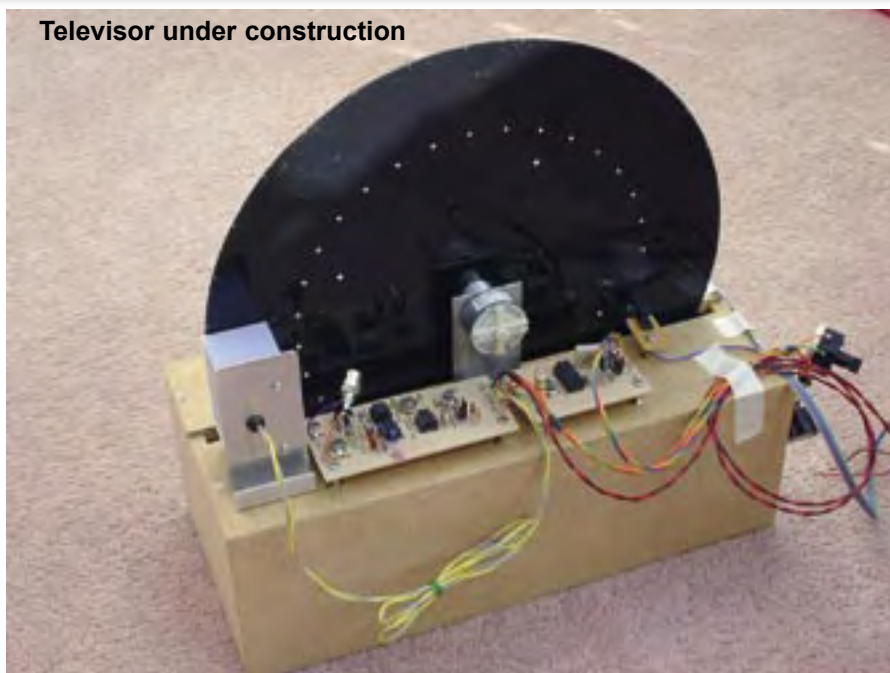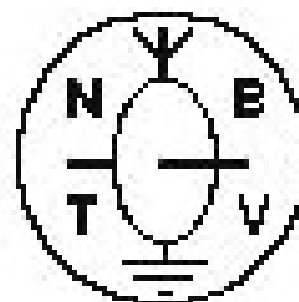
Televisor under construction

7x5 LED light source

NBTV picture

DATV Experience so far...

By Ian Waters G3KKD

The AGAF DATV boards from Wuppertal University

When the club received some AGAF DATV boards from Germany, I was asked if I would take one set on loan for evaluation. Part of the deal was to write up the results for CQ-TV.

For those not familiar with them a set comprises two boards each 4 X 6 inches, an encoder and an exciter.

The encoder accepts either PAL/NTSC composite video, or Y/C plus left and right audio. It digitally compresses these according to the MPEG 2 specification and produces a transport stream with a bit rate selectable from 1.68 to 27 M bit/s. This is passed to the exciter which adds forward error correction (FEC) selectable from 1/2 to 7/8 and modulates a carrier in the 70 cm band using either quaternary phase shift keying (QPSK) or gausian minimum shift keying (GMSK). The default settings, as received, are: QPSK at 4167 M bit/s and 7/8 FEC.

I built these boards into a small rack frame (Fig 1) together with a suitable power supply and a home designed up-converter from 70 to 23 cm. I arranged for the 70 cm frequency to be set to 437.25 MHz, which seems to be optimum for ATV in that band and then specified the up-converter crystal to give a 23 cm output on 1260 MHz. This falls between the input and output of the local GB3PV repeater and is free of radar. RF drive on both bands is thus available.

After some market research I decided to buy a Technomate TV-5500D free to air (FTA) set top box satellite receiver. This seemed to be the most suitable for ATV purposes and one of the least expensive. As it tunes from 950-2150 MHz it can receive a 23 cm transmission directly and it transpires that its sensitivity is better than some of the earlier types thus often removing the need for a preamplifier. After finding out how to set up the receiver, the hand book is not much use, and - connecting the TX and RX via a 60 dB pad - excellent digital pictures appeared.

Shuttleworth

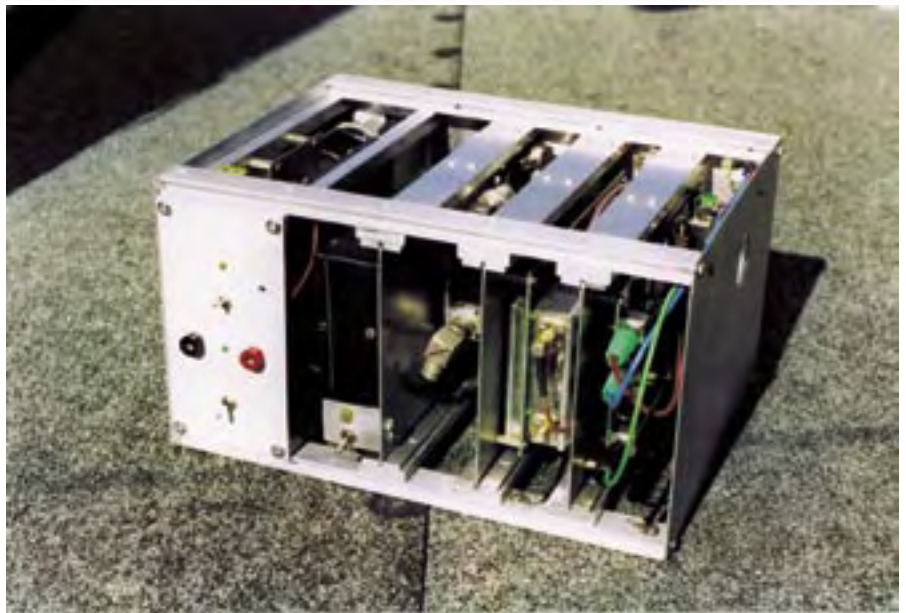As reported elsewhere, DATV featured prominently at this year's convention

Figure 1 - The boards in a small rack frame

with presentations by Noel Matthews and Dave Crump as well as myself.

I used the exciter and FTA receiver together with two small aerials to transmit pictures across the lecture room and demonstrate some of the interesting features of DATV.

For years we have been accustomed to see some comforting noise on a receiver before trying to tune in a signal. Not so with DATV. One has a totally blank screen until a signal of adequate strength is acquired when the result is at once P5. It is P5 or nothing, no noisy pictures.

When the signal drops the sound goes at once but the receiver continues to display the last received picture frame. If this is a still test card, one may not be aware that the signal has gone until a "No signal" notice appears.

If one is in QSO with a talkback link in use one becomes aware of the 0.75 sec coding and decoding delay which can be quite disconcerting.

If one looks at the spectrum of an AM or FM TV transmission one sees variations with changes in picture content. The QPSK spectrum looks identical regardless of whether it is modulated or not.

If one listens to the transmission on a communications receiver one hears no frame buzz or bursts of sideband energy every 15 kHz, just white noise.

One only sees an increase in noise when tuning in a DATV signal on a conventional ATV receiver.

After Shuttleworth

After Shuttleworth I decided to buy the boards on loan from the club. This would permit experimentation without time constraints. It would have been unfortunate to have put a lot of effort into developing equipment, only then to relinquish the fundamental component.

70 cm Transmission

Both I and the club feel strongly that we should invigorate ATV on 70 cm and see digital as a way to do this. As an interim measure during 2001, while waiting for the AGAF boards to arrive, I developed a narrow band 70 cm AM transmitter and receiver, which was published in CQ-TV 196&7. With this I proved it is possible to operate ATV on 70 without interference from or to other band users. And that was using AM not digital.

There are two approaches to using DATV on 70 cm, QPSK or GMSK. The 70 cm tests carried out so far in the UK, see CQ-TV 206, have used QPSK signals of appropriate bandwidth generated by ex-commercial equipment. However I wished to use the AGAF boards the default settings of which, given above, produce a signal a little over 4 MHz wide, which is of course too wide to radiate on 70. At the time of writing, 16 August 04, I am discussing with our German friends the possibility
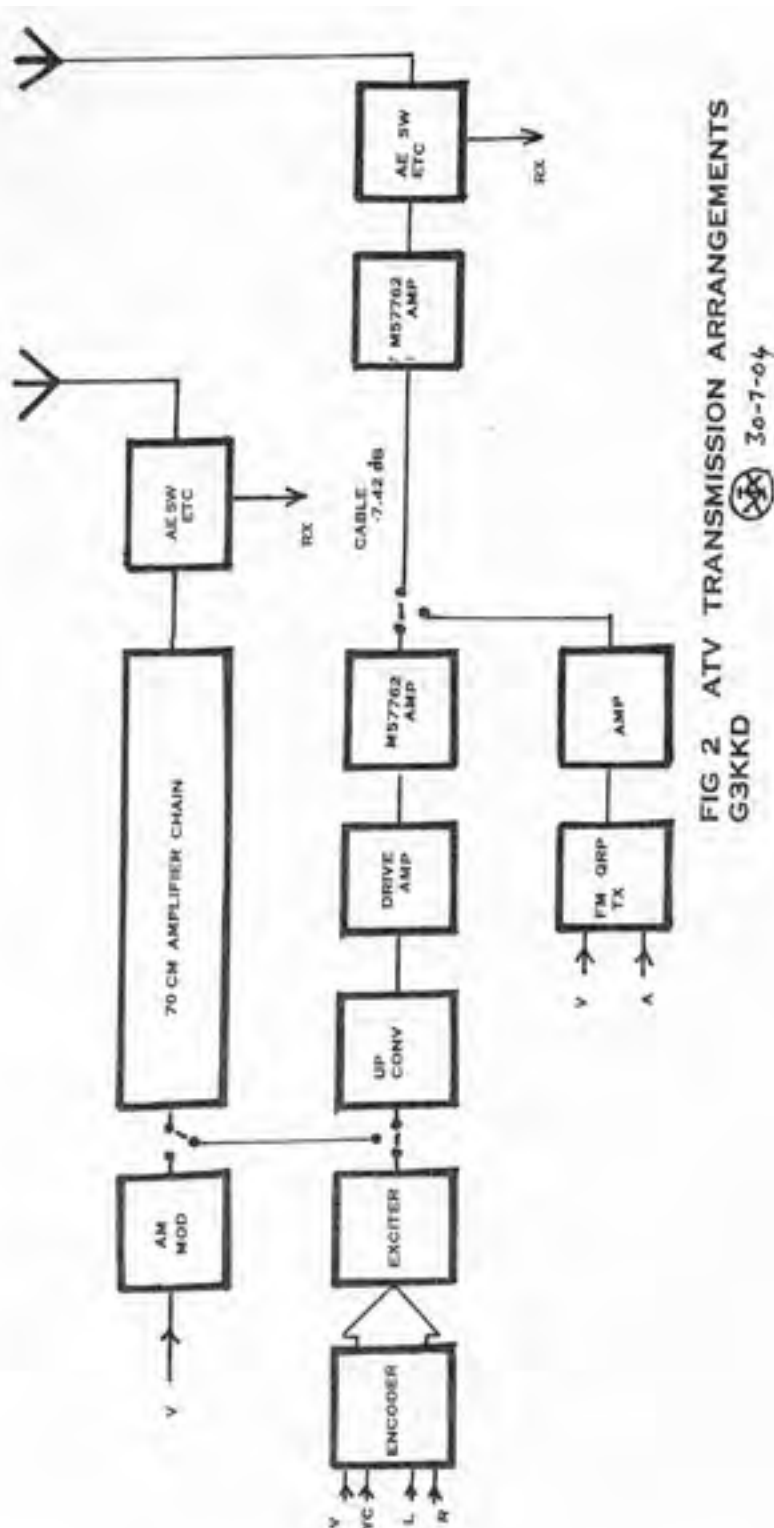
FIG 2 ATV TRANSMISSION ARRANGEMENTS
G3KKD
30-7-04

of obtaining some boards set up to produce an appropriate signal.

