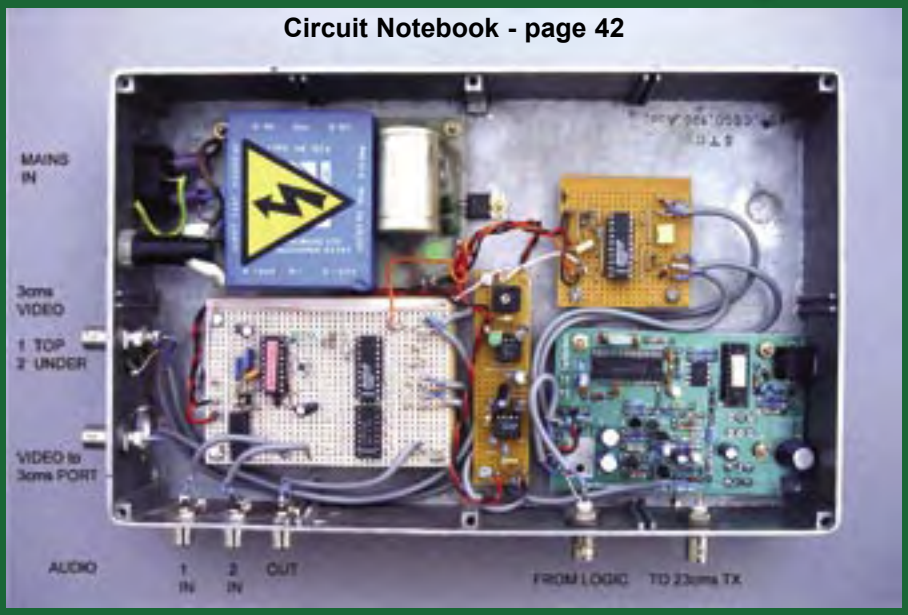
CQ-TV 210

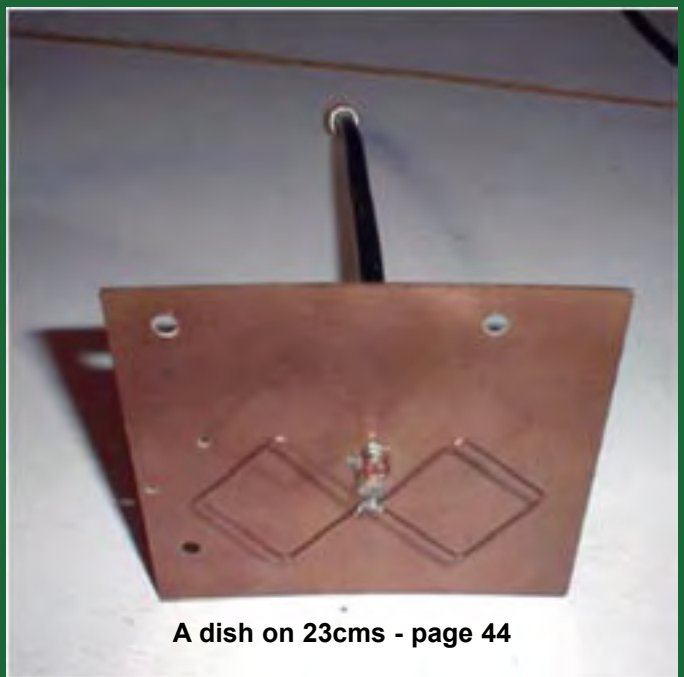
ISSN 1466-6790

BATC

May 2005



Circuit Notebook - page 42



A dish on 23cms - page 44

www.cq-tv.com

BlackBoxCamera™ Company Limited

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.

This unit features the ability to construct scrolling video text overlays from text typed on each of the units four available screen pages. Each message can be upto 308 characters long. Text, and the scrolling feature, are stored when the unit is switched off and scrolling will restart when power is restored. The unit uses the standard UK keyboard key mapping, see the documentation. There is no facility to change to the keyboard mappings of other countries.

The unit is housed in a smart ABS plastic enclosure with phono connectors for video in / out, a 2.1mm DC power socket and a 9V PP3 battery clip. It is designed to be powered from the same power supply as the camera and so the unit does not have a power switch. Keyboard connection is via a 6-pin mini DIN socket for a PS/2 keyboard.

- ►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

CQ-TV 210

Contents

Legal Niceties (the small print)

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Committee Contacts

President: Mike Cox, CEng., FIEE

E-mail: president@batc.org.uk

Chairman: Trevor Brown, G8CJS

Club affairs, Videotape library, and Technical queries, especially relating to handbook projects. 14 Stairfoot Close, Adel, Leeds, LS16 8JR. Tel: 01132 670115. E-mail: chairman@batc.org.uk

General Secretary: Paul Marshall, G8MJW

General club correspondence and business. Library queries relating to the borrowing or donation of written material. Fern House, Church Road, Harby, Notts., NG23 7ED. Tel: 01522 703348. Email secretary@batc.org.uk

Hon. Treasurer: Brian Summers, G8GQS

Enquiries regarding club finances, Donations, and constitutional enquiries. 9 Prior Croft Close, Camberley, Surrey, GU15 1DE. Tel: 01276 677879, Mobile077 4029 1191, Email: treasurer@batc.org.uk

Membership

Anything to do with membership, including new applications, queries about new and existing membership, non-receipt of CQ-TV, subscriptions, membership records etc. **Pat Hellen**, The Villa, Plas Panteidal, Aberdyfi, Gwynedd, LL35 0RF, UK. Telephone 01654 767702. E-mail: memsec@batc.org.uk

Club Liaison: - And anything of a political nature, co-ordination of ATV repeater licences. **Graham Shirville, G3VZV**, The Hill Farm, Potsgrove, Milton Keynes, Bucks., MK17 9HF. Tel: 01525 290343. E-mail g3vzv@amsat.org

Contests: - Richard Parkes, G7MFO, 7 Main Street, Preston, Hull, HU12 8UB. Tel: 01482 898559. Email: contests@batc.org.uk

CQ-TV Magazine: Editor Ian Pawson

Anything for publication in CQ-TV, Articles, Review items, Letters to the editor, and other material except as below. 14 Lilac Avenue, Leicester, LE5 1FN, England. Tel: 0116 276 9425, Email: editor@cq-tv.com

Photographs for the CQ-TV covers: - Please send any photographs by post, electronic images by email, to the editor at the above addresses.

TV on the Air: - Graham Hankins G8EMX, 17 Cottesbrook Road, Acocks Green, Birmingham, B27 6LE. Tel: 0121 706 7384

Satellite TV News: - Paul Holland G3TZO, Chatterton, Chapel Lane, Threapwood, Nr. Malpas, Cheshire, SY14 7AX. Tel: 01948 770429, Email: satnews@batc.org.uk

CQ-TV Advertising Manager: - Trevor Brown, 14 Stairfoot Close, Adel, Leeds, LS16 8JR. Tel: 01132 670115. Email: adman@batc.org.uk Members adverts for inclusion in CQ-TV should be sent directly to the editor and the above address, either by post or e-mail.

CQ-TV Awards: - Bob Webb G8VBA, 78 Station Road, Rolleston on Dove, Burton on Trent, Staffs., DE13 9AB. Tel: 01283 814582

Exhibitions

Graham Hankins G8EMX, 17 Cottesbrook Road, Acocks Green, Birmingham, B27 6LE.Tel: 0121 706 7384 Email: exhibitions@batc.org.uk

Club Sales

Members Services: - PCB's, components, camera tubes, accessories, etc. (NOT PUBLICATIONS). **Peter Delaney, G8KZG**, 6 East View Close, Wargrave, Berkshire, RG10 8BJ. Tel: 0118 940 3121. Email: services@batc.org.uk

Publications: - Handbooks, Back copies CQ-TV, and anything related to the supply of BATC publications. **Paul Marshall**, Fern House, Church Road, Harby, Notts., NG23 7ED, England. E-mail: publications@batc.org.uk

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

I was extremely sad to see the report of the death of Laurie Hunton G3ILD I never met Laurie, but his eight valve TV camera in CQ-TV 48 was one of the first TV constructional projects from CQ-TV that I built. I had not even joined the club back then; CQ-TV 48 was among a pile of back issues loaned to me by another now silent key. I think it is part of what we as a club are all about - sharing our knowledge and skills, and often helping people we have never met. The Cat Box on page 14 was an idea from Mark Bloor, one of our members. I started the engineering and am indebted to Paul Marshall for his engineering support and Allan Robinson for all the drafting work. The project was telly worked between us on the Internet, and I hope reflects again this spirit

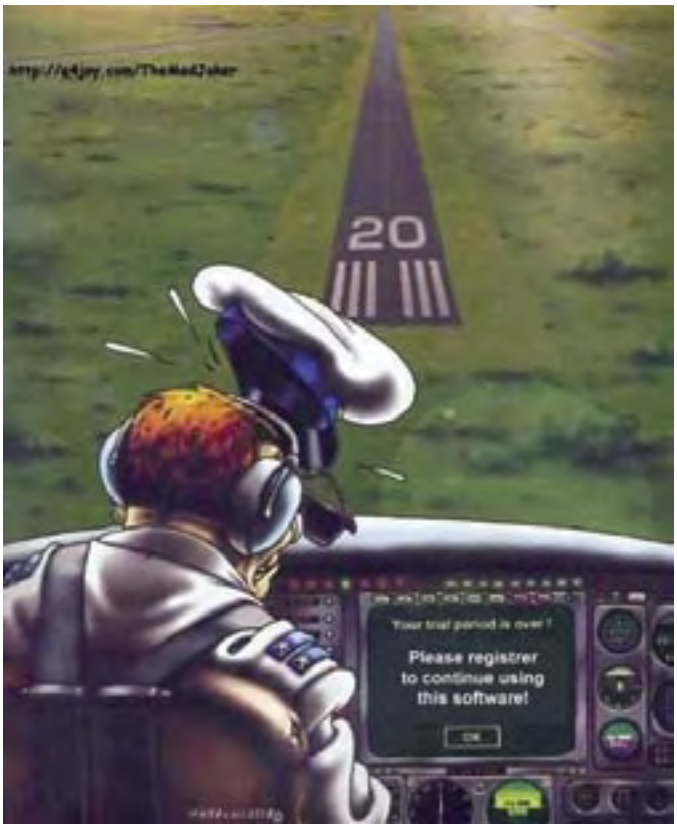
CQ-TV has always been a broad church, covering a wide and diverse range of subjects from simple engineering projects for the home constructor, to more complex projects, which may not be for the beginner, but we hope will keep you up to speed on technology. Also mixed into this is what is happening on the ATV scene, and ATV politics, some of the member's private and individual projects - from historic outside broadcast vehicle restoration to my personal ever-changing VT edit suite - mixed in with nostalgia in engineering or just Dicky Howett's personal views of times now gone. In order to get this mix into the shape you would like to see it, we need your feedback and to this end we have published a questionnaire on page 21 and repeated it on the website. Please take a few minutes to complete and return it. We value your input, and hope it will help us adjust and optimise this mix, in order to keep CQ-TV as you would like to see it.

A member asked me last week what progress is being made on the DATV front, and in particular with the club DATV modules. Yes, it has gone a little quiet. We originally bought five modules in order to get the production run up to the 100 required by the PCB manufacturer. Since then three have been sold to BATC members. So the original investment of £2500 is now only £1000. Of the remaining two, one is with Allan Robinson G3TQA for evaluation and one is with Steve Mitchell (G8JMJ) also for evaluation. The modules work well on 24 cms and can be received on set top boxes. It was hoped that an even narrower bandwidth DATV could be produced for use on 70 cms. We will have more information for you in CQ-TV 211. While I realise that everyone is not a supporter of DATV, can I draw your attention to our first convention in 1951, where we set the ATV standard. 405 lines 50 frames per second positive amplitude modulation on 70 cms. Change is inevitable and it is important that this change also encompasses making ATV spectrum friendly, particularly when OFCOM are about to make some sweeping changes - see page 11 I am not against change. When I started ATV it required a special G6 call sign and portable operation was only possible from a few agreed locations, which the authorities still insisted on advance warning of any operation from those. Change is not bad, but it needs managing and anything which would infringe on our CEPT agreements for using ATV in other countries would be a very retrograde move

I have been working my way through the BATC video archive in my garage. The only machine I had left from my original edit suite, which would replay the archive, is now on its way to the States for another project. I have committed Dud Charman's aerial circus to DVD, as well as Steve Birkill's early satellite TV, the last 'Posthouse' rally (remember the marquee?) and a very early film sent in by John Tanner, which unfortunately does not have any sound with it. I hope we can construct some commentary and make it available as part of the clubs ATV archive.

New this issue is a caption contest on the rear cover, The Black Box Camera Company are continuing

their sponsorship with us, and as such for this issue we will be awarding the prize to the best caption. If you have a picture suitable for this competition, please let the editor have it along with your suggested caption and let's see if our membership can do better. We hope also to run this competition on our website, which is still expanding and receiving a record number of hits. Coming to the website is a book on TV lighting, by Peter Alan Johnson. We were asked if we would publish this by the author, and have decided to do it in electronic format on the website. TV lighting is a complex subject and often overlooked by professionals and amateurs alike. I hope this publication goes somewhere to correcting this.



Yet more on the digital mixer

By Mike Cox

At the end of a report on IBC2003 was a paragraph entitled "Final Thoughts on SDI Mixer". Nothing is ever final!

My old company motto was "our policy is one of continuous development and improvement, and we reserve the right to change specifications without notice" or similar words. So it is with the mixer project, particularly when we recently got some feedback from Wendy, the IBC Info Channel Aston operator. For IBC2004, and because of the use of 3 regions of the display screens [Fig. 1, shows an off-screen shot of the output.] for different information, we had 2 Aston Red and one Aston Green character generators [CGs] on loan from Aston. The Reds have two planes, allowing one plane to be used while the other is being set up. However the Green has only one plane, so that any changes have to done "on air", or the CG taken off-line to edit. Originally the installation included a downstream keyer to be fed by the Green. This proved unreliable when the installation was complete so plan B was used. This meant using the Green as a keyer. This left the problem of taking it off-line, and a quick modification to a 4 input SDI switcher made a bypass route, controlled by a toggle switch on the mixer panel.

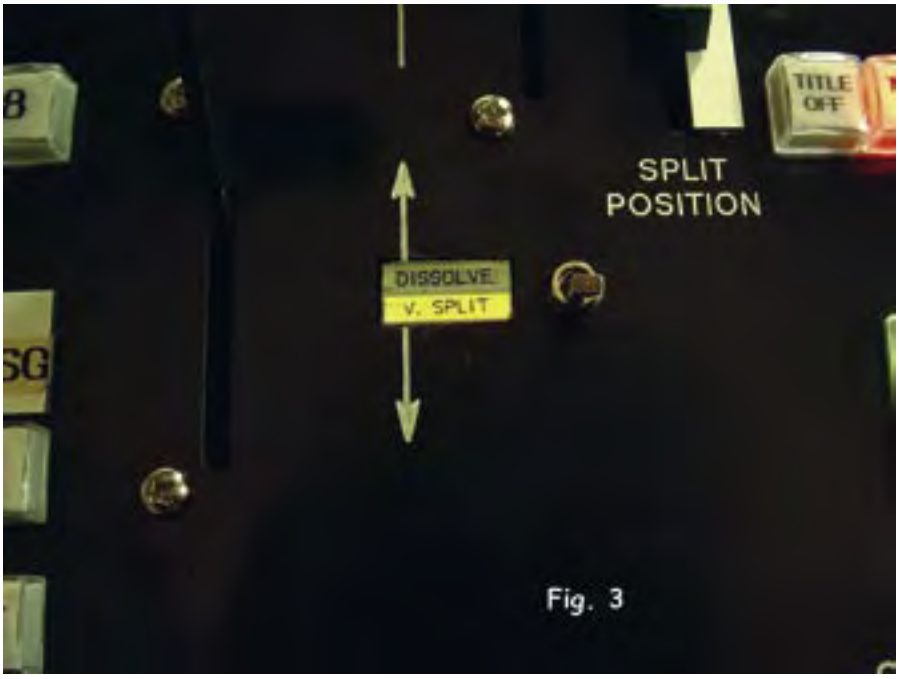


Fig. 3

Wendy has asked if we could have 3 Reds [or equivalent 2 plane CGs] for IBC2005. This would obviously make life easier for her, but brings up the problem of how to get all three Reds up on screen without using a downstream keyer.

The Red is not equipped with a built-in keyer, unlike the Green. As was, the mixer had 2 M/Es, with the first between A and B banks used as a Dissolve device, and the second for a horizontal Split Screen. As the Dissolve facility is seldom used, the thought occurred to use the M/E for a vertical Split Screen. Both the faders allow the Split Screens to be faded in and out.