In the interim, for a test, I have fed the default signal into the amplifier chain of my 70 cm AM transmitter running into dummy load. These amplifiers, developed for amplitude modulation, proved quite adequate for digital and gave an output of 14 W with spectral re-growth better than 35 dB below carrier.

It was realised that the up-converter, developed for 23 cm would also be suitable as part of a 70 cm receiver. It could convert the received signal, after pre-amplification, to a channel that could be processed by an FTA STB. There may however be a problem with some STBs not decoding the low symbol rates associated with the narrower bandwidth.

The other approach, GMSK, has been used with excellent results in Germany employing a special receiver developed by AGAF. Not only does this permit signals of

suitable bandwidth, but the use of GMSK, being an FM like signal, enables non-linear power amplifiers to be used permitting higher power without the generation of spectral spread.

Pending further information, 70 cm development is currently on hold. I will probably first try QPSK and then if a receiver becomes available try GMSK.

23 cm.Transmissions.

I have a rather strange arrangement at my QTH for 23 cm forced on me by being surrounded by wooden attenuators ie large trees. To get the best take off the aerials are some 150 ft from the shack with the TX PA and RX down-converter in an annex at the base of the mast. For conventional FM I produce about 3 W of carrier frequency RF in the shack, which is sent to the annex by a piece of 0.75 inch coax with a loss of 7.42 dB. The 500 mW arriving then drives an M57762 amplifier brick to give about 10W. After final feeder loss and aerial gain the ERP is about 1 kW. When adding a digital capability to the station it was obviously necessary to fit in with this arrangement. A simplified block diagram is shown in Fig 2.

For 23 cm digital 70 cm QPSK, from the AGAF exciter, is first up-converted to 23 cm. It then passes to a drive amplifier. This consists of an electronic PIN diode attenuator, which permits the TX output power to be varied, followed by three stages of broadband amplification. At maximum power these deliver some 62 mW to the next amplifier stage. For this I used another M57762 amplifier brick. This is perhaps overkill but the module was available and as it has a maximum power capability of 18W it was operating in this application significantly de-rated in the interests of linearity and hence a reasonable level of spectral re-growth. It may be noted that while the data sheet for this device gives the small signal gain as 13 dB, in fact when only being called upon to deliver 2.5W the gain is nearer 16dB.

The output passes to a patch panel which permits either the FM or digital drive to be sent via the cable to the annex, amplified and transmitted.

Results

Once the system was up and running simplex transmissions were made to stations in the Cambridge area. I am indebted to Bob G1SAA of Histon near Cambridge who used his FTA satellite receiver and co-operated in the first tests, which were of course P5. Since then P5 results have been

FIG 3
70-23 CM UP-CONVERTER
3o-7-o4

received by three other stations. I think it no exaggeration to say that they were rather amazed at the quality of the pictures and sound.

Perhaps most noticeable is not just the absence of noise, but the complete absence of noise in the colours and the colour quality. As is well known, our FM system is a cut down version with half the bandwidth of the FM system once used for links and satellite broadcasting. This means that while several sidebands of the lower frequency luminance components of the picture are transmitted, only the first sideband of the colour gets through. As a result the colour sub-carrier is 6 dB below the luminance and it takes a very strong signal to completely eliminate chroma noise. On digital, the colours are clean and strong. The pictures are also free of ringing, group delay errors, streaking and all the other artefacts we have lived with for years.

The variable attenuator permitted the TX power to be reduced by up to 12dB, or to an output of 0.5W. On most paths it has been possible to do this without losing the P5 picture. This was some 10 dB down on the reference FM picture which was reported as P4.

Picture quality is now mainly determined by the sources. Video cameras, which looked fine on FM now show their imperfections!

TX Module details
As this is not a constructional article I will only give a general outline of the modules constructed for the DATV TX. I do not suggest that these are optimum arrangements; they were put together using parts available, but they work. If anyone would like more detail please contact me.

The 70 to 23 cm up-converter
The circuit of the up-converter, Fig 3, is quite conventional. The 70 cm output of the AGAF exciter, at about –18dBm, is fed to the mixer by a 13 dB attenuator. This was found to be necessary to prevent the mixer from generating spectral spread. The 23 cm signal from the mixer is then amplified by a single ERA-5 MMIC amplifier having a gain of 16 dB. An interdigital filter, with an insertion loss of 2 dB, then removes any local oscillator and other unwanted mixing products so that an output of about –24dBm is available.

The up conversion local oscillator uses a well known circuit. The output
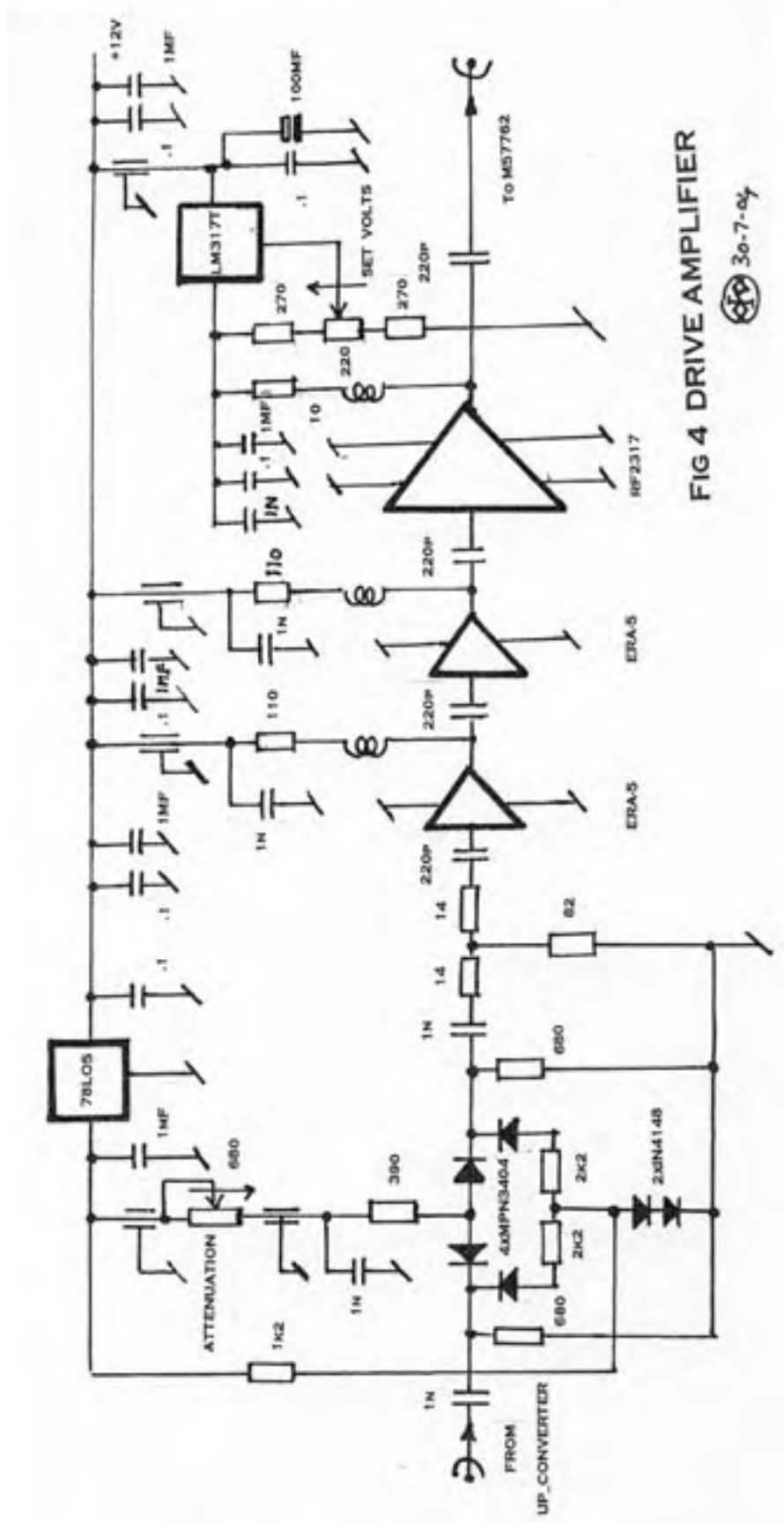
of an oscillator, using a 68.56 MHz third overtone crystal, is multiplied in two frequency doubling stages to give 822.75 MHz. This when mixed with the 437.25 MHz output from AGAF gives the 1260 MHz carrier desired.

The Drive Amplifier
The output from the up-converter is fed to the drive amplifier. This module, Fig 4, comprises an electronic PIN diode attenuator, which permits the TX power to be varied, followed by three stages of broadband amplification.

FIG 4 DRIVE AMPLIFIER

The variable attenuator employs 4 PIN diodes type MPN3404 in a series shunt arrangement. The amount of attenuation, up to 12 dB, is controlled by the voltage applied with respect to a fixed 1.2V established by two diodes. The whole attenuator is supplied from a 5V rail.

When the system was tested it was found that there was a little too much gain so a fixed attenuator of 5 dB was added following the variable element.

The two stages of ERA-5 amplification employ the manufacturer's circuit values, although it has been found that none of the devices used give as much gain as the data sheets suggests.

The third stage uses an RF Microdevices amplifier IC type RF2317. This is mainly intended for CATV applications where linearity is necessary to amplify many channels without inter-modulation. It is claimed to have an output IP3 of +47dBm. At maximum TX power this delivers 62 mW, +18dBm, to the next stage. As the RF2317 requires a device voltage of 8.5V at 150 mA the LM317T regulator is adjusted to provide this.

As all these amplifiers are broadband 50 ohms in and out, no tuning or matching circuit elements are required. It is however desirable to keep the coupling capacitors small (220pf, Xc 0.57 ohms at 1260 MHz) and adequately decouple the supplies to prevent excessive LF gain that could lead to instability.

Power measurement

Power measurement is a bit tricky. Using a spectrum analyser fed with appropriate power attenuators needs to be done with some care. Among other difficulties, the spectrum analyser's resolution filter bandwidth needs to be appropriate for the spectral width of the DATV transmission or serious errors can arise.

The best approach, which I use for signals over about 0dBm or 1 mW, is to use a thermal power meter again with appropriate power attenuators. Don't forget to put them in line, its expensive! This measures the RMS value of the whole QPSK spectrum ie all the power arriving at the thermal sensor. Of course, the accuracy is only as good as that of the attenuators.

The various diode probes etc present in the station, while useful to show that the TX is working and at its normal power output, are of little value for actually measuring power.

Where Next?

When one looks at the benefits of digital - greatly improved picture quality, bandwidth conservation and the possibility to reduce transmitter power - it must be the way ahead.

Until the price of the encoder and exciter boards falls, and prices usually do, not many individuals will want to invest in digital for their home stations. However by equipping repeaters with an optional digital output the cost can be spread and will probably be acceptable. With a higher quality down link, the overall results through a repeater will be enhanced. People will certainly then see any imperfections they may have in their own transmissions. As FTA set top boxes are less than £100 new and may soon come on the surplus market for less, reception should not be beyond most people.

When one looks at the complexity of the AGAF boards one doubts if there will be much if any home construction possible. However all the rest of the station, the up-converter, amplifiers and power supplies etc all fall well within amateur construction capability.

For my part I intend, when possible, to press on with 70cm development and perhaps at some future date publish details including an up-converter for receiving 70 on a FTA set top box.

My station is QRV for 70cm AM and 23cm FM and QPSK digital. I keep an eye open for lifts, but if anyone sees extra good propagation developing and would like to try a QSO using any of these modes, or all of them, please do contact me. I am usually at home. My QTH is Stow-cum-Quy, 5 miles East of Cambridge. Locator JO 02 CF. My e-mail is ian.waters@freenet.co.uk, but as I do not log on all that frequently it would be best to phone 01223 811477. Other details are as in the call book. I look forward to seeing you.