The mixer project archive box was searched, and the original Mark 1 Split Screen board found. As it would be nice to keep the Dissolve facility as an alternative, the card was modified by the addition of an extra 74HC574 in parallel with the original '574 output latch. The input of this extra chip was wired to the control input – from the

Fig. 1

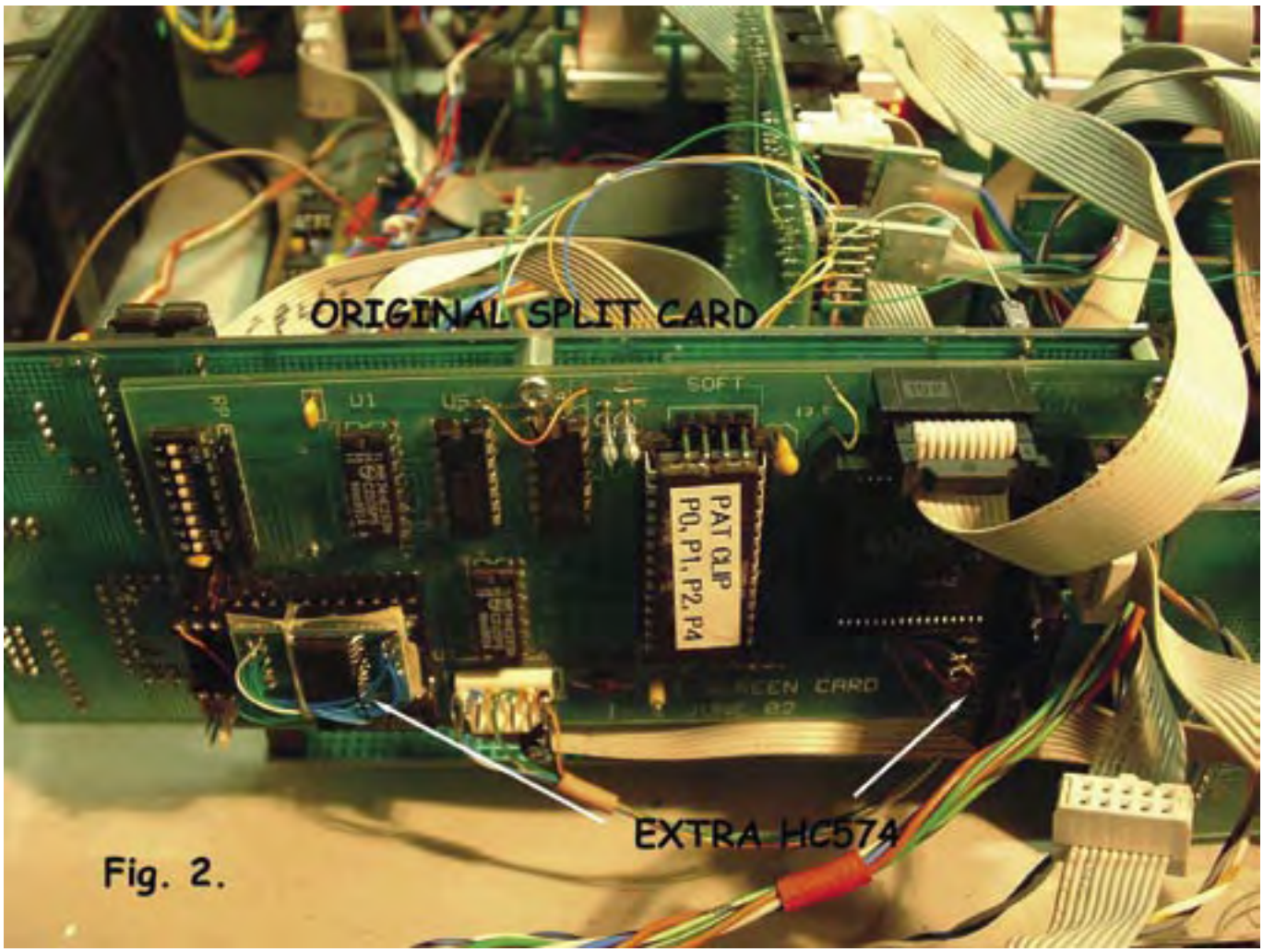
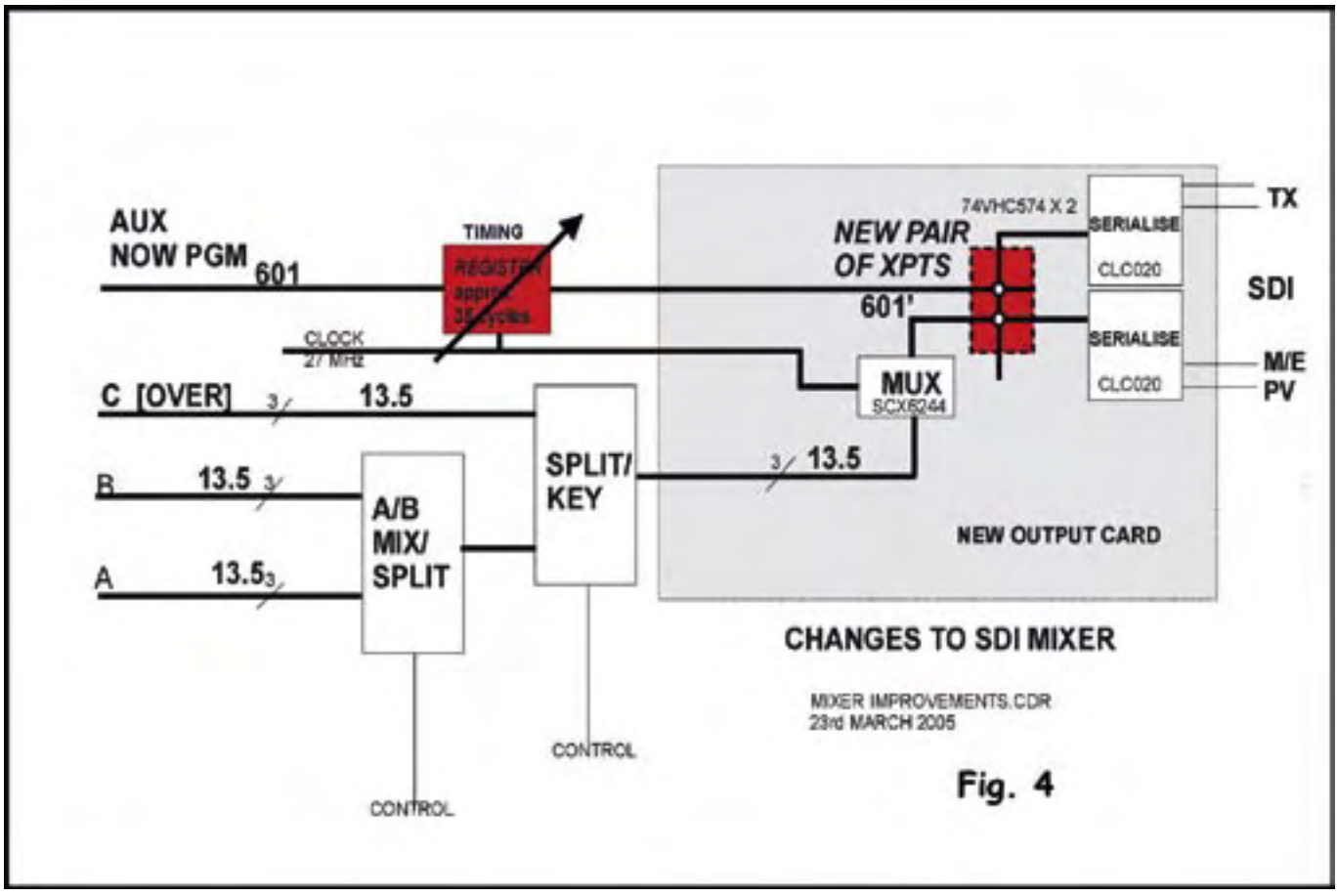

ORIGINAL SPLIT CARD
EXTRA HC574

Fig. 2.


AUX
NOW PGM
601
TIMING
CLOCK
27 MHz
C [OVER]
13.5
B
13.5
A
13.5
A/B
MIX/
SPLIT
SPLIT/
KEY
74VHC574 X 2
NEW PAIR
OF XPTS
601'
MUX
SCX6244
SERIALISE
CLC020
SERIALISE
CLC020
TX
SDI
M/E
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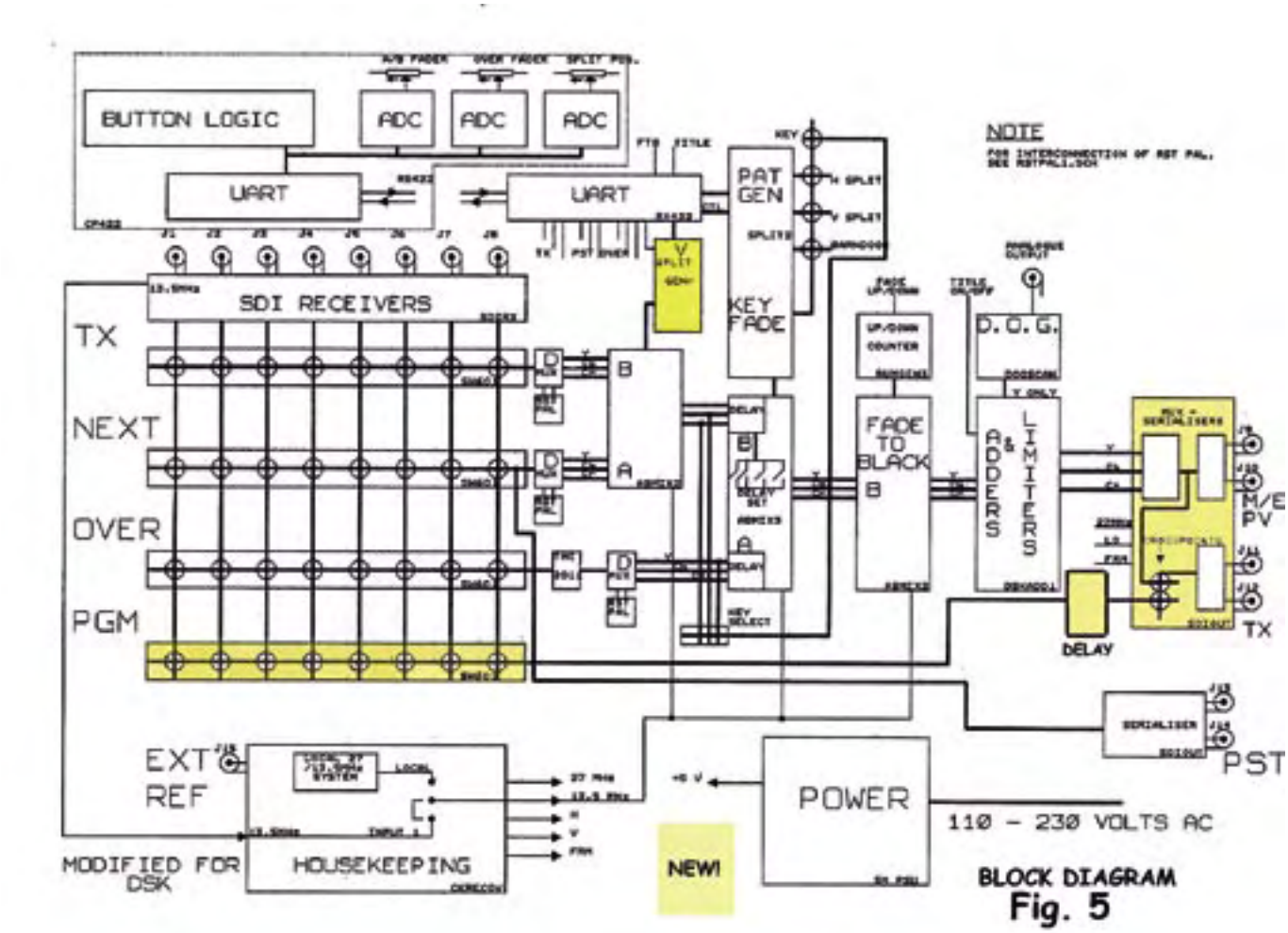
NEW OUTPUT CARD
CONTROL
CONTROL
CHANGES TO SDI MIXER
MIXER IMPROVEMENTS.CDR
23rd MARCH 2005

Fig. 4



fader. The only other change was to make the counter count pixels rather than lines, as a vertical split is required. The card was then bolted to the rear of the main Split Screen card. [Fig. 2 shows the extra card, together with the add-on components]

As the split is preset, 2 hexadecimal switches were fitted to the electronics crate panel for setting up.

An advantage of the use of ribbon cable for the 8 bit signal and control interconnects is how easy it was to patch. The extra Split Card into the electronics crate. [Fig. 3, extra switch on control panel together with tally]

An appropriate switch mounted on the panel selects either of the two '574 outputs. There was spare capacity in the RS422 control highway to take control back to the electronics crate.

When the Dissolve function is operational, the CUT button on the mixer control transfers the source selected on the B bank to the A bank, and conversely. When the Split function is selected, the CUT button is inhibited. All this has now been done.

However, commercials need to be shown full screen. The transition between three regions and one can be interesting, to put it mildly.

With the existing architecture, it is not possible to preview the three-region set-up while on a single region section.

Now we have the 8 x 8 SDI router [see CQ-TV 207] available, the Aux. Bus is not really needed. Could this be turned into a Program bank? [PGM]

The output of the 8 x 1 switch strip is 8 bit parallel [CCIR601']. If the bank is to have an input from the M/Es, an extra crosspoint is needed. Also, the M/E output signal has to be 8 bit parallel as well. By switching here, a single serialiser can turn the 8 bit parallel signal back to SDI. A second serialiser can take the M/E 8 bit signal and provide an M/E preview output. [Fig. 4, Addition of PGM bank to mixer]

A convenient way to do this is to lay out a new output card. Originally, this took in the YCbCr 8 bit signals from the M/Es, multiplexed them to 8 bit parallel and then serialised the stream to SDI. The new version still takes in the YCbCr signals and multiplexes them, but the output is then taken direct to the preview serialiser, and to one input of a pair of crosspoints using 74VHC574 devices [fast 8 bit latch, as used in the 8 input switcher card]. The other input comes from the Aux. bus, now re-named Program [PGM]. This has been achieved on the same profile as the original card, with an extra inch length. Fortunately there is ample space in the crate for this.

Originally the card had 4 SDI TX outputs, but these were never all used, so having 2 outputs each for TX and M/E PV uses the same number of output connectors and rear panel piercing.

It is obvious that there will a great timing difference between these two signals, and some form of delay will be needed so that sources selected on the PGM bank will be co-timed with the same source via the M/E route. This will involve delay of around 40 – 60 clock cycles. This will be patched into the feed from the PGM bank switch card. The revised block diagram for the mixer is shown [Fig. 5, Revised Block Diagram] with the changes hatched in yellow.

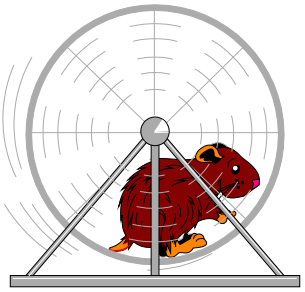
A revised button strip with 8 buttons for the PGM bank plus an extra for routing the M/E system to line now has to be made up, and shoe-horned into the control panel below what is now called the TX bank. As there is another 5 months before IBC2005, there may even be time to get a new control panel made. With our Editor's permission, I will let you know how it goes.

The advantages of not cramming the electronics into too small a space have become abundantly clear. As the mixer has now been used at 3 IBCs, and is coming up to its fourth, modifications and improvements have been made according to the operational requirements. This would not have been as feasible with a compact layout.

Finally it is hoped that Aston will be able to let us borrow 3 Red CGs for the show. We are very grateful to them for their support at past IBCs.

References: -

A series of articles in CQ-TV 200 through 203, with odd references subsequently.



Silent key

Laurie Hunton G3ILD died on March 7th after a short illness aged 71. He and I did a lot of ATV on 70cms back in the early 60's. He was very fortunate having a QTH at 600ft ASL. with an excellent take off to the South. At one time he held the distance record for ATV. He was a keen constructor building much of his equipment for HF. Satellite and ATV as well as aerials. His first camera was the 7 valve design in CQTV 48. I enclose pictures taken at my QTH over 25 miles. Seventy cms 405 lines, no interlace. I was using a Bush TV22 with home brew converter. His ATV activities ceased for some years when he moved from his Qth to a lower level after getting married and having a family. When he came to retire some six years ago I suggested he returned to ATV. He did on 23cms and 3cms colour and finally getting round to using our new repeater on 13cms GB3KM.

He spent many hours in his shack and he is very much missed already.

Regards Brian A. G3KJX

Who we are:

AMSAT-UK AMSAT-UK represents the interests of Radio Amateurs who design, build and operate satellites under the regulations of the Amateur Satellite Service.

Our members carry out innovative experimental work with satellite communications using frequencies allocated to the Amateur Satellite service between 21 MHz and 24.5 GHz.

Since the launch of the first Amateur Radio Satellite in 1961, a total of 51 satellites have been launched by Radio Amateurs from various countries. Currently there are over 15 operational satellites in orbit operating in the Amateur Satellite Service, including an Amateur Radio Station on board the International Space station, a facility supported by our members.

Radio Amateurs are currently constructing their first Interplanetary Vehicle, a Mars Orbiter scheduled for launch in 2007. This will use the Amateur Satellite 10.45 GHz allocation to send data back to Earth for reception and analysis by Radio Amateurs.

Further information on AMSAT UK is available at www.uk.amsat.org and about amateur satellites generally at the AMSAT North America web site at www.amsat.org

The British Amateur Television Club has a membership of almost 1000 whose interests encompass the full range of challenges presented in producing and transmitting/receiving television signals. The Club started in 1948 and was experimenting with outside broadcast units and colour systems almost before the BBC.

Presently our members use all the amateur radio allocations from 435MHz up to 47GHz for both simplex and repeater (transponder) operations.

We are also developing simple DVB systems for spectrum efficient digital transmissions.

Further information is available at www.batc.org.uk

Response:

10 GHz (10.125-10.225 GHz paired with 10.475 – 10.575 MHz)
Question 6.2 Do you agree with the proposal to award a single UK licence on a service and technology neutral basis?

The present allocation to the amateur radio service of 10.475 –10.500MHz is presently available for amateur television experiments in a part of the allocation not presently used by our repeater network.
The allocation to the amateur satellite service of 10.475-10.500MHz Is for both uplinks and downlinks and therefore access to frequencies which permit the reception of signals from space having a low pfd at the earth surface Is of paramount Importance to us.

The Future of Amateur Radio Licensing - The Facts

By Colin J. Thomas, G3PSM Spectrum Director & HF Manager Radio Society of Great Britain

During autumn of 2004 at about the same time as Ofcom published the consultation paper - The Radio Spectrum Framework Review, RSGB was led to believe that a further consultation paper concerning the future of amateur radio licensing would be published, probably early in 2005.

In preparation for that document the RSGB intimated to Ofcom representatives, on an unofficial basis, that the Society would be prepared to assume the responsibility for issuing licences and all the administration that would involve. RSGB was aware that Ofcom wished to substantially reduce its financial commitment to licence issuing, particularly the resources currently involved.

During February 2005 it become apparent that Ofcom had abandoned the idea of a consultative document and was preparing a 'proposal document' that would set out Ofcoms intended preference and in which some reference would be made to low priority alternatives. This would pay lip service to consultation and instead would confirm Ofcoms proposals.

The Society began to realise that the intended preference was to tempt amateurs with a free licence for life and then after a few years completely de-regulate our hobby.

The free licence for life was going to be proposed in such a way that amateurs would think they were going to get a good deal and then once that had been accepted Ofcom would re-visit the licensing issue and then de-regulate. We must be on our guard as they have made the de-regulation statement both in the 'Spectrum Review' consultation document published in late 2004 and in the yet to be published 'Future of Amateur Radio Licensing' consultation document. It is vital that we stop any attempts to de-regulate the hobby, therefore we must oppose any movement towards a license for life.

- De-regulation would disenfranchise all UK radio amateurs.
- De-regulation would remove the need for examinations.
- De-regulation would mean anyone operating on the amateur bands in the UK would not need a licence.
- De-regulation would mean that ALL UK radio amateurs would be prevented from operating abroad under CEPT agreements.
- De-regulation would mean any UK amateur moving abroad would be unable to participate in reciprocal licensing agreements.
- De-regulation would mean the end of the repeater network.
- De-regulation would mean the end of the packet network.
- De-regulation would mean the end of Notices of Variations.
- De-regulation would mean the end of band-plans in the UK.
- The RSGB is not prepared to see the hobby of amateur radio in the UK destroyed.
- The RSGB does not intend to be enticed by short-term promises of a free licence.
- The RSGB will do all in its power to prevent de-regulation.

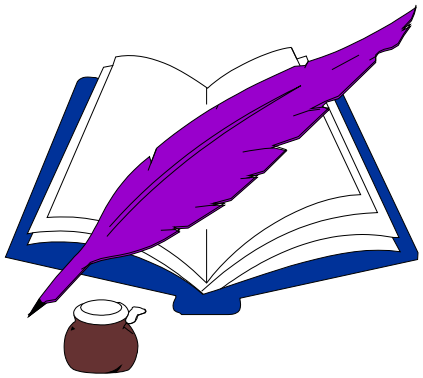
The RSGB has approached authority to highlight the dangers of de-regulation. As a result of our initial approaches the Ofcom Board has thrown out the immediate publication of the supposed consultation document. They have referred back the document for re-evaluation.

The RSGB has over 80 years of amateur radio experience and we are prepared to challenge Ofcom arrogance.

We deplore 'preferred option' being issued under the guise of consultation.

We will now seek a document that is genuinely "consultative".

Please support your Society in this campaign.



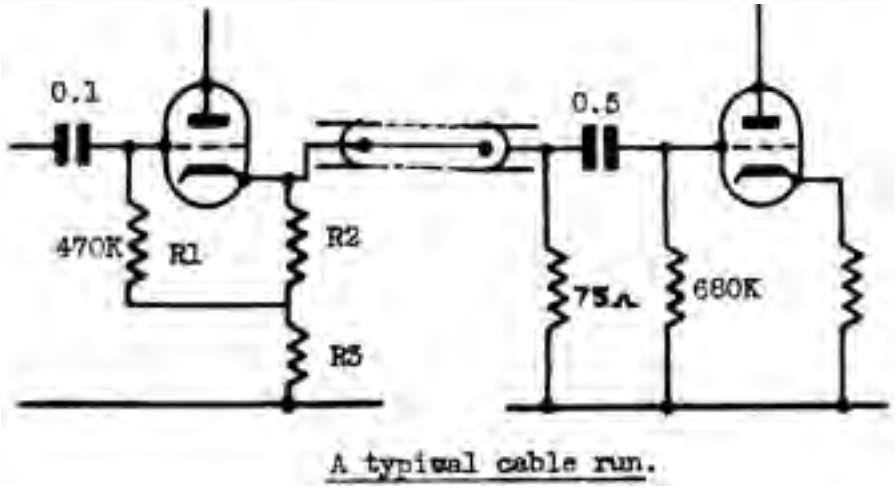
Turning Back the Pages

By Peter Delaney

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

CQ-TV 24 - "Sixth year"

The editorial, written by Margaret Barlow, began "as mentioned in the last edition, the new style of printing has thrown rather a strain on the Club's financial position. .... All Club members will wish to join (the Treasurer) in thanking those who so kindly sent something more than their subscriptions."



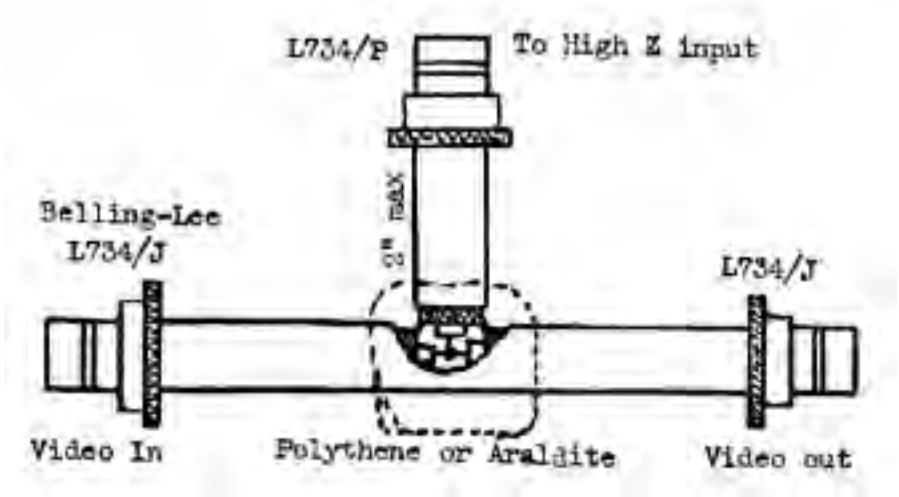
A typical cable run.

"A suggestion has been put forward that we hold a Dinner later in the year. London is suggested 7/6 or 10/- to pay, and a Friday or Saturday evening. Your comments and suggestions are invited, particularly as to whether or not the meeting should be in the nature of a 'Get-Together', or if we should invite a Guest Speaker" (*The pre-decimal 7/6 and 10/- would now be 37.5 p and 50p*)

An article by Don Reid on cathode followers stated that "there seems to be a lot of confusion about cathode followers in particular and unit interconnectoions in general.". Don continued "it will be recalled that in order to send a waveform down a long cable without distortion, it is necessary that the cable 'be accurately matched at each end'. ..... The usual cable used for television work is a co-axial cable of 75 ohm characteristic impedance. ... If the cable is terminated at the far end with a pure 75 ohm resistance, no matter how long it is it will appear to be just a 75 ohm resistance at the near end. ..... To handle vision signals properly without distortion a cathode follower must be used. This is a power amplifier, the input being at high impedance (some 10 times the value of the grid leak R1) and the output at low impedance (roughly $1/g_m$ for the valve). There is no phase inversion, and no dc or ripple trouble. The stage can in fact be designed to have its cathode at any desired dc potential, a point of importance in modulators, for instance. The bias for the valve is developed across R2, and R2 + R3 must be big enough to give a standing DC potential at the cathode larger than the peak video swing required. ..... One last point is that the far end of a cable usually feeds a grid circuit. This will be of high impedance, and does not therefore terminate the cable. Therefore always add a physical 75 ohm resistor; there will be one volt across it, so a coupling condenser (*capacitor*) and grid leak can be used to transfer it to the grid in the usual way." (*The modern equivalent is, of course, a source follower*).

The 'What The Other Bloke Is Doing' page commented that "we have had a good number of reports this month, for which many thanks. Remember, your hints and tips and happenings are of great interest and value to other members, so keep in touch, won't you?" (*Maybe current members could enable us to revive this page !*). "John Adams (Iver) is one of the more active telecine enthusiasts, and he is building a 16mm machine on the Philco pattern. In this the film is wrapped round a rotating glass polygon, scanned with a complete raster. It has the advantage that a picture is produced at all film speeds. Ivan Howard G2DUS/T (Baldock) has the Test Card C monoscope unit running, and can give demonstrations any time with only two small cases and a TV set. Robert Torrens (GI3FWF/T) suggests the Club might start a library of useful books, and offers to start the subscriptions off. Charlie Newton G2FKZ (Dulwich) has had to rebuild the transmitter power supplies, and complains that the valves are multiplying like rabbits!"

Under the heading "Smooth Wrinkles", G6AST suggested a way to make a T-piece, "to provide video in-video out paths as per BATC standards, if an existing unit has only one input."



Dicky Howett writes: Here's a little novelty. This rather murky picture shows the official opening of BBC Television in studio B at Alexandra Palace on November 2nd 1936. Despite contrary publicity, the 'worlds first' high definition service was in fact opened using a lowish def German/US film system and a Baird 'spotlight' scanner all running at 25fps-240 lines. What is never reported (and the BBC always like to promote the 'all British electronic' EMI system) is that J L Baird had also in studio B, a Farnsworh Image Dissector camera. This can be seen on the left of the picture surrounded by attendants in white coats. Now, whether this electronic camera was actually working at the time is not reported. The official 'programme as broadcast' sheets only mention the Intermediate Film Camera and spotlight system. Note also that the gentleman speaker in the picture is facing front, towards the IF camera and not the electronic camera, so it seems entirely possible that the Farnsworth machine was there only as set dressing. Of the entire (two) opening ceremonies no moving images were ever recorded of this historic occasion but it's just possible that some wealthy individual took a movie from the screen with this footage now awaiting discovery in an attic or garden shed. We live in hopes.

DON'T SHOOT!
Dicky Howett's missus Margaret aims a lethal looking turret plate. The plate is a cosmetic item usually found attached to the front of the EMI 10764 Orthicon camera, seen here reposing on a pallet at the National Museum of Photography, Film & Television's special store. Note behind also two EMI 204 colour cameras on the shelf. Best place for them...
Picture by Dicky Howett

Turn your camcorder into a Studio Camera

By Trevor Brown and Paul Marshall

Looking back over some very old CQ-TV magazines, I see we once had a common standard for connecting TV cameras and TV transmitters. It was nothing more than one volt of composite video to be terminated in 75 ohms and connected via Belling Lee aerial connectors. Life was simple then. We don't get together to connect home made cameras and transmitters, but we do still meet at BGM's and on several occasions record lectures. It would be very advantageous if we could have a common interconnect standard, so that camcorders could work together on these productions. We would require a little more than just a video standard. The minimum for one of these events would be one-way communications with the camera operators, from the mixing desk to the camera operator combined with on-air tallies. Video connections between the camera and the mixing desk are also essential. These vary from camera to camera and link options are required, so that the highest quality video connection could be selected along with reverse video for genlock, or even a teleprompt should we get ambitious.

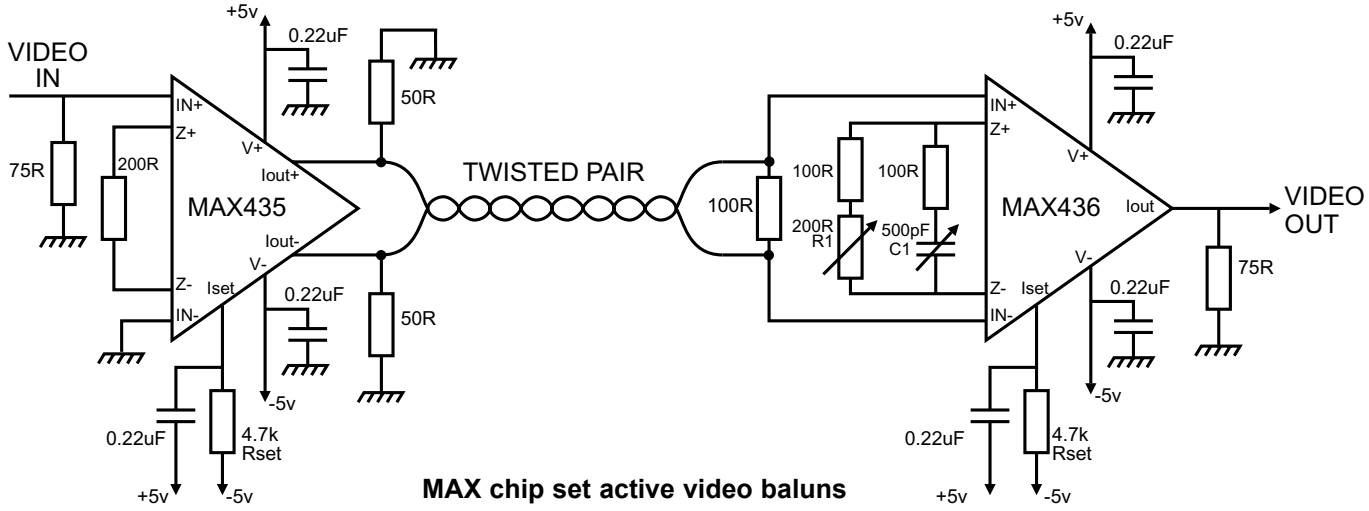
The interconnect started to grow and, when you consider how small some of these camcorders are, multiple coax would make camera work almost impossible, whilst Triax with multiple sub-carrier channels for video and communications might leave us with a unit bigger than the actual camera. When what needed was some thing that would fit in into a small box and mount on the camera's accessory shoe or bolt between the camera and the tripod and deliver all the signals down a single, small, inexpensive cable.

It seems we are not alone in trying to find alternative solutions to these problems. The following press release for a company using media twist cable for broadcast quality connections was an idea worth persuing

When Univision, the parent company of KDTV-Channel 14, decided to commission the building of a new television broadcast facility, chances are the company had no idea that its cabling infrastructure would make broadcasting history -- but, in fact, it has. KDTV-14 is the first television studio to use Belden's revolutionary new MediaTwist UTP cable for virtually the entire cable plant. Incredible as it may sound, one cable -- MediaTwist -- has been successfully installed here for a multitude of applications, including analogue audio, digital AES/EBU audio, analogue video, digital video, RGB video and RS-422 machine control

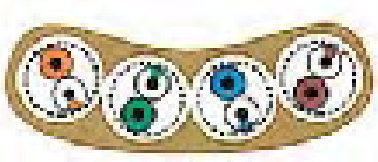
So what is Belden MediaTwist cable. It is a development of CAT 5 but with a different layout and a tighter specification

It comprises four twisted pairs and can be terminated in RJ45 connectors.