Using Stripboard (Veroboard) for Video Projects by John Lawrence GW3JGA

In the past, when the relevant Printed Circuit Boards were readily available from BATC Member's Services, I was an avid builder of BATC projects. Unfortunately, because of low demand it is no longer economical to provide them. I do not have access to PCB facilities so I have to consider alternatives. For very short term projects I have resorted to using a 'Plugblock' (Maplin FD31J) and fixing the completed circuit and 'plugblock' in a suitable box. For a more permanent arrangement I use stripboard, for example the Video Detector in Circuit Notebook 83.

Stripboard

Stripboard is made of PC board material (e.g. SRBP) 1.6mm thick and is punched with 1 mm holes on a 0.1 inch grid. One face is plain, where the components are mounted, (the 'component side') the other face (the 'copper side') has
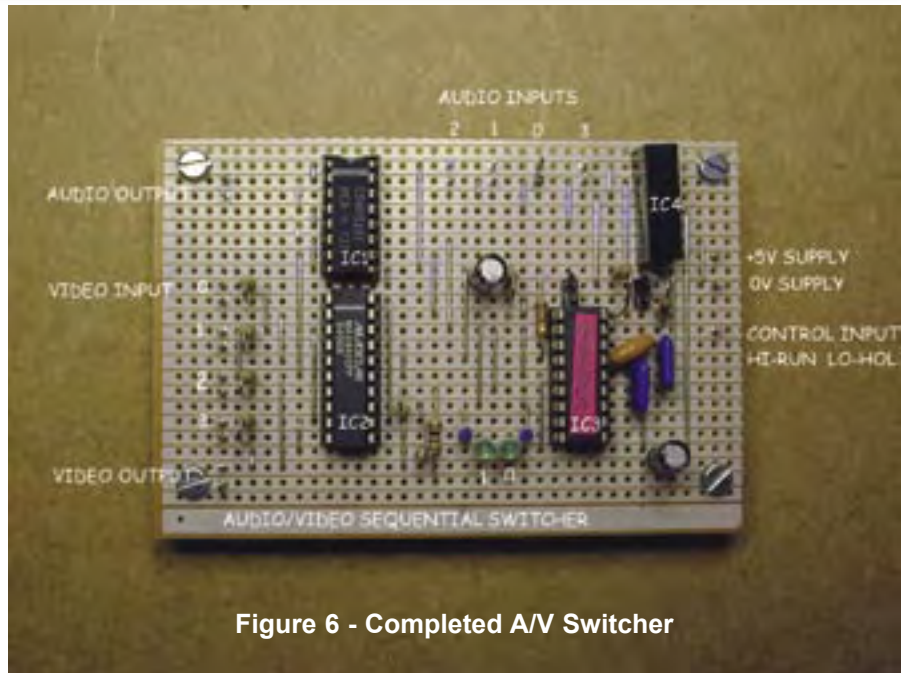

Figure 6 - Completed A/V Switcher

copper strips running the length of the board at 0.1 inch centres. Stripboard is available in various lengths and widths (from Maplin as SRBP Matrix Board e.g. JP49D) and can be readily cut to

size. The purpose is to make use of the copper strip as a conductor along one direction while using components and wire links, at right angles to the copper strips, to form the complete circuit. The

Figure 1 - Circuit Diagram
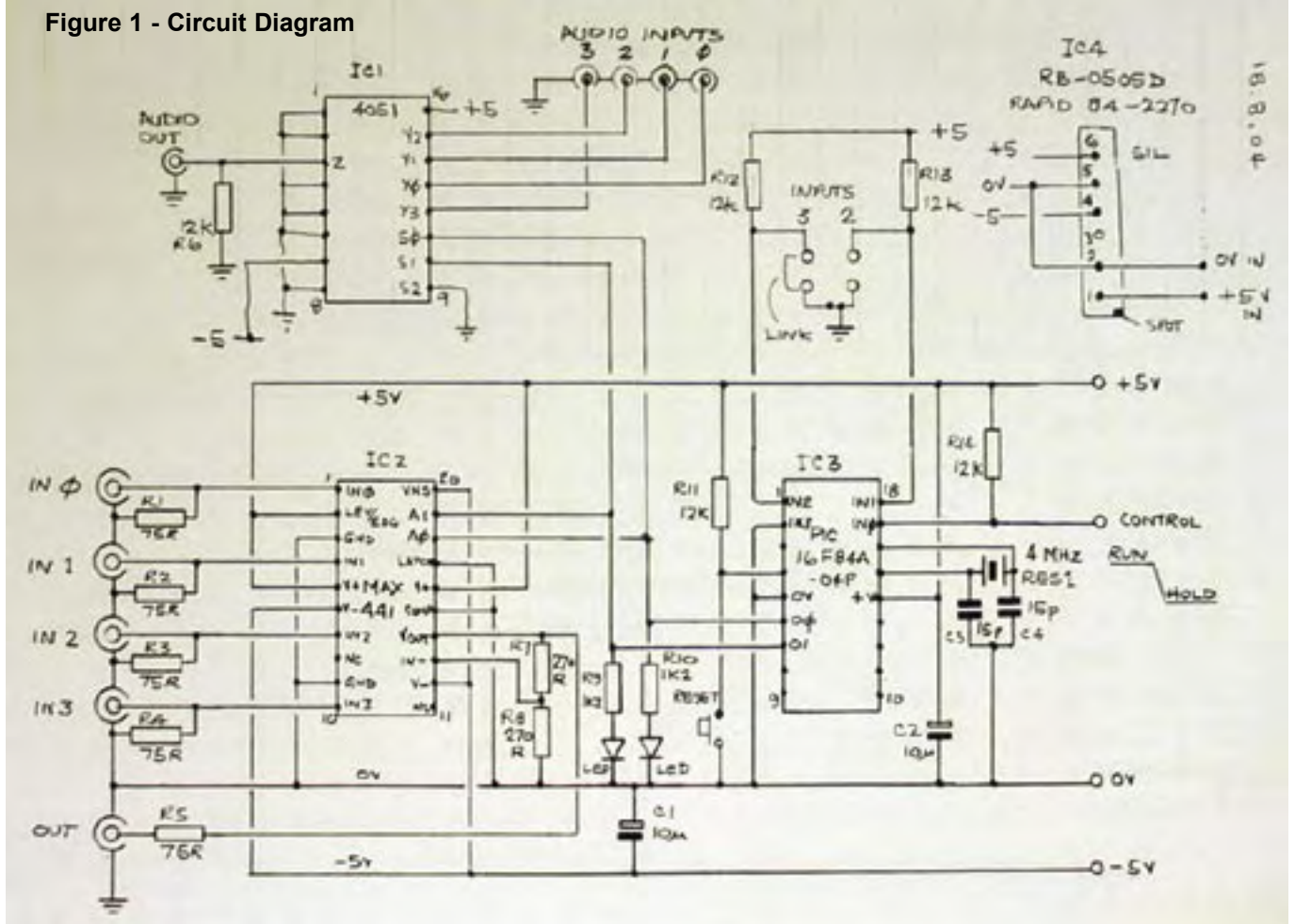
Figure 2 - Stripboard Layout

copper strip can be cut at appropriate positions to isolate a particular section. Stripboard users have varying methods for arriving at a completed board. The method I use is described below.

The Circuit Diagram

For the purposes of explaining the method, I am using the circuit diagram of an Audio/Video switcher, shown in Figure 1. This will eventually be used in our ATV Repeater GB3TM. Its purpose is to sequentially look at several video inputs (controlled by an onboard PIC) and hold when a valid signal has been located. I have already patched up the circuit on a Plugblock to check that it works. It contains audio, video and logic signals. It is not meant to be a constructional project but a real circuit with which to show the various stages leading to a finished unit.

First draw or redraw the circuit diagram in pencil on squared paper (school exercise book). Drawing the circuit in a tidy way will be helpful in laying out the stripboard later. The ICs are drawn in their physical form and orientation, with the pins numbered and in the correct positions, as viewed from above. The connections between the components are drawn with either horizontal or vertical lines and right angle bends. If the lines become too close together or something needs repositioning, then rub out and redraw. This may seem tedious but it is the first stage of a process which hopefully leads to the most suitable arrangement for finally laying out the components on the stripboard. A circuit drafting programme on your PC could be used, but only if the IC pin layout agrees with the physical positions. It leads to confusion if it doesn't!

The Stripboard Layout

After manipulating the circuit into an accurate and tidy diagram, the information is transferred into the layout drawing, as shown in Figure 2. It is helpful to have the circuit pinned up in front of you when drawing the layout. It is also helpful to make the drawing to a larger scale than the 0.1 inch grid of the stripboard. I find that 0.25 inch or 5mm squared paper to be about right. I have printed out on my PC some A4 sheets with lines and small circles to look like stripboard, but squared paper is fine.

Only one layout drawing is made, this is of the component side. The copper strips are shown as viewed through the board (X-ray fashion). For each soldered joint a black blob is penciled in at the hole position, for each cut in the copper track an 'X' is marked on the

hole. Tracks are only cut at the position of a hole.

I normally start laying out the board with the most signal-critical part of the circuit first which, in this case, is IC1 and IC2. Keep in mind where the signal and address lines might go and how the supply lines may link together. Draw in wire links to connect together, say, all the earth pins. Put 'X's to indicate breaks in the tracks. If a clash occurs somewhere, then rub out and try again. Resistors can be fitted flat on the board or stood up 'Japanese style' taking up less space.

When all is complete and every connection has been checked, then connecting pins and fixing holes are added. You can now see the overall size of the board. The copper tracks are marked alphabetically with track 'A' at the bottom and the holes are numbered horizontally with row '1' at the extreme left. This gives each hole a unique address e.g. N13 (which is a cut in the track under IC2).

Stripboard Preparation

A piece of stripboard is cut to size, in this case 24strips wide by 38 holes long.

It must be possibly to identify any hole from both the component side and the copper side. A strip of masking tape is stuck on the component side along the bottom edge, just below the lowest row of holes. Another piece of masking tape is stuck at the extreme left edge, but not covering any holes. See Figure 3. Turn the board over and place strips of tape
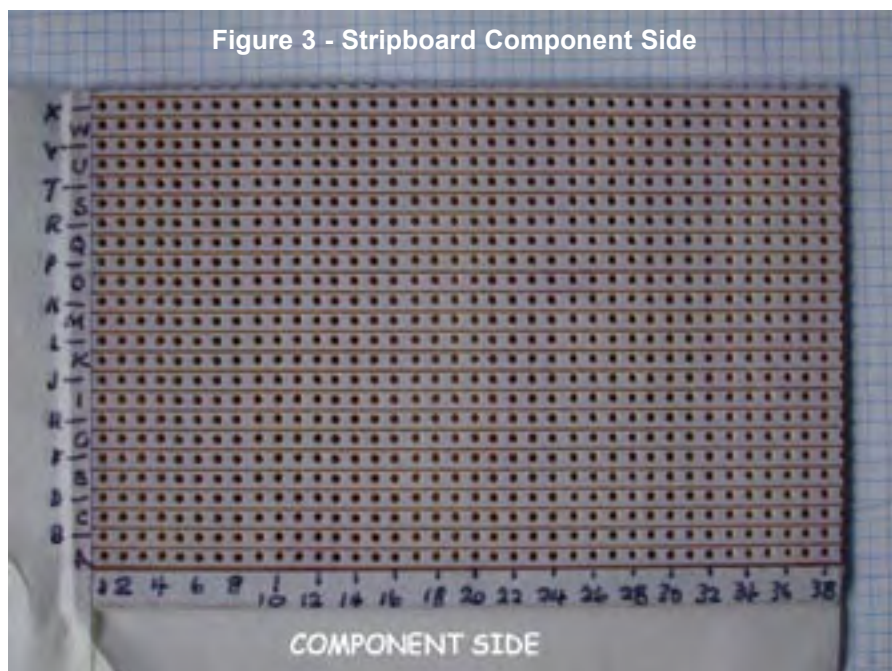
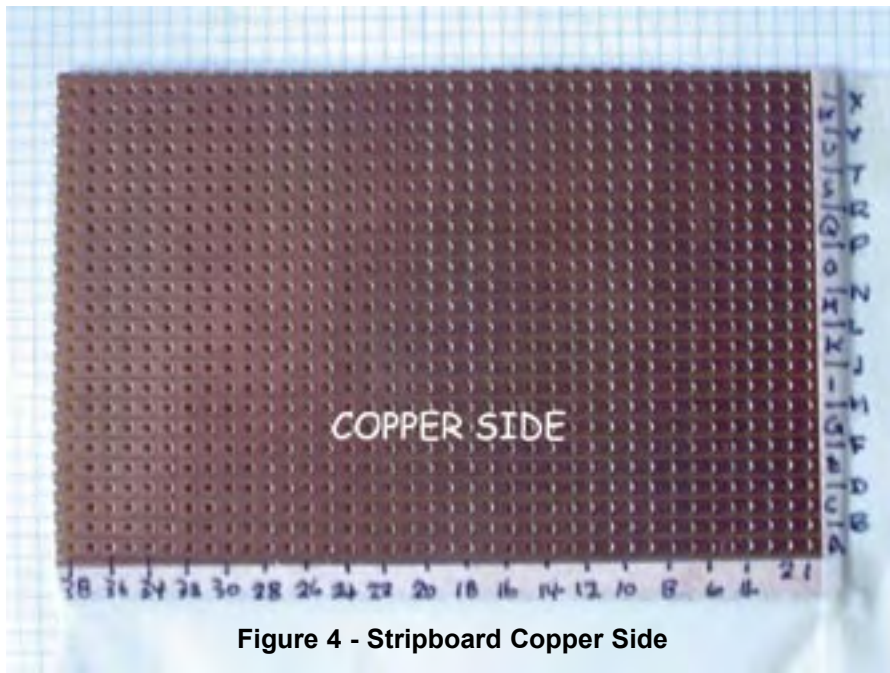
Figure 3 - Stripboard Component Side