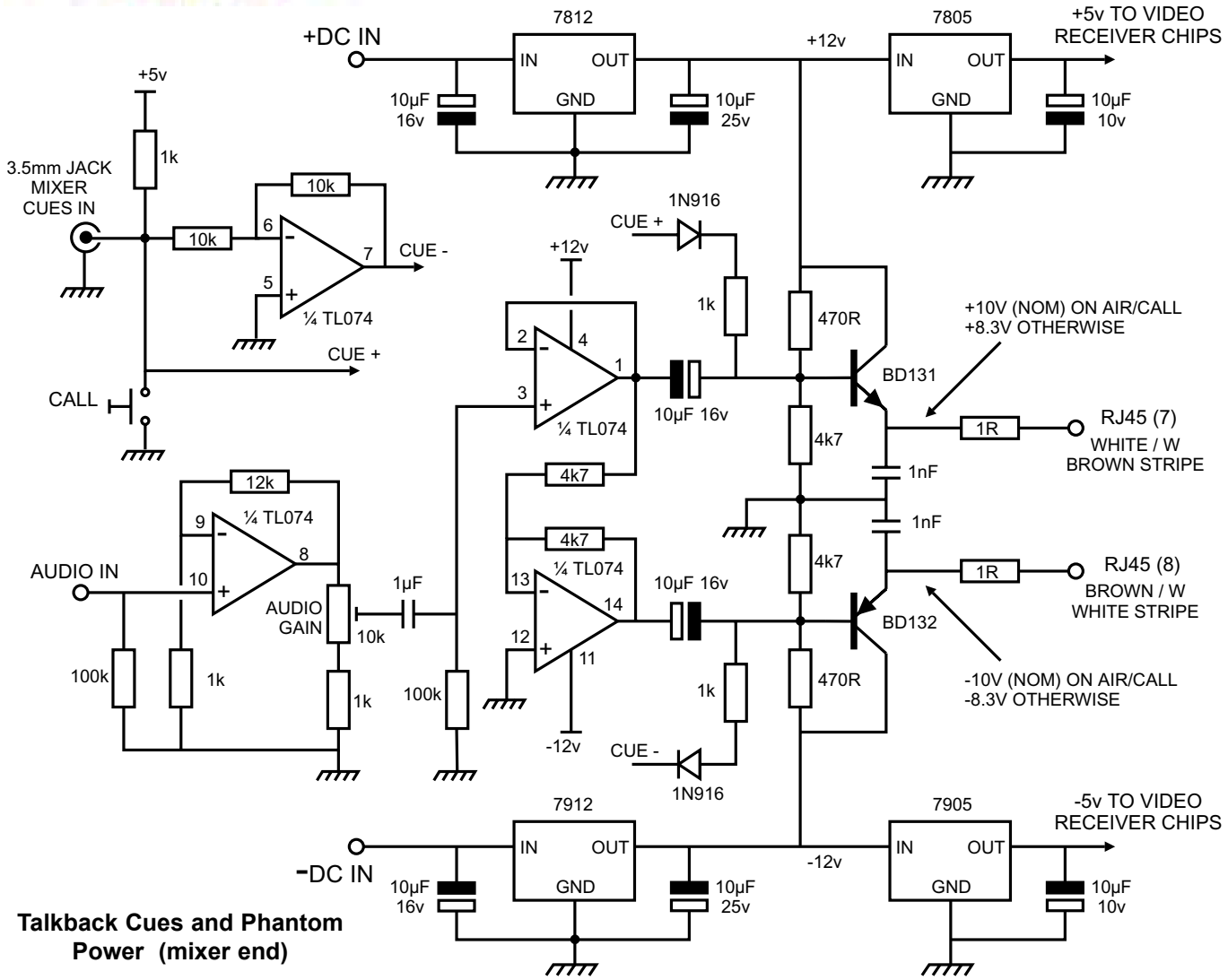


MAX chip set active video baluns

CAT 5 has been used by the CCTV industry for television pictures and both passive and active baluns are available to connect unbalanced coax camera and monitors to CAT 5 twisted pairs, at very reasonable costs. A troll of the Internet soon produced several data sheets on active baluns for sending television pictures down this kind of cable. The MAX chip set seemed to be the most attractive in both price and availability.



If we could reserve three of the twisted pairs for video then we could have CVBS, Y/C and even component connections. In the case of CVBS and Y/C which only require one or two of the twisted pairs, a return video for genlock purposes would also be possible. This would not be possible for component, as all three twisted pairs are required. Link option links would mean we could engineer something that was flexible, and it may be possible to future-proof things with a link selected SDI path. Genlock is not as vital to small-scale productions as it once was; many mixers now have synchronisers built into them to enable mixes between free running sources.



Talkback Cues and Phantom Power (mixer end)

Both CAT 5 and MediaTwist have four twisted pairs. Let's think about the last twisted pair. Could we supply communications, tallies and power for the camera end box down a single twisted pair? This should be possible and would provide a very elegant video comms and cues unit.

Circuit descriptions

Video differential launch and receiver system

The MAX435 and MAX436 pair from Maxim form a complete differential launch and receiver system. The IC's are essentially self-contained, requiring only power supplies of +/-5V and video in/out.

The general schematic of the receiver end includes an impedance matching and HF peaking network. On test it is necessary to adjust the MAX436 receiver impedance matching variable resistor for minimum ringing on an HF transition (a 2T pulse is ideal). In addition, the variable capacitor on the receiver side should be adjusted for as flat a frequency response at HF as possible. Adjusting for the correct amplitude of PAL colour bars is one quick way, but a swept frequency response system or a 2Tc pulse will work better.

Layout is not too critical, but the usual 'good practice' methods of close decoupling, avoidance of long input/output leads and a ground plane if at all possible will certainly help.

Cues/Comms/Power Supplies

There is only one twisted pair left in the CAT5 cable for use of cues, communications (mixer position to cameraman talkback – 'prod talkback') and the delivery of plus and minus power supplies to the sending (launch) end. This places some constraints on what is possible. Clearly, some form of RF technique with audio and digital command lines embedded on carriers would be possible, but on the 'keep it simple' principle, it was decided to avoid these. With twisted pairs it is always advisable to respect the natural balance of the system and take advantage of the interference nulling properties of such a scheme. As a consequence of this, it is difficult to envisage how such a limited conductor system can provide capacity for a true earth return between the launch end and the receiver. In practice, a twisted pair system (subject to some limitations) doesn't need such a ground and the only real necessity is for the correct positive and negative rails to appear at the camera (launch) end.

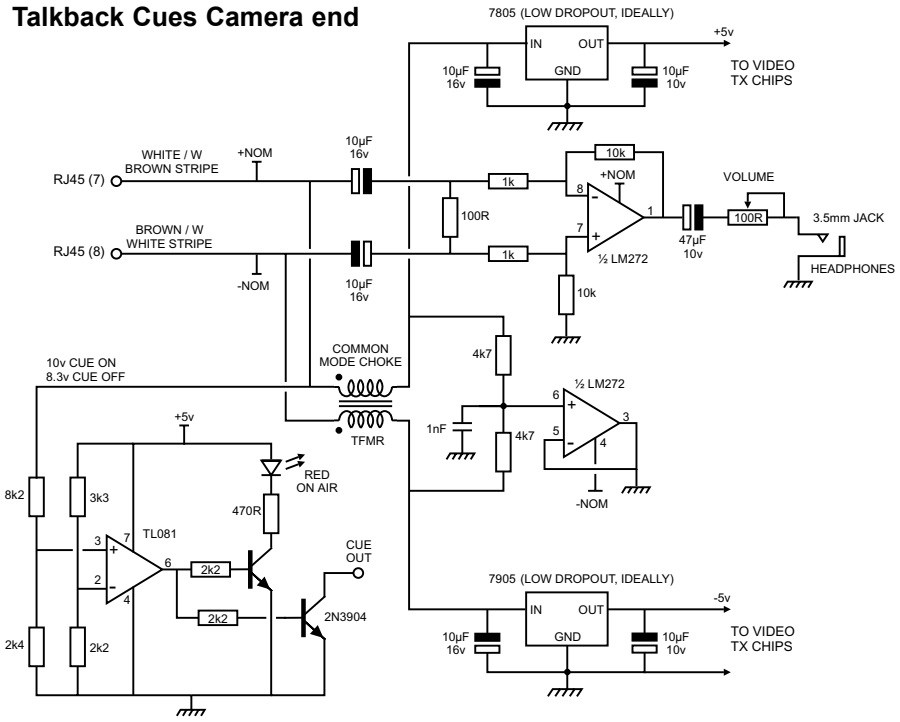
The circuit devised satisfies all of these requirements by sending plus and minus power, balanced communications audio and a tally (cue) system created by modulating the power supply lines.

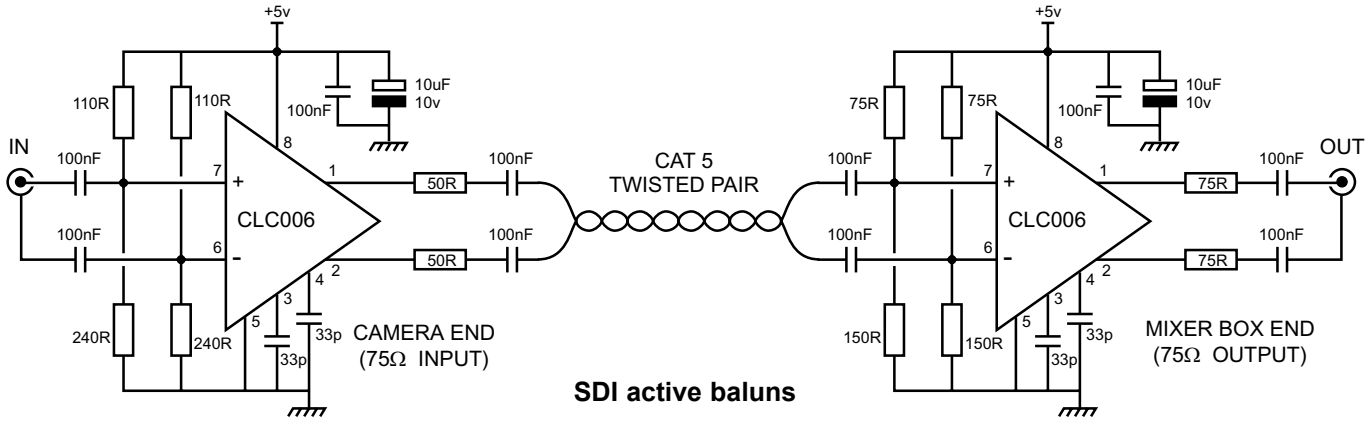
The 'mixer end' circuit comprises a balanced audio driver with positive and negative audio feeding a pair of complementary emitter followers that feed the line. The emitter followers (BD131/BD132) also carry the positive and negative power supply rails derived from +12 and -12V regulators. These regulators should be fed from an appropriate raw DC mains PSU or they can be bypassed if +/- 12 volts is available from batteries. These supplies also feed positive and negative 5 volt regulators that in turn provide the supplies for the mixer end MAX IC's.

A feature of the emitter follower cable supplies is that they are also controlled by the cue (tally) circuit. With the camera not on air, the voltages fall to +/- 8.3 volts (approximately) whilst when 'on air' the voltage rises to about +/- 10 volts.

The 'camera end' circuit receives the incoming mixed PSU voltages (with cue signalling) and the balanced audio for talkback/communications. The audio is isolated from the receiving power supply regulators by using a 1:1 common mode choke. Any miniature

Talkback Cues Camera end





SDI active baluns

1:1 transformer (iron cored) can be used providing the windings have and inductance in the low mH. Since positive and negative supplies both pass through the 'choke' in anti-phase, any magnetising effect caused by the DC is cancelled. In this way the inductance and choke efficacy offered to the audio is maintained.

The DC supplies are passed to two more positive and negative 5 volt regulators. Given the likely line voltage drop, the regulators should be of the low drop out type for best results.

A novel feature of this power scheme is how the unit develops an 'artificial ground' by using a power op amp (LM272) that simply buffers the mid potential 'rail' formed by a potential divider. The output of this amplifier is the artificial ground used by the rest of the circuitry. Clearly, as the cue supplies symmetrically modulate the supplies, the ground 'potential' does not change.

A simple comparator formed by a TL081 op amp determines the cue status and the other half of the LM272 drives the cameraman's headset.

SDI Interface

Whilst most users of this system will not be using SDI, it was felt worthwhile to include a simple interface scheme that could work with a number of possible configurations, both external connections and internal to other equipment (e.g., a home made serial input video mixer).

The launch/receive pair in the schematic are both based on the versatile National CLC006 device. This IC can handle both differential input and output for both 75 and 50 ohms. Clearly, as the impedance of the twisted pair is approximately 100 ohms, a differential feed sourced in 50 ohms will deliver the required line source impedance to a balanced twisted pair line.

The question of input and output is left to the prospective user to define. As drawn the circuit will accept a differential 75 ohm input, but grounding one input will result in single ended operation. Likewise at the receiving end, disregarding one of the outputs will produce a single ended unbalanced feed.

Note that all inputs, outputs and line feeds are AC coupled which is acceptable for SDI working.

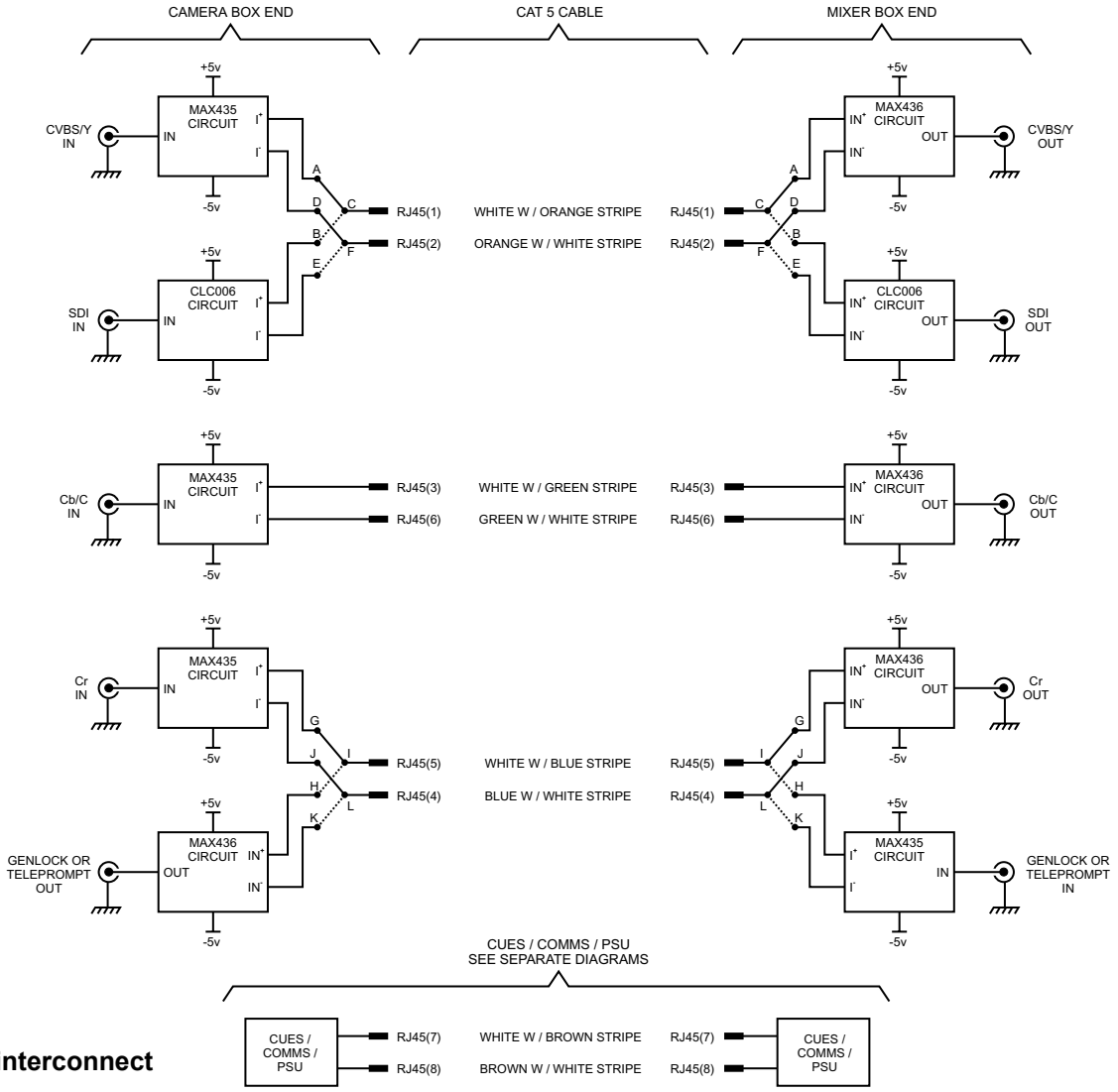
It's a long way from the original BATC camera and transmitter interconnection proposed all those years back, but with a common RJ 45 connection and the flexible approach provided by the option links and the digital path for SDI lets hope this new project will enable a common production connection for some time to come.

Link A to C and D to F for Composite YC Component

Link B to C and E to F for SDI

Link G toI and J toL for Component no Genlock

Link H to I and K to L for Composite YC SDI and Genlock return



Master interconnect

DATV in simple terms - part 3

By Brian Kelly

So far we have looked at how a signal is converted to and from a stream of digits and how the digital representation of a picture can easily be manipulated. In this part, we will look at the methods used to lessen the burden of handling such vast quantities of digits. The technique of reducing the amount of data is called compression and it is something we are all familiar with, even if we haven't realised it.

Imagine this scene: "a golden sandy beach stretches into the distance, to the right are rows of palm trees gently swaying in the breeze, the left a deep blue sea with waves gently lapping the shore. Overhead, the sky is clear and blue, you hear the distant laughing from children playing at the waters edge."


fig.7

OK, that's the end of my description, I think you see in your minds eye a tropical paradise. If that was a video clip, lasting maybe 10 seconds, it would need about 200,000,000 bytes of storage, my description did it in 283 bytes! That's compression for you. The trouble of course is that each of you saw a slightly different picture, although (hopefully) the theme was the same. Video compression is also like that; some of the picture is taken away so you don't have to transmit or store it, but not enough that anyone really notices. I know the purist among you are now crying, because - to the trained eye - the compression is obvious but to the masses, it isn't apparent at all. The trick is to find a suitable compromise between quality and quantity and the balance of the two is to a degree dependent upon the picture content.

Let's look at the methods used to save space. There are two methods of compressing data; one is called 'lossless' compression, the other 'lossy' compression. Lossless is just that, all the information in the picture is retained but by cleverly rearranging the data it is packed into a smaller space. Lossy compression does the same but by making assumptions about human eyesight and by analysing the picture, frame by frame, it also completely discards some of the information. What is left is obviously smaller than the original. For a fixed amount of data, the difference in original size, and the size achieved by each compression method can be huge. Lossless may give a reduction of 30-40% while lossy can reach 80-90% in extreme cases, visually both showing similar end results.

So how does it work? Looking at lossless first, a typical stream of digital picture information, as hexadecimal bytes might be: 10 10 10 10 10 10 10 10 11 11 32 45 96 A6 C5 C5 C5 C5 C5 C5 D6 EF 30 32 I know this isn't in itself very meaningful but the sequence should serve to show how it can be made smaller. You will notice that although there are several different numbers, there are also some repeating patterns. Lossless compression works by looking for repeats and instead of storing each occurrence of the number, it substitutes a reserved number, sometimes called a 'sentinel byte' followed by one copy of the number and a repeat count. So our original sequence of eight 10s might become FF 10 08 where FF is the sentinel, 10 is the actual number and 08 is the number of times it is repeated. Already, eight bytes are squashed down to three. When uncompressing, when the sentinel is found, it and the count are removed and instead, the following number is repeated eight times, taking us back where we started. Of course there has to be provision made for those cases where the data is the same value as the sentinel and could be mistaken for it. In a real video stream, there tends to be long repeats of the same number, for example the black borders around the picture and in the sync intervals. Most compression algorithms also take into account that the most common recurring numbers may change from scene to scene and adapt, so the ones with most repeats are given the compression treatment. They also look for repeating sequences of different numbers, for example 10 11 10 11 10 11 10 11 may be recorded as four occurrences of 10 11.

Lossy compression also uses the same method of detecting and counting repeats but takes a step further. In its simplest form it treats each frame of video as an individual image and looks for whole areas that are identical or very near matches. Imagine the picture has a grid of lines across and down it, dividing it into square areas. If more than one square holds the same or similar picture, only the first is used and a duplicate is put in the second and possibly subsequent positions. Obviously, the size of the squares is important; too big and the likelihood of matching ones being found becomes unlikely, too small and the benefit of chopping the picture this way is diminished. This technique is used in still digital camera images and widely used on Internet images because being applied frame by frame makes it suitable for any motionless image. Indeed, most of the images in CQ-TV are stored this way to keep the magazine masters down to a workable size. On photographs, this image compression is referred to as JPEG (Joint Photographic Experts

Group) and when used on frames of video is called MJPEG or Motion JPG. Essentially when viewed as a television picture, you actually see a rapid succession of JPEG compressed stills.

Far more commonly used in video work is a similar system called MPEG (Motion Picture Experts Group) which as well as working on a single still frame, takes into account that parts of images sometimes stay the same from one frame to the next. This is called 'temporal' (meaning 'time') compression whereas the JPEG uses only 'spatial' (meaning 'within a space'). This is nothing to do with Doctor Who and his Tardis, it simply is a way of looking at what changes in time as well as what changes in position. Go back to the grid arrangement mentioned earlier, if the grid was overlayed on several adjacent frames of video, the chances are that not only would some squares be the same within a single frame but they would also be in the same place in the following frame. Take for example a newsreader in the television studio, typically they would have a fixed camera on them so their backdrop would remain in the same position from one frame to the next.

Only the newsreaders head would be in motion. From a compression point of view, a portion of the picture changes (the head) but most of it is static. To reduce the amount of data, the parts that remain in the same place are not stored or transmitted, only the moving parts are. This has a dramatic effect on the amount of data as, instead of sending a whole picture, we only have to send updates of the parts that have changed. Look at fig.7 and fig. 8 which are actually adjacent frames from a video production, fig. 9 shows the difference between them which is all that would need to be sent to update the first picture to the second. In fact, on a motionless picture it is theoretically possible to send just the first frame and an instruction to keep repeating it. In practise, this isn't such a good idea though, because in most scenes there are very minor variations in lighting and movement and if we just keep repeating the same data it quickly mounts up to an appreciable difference to the real picture. There is also a potential problem when a complete scene change occurs and all the squares in the previous frame suddenly become out of date and have to be renewed. To get around these problems, the image is treated in two ways - either it is a whole frame of information or it is an update frame that modifies the last image. Periodically, every few frames, a new full frame is sent anyway so the image never becomes 'stale'. If a scene change occurs, a new full frame is also sent, even if it isn't due as part of the periodic refresh yet. This compression is called MPEG-1 but there are other variations, notably MPEG-2 which takes the concept of only updating parts where necessary one step further.

With this method as well as looking at which regions differ from one frame to the next, it takes into account that many frames contain the same image but with parts of it moved to somewhere else in the picture. For example if the camera panned to the left, each frame would contain the same background detail but displaced slightly from its position in the previous frame. Instead of looking only at the same grid square in adjacent frames, MPEG-2 looks at neighbouring squares to see if the contents of the first frame have now be repositioned in a new grid square on the second. This takes much more processing power to achieve as not only is the frame by frame comparison being made on the same grid square but also on all its adjacent squares.

The outcome of both methods is the same though, as there is no need to convey the data that makes up the detail within the square, only its position, so the amount of data is greatly reduced. The MPEG-2 system is used by terrestrial digital television and by almost all satellite broadcasters. It is also used in Europe and most of the World to compress video content for DVD products although in some Asian countries, MPEG-1 is the preferred standard. A less common compression is called MPEG-4 which is similar in operation to MPEG-2, but uses a more efficient lossy compression technique. Incidentally, MPEG-3 does not exist; the sound compression from MPEG-2, being very efficient, was 'hi-jacked' for use in music recording and christened MP3 so although the name MPEG-3 would have been the obvious choice, it was avoided to save confusion with MP3.

Going back to electronics, MJPEG and MPEG are complicated to implement and are best left to the custom chip companies to develop. The cost is not great though, as most of the expense is in the design and production of chip masks. When in production, the real cost per device is pennies. Uncompressing MPEG is much easier than would first appear, as reconstructing the image is simply a case of taking the incoming data, decompressing it as described under 'lossy' above then storing the data in a memory device. This memory is then read out through a DAC to reproduce the video signal. If a full frame video is received, it fully fills the memory; if an update frame is received, only the applicable part is updated.

Being a memory device, the updated region will replace what was originally there so only that part of the picture is changed, the rest remains as it was in the previous frame. The complicated part is compressing the video in the first place. In order to look for changes from one frame to the next, and particularly


fig.8

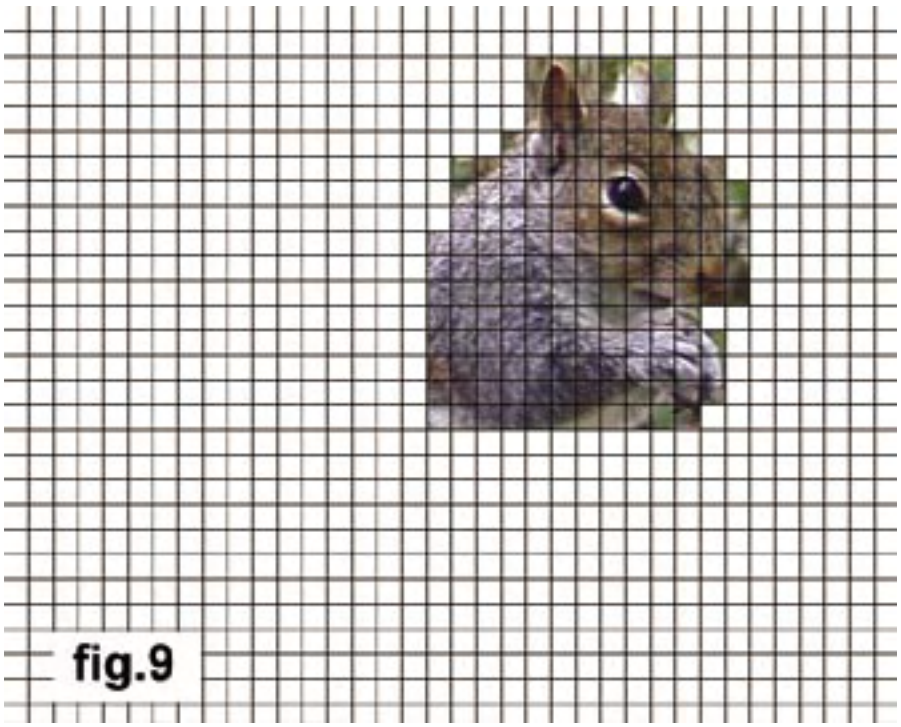


fig.9

if motion detection is being used as well, as in MPEG-2, it is necessary to hold several frames in a queue. The algorithm can then look back and forth in the queue to see what can be left alone and what needs updating. Quite apart from the enormous amount of computing power this needs, it creates a delay of several frame periods while they are being held for analysis. If you have consumer digital TV and analogue TV showing the same programme material, it is interesting to look at the two side by side. There will typically be a delay of about half a second with the digital picture lagging the analogue one while the compressing and decompressing take place.

That concludes the short tutorial on digital TV. If you want to follow up these articles for more information, there are many sources on the Internet covering digital techniques and television. It is worth searching for information on commercial MPEG devices as these often give background details on how these work.

Send in your stuff!

Material for publication in CQ-TV

We are striving to make CQ-TV better!

To this end, we would like to offer advice on how material can be submitted to relieve any production problems, and allow the artwork to be put together more easily.

Probably our biggest problem is with embedded pictures and diagrams which are submitted as a complete Word document. Whilst this is great for you to visualise the layout of a particular article (although graphic considerations in the magazine as a whole may require the re-arrangement of any suggested layout) they are a pain to remove from the document, which we have to do in order to import them into our layout program

The upshot is: **can you please supply text and photos as separate files.**

Text is fine as a Word document, Notepad or as email - most formats can be accepted from Windows computers. Artwork should be scanned in at **300dpi** (or as best you can manage) if at all possible. If in doubt, pleas feel free to email for advice.

If you would like to send photos/diagrams for inclusion, we will accept them through the post and that is fine as well.

Contact address for postal submissions is:- **CQ-TV Editor, 14 Lilac Avenue, Leicester, LE5 1FN, England.**

Email address is: editor@cq-tv.com

Reader Questionnaire

Every month, the BATC Committee receives comments about the content of CQ-TV and the Club's plans for the future. Some of the comments are very positive and complimentary, some are critical and list complaints about the direction the Club is heading. The critical people appear to be the first to step back when their own input is requested and, invariably, also seem to be the first to produce a list of good excuses why they can't contribute personally to the progression of Club activity. Nevertheless, as time goes by, those of us who do most of the work lose focus on the demands of readers and members and tend to drift off at a tangent. We accept criticism when it is due and, of course, are happy to accept accolades when presented. Now is a good time to 're-synchronise' with reality and ask what the 1,500 or so of you out there really want from the BATC. We cannot guarantee to please everyone; we know members range from professional studio managers through to people working with Veroboard in their garden sheds. It is a broad spectrum that we try to cater for and, although we do our best, someone somewhere will always feel left out.

To help us understand the needs of the membership, we ask you to tell us where your preferences lie. If you spare a few moments to answer these questions it would help us decide the best content for CQ-TV and, perhaps, the direction the Club takes as a whole in the future. Please bear in mind that all of us have other demands on our time as well, and we can only publish material sent to us by members or selectively copied from willing sources. We do not have any 'staff', being run entirely by volunteers, so it is impossible for us to devote ourselves to full time product development or research projects.

Please put pen to paper and help us to help you. You can FAX a marked-up copy of this page to 01525 290035 (UK number) or write to us at the Membership Secretary's address which is listed at the front of CQ-TV or email your replies to to 'memsec@batc.org.uk'. You can remain anonymous if you like but, obviously, if you do that we can't send an individual reply to you. If you answer the questions below it would be very helpful but feel free to make your own comments and observations as well. The more we learn about you, the better we can try to cater for your needs.

Hopefully, in the next issue we will be able to summarise the responses we get back so all of us, not only the Committee, know where we stand. Please don't leave it too late before replying, though, as the next issue will already have started production by the time this one reaches you.

Questions:

1. Which category do you think you fall in ? Hobby / Professional / Both

2. Do you or have you in the past worked in professional TV? Production / Engineering / Both

3. Do you hold an amateur radio license? Yes / No / Did but lapsed / Would like one.

   If so, do you transmit or receive ATV at least once a month? Yes / No.

   Do you receive signals from an ATV repeater at your home QTH? If so from how many?

   Do you support the need for ATV to experiment with digital techniques? Yes / No.

4. Do you build electronic items yourself ? Yes, I design my own / Yes, from kits / No

5. Do you produce video material ? Yes /No - please tell us if you edit and/or shoot your own.

6. Do you have access to pro or semi-pro editing equipment ? Yes / No.

7. Do you have a video camera or camcorder ? Yes / No.

8. On a scale of one to ten, how interested are you in the history of television ?

9. On a scale of one to ten, how interested are you in the RF aspects of transmitting ?

10. On a scale of one to ten, how interested are you in studio and production techniques ?

Please also tell us what other types of articles you would like to see in CQ-TV and if you are involved in local radio clubs or repeater groups. The more you add the better.

General comments:-

National Vintage Communications Fair

*N.E.C. Birmingham UK

Sunday 1st May 2005

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10.30am to 4.00pm • £5 admission
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http://www.bvws.org.uk
Car parking charges apply

From the membership department:

The BATC is a non-profit making club and, as such, our income needs to closely track our outgoings so that we can stay in operation. Inevitably, the cost of producing and posting CQ-TV to members increases over time and this forces us to increase our income to compensate. Almost all our income comes from subscription payments, so regrettably we have had to make some changes to them. We have done our best to minimise the increase and rather than make the annual payment higher, we have reduced the discount for paying for several years in advance. The discount has always been a problem to us because it not only reduces our present income - it has to pay for future issues of CQ-TV which will cost us more. The new rates are one year: £15 (unchanged), two years: £29.50, three years: £44.00 and four years: £58.50. Even over the four year period the increase has been kept down to only £3.50. Cyber membership costs, which do not include the expense of printing and mailing, are maintained at £10 per year.

You can help us keep the costs down in three ways:

1 Pay by cheque or debit card rather than a credit card. We have to pay commission on credit card transactions so the amount we actually get is less than the amount you are charged.

2. Pay promptly when you get your reminder letter. CQ-TV is bulk mailed which is cheaper than individual postings. When someone pays late, we have to send single copies by hand.

3. Try to recruit more members. The cost per magazine is less if we order more copies from the printer. The administration costs only increase slightly.

Mrs Pat Hellen, Membership Secretary.

Dicky Howett adds, 'This quaint US advert from a magazine called 'Communications' 1949 November edition shows a Dumont 3" TA 14B image orthicon camera which despite the enthsiastic copy was only adequate in performance. US collector Chuck Pharis now has a 'restored' TA 124B channel in his collection. A rare item ideed.

Contest News

By Richard Parkes G7MFO

Congratulations go to the Severnside Television Group for first place during the International last year and the other four stations for sending in results. The full results can be downloaded from the BATC web site.

I received a nice letter from Dave G4TIW and Mike G0DPS after the International. They both went to Corney Fell in south-west Cumbria. I have included the letter below. After reading it hopefully a lot more of you will go portable, a few pictures can be seen in CQ-TV of their portable contest station.