COMPONENT SIDE

Figure 4 - Stripboard Copper Side

back-to-back with the previous strips of tape. See Figure 4.

To avoid confusion please note that the piece of stripboard shown in the photographs had unusual white stripes already printed on the plain side which unfortunately makes it look like the copper side! Use a fibre tip pen to identify each copper strip by letter and each row of holes by number. The component and copper sides with letters and numbers are shown in Figs. 3 & 4 respectively.

The copper tracks can be cut using either a Spot Face Cutter (Maplin FL25C) or a 3.5mm drill held in a pin vice. Working from the left side of the layout, identify a break in a track at, for example, B3. On the copper side locate hole B3 and cut the track. Continue until all the breaks have been cut. It is easier to cut tracks before any soldering has been done. See Figure 5.

Fitting Links and Components
It is best to start with wire links followed by resistors, small components, IC sockets, connecting pins, leaving any large components until last. For links I use 22swg tinned copper wire which has been pre-stretched to make it really straight. I bend the wires and component leads to match the hole spacing and after inserting the component I slightly splay

the leads so that the wire or component stays in place during soldering. The completed unit is shown in Figure 6.

Testing
Testing follows the usual procedure, a critical visual inspection for correct components, dry joints, solder blobs etc. Common faults are missing wire links or the omission of a cut in a track. If the ICs are on sockets then remove them and make an ohmmeter check for possible short circuits. If all ok, insert ICs, apply power and perform static voltage checks followed by a functional test.
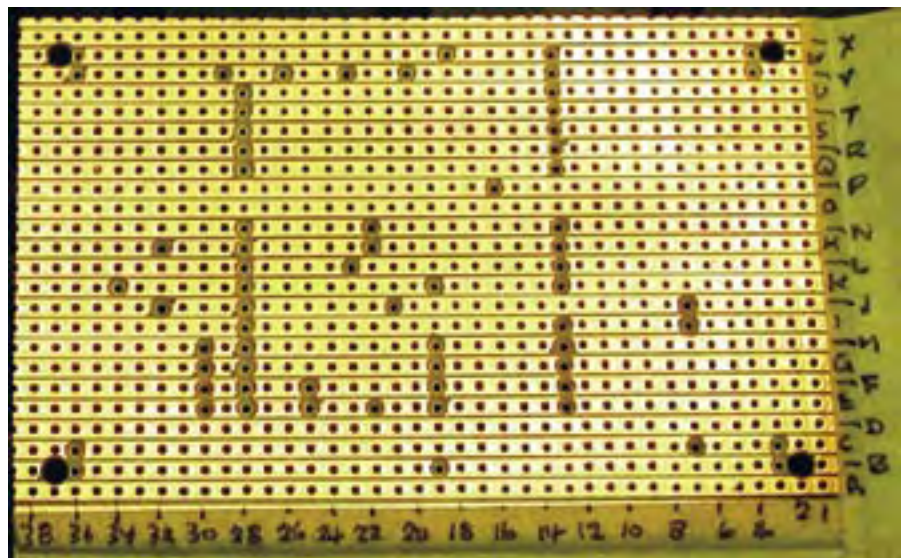
How long will all this take?
Starting with a circuit similar to Figure 1, which is a tested circuit, I would guess the project could be completed in about two evenings.

Stray capacitance
The measured total stray capacitance between one track and the two tracks either side is 3.5pF/inch (1.4pF /cm). At first sight this may seem a lot. In the layout discussed, the most critical components, as far a stray capacitance is concerned, are R7 and R8, which set the gain of the video amplifier in IC2. Stray capacitance here could affect the video frequency response.

The stray capacitance across R7 is 3.5pF/inch x 0.4 inch (length of adjacent track) x 0.5 (one side of track only) = 0.7pF. The stray capacitance across R8 is the same. In this instance the attenuator R7 and R8 is actually frequency compensated by the equal stray capacitances across the equal value resistors (how lucky can you get?). The measured frequency response of the stripboard video switch circuit is flat to 6MHz (the limit of my multiburst generator).

Reference
Making Circuits (Plugboards & Stripboard) Construction and Workshop Practice - Radio Communication Handbook p.16.17, Sixth Edition, Radio Society of Great Britain

Figure 5 - Stripboard cut tracks

Reflections on IBC 2004

By Mike Cox

IBC 2004 has been and gone. What did 40,000 + visitors and exhibitors make of it? First of all, the atmosphere around the show was very positive – exhibitors were more confident of their future than they were last year.

There are some exciting developments around. If you ask me to highlight them, then the predominant ones are:-

- High Definition [HD]; almost everyone and his dog are offering HD capable equipment.

- The LED has arrived as a serious source of illumination and light for displays.

- Tape may be on its way out; Panasonic are deadly serious with their P2 system using compact flash memory.

HD is the subject of much debate, mostly about the distribution format. There is intense competition between WM9 [Microsoft] and MPEG-4, both of which can deliver HD with around 4 – 8 Mbps bit rate, ie only slightly higher than existing digital distribution on SD using MPEG-2. Euro1080 has jumped the gun somewhat by starting a satellite delivered service using MPEG-2 encoding, with 19.1 Mbps bit rate.

As mentioned in CQ-TV 205, JVC launched their HD10 prosumer camcorder last time, but the 50 Hz version is still not ready, but Sony [and others] have the HDV format. [FIGS 1 & 2]. This neat camcorder records 1080I on DV tape cassettes.

They have allied themselves with Pinnacle, Avid, Apple, Ulead, Canon

Fig. 1

SONY HDV CAMCORDER

Fig. 2

SONY HDV CAMERA

etc so that there is editing capability for the format, and further camcorders likely.

A small row blew up when someone from BBC Research suggested that the EBU should adopt the 720p standard [1280 x 720 pixels, roughly equivalent to a 17" LCD display].

However this view was countermanded, but many felt it had highlighted a need to decide to whether to ditch interlace in future systems. There is much support for this as both camera sensors and modern displays are by nature progressive, and interlace introduces difficulties in processing, particularly at the display end. The last bit of news was a statement from the BBC that they had probably bought their last SD cameras.

A few years ago, a blue LED would cost around £5, and was pretty dim. Now blue LEDs cost a little more than red and green ones, but they are now of equal brightness.

Barco, Daktronics, Mitsubishi and Sony were showing excellent large screen displays using LEDs. Two of these were used by the IBC Info Channel [CQ-TVs passim].[FIGS 3 & 4]

Fig. 3

BARCO LED DISPLAY

However the other part of the story is the rise of the white LED. Up to now this has been used for bicycle lights, but

Fig. 4

4 X 3 ARRAY OF BARCO PIXELS
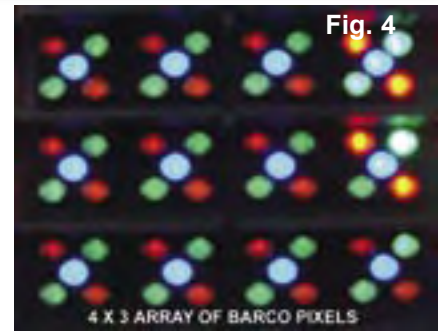
is now a serious contender to replace the filament lamp.

Several manufacturers were showing LED camera lights. IDX, normally known for batteries, were showing a particularly neat lamp to replace a 35 – 40 watt halogen lamp. [FIG. 5] This one only draws 11 watts for the same light output. Other advantages include no colour temperature shift as the light is dimmed. Others were showing around-the-lens rings [FIG. 6], or bars. Another benefit of the LED is its ruggedness compared with a filament lamp.

Fig. 5

LED CAMERA LIGHT BY IDX

The ruggedness aspect is enhanced by Panasonic's work on solid state memory to replace tape or disc in camcorders. Their P2 technology has now matured and IBC TV News cameras used these cameras this year. [FIG. 7]

Fig.6

LARGE LED RING ON 35 mm CAMERA

Although the 4 GB cartridge [the same size as a PCMCIA card] costs about 2000 euros at present, this is sure to drop, and each card is good for 100,000 recordings. The almost

Fig. 7

complete absence of mechanical parts in the camera apart from the lens must make for a much more reliable system.. If you are news-gathering, the LED camera light will add to the robustness of the unit.

Looking around the exhibition, the CRT display is somewhat rare, being replaced by ever improving LCD or Plasma displays. This year, a Display Zone was inaugurated. This offered space to display manufacturers, and had displays of every size from small Teletest LCDs through 61" Sony Plasma displays to large digital cinema projectors from Christie and Sanyo. Nearby, Mitsubishi had a stand topped by a large LED display, with some excellent DLP back projectors arranged as video walls. [FIG.8 AND 9,]

Fig. 8
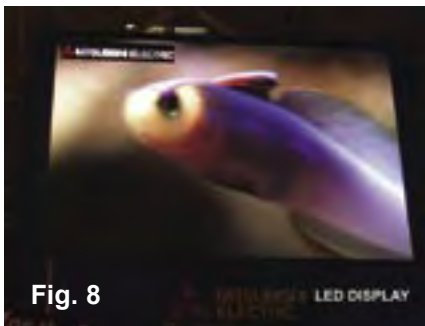
Elsewhere in the show, ARRI showed a camera with a large CMOS single chip sensor, as used in high end still cameras. This is intended for digital cinematography, and records at 72

Fig. 10

frames per second. From this, all the normal frame rates can be derived by interpolation. A large screen demonstration looked pretty impressive. They have linked up with Snell and Wilcox for the processing technology. [FIG. 10]

The Info Channel worked well for 6 days, 24 hours a day, with the SDI mixer behaving itself, as did the SDI Router [FIG. 11]. This was put to good use as two of the Info Channel sources were also needed elsewhere in the IBC

Technical Facilities system. They had to record as well as play-out to CAR, and so the Router handled all that without patching. Embedded audio passed without a problem.