I'm finding it hard, to find enough time to fulfil the role of the BATC contest manager. If anybody else would like to take over, please get in touch.

The dates for the next two contests are as below; note the times for the Summer Fun has changed to a full 24hr contest, due mainly to more available light on the Saturday (setting up, fault finding etc).

Please get in touch if you require any help with contests and don't forget to send in your results!

Richard Parkes G7MFO 7 Main Street, Preston, Hull. HU12 8UB. England. Tel:- 01482 898559

E-mail: contests@batc.org.uk

International 2004 results

Place	Call		70 CM	23 CM	13 CM	3 CM	1,5 CM	0,7 CM	Points
1	G7ATV/P			2736	930	675			4341
2	G0DPS/P			364	910	910			2184
3	G8GKQ		133	410					543
4	G6RC		58	142					200
5	G0ATW		22						22

Mike G0DPS and Dave G4TIW DXpedition to Corney Fell South-West Cumbria

Encouraged by our experience of the Summer Fun competition in June 2004 (first place). Dave G4TIW and I decided to try to improve our equipment for the September International event. Dave had the idea of working from a greater height than the 400m site we used previously, which meant carrying all the gear up to the 550m hill about 2km from the van site .During the next 3 months, Dave designed and constructed miniaturised gear for three bands, to be carried in backpacks by his son and himself, including camping equipment to stay overnight for the duration of the contest, no mean achievement you will agree!.

For my part, I set about building a set of four 36 element long yagis to replace the single yagi used on 23cms previously, after testing these, they gave an improvement of just over 5db over the single yagi which was most encouraging We also made improvements to the system by the addition of a 2kw generator for power.

Leaving Leeds at 8 am on the Saturday morning, we arrived on site high in the Cumbrian hills by 11am to find the site covered in low cloud and rather windy. Dave and son set off up the mountain at 1 pm, rapidly disappearing into the mist at about 50m distance. My station was set up by 2pm in my van so started to see what television conditions were like, hmmm!!! Not very good. The Anglesey repeater was only P1 and nothing at all was seen from the Belfast repeater, which had been P5 during the summer fun competition.

The weather gradually went from bad to horrible as the day wore on and despite regular calls, nothing was heard on the talkback channel, apart from Dave, trying his best to avoid having his

tent and gear scattered all over Cumbria by the wind. By 10 pm, I turned the antennas downwind and decide to call it a draw for the night, but it was impossible to sleep in the conditions as at 2 am Sunday morning my van was lifted onto 2 wheels by the wind, lucky for me it landed back on 4 wheels, not a very pleasant feeling.

Daybreak saw a slight improvement in the weather and was quite surprised at 7.30am when I heard a call from Nigel GM7JZP/P from Glenluce South-West Scotland, and started to work him successfully on the 3 bands, when Dave and son returned from their hilltop perch looking rather worse for wear. Gave a few more calls but by 9.30 we were all feeling much worse for wear as no one had had any sleep, it was decided to call it a day and return home.

It transpired later that several stations were operating and looking for our stations later in the morning, and to those stations I offer my apologies, but we were in no state to continue, but WE SHALL RETURN

Contest Calendar 2005

Summer Fun 2005 (Joint European) Saturday June 11th – Sunday June 12th

From 1200 UTC Saturday to 1200 UTC Sunday (Full 24hr Contest!)

IARU International ATV Contest 2005 Saturday September 10th – Sunday September 11th

From 1800 UTC Saturday to 1200 UTC Sunday

Fast Scan ATV all Bands.

In the Edit Suite - part 4

By Trevor Brown

My new non-linear edit suite is now up and running, but I have one or two minor problems to sort out - the first on is managing it. The rushes (camera tapes) I always keep, along with a copy of the final project, usually on DVD. I am often asked for additional copies at a later date and duplicating the DVD is the best solution to this. The problem comes if I am asked for a different version at a later date. I don't like to edit the DVD, for a number of reasons, one of which is picture quality, another is software performance on MPEG2, and the last is recovering an MPEG2 file from a DVD. The original cut has often been cleared from the hard drive to make space for another project. This would be the ideal starting point for an alternative version, if it could be easily re-created. The one thing that remains is the cutting list, because it does not take up much disc space. So lets re-digitise the rushes, import the cutting list and the original material will appear on the time line - or will it?

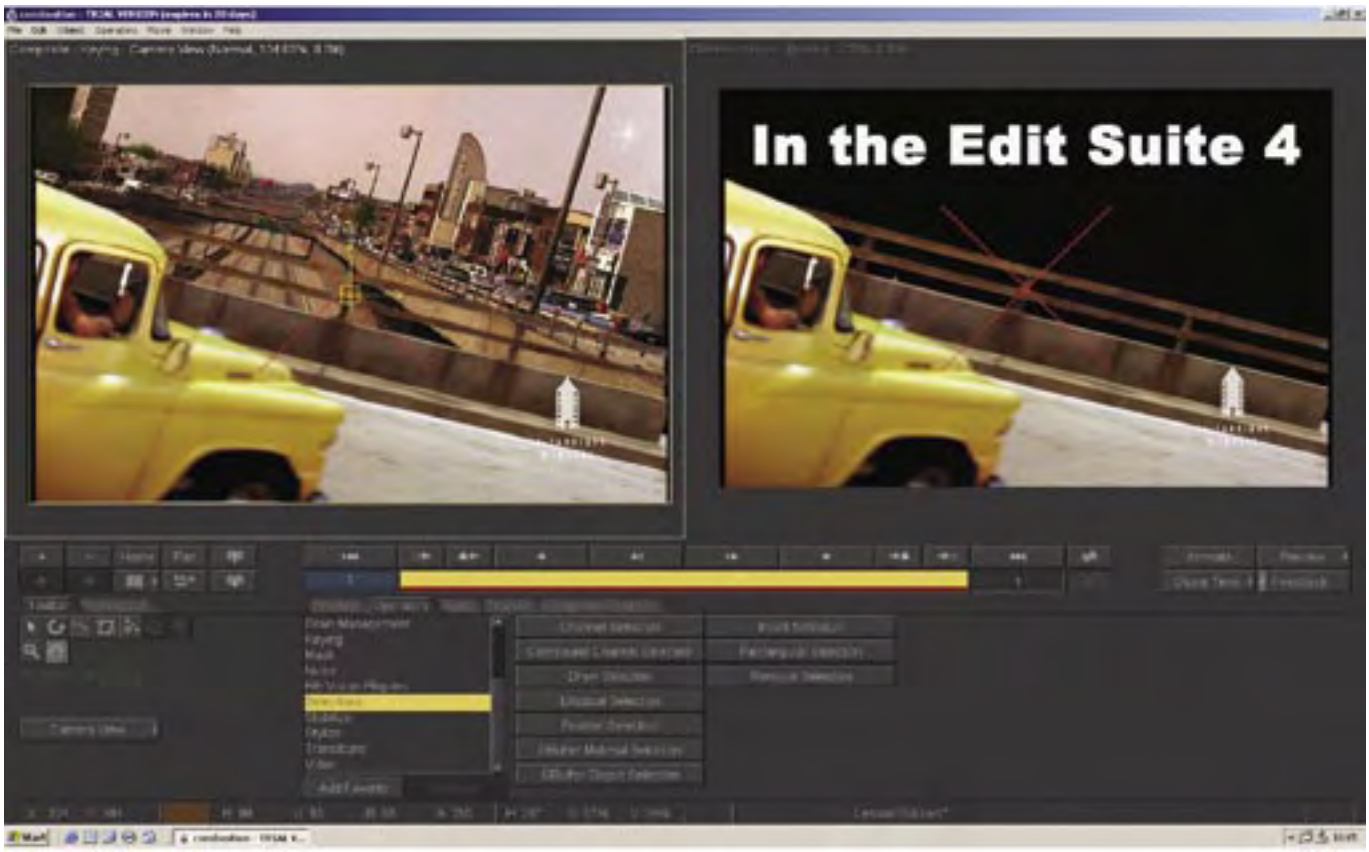
If it was DV it will have embedded time code and there is a good chance, subject to clip names and directory structure, that you may achieve this. For non-DV formats the time code is not embedded and needs to have been transferred along with the original capture, so as to be part of the cutting list.

Let's look at how to achieve this; the best way is the RS 422 socket on the source VT. This is the standard for TV hardware. It is a 9 pin female socket and works on the Sony P2 protocol and is how linear edit controllers instruct the decks. This is a duplex current communication system; two wires form a current loop to carry data to the machine and another two wires to carry information from the machine to the edit controller. The protocol is a mixture of commands, acknowledgements and data. If we can connect this RS 422 signal to the PC, then the edit control software will provide all the necessary deck commands and will also embed the tape time code into the captured clip. However, the PC does not have RS 422 - it has RS 232. This is not a current loop communication, but is a voltage logic often swinging between + – 12 volts.

You can buy converters for about £100. I thought it might be fun and cost effective to build one. I was on my third design before I regretted this move. The problem was that I tried to make it self-powering from the RS 232 handshake command. The editor software usually facilitates this by putting the handshake lines to +12 volts, (Toaster is no exception), but several designs failed to control the VT from Toaster. Sierra Madre supply a very nice deck control and time code reader utility that I found invaluable when designing this project. The utility is called WSONY II and can be downloaded from http://www.sssm.com/rs422/rs422.html, which provided an alternative to the Toaster software and would control the machine when Toaster would not. It can read both VITC and LITC code and is useful for checking that they are the same (not always the case).

I suspect the problem with my early designs was one way communication, as WSONY II would control the machine, but could not read time code, whereas Toaster would not control the VT with one way communication. I had been reluctant to use dedicated chips, as the data sheet put their current consumption beyond the handshake current capability.

The final hardware solution came when I took the plunge and used dedicated chips. The DS8921 is used to control the RS 422 and the MAX 233 to control

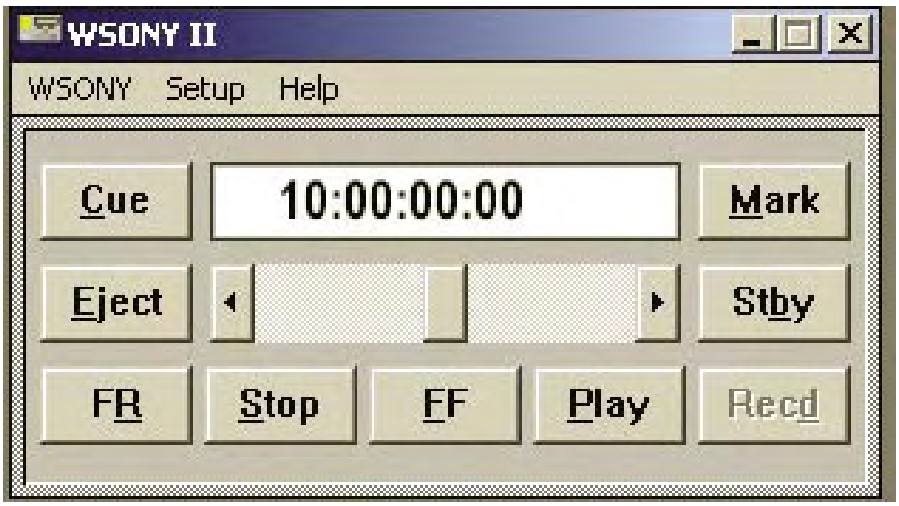


the RS 232. With a simple two wire connection between the two chips, both the Sierra Madre and Toaster could control the VT deck and read time code. The chips require a +5 volt, regulated supply and I managed to fit both chips and a 5V regulator into a small Maplin's box.

The downs-side, as expected, to this new robust RS 422 to RS 232 converter is that it could not be powered from the RS 232 handshake controls, which both sagged under the load, and required a separate power supply - a small price to pay for a working solution.

The chips were available from CPC and cost around £12. The power supply was from the junk box, so I suppose I saved money, and learnt a lot on the way. With this in place, it should be possible to recapture clips and rebuild a cutting list into the original programme, providing the clips have the same names and directory structure as the original capture. To this end it is important to organise a way of numbering the rushes - if you capture the whole reel then 'tape1', 'tape 2' may be sufficient; if you are a batch capture person then you are going to have to think long and hard how you manage the system.

In part 2 of this series I gave you some web addresses for editing software down loads, so you could try some of the non-linear PC based editing systems for yourself, and find the one that best suits your needs. This time I would like to look at a desktop motion graphics package from Discreet called Combustion. Combustion is top end professional software and retails at $995. This professional package is probably well outside most of our budgets. But before you skip the rest of this article, you can down load a 30 day trial along with a full set of tutorials. It's not every day that you get to play with something like this. It is complex to drive but well worth the effort. The PC needs to have a reasonable spec and I found the VDU needed to be 1600 by 1024 to get the best out of the display, but since flat panel screens now dominate the market, the old fashioned CRT monitors change hands at very reasonable prices, including the 19" and 21" professional models. The link is http://www4.discreet.com/combustion/combustion.php?id=207#



Combustion requirements

Minimum Windows configuration

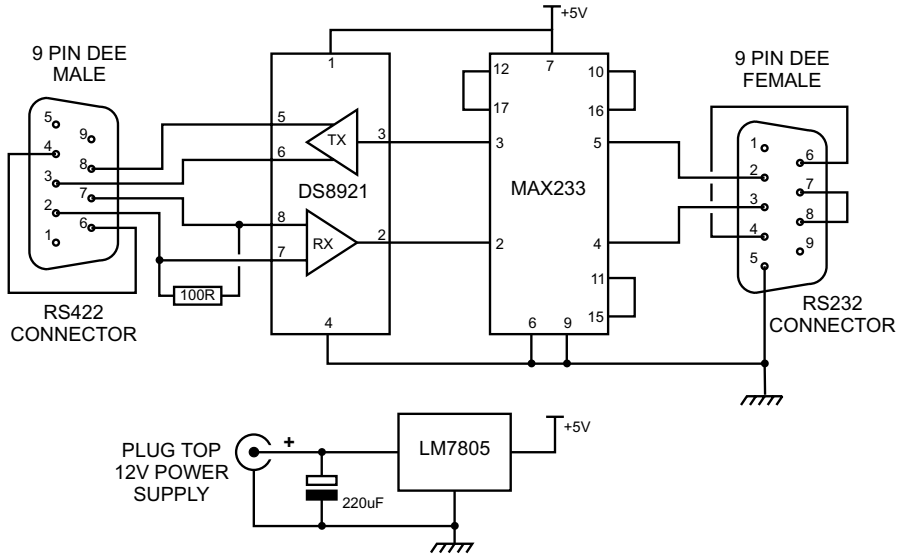
- Intel® Pentium® III, Pentium 4 or AMD® Athlon™ XP CPU, 850Mhz or higher
- Windows XP or Windows 2000
- 2GB main hard drive with ~120MB free space (70MB for the software, 45MB for help)
- 256MB of RAM
- Video display card with 4MB of VRAM (1024x768 display with 24-bit colour minimum required)

Recommended High-End Configuration (Windows OS)

The following configuration provides higher performance with combustion 3 :

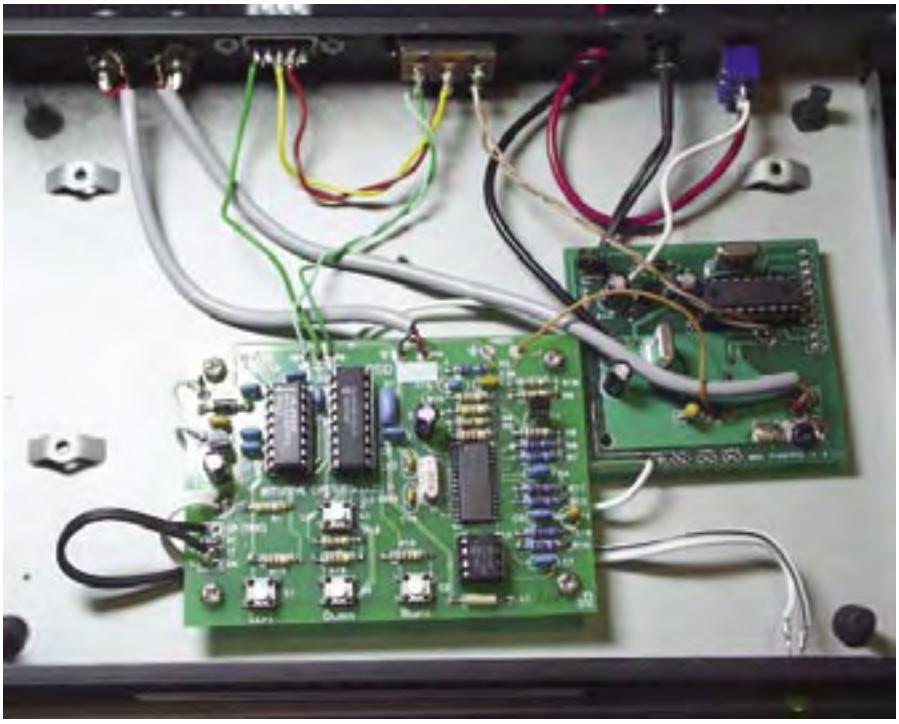
- Pentium 4 or AMD Athlon XP dual processor CPU, 1.7 GHz or higher
- Windows XP
- 8GB main hard drive with ~570MB free space (70MB for the software, 45MB for help, and 450MB for the tutorials)
- 2GB of RAM (for film resolution work)
- A dual monitor-capable video display card with a minimum of 32MB of VRAM or more, with OpenGL hardware acceleration
- DirectShow or QuickTime-compatible video capture/playback card
- Fast/Wide SCSI or Fiber channel card and RAID array to accompany the video capture/playback card
- Wacom® Intuos® 2 tablet
- Three-button mouse with scroll wheel

Most of us have PC's that will run the minimum configuration so why not have a play with some top end professional software and see what you can create.



Record the Net

By Mark A Phillips, G7LTT



On many occasions whilst doing ARES/RACES/RayNet type activities I've thought that it would be a good idea to record the proceedings. The problem is that the recording needs to be of the whole event which can be hours long and so well out of the realms of a simple cassette recorder. Also, the recorder has to be placed in such a position as to be able hear all the station involved in the event.

This need was demonstrated to good effect recently when my local ARES team was involved with a Half Marathon event in Staten Island. One of the competitors dropped down dead of a heart attack. This resulted in much finger pointing at the various agencies whom together we very tardy in handling the call for help. If they had a recording mechanism ARES could have proved that they did their job in short order. Thankfully nothing became of the finger pointing.

One of the events that I'm involved in is the New York City Marathon which is held every year in (you guessed it!) New York City. The group I'm involved with handles all the "Start Event" comms within the confines of Fort Wadsworth on Staten Island where the Marathon starts. This year I was the Net Control Operator and handled about 15 Hams littered around the Fort and the Verazano Bridge Toll Plaza. I also had stations passing through who were attached to various elements of the Marathon organisation, the Mayor of New York City, and the various chase and lead vehicles. So with the Net Control job in mind I set about constructing a recorder capable of recording the radio traffic for the entire operation.

The result is what you see on the picture below. It's basically a VCR with a Police type Scanner and a video overlay board attached.

The VCR was a cheap and cheerful Sharp VC-A410 4 head device that I bought at a local Electronics store for $35. It is a mono device but is capable of Long Play/Record and so a T-180 video tape can be made to record for up to 8 hours with fairly low video quality.

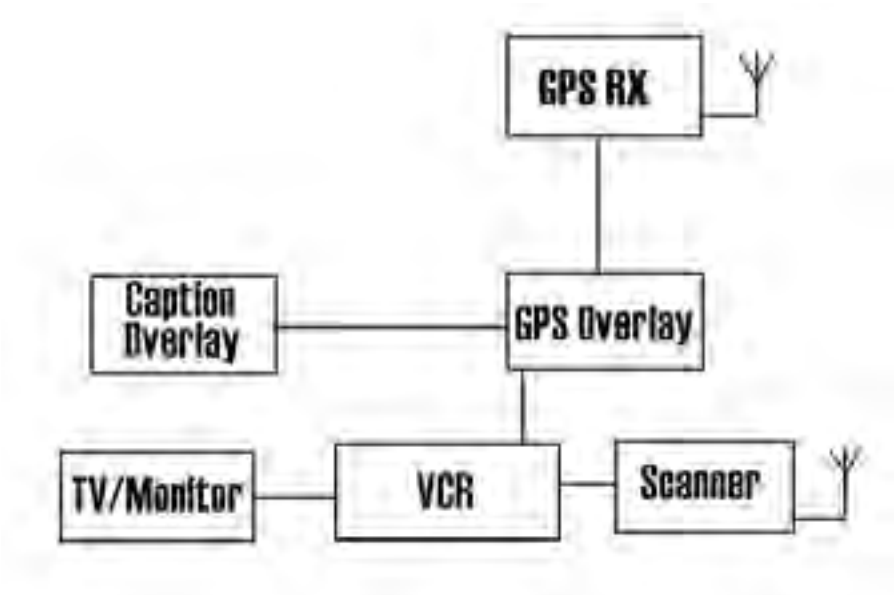
Added to this was a police type scanner radio. It was tuned to the Net frequency of 144.335MHz FM and the received audio was fed to the VCR's Line In port. It was at this point that I had 2 problems.

1) The VCR wouldn't record anything unless there was a picture present;

2) How would I know where in time I was when listening to the tape?

So I set about building a time source that could be displayed as a picture thus fooling the VCR into recording something. I still have some of my old ATV gear kicking around and so I started with that. The picture you see on above is actually made up of 2 devices.

The lower half of the picture is a video overlay board from icircuits.com http://www.icircuits.com/prod_osdgpsid.html. I can change the information on this device to say whatever I want. As you can see, I configured it to ident the tape with the event name, location,



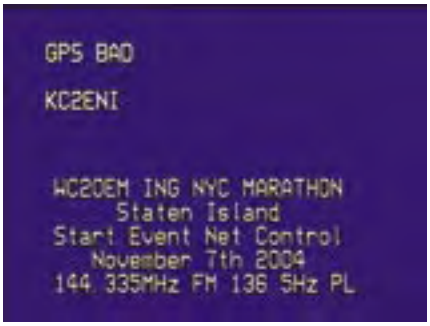
date and frequency information. The board is also configured to display the information on a blue background. Other options could be to have it superimposed upon an incoming picture such as a CCTV camera. I did briefly think about feeding the NBC coverage of the Marathon into the system but as we started at 0400EST and the coverage didn't start until 0800EST it became a mute point. The overlay board is programmed by a Windows application over the serial port. This poses me a problem as I'm a Linux user. I had to start a whole new adventure with an application called Wine http://www.winehq.com/ that would allow me to run Windows applications on Linux. If icircuits.com are reading this please make note that you live in a multi OS world and please do some cross compiling (it works fine under Wine though).

The upper half of the picture is a GPS overlay board from blackboxcamera.com http://www.blackboxcamera.com/Stv5730a/STV5730A.htm. When fed with a 4800bd NMEA GPS signal is produces the overlay as seen on the left. Position, altitude, speed, course, ident and of course the time/date.

This device requires that it be fed by a picture as it must use the incoming sync pulses to output its bit train onto the picture. It has very few options and unlike the ident board it can be programmed by a Linux machine. It uses commands sent down the serial cable from a terminal program. I used Minicom and all was fine.

The observant ones amongst you will have noted that there are 2 separate call signs displayed in the final output above. The reason for this was simple. We use the club call when doing events such as the Marathon but it could be any one of us that operates the call. As I foresaw the tape being used as evidence I thought it useful to identify both the station and the operator. You never know...

The project took a little less than 2 weeks to get together. I already had the boards and the VCR I just had to wire it all together. The icircuits.com board comes as a plain board but the GPS board comes in a box as shown in the picture. I chose to put both boards into a single housing that could sit on top of the VCR. Added to the mix was a 9 inch portable TV set so that I could see everything was working. The TV set had 3 purposes on the day. It allowed me to check on the recorder system as well as use the clock for the net time stamping. I could also watch the Marathon coverage on the TV. Net Control is a very disconnected job and one has no view of the event from within the Control caravan.



This is what happens when the GPS drops out.

And then it does this after 30 secs of no GPS.

Future improvements may include changing the mono VCR for a stereo one as there is a LMR net going on concurrently with the Ham Radio Net.

© by Mark A Phillips, G7LTT
http://www.g7ltt.com/recorder/

NHK Museum of Broadcasting


NHK


同時性では生中継
NHK

Dicky Howett writes, 'We have nothing like this in the UK, home of the 'birth' of television, BBC please note! I'm indebted to my Stateside chum Kevin Hempson who visited recently this fabulous museum in Tokyo and sent me these excellent snaps. On display in the museum are stacks of tv sets and cameras, all within touching distance. (Not something we're used to over here I'm sad to say.) Cameras featured include a monochrome 525-line Pye Mk 3 from 1951, a Japanese 1960 version of the three-tube 3" I.O. RCA TK 41 colour camera and an example of the first Hi-Vision (HD-TV) camera (looks like an Ikegami) from the NHK labs (1980). Also an early ENG kit and an original Baird Televisor, about which it says on the info card, "imported for study use". And we all know why....'

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 134 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.

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. 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.

A 500mW Linear Amplifier for 1249 MHz

By Geoffrey Pike, GI0GDP.

This amplifier was designed to replace the Mitsubishi M67715 module that is often used in conjunction with the bigger module, M57762, to achieve 18 watts. Typically a G1MFG module produces 60mW and this will drive this amplifier to 500 mW, which drives my M57762 to 16 watts.

This is a cost effective solution to buying the M67715 module as a driver, as the single device used here costs approx £3.50 at the time of writing.

The single BFG235 device (Farnell part number 300-6736) is built using transmission lines and the design simulated with Puff. The component values and simultaneous conjugate impedances are calculated with Excel, using S - parameter data from Infineon.

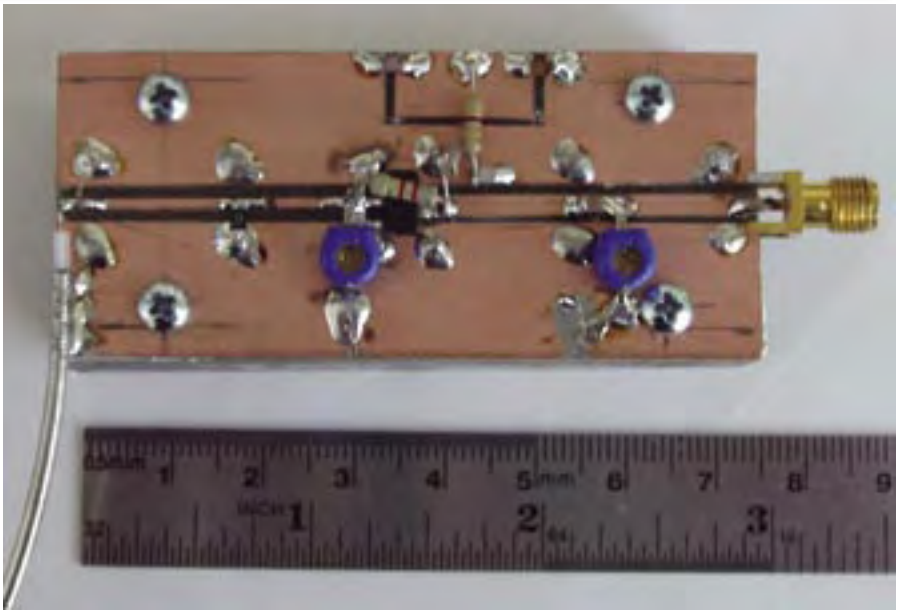
The bias conditions are approx 150 mA at a supply of 13.8 volts. The S2P file from Infineon was for Vce 8 volts and Ic =150mA.

This gives starting S - parameters of

S11 0.853 ∠ 144.3°

S21 1.430 ∠ 38.1°

S12 0.136 ∠ 48.0°



Component layout

S22 0.583 ∠ 147.4°

These reflection coefficients translate to an input impedance S11 of 4.38 + j 15.97Ω. With an associated output impedance S22 of 14.2 + j 13.5Ω.

However these are not used to design the amplifier; instead, the new conjugate values are used

S11 new 4.32 + j 13.13Ω

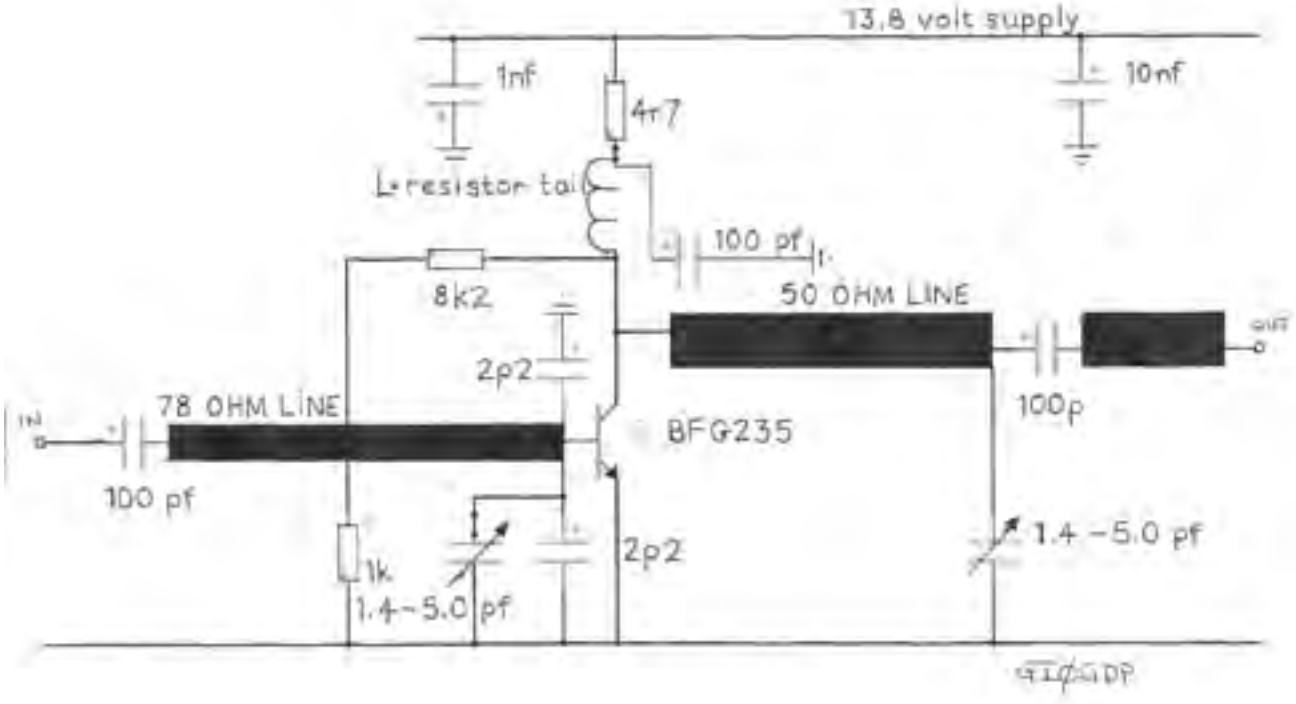
S22 new 25.5 - j 56.9Ω

These values are used to compute the transmission line geometry in Puff.

This results in an input line of 78Ω with a length of 86°, which equates to a line 1mm wide and 3.1 cm long on standard 1.6mm double sided FR4 PCB.

The output line is a 50Ω line 47° long which equates to a line 1.6cm long and 2.5mm wide.

The simulated plot in Puff gives excellent predicted input and output



Circuit diagram of 500 mW amplifier for 1240 to 1310 MHz

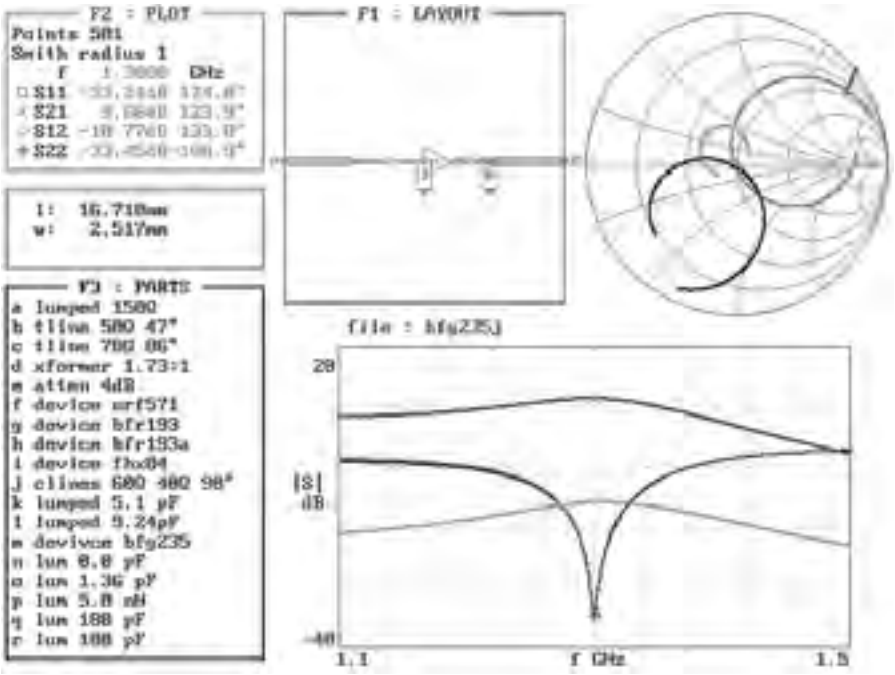


Figure 1 S-parameter plot of BFG235 amplifier.

matches of -33dB, which is an SWR of 1.05:1. The forward gain is estimated to be 9.66 dB and the two prototypes measured 9.8 and 9.0 dB. This was fed with 60 mW from an G1MFG TX, which resulted in 580 and 480 mw output respectively, measured using a HP432A power meter with a Mini-Circuits 20 dB attenuator.