Fig. 11
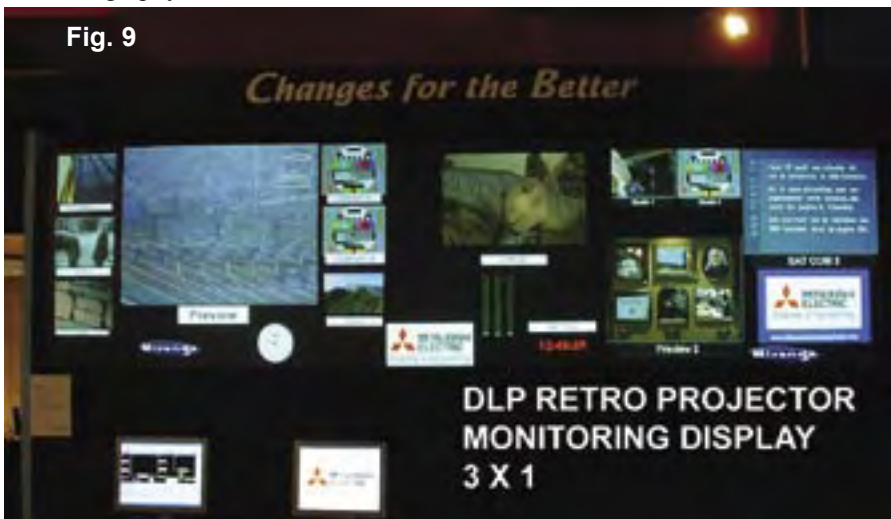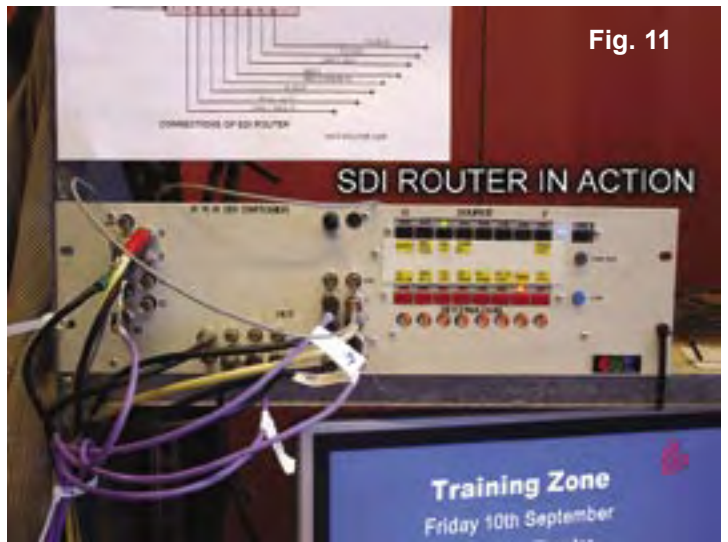
We closed the Info Channel down at 6pm on the last day, and managed to get all 19 boxes of kit packed up by 12 the next day. The philosophy of using 3 screen areas worked, as we were able to get the IBC TV News subtitled and re-framed to top left of screen, leaving the strap and right hand areas for information. [FIG. 12]


Fig. 9

Fig. 12

Audio Routing Switcher

By Richard L. Carden VK4XRL

Not much information has been forthcoming in regards to audio facilities relating to ATV. It maybe nice to have those beautiful colour testcards, computer graphics, videotape and cameras, but not much good without the associated audio.

The digital domain takes care of the audio by imbedding it with the associated video signal. Maybe we might see an article from Mike Cox in the future to follow up on his excellent digital series of articles. In the mean time, most of us will have to do with the old analogue system. This circuit was developed when John VK2ZUH required an audio switcher to marry up with a video switcher that I had drawn up some time ago. Since we wanted
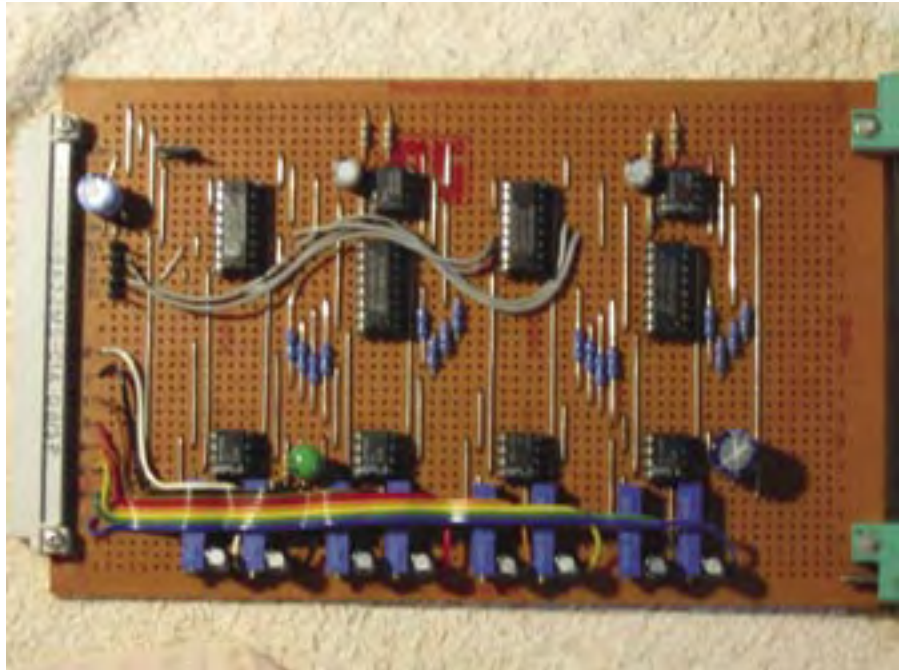

to have some control over input levels, it was decided to provide these facilities within the audio router. This saved on separate audio DA's.
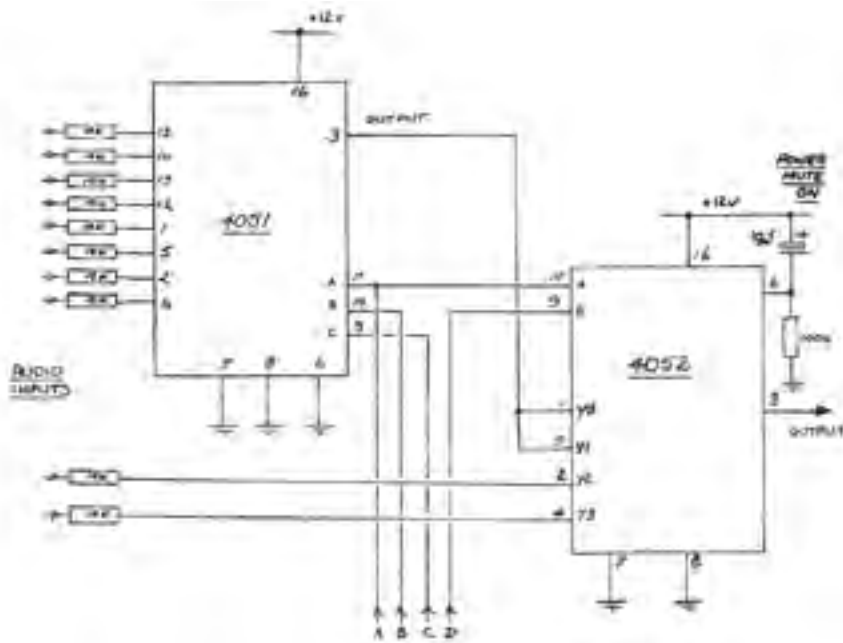
The Audio Switcher

Each audio input is fed via a level control so we can match all input levels that are to be handled. It can handle a minimum input level of around 250mV p-p for around 1.5V p-p output, separate VU meter facilities are also provided to simplifier setting up. Each voltage follower input op-amp feeds the inputs to a 4051, an 8 x 1 data multiplexer. The input is fed via a 10K resistor to the 4051 while the output feds another op-ampforming the output circuit. The output also feds a second op-amp which is connected to a VU meter if required. The 10k resistor and the output feedback resistor of 56k give a gain of around 5.6, while the parallel capacitor reduces the bandwidth.

Dual 8 X 1 audio switchers can be made for stereo by duplicating the 4051 and associated output circuit.
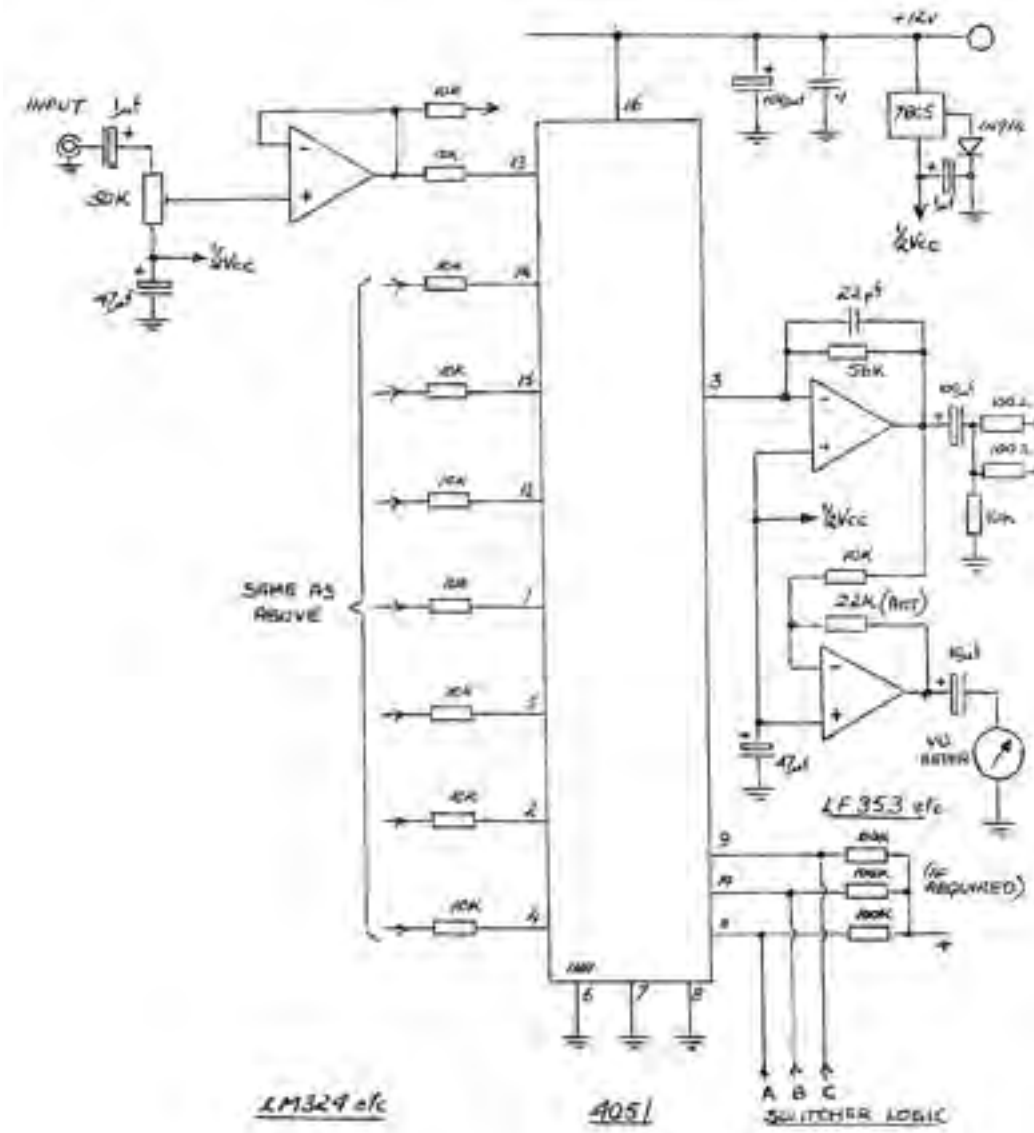
Control is carried out via logic applied to the ABC select inputs (pins 11, 10, & 9). This can be connected to the vision switcher select logic to allow audio follow video switching.

So far we have only arranged for eight audio inputs, however some people require even more inputs. Eight inputs was easy to provide because of the 4051 8 X 1 data multiplexer IC. However, if we need to go further then this, then we could use a 16 X 1 data multiplexer, for example the 4067 IC. It is also possible to use the original 8 x 1 circuit and add extra circuitry to provide the other two inputs. I have included a circuit which uses a 4052 IC to provide these extra inputs. To make the logic simple and to save any changes in this area, you will notice that for inputs one to eight the 4052 toggles between the inputs Y0 and Y1, these inputs been connected to the output of the 4051.

STEAM TV
Dicky Howett reports

Cameramen get younger every year! This happy chap finds something to look at during this Augusts Lincoln Steam Rally. The camera is a veteran Marconi Mk 7, exhibited with two ob vans as a side show by Paul Marshall and friends. Much passing interest was expressed about 'how to do tv ' even if it was all a shade over thirty years ago..and the camera still works!

Test Card Generators through the ages…

1981
(published in BATC Handbook)

1992
(monochrome)

2003
(colour; user programmable)

Richard Russell, G4BAU, proudly presents the latest in a series of electronic Test Card Generators spanning more than 22 years. This new model is user-programmable and has the following features:

- Digital storage, using 12 MHz sampling and 8-bits linear coding.
- 'Mathematical' PAL coding, ensuring compatibility with all 625-line PAL equipment.
- Stores any still frame (8-field PAL sequence) and four *fastext* teletext pages.
- Image and teletext are user-programmable using Windows™ software supplied.
- Supplied pre-programmed with colour test card and informative text pages.
- Integral vertical-interval test signal (pulse and bar) and line 23 signalling.
- Baseband video output on 75Ω BNC connector; BNC-phono adaptor supplied.
- Approximate size, excluding connectors, 130 x 65 x 25 mm. Weight 140 g.
- Supplied with a 230 Volt 'plug top' AC mains adaptor.
- Alternatively may be powered from 9 Volts DC at approximately 150 mA.
- Supports 405-line, 441-line and 819-line operation via future software upgrades.

The generator costs £100.00 + £5.00 postage & packing, excluding VAT (£123.37 inclusive). The units are made to order; enquire for current availability and allow two weeks for delivery. Visit our website for more details http://www.rtrussell.co.uk/ or email info@rtrussell.co.uk

R. T. Russell
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1W-PA for 13 cm FM-ATV

By Torsten Fechner, translation by Klaus Kramer, DL4KCK

After building the 13 cm-ATV exciter we have to raise the output power from 300 mW to 1 Watt. This is done by a BFQ34 UHF transistor.

Construction

A double sided epoxy board has to be etched and cut following the layout plan, then holes for the trimmer, resistor and Sky capacitors are drilled. The collector and base connectors of the transistor are cut to 6 mm length, bent upwards, and a square hole for it`s broad connector plates is rasped through the board. In order to shield it we prepare a copper foil 3 cm x 3 cm, tin-plate it on one side and drill a small hole in it`s center for the ceramic body of the BFQ34.

The board (Platine) will be mounted just behind the cover (Boden) in order to pass the ceramic body through it and fix a heat sink at the bolt. Mark the cover through this transistor hole and drill it accordingly. The heat sink (the same size as the sheet metal case) is drilled in the same way and is then test fitted together with the transistor, board and case. The input and output connectors (BNC or N type) are mounted similarly close to the cover with the signal pins lying on the strip line (Leiterbahn) of the board, so the edges will be protruding over the cover.

The distance from the cover to the board should be around 3 mm, and if a connector`s teflon flange hits the board, it can be cut off. Now close the covers and solder the connectors with a big soldering iron and sufficient solder. After it has cooled down, put the board into its place and solder the ground side to all the sheet metal sides.

BFQ34 mounting

Tin the ground side of the board around the transistor hole and mark the collector side of the transistor with a ballpen on it`s body. Now put it through the hole from the ground side and bend the four connectors accordingly onto each circuit path and solder them. On the ground side the copper foil is laid with its tinned side onto the emitter connectors, pressed flat and soldered using a high temperature. The tin should be squeezed out of the edges.

Schaltplan

Layout

Bestückung

Bild 1: Montage der Platine
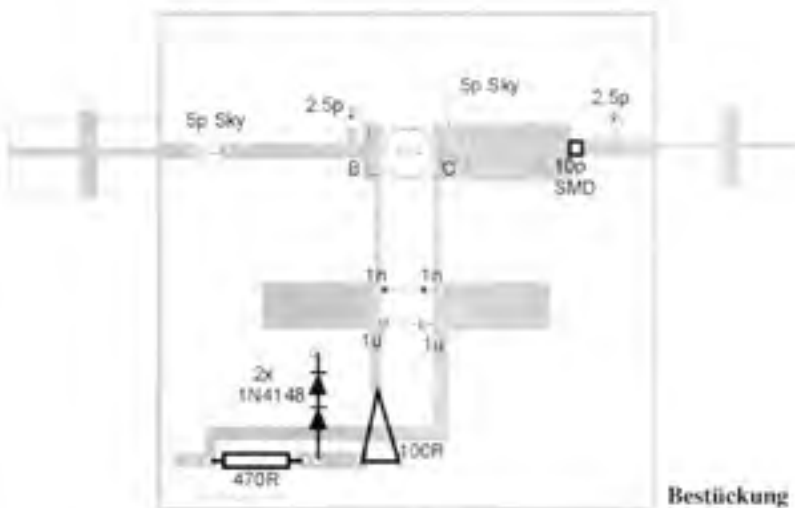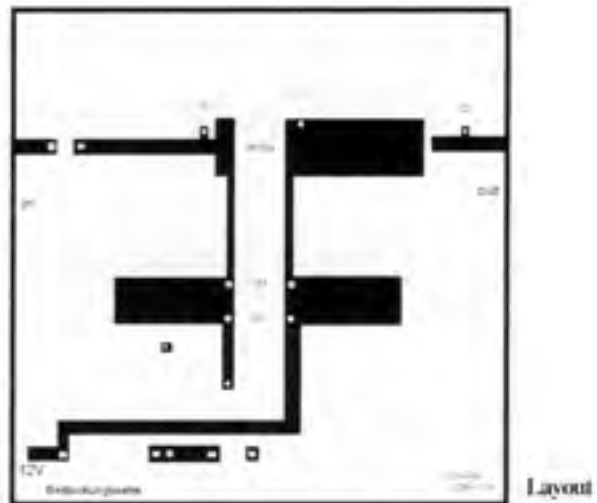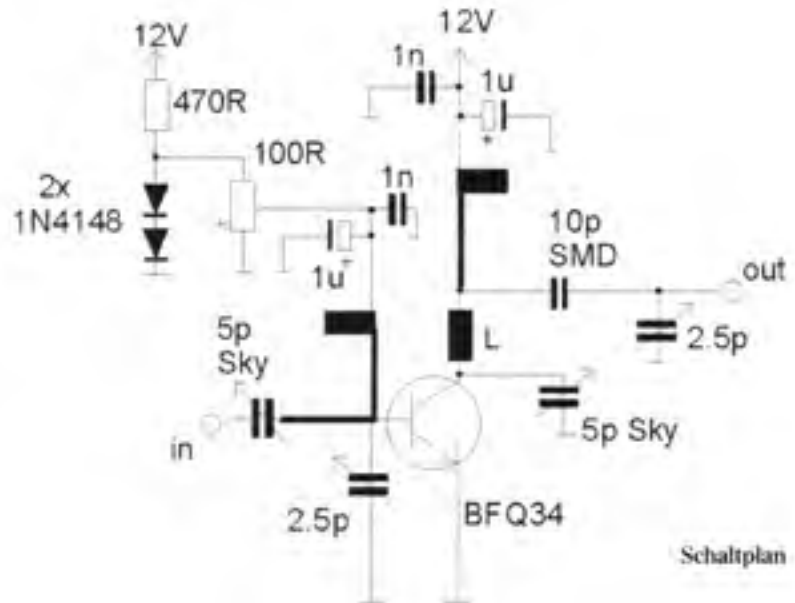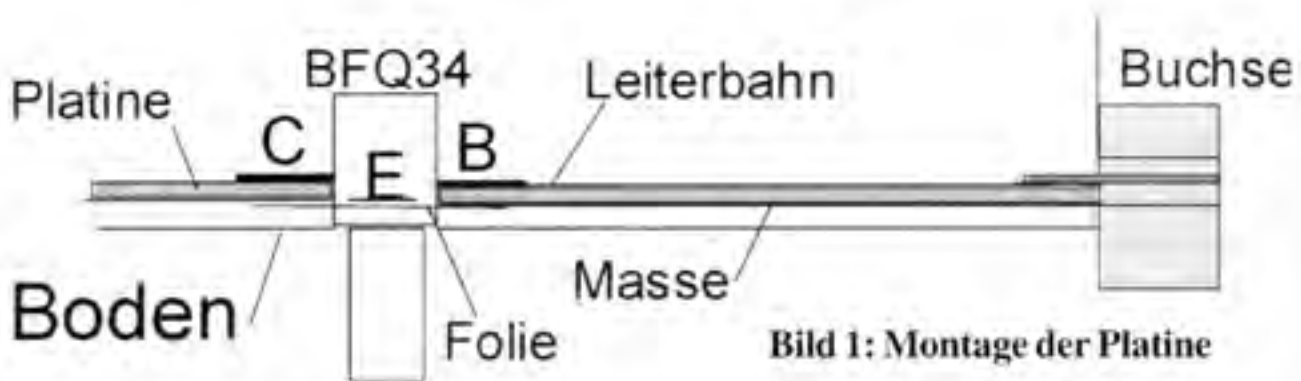
Assembly

Now the other parts are mounted and soldered onto the circuit path side, not forgetting the supply voltage components. The 2.5 pF Johanson trimmer capacitors are mounted carefully with the red dot pointing to the ground connection hole.

Alignment

For the Sky trimmmers we need a small plastic pin with a flat end; for the Johanson trimmers there are special pins available, but DIY is possible. In each case be careful because the trimmer plates are fragile. Terminate the input and output by 50 ophm, and then apply a 12 Volt supply. The

Parts List
2 x BNC or N connectors
1 x resistor 470 Ohm
1 x trim resistor 100 Ohm
2 x diode 1N4148
2 x capacitor 1 uF
2 x capacitor 1 nF
2 x Sky capacitor trimmer 5 pF
2 x Johanson microwave trimmer 2,5 pF (type 5800)
1 x SMD capacitor 10 pF/EDPU
1 x sheet metal case 74x74x30 mm
1 x supply voltage connector
1 x heat sink (see text)
1 x transistor BFQ34
1 x copper foil 3 cm x 3 cm

quiescent current is set to 150 mA using the 100 ohm trimmer, and - with a power meter for 2 GHz at the output and a 250 mW TX at the input - the Sky trimmers are set for maximum output. The 100 ohm trimmer has to be adjusted again for 150 mA maximum DC current.

Now the Johanson trimmers are aligned carefully for peak output, in turn with the Sky trimmers. Each capacitor may have a second position for maximum output, then all other trimmers have to be realigned.

Reprinted from TV Amateur issue 133, http://www.agaf.de

ATV meeting at broadcast station NDR Hamburg

More than 50 guests listened to interesting lectures from different readers. Everything was transmitted via DB0FS (Hamburg ATV repeater), around 30 percent of the guests are active there. We have plans to move it to a TV tower in 165 m antenna height gaining more coverage. TX frequency is 1288 MHz with hor. polarisation, QPSK modulation with 5 Megasymbols/sec. Behind the receiving antenna a selective 40 dB preamp should be used in order to avoid overmodulation by mobile phone relais stations. Now the lectures:

1) Martin Fritz, DL2HAO, reported latest news from the inviting ATV group with 51 members now, existing since 1977 at two locations in Hamburg Lokstedt and Rothenbaum.

2) Norbert Huckfeld, DK6XU, gave an overview of DB0FS developments since 1978 and showed coverage diagrams. He discussed pros and cons

of different ATV modulations in respect to TX power and rf bandwidth. So a 10 Watt FM-ATV signal equals to 180 KW AM-ATV, and digital QPSK gains some 6 dB more together with MPEG video compression for reduced bandwidth.

3) Stephan Reimann, DG8FAC, explained design and usage of his D-ATV components, digital satellite receivers are containing quite similar devices. Another supplier of rf components is Michael Kuhne, DB6NT.

4) Thorsten Schulze, DG1HT, discussed properties of different satellite receivers used for ATV, some update software for them can be found on his excellent homepage www.dg1ht.de

5) Iwo Schulz, DG0CBP, reported the present state of the ATV repeater linking project in northern Germany, comprising of DB0EUF on a 342 m telecom tower near Hoehbeck-Gartow with ATV links to Berlin, Hamburg

(DB0DTV) and DB0HEX on the Brocken mountain, homepage wwww.db0hex.de. He showed nice pictures from the tower and a software program used for calculating the range of a link (www.cplus.org/rmw/english.html).

6) Roberto Zech, DG0VE, from Brauna near Dresden introduced his components and explained construction of PAs with Motorola transistors specified for 960 MHz, but also useful at 1300 MHz, as well as alignment with Smith diagrams and layout design by a software called "PUFF" from www.ukw-berichte.de. Roberto's homepage is at www.dg0ve.de.

Catering with coffee and cakes completed a very interesting day which will be followed by more to come in a two months interval. Thanks to the organizers,

73 Manfred, DC2FK, translation by Klaus Kramer, DL4KCK

That Elusive Spot

By Doug Pitt

In the Summer issue of "CQ-TV" Dicky Howett belatedly donned a suit of sackcloth and ashes to atone for repeating an unsupported claim by the late Albert Abramson.

Abramson was, in general, a meticulous writer but the subject referred to by Dicky represented an isolated exception to his general method. In the "History of Television" quoted, Abramson claims that Baird secretly used the flying spot technique to create his earliest successes (i.e. from October 1925 onwards) rather than from autumn 1928 when conventional wisdom, including the testimony of old Baird employees such as Tony Bridgewater and Ben Clapp, says that W. Jacomb unveiled the first spotlight apparatus.

Yet Abramson admits that floodlight TV involves oppressive levels of illumination while the flying spot technique gives its best result in the dark (i.e. without additional lighting). Yet William Tainton, allegedly the first living TV subject, retreated from the heat and glare of the first (October 1925) success.

It is easy to confirm experimentally that spotlight-derived TV signals are hugely superior in signal-to-noise ratio to the corresponding floodlight equivalent, yet complaints about heat and glare continued to be voiced by subjects throughout 1927 and early 1928.

The strongest piece of evidence against Abramson's theory probably occurred in February 1928 when Baird and his helpers invested a huge amount of secretive work in the transatlantic TV transmissions. This was Baird's most elaborate publicity stunt, yet photographs taken at the time of the subjects reveal huge banks of incandescent lamps; neither William Fox nor Mrs. Mia Howe for example are able to open their eyes fully because of the glare. It is absolutely inconceivable that Baird would have used this inferior floodlight method if the vastly superior signals derived from the spotlight technique had been available to him at that time.

The floodlight system was not alone in attracting criticism from its subjects. The absence of steady ambient light led many subjected to the spotlight technique to complain of being unable to see their own extended hands and feeling disoriented by the 12.5 Hz flashing in the eyes. (The writer of these lines was once the target of a Baird spotlight projector). Just one such complaint prior to autumn 1928 would have added some weight to the Abramson theory.

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Cyber membership is currently only available to members outside the UK. Cyber member will **not** receive a paper copy of CQ-TV, but will be able to download the electronic (pdf) version. *Please note that these files require the Adobe Acrobat reader version 6 or above.*

DATV boat mobile

translated by Klaus, DL4KCK

For the HAM RADIO 2004 fair in Friedrichshafen AGAF (with Uwe, DJ8DW and Willi, DC5QC) had prepared a new attraction: after the Zeppelin last year it was DATV boat mobile from the Lake Konstanz this time. The first 1 Watt/13 cm digital ATV signal went up to "Pfaender" mountain in Austria and was retransmitted digitally with 4 Watt on 23 cm to the AGAF-DARC stand in Friedrichshafen. A big Tv set there showed beautiful pictures from the Alps and the lake, and sometimes the operator Rudolf, DJ3DY, at the "Pfaender" mountain was able to switch to the live DATV signal from the round trip boat where his son Thomas, DK5DF, could barely direct the antenna in the fair wind on deck. With greater distance the second TX signal on 23 cm at the mountain inhibited live video from the Isle of Mainau (about 46 km), as long as the HAM RADIO stand was fed. Besides magazines like the new TV-AMATEUR there was an HDTV projection shown with high resolution video files from PC hard disk received on the Astra satellite channel "Euro1080" and on the internet.

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40 . . . . . I^{2}C CPU PCB	£10.00	£0.43	....	....
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The BATC DVD	£5.00	....	....

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PLEASE MAKE CHEQUES PAYABLE TO 'BATC'.

By Richard L. Carden VK4XRL

Over the past few months the repeater VK4RKC here in Brisbane, Australia has been upgraded to digital. A digital receiver was installed first so that either 1250 MHz FM or DATV can be received and re-transmitted on 426.25 MHz. This has enabled tests to be conducted from other members QTH's to ascertain if going digital at their location would at all work. Results so far have been very encouraging, with only 1W DATV being required in most cases to obtain P5 pictures.

VK4RKC goes digital

The 1250 MHz DATV transmitter has been set with the following parameters, Symbol Rate 7500 and FEC ¾ as shown above. These settings allow dual transport streams which are set as Video 1, 4800 and Video 2, 4600. An extra receiver will be installed over the next few months to enable the second channel to be utilized.

DATV Transmitter

To enable DATV from our site we elected to use 13cm, the frequency selected being 2439 MHz. The reason is that we obtained a MDS transmitter which was capable of producing 50W FM or 15W digital. We initially modified it to accept a 70MHz IF

input from a 70MHz FM exciter to do the initial testing. Having proved its capabilities, the DATV exciter from SR Systems was connected with the same parameters as used on 23cm to the final PA. Good results have been obtained using a down-converter from Mini-Kits here in Australia. However at times the signal will disappear due to other activity in the 13cm band i.e. Wireless LAN systems and the portable Video Senders now operating in the band.

Since the bandwidth is only 10 MHz, we may try shifting it within the allocated band 2439 +/- 9 MHz to see if we can eliminate the problem. The SR DATV units produce a fixed testpic, which is utilized to show the frequency and parameters used as shown below.

With dual transport systems from the digital transmitter,

Glass House Mt. as discovered by Capt. James Cooke in 1770, viewed from the camera on the repeater site mast

it should be possible to conduct two way exchanges using different input frequencies. Tests will be conducted once we have a second input frequency. Also, we hope to conduct tests using the RF input module from SR Systems.

Look what I found! RCA Telecine caught in a Time Warp

By Peter J Stonard

My friend Rich, who is well known by his nickname "LabGuy", sent me an email in late May of this year, relating to an item on eBay "RCA TK-29B TELECINE TELEVISION CAMERA NEW IN CRATE" Hmmm. That's the kind of thing that both he and I dream about. In fact our friendship began several years ago with a few "eBay Battles" over TV camera tubes and other bits. We've learned not to fight, and in fact we live fairly close to each other, and often lend a hand as our collections grew past the tabletop scale. Some of our nicer pieces (studio cameras, even studio VTRs) often require a "Two Person Lift".

So what do we have here, anyway? Well, it turns out to be a very interesting story, and as of this writing only some of the details have been determined. If you'd rather stay in suspense skip this paragraph, otherwise read on, spoilers follow. The item was more than just the camera, and it was brand new and in the RCA factory crates! It's now in my procession, and hopefully by the time this edition CQ-TV is printed the telecine will be assembled together. To get it from the seller I had to be the top bidder on eBay, and that process ended at almost seven hundred dollars. Not bad for an item that is thought to have cost the original owner about one-hundred-and-fifty-thousand dollars in 1983. This is the tale of what we got and how we got it.

The seller of this item on eBay provided some background, and clearly didn't know what he had on his hands. His motivation was money, and once my cashier's check arrived to pay him the high bid we fell into a strained relationship that ended once the crates were picked up by the trucker that I

TK-7B slide projector

arranged. So where to begin? Let's wind the clock back to 1983.

What Is A Telecine?

In the early days of television the only practical recording method was to film the monitor screen and later play back that film (after chemical processing). The cinema craft was a little further along, in its second quarter-century when TV broadcasting started in 1936, so mastering film-to-video became a high priority.

A common alternative name for Telecine is "Film Chain" or "Film Island" – a good indication that equipment is far from compact and simple. From the beginning and until the application of video tape recording in the late 1950s, film was the only video storage. Later, with the proliferation of digital computer tools in the 1990s, television source materials shifted from film and videotape to digital storage. So for a very long time equipment was needed to transcribe film to video for transmission, and even today it's still needed for TV and DVD mastering work.

There are two principle methods to this end, both called a Telecine, but using different techniques. For direct conversion to video the film can be projected in to a television camera lens, and that is the method used by RCA to this day (there are a few systems still in use, although RCA ceased operation as a company in 1986). The other method uses a flying-spot from a precision CRT to scan the film frames and the light is collected by a PMT (Photo Multiplier Tube). This method has been refined commercially, by Rank Cintel. More recently Bosch has taken the path of using CCD imagers and digital signal processing.

How Does A Telecine Work?

The images on film are composed of frames, and each one is projected to a screen in sequence, and fast enough to give steady motion (because it's above the persistence of human vision). The images on the film may be slightly different, thus portraying motion in the scene. The camera captured these frames with a similar stop-motion shutter mechanism. The universal film speed is 24 FPS (Frames Per Second), and a double shutter in the projector give the screen 48 flashes per second

Author emerges after taking the rig out on the local motorway

to reduce flicker even further. Standard movie theatre film is based on 35mm positive film; the format is standardized by the SMPTE (Society of Motion Picture and Television Engineers).

While 35mm prints widely exist for theatre releases, and are therefore available to TV stations, the station in turn must have a means to convert them to video for transmission. This is the work of post-production houses, and they also turn out the masters for a DVD release of a theatre film. Overall it's very costly to create and distribute on 35mm film.

For this reason in the days prior to about 1975, when ENG (Electronic News Gathering) appeared, all medium and large market TV stations had 16mm format film cameras and darkrooms in house. The expression "film at eleven" was often used to excuse the late arrival of film from the field, missing the early evening news.

So a typical telecine might be set up for both, 16mm or 35mm film. The national network feeds would source film from 35mm theatre stock, while local market stations would air from a 16mm source. A further complication is that theatre prints have optical sound tracks (that are 'printed' on the film at the same time as the images) but locally shot film uses magnetic sound tracks. A telecine 16mm projector requires both methods of audio playback.

The author in a state of unbalance

It's not been possible to fit a feature movie on a single roll of film except in some special cases such as in-flight 16mm movies of the 1970s, and more recently for 70mm film used by Omnimax theatres. For continuous program playback a telecine really needs two projectors much like a theatre, to allow one to be loaded while the other is projecting. The switchover is signalled by that little circle flash in the top right-hand of the screen to alert the projectionist. The single TV camera of the Telecine is switch (or Multiplexed) optically between two or more projectors.

There are other uses for a telecine in addition to transcribing movies. Much of the graphics in Television before the invention of the CG (Character Generator, often called a "Chyron" due to the popularity of one of the first commercial units, again during the 1970s), were stored and used in 35mm slide format. So ideally our telecine should have a 35mm slide projector (or two).

Three-Four Pull-Down

The two principle TV standards in the world, NTSC and PAL, do not operate at 24FPS. So some trickery is needed to make clean video from film. In the PAL world the film is sped up a little bit to 25FPS and uses a conventional projector. For NTSC there is a nasty conversion up to 29.9FPS (actually we say "30FPS") that involves exposing some frames twice. In the modern world of home theatres the opposite is done to get back the original 24FPS format by a process called Three-Four Pull-Down. As a practical matter the Telecine projector for NTSC has a five bladed (instead of four blades) shutter.

As an aside, here's a little movie trivia. If you see a TV image in the scene of a theatre movie it's really operating at 24FPS to prevent banding or flicker on the film's image. This takes some digital image conversion on the set of

the movie, and modified TV monitors with 48Hz vertical scanning. One may spot a credit at the end of the movie for the crew that did the "24 Frames Playback" work.

Surprise Package

Knowing a little about the equipment, but not really a lot, I set my expectation low. Perhaps this was just a camera (which is still a welcome addition to my collection)? I emailed the seller for help and got a laundry list of RCA MI (Master Index) numbers, that RCA gave to everything from complete transmitters down to the smallest hardware fastener. Not much help so far…

The seller said that he opened one of the crates and read the "TK-28C" name from the big red book. Aha, this project comes with documentation! Wait, one of three crates? So the sixty-four thousand dollar question has to be "What's in the other two?" How ironic that the phrase sixty-four thousand dollar question originated on a TV game show in the 1950s…

This and other questions were nagging at me during the seven-day auction. I fired off a couple of email messages to other collectors and pieced together a story. A moot point as there would be only one winner and with eBay it's "winner takes all".

As you may guess, I was the high bidder and after a few email messages to the seller we switched to phone contact. He was in Abilene, Texas, and I am in San Jose/"Silicon Valley", California. About 1600 miles (2600km) by road… He'd won the crates and boxes at a live auction and didn't realize the size of the prize until it was dropped in

Rich works the tailgate

TP-66 16mm projector upended to a pallet jack

his driveway. The auction was held in Abilene to clear an old warehouse that had been abandoned for almost two decades. The crates were addressed to an Abilene TV station, WSUZ, from three separate RCA facilities in New Jersey, USA. We found out that WSUZ had been granted an FCC license in 1986, but did not go on the air. The seller pointed out that Abilene was in the "bible belt" of Texas, and many local churches operate radio or TV outlets. Apparently this was brand new equipment that was delivered but never installed! It had sat for almost twenty years in a warehouse. Protected from the sun but not protected from the famous Texas humidity and high temps.

Take The Long Road Home (with apologies to "Super Tramp")

Options for me were:

(1) To go and get it (and likely rent a truck after flying in to Dallas, about 200 miles east of Abilene).

(2) Arrange a door-to-door freight by truck.

(3) Arrange a combination of air cargo and truck freight

(4) Forget about it, and leave the prize for the eBay "under-bidder" or the landfill. (The seller said he though the crates were useful, everything in them could be dumped).

I decided to make my own delivery arrangements, and after a few phone calls I was hooked up with David

Smith Trucking out of Dallas, who drove out to pick it all up and dropped it off at the Dallas/Fort Worth Airport cargo company. David did a great job, was patient with the seller, who took a one-week holiday when my auction payment arrived. David's driver helped me get the crates weighed in at an Air Cargo company. Very nice!

Once the crates were in DFW cargo I arranged for them to be flown to San Francisco. The carrier does a lot of business and probably doesn't know me very well, but over the years they've flown several bits of my collection around the USA. This was to be the middle leg of the journey, and now the crates were in California but still 45 miles (72km) from home. The quotes for the last leg of the haul were higher than the airfreight leg! So with Rich's help we rented a large truck and went on an adventure of our own.

This is the story summary, in real time this took from the end of May to the beginning of July, and it was delayed a few days further by the national 4th July holiday. Also, neither Rich nor I had seen the crates or their contents.

On the day of our final leg of the delivery, the local truck rental company let us down and time was wasted. They didn't have a truck with a power lift tailgate, or the required pallet jack, both items were specified in the reservation. Rich came to the rescue, with the name of another local rental company. While more expensive they were also reliable, and we took command of the biggest rig I've driven. It's not the biggest on the US highways, and I don't have a 'Class A' license, but at 26,000 pounds (11,800kgs) and 24 feet (over 7metres) long it was a monster.

Just as well! The shipment was more than the three crates we'd been expecting. While the largest crate was

TP-55 optical multiplexer opened

a whopping 605 pounds (275 kg) and approx 65 x 64 x 26 inches (1.63 x 1.62 x 0.66m) there were two smaller crates and two pallets of cardboard boxes for a grand total of 1826 pounds (830kg). Needless to say we worked very hard that afternoon to bring the crates to my driveway and return the rented truck with a full tank of diesel.

Treasure Trove

You can't hide a project of this size. Our neighbours wondered why we might need three new pianos. (Judy, my wife, wonders why we need one telecine…) So over the next couple of days we took apart the crates, and while not quite the same as opening an Egyptian mummy's tomb, we were gazing on a time warp of twenty years. During the past couple of decades all technology has raced forward.

Remember, I was only expecting a 1970s studio camera guts in a metal cabinet. This was indeed there! Along with a TP-55 Multiplexer cabinet, a TP-66 16mm Movie Projector, and a TP-7B 35mm slide carousel. Not to mention every possible connector and nut, washer, and bolt. The materials and detailed drawings were found in the factory wrappings. Nice clear technical drawings done by several skilled hands no doubt – this project left the factory in late 1983, just before the dawn of CAD/CAM and computer drafting.

What's next?

I had decided to participate in that eBay auction for two reasons. (1) I'm curious, and (2) I couldn't bear the thought of this 'time capsule' going to the landfill. So I took action. Now it was in my hands (well in my driveway until SWMBO said otherwise), what should I do? I thought of piecing it out, back to eBay perhaps? A donation to a museum, for the tax credit? Or, drum roll please, building my own Telecine Suite!

To install this equipment requires a floor space of about 40 square feet (3.75 square metres), the installation manuals give details of concrete footings and cable ducts. After all, we are trying to align three huge cabinets to eliminate distortion and vibration in a 16mm movie frame…

So I've decided to shuffle around my home video lab and try to fit it in. I can't wait too long; as of this writing we're enjoying the last of the summer sunshine. Another incentive is that the local City will hold their annual clean up day later this month. This year it

TK-28C camera crate opened

looks like the City will be picking up the crates from an RCA telecine.

Film at Eleven?

One of the first tasks is to operate the projector. I needed some 16mm footage; so we've been looking at the local flea markets, boot sales, and Hamfests for 16mm stock. Bingo! In southern California near Hollywood we found a reel of cartoons (B/W, sound) and a colour print of the "Bob Newhart Show" (a comedy TV series 1972-1978). Hopefully it's a complete episode (18 – 20 minutes?).

Later, on eBay again, I won an amazing array of WW-II military training films, a mix of B/W and rare colour 16mm stock. So far I only know them from the labels, but we're looking forward to viewing such topics as "The Cathode Ray Oscilloscope" and "Radio Compass in Flight" and "Flying Weather" and something about propellers and also one on wood shop machines. About two-dozen rusty cans in all (the film looks dry and clean inside).

I'll follow up with more news and pictures (and hopefully some 1980s vintage NTSC video) as the project continues. If you have any operational experience with the RCA TK-28C system then please send me an email!

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ATV 10 GHz – New World Record

By Paul-André Schmid

July 1, 2004, towards 12h00, the team EA7/F4CXQ-F1URI operated by F4CXQ/Hervé and F1URI/David as well as the team I8/HE5IBC operated by HB9DUG/Michel and HB9RXV/Paul, made the exploit to push back the distance of the ATV 10 GHz world record to 1'564 km! During nearly 20 minutes, B3-B4 images were exchanged and recorded.

The two teams wish to pay tribute to the holders of the preceding record for the motivation they transmitted to us, that is to say HB9AFO/Michel and EA/F1AAM/Jean-Pierre which realized, June 17, 1999 at 7h30 the distance of 1'031 km.

It is a team success! A big thank you to all the OM suppliers and friends who contributed, by their participation, to the success of this week "La Grande Bleue" and made it possible to push
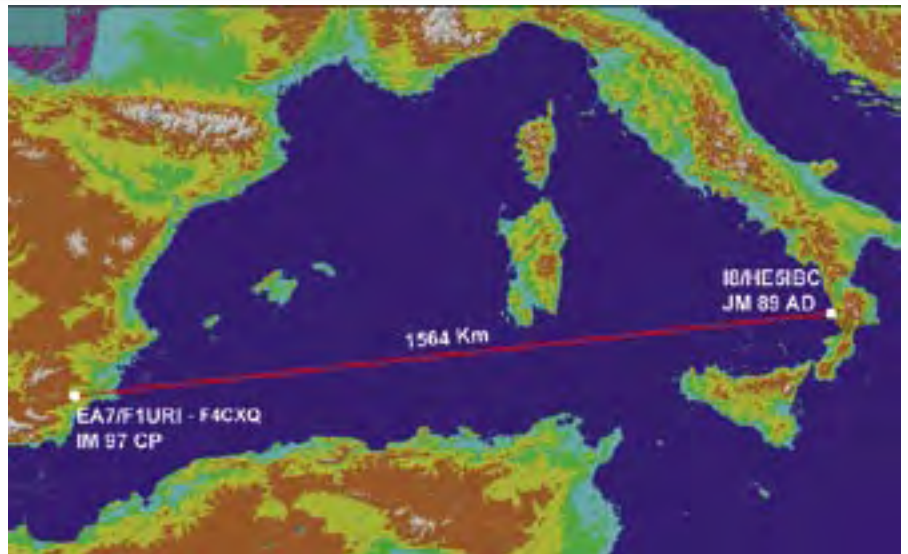
The trunk made

back the limits of the exploit radio TV amateur.

Station EA7/F4CXQ was in IM97CP, south of Spain and station I8/HE5IBC in JM89AD in the south of Italy. The trunk of 1'564 km, completely maritime, passes below Sardinia.

Station EA7 / F4CXQ

Station I8/ HE5IBC

Picture received at EA7 (IM97CP)

Picture received at I8 (JM89AD)

The equipment in EA7/F4CXQ:

> Dish 150 cm
> 15 watts SSB and ATV
> Altitude: 30 m asl

The equipment in I8/HB9IBC:

> 2 dishes 120 cm
> 25 watts SSB and 23 watts ATV
> Altitude: 60 m asl

The attempts were numerous during the week to benefit from the experiments already accumulated in 2003. But also to test the many information read on these famous "ducts", kind of tubes, which leave under certain weather conditions to pass the signals at such distances, this in spite of the roundness of the ground. It is often between 11h00 and 15h00 that we noted on our SSB beacons the best signals allowing us to hope for an ATV liaison.

The pointing of the antennas was made with an half degree precision and… we had just to wait that the propagation wants to do its work well!

Thank you to the OFCOM (Federal Office of the Communication of Switzerland) which allocate us the special call sign HE5IBC for this attempt. All the details are available on the site www.swissatv.ch under the heading "La grande bleue".

EA7/F4CXQ:-
F4CXQ/ Hervé and F1URI/ David

I8/HE5IBC:-
HB9DUG/ Michel and HB9RXV/ Paul

Deadlines

CQ-TV is published quarterly in February, May, August and November each year. The deadlines for each issue are as follows: -

February	*30th December*
May	*30th March*
August	*30th June*
November	*30th September.*

Please send your contributions in as soon as you can prior to this date.

Will all prospective contributors please be sure to read the 'Notice to Contributors' on page 3 so that you understand the implications of submitting an article for publication.

If you have pictures that you want including in your article, then please send them, in the highest possible quality, as separate files.

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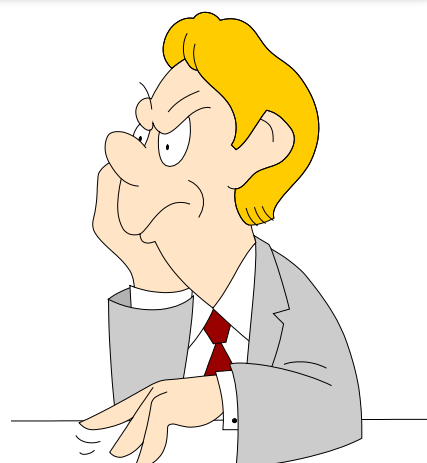
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