The PCB is made from a normal double sided 1.6 mm FR4 pcb measuring 6cm by 3cm. The board is not etched, but the lines cut with a sharp modelling knife. The gaps are then peeled away using a hot 25 watt soldering iron.

Adjacent to the input and output line there are 6 vero pins to ground the top ground plane to the bottom plane. This is the bare minimum grounding and really the PCB edges should have their edges bonded using copper foil from H100 coax or similar.

The passive SMD are all 1206, except for the input 100p which is 0603 and the two 2p2 reactance cancelling capacitors mounted close to the base emitter leads of the BFG235, which are 0804. Conventional ¼ watt leaded resistors are used for R bias and R collector. The 4Ω7 collector resistor also forms the inductor and is 2 turns over a 1/8in former.

Construction:

After preparing the PCB it needs to be cleaned with methylated spirits or similar to make soldering on the upper ground plane easier.

After marking the holes for the through pins, they can be drilled with a 1mm drill and the pins soldered top and bottom; the two pins adjacent to the emitter leads can be left to the last and soldered at the same time as the 2p2 capacitors.

Next fit the BFG235, the SMD parts and the two trimmers. Make sure that the earthy side of the trimmer is earthed to the upper ground plane. Use good SMA end connectors and thoroughly solder.

Preset the trimmers at 15% meshed (2 dots at 2 o'clock position). Use 12 volts initially and then when all is OK go to 13.8 V. Typical current drain is 150 mA approx 0.7volts across the 4Ω7 collector resistor.

Tune the trimmers for max output, bearing in mind that S12 is a major player here and the output effects the input and vice versa. This may take a few iterations. Most power meters are inaccurate at this power level, so don't be surprised if only 100 mW is indicated. When connected to a M57762 module I get 16 watts using a G1MFG as a drive source.t

Note this PCB is 6.0 x 3.0 cm. transmission line details from text.

Widescreen Signalling

By Mike Cox

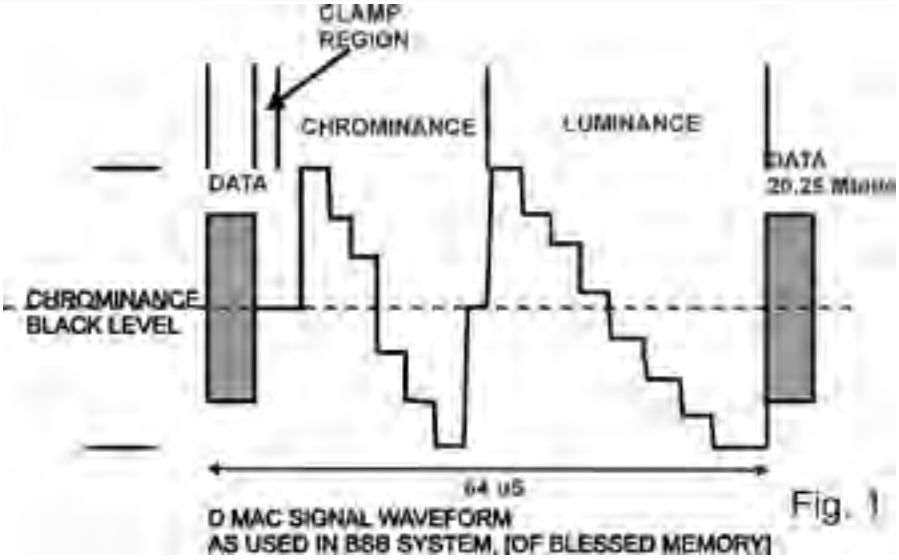
Historical Introduction

In the late 1980s, Widescreen Television was thought to be the future. The D MAC [Multiplexed Analog Components] system to be used by BSB was designed around 16:9 aspect ratio transmission by satellite. As far as the UK was concerned this was effectively wrecked by Murdoch when he took a transponder on the Astra communication satellite transmitting his Sky channel in 4:3 PAL. Not many now remember BSB and the 'Squarial'. However, around Europe, the idea of Widescreen was kept going by the Vision1250 group that was promoting 1250 lines High Definition television, with 16:9 aspect ratio. At the time the transmission proposal was a form of MAC called HD-MAC.

There were a number of transmissions from the 1992 Barcelona Olympics in HD-MAC, to demonstration facilities around Europe.

The European Commission was sufficiently impressed by this that they put up funding for programmes to be made in 16:9 format [EC Action Plan, 1993]. The transmission means was immaterial.

At this time, it was well nigh impossible to buy a 16:9 display except at a very high price. Not much 16:9 glassware was being made. But various European manufacturers realised that the domestic TV market was one of replacement, and felt that perhaps the 16:9 receiver would encourage the process. At the time, however there was no practical way other than satellite to deliver a 16:9 picture to the home. The issue of compatibility with existing 4:3 receivers was a serious difficulty.



D MAC SIGNAL WAVEFORM
AS USED IN BSB SYSTEM. [OF BLESSED MEMORY]
Fig. 1

The development of the MAC system introduced digital processing and storage to the receiver. The D MAC system [Fig. 1] was used for only a few years in UK by BSB, but carried on in Scandinavia. The basis of the system was that Chrominance and Luminance components do not need to be transmitted simultaneously as in PAL and NTSC, but can be stored and combined in the decoder. Whereas PAL is an example of Frequency Division Multiplex [FDM], D MAC is an example of Time Division Multiplex [TDM]

An analogous development led to the PALplus project [Fig. 2]. The basis for this is the transmission of a reduced height picture from say a 16:9 film, which has the correct aspect ratio on a 4:3 display [432 lines], albeit with black bands top and bottom. These bands also carry helper signals on a carrier at black level. In a true 16:9 receiver, the helper signals are stored, and used to enhance the resolution of the picture, and the 432 lines are redistributed to the 576 lines of the display [Fig. 3].

So the 16:9 viewer sees the whole screen at enhanced resolution. Immediately, a problem arises in that much programming is still in 4:3. The 16:9 receiver needs to be switched so that it displays a correctly proportioned picture. So Widescreen Signalling was introduced. This consists of a digital stream carried on Line 23 of the video signal. In addition to straight 4:3 – 16:9 information, the stream also carried information about enhanced services, and sub-titles (if any).

PALplus was first transmitted in Germany at the end of 1994, and was used by Channel 4 in the UK until 1998 when they ceased transmitting the "helper" signal.

A 16:9 picture that is recorded on tape or DVD is known as "anamorphic", and will appear squashed horizontally on a 4:3 display [Fig.4].

Similarly, a 4:3 picture on a 16:9 display will show people with fat faces; the well-known Dixons/Currys effect.

The Principle of PALplus

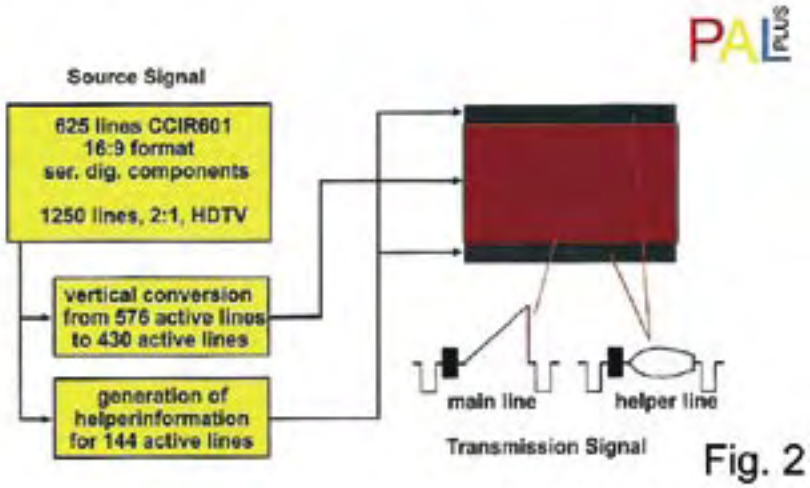


Fig. 2

PICTURE ON 16:9 DISPLAY Fig. 3 SAME PICTURE ON 4:3 DISPLAY

Application

What, you may ask, is my interest in an obsolete technology?

It started when I acquired the latest version of Pinnacle Studio editing system, V9. I also have a JVC PD-1 camcorder used in 16:9 mode. A lot of material was shot at IBC2004 and subsequently edited on the Pinnacle system. During this, an interesting artefact was noticed. The system accepts a 16:9 signal on Firewire from a DV player. It will not in the same timeline accept some stored colour black, used previously in a 4:3 edit. I then happened to look at the manual for the Sony DHR1000 DV machine that I use for editing. This machine was introduced in 1996, and the manual stated that it would accept a PALplus signal. Delving into old IBC Conference papers gave me the clue for the Line 23 signals. A trip to the web gave me the ETSI specification for PALplus and its signalling.

My requirement was to have a generator add a Line 23 signal indicating 16:9 to a composite or Y/C feed looping through it. Specification ETS300 294 [September 1997] gives all the details of the signal. It is based on a 5 MHz clock, with each symbol occupying 6 clock cycles, so the resultant bandwidth is quite low. This was deliberate so that it could be recorded on a VHS VCR without distortion. [Fig. 5]

To minimise any distortion to the video signal, it was decided to use current addition.

That way, there is no video through path. It is a technique that I have used

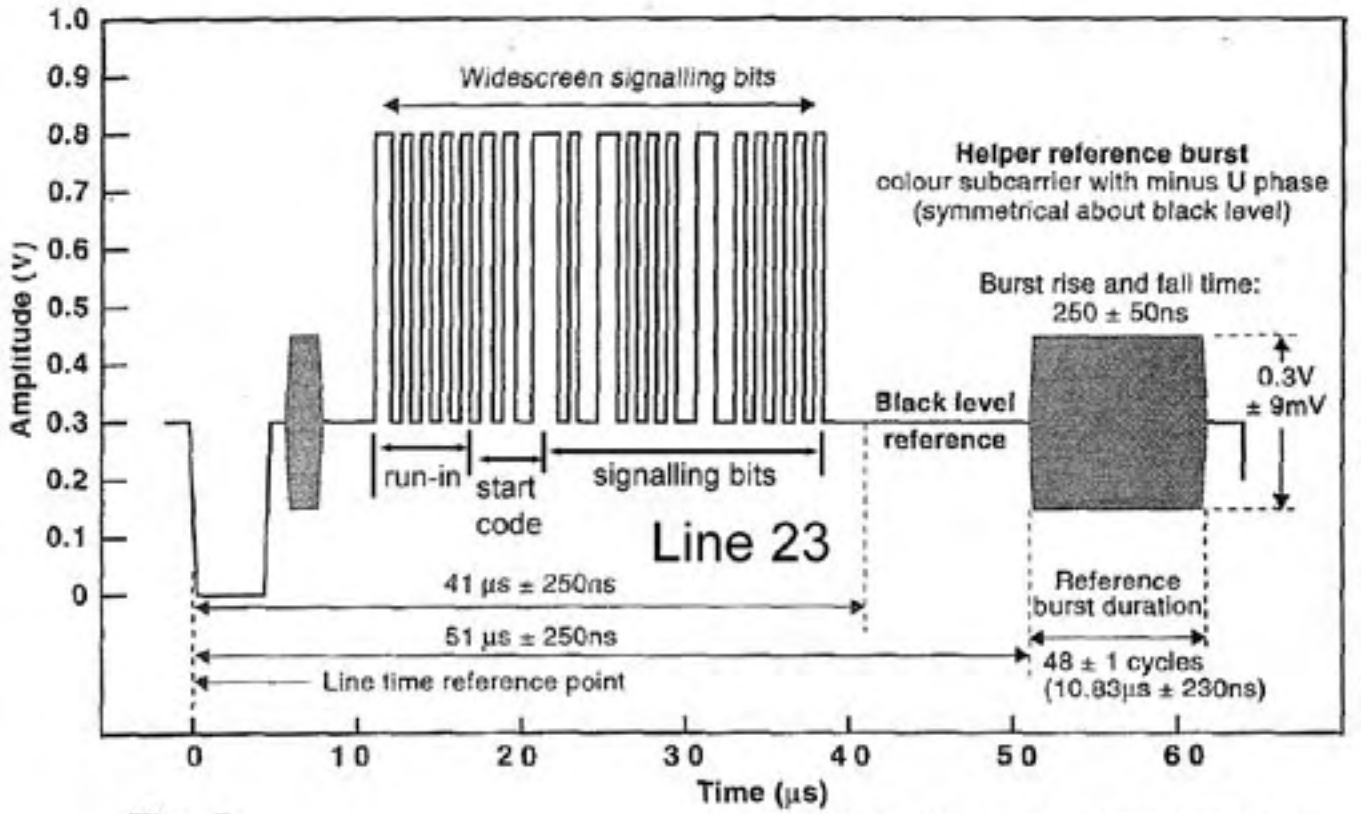


Fig. 5

FROM A PAPER PRESENTED AT IBC94 BY RICHARD ELLIS

very successfully on Source Ident and Cue Dot inserters in the past. If a Y/C signal is used, the L.23 signal is added to the Y channel only.

Experimental Result

A circuit was lashed up on a peg board to use separated sync from the through signal to make a gate for line 23, and 5 MHz locked to the input. An EPROM was programmed with a single bit according to the ETSI specification. Great was the joy when a PAL video signal was recorded on the DV machine with the L.23 signal; played back from a different DV player into the Pinnacle system, and was accepted as a 16:9 signal. Obviously, there is a flag in the Firewire DV bitstream to indicate that the picture is 16:9.

A further test involved recording a PAL signal with Line 23 flag on a Sony GR-D300 which is a simple DV recorder player, usually used as the player with the DHR1000 as recorder in an edit system. This too was successful.

Design of Line 23 Adder

Spurred on by this modest success, a proper unit had to be built for serious use in the edit room. One of the problems with inserters is that they usually have to have clamps and clamp pulse formers so that the dc of the inserted signal is correct.

However, with a data signal such as our Line 23 example, this is unnecessary. The video signal is normally at black for the first half of Line 23, so if current corresponding to the data is added, it will sit on the video signal correctly.

The circuit for this is extremely simple, consisting of a PNP current mirror driven by a pull down transistor. [Fig.6]

The first task for the adder is to decode Line 23. One of the useful attributes of the ubiquitous LM1881 [and its Gennum equivalents] is a frame output, high [1] for field 1, and low [0] for field 2.

A 12 bit counter [U2, 74HC4040] is driven by mixed sync from the LM1881 [U8], and reset by the inverted frame signal. The counter can then only count during field 1.

A diode AND gate selects the start of line 23 and toggles a bi-stable [U3a, CD4013]. The Frame signal resets the circuit. The edge of this output toggles a second bi-stable, [U3b] which is reset by sync. The output of this is a gate

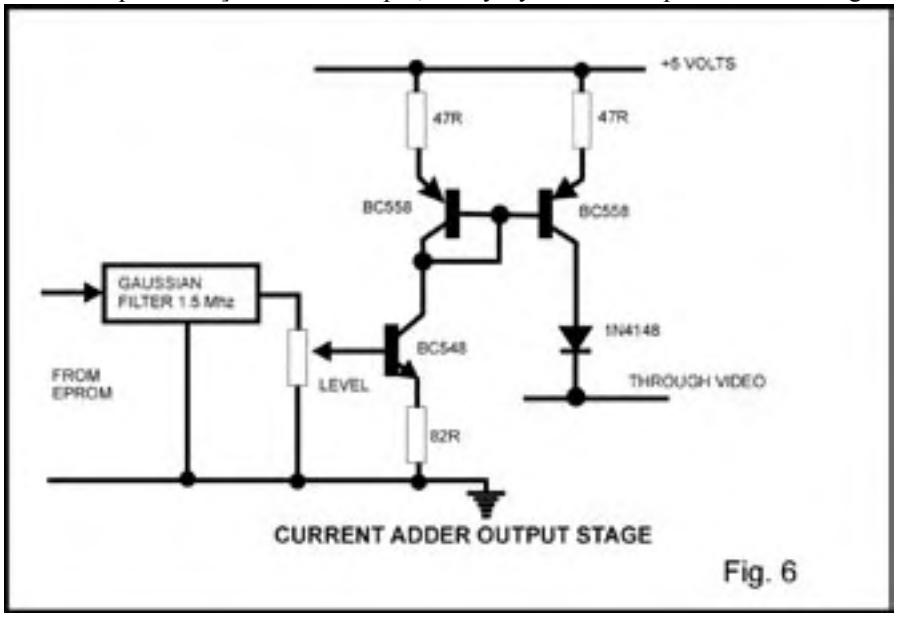


Fig. 6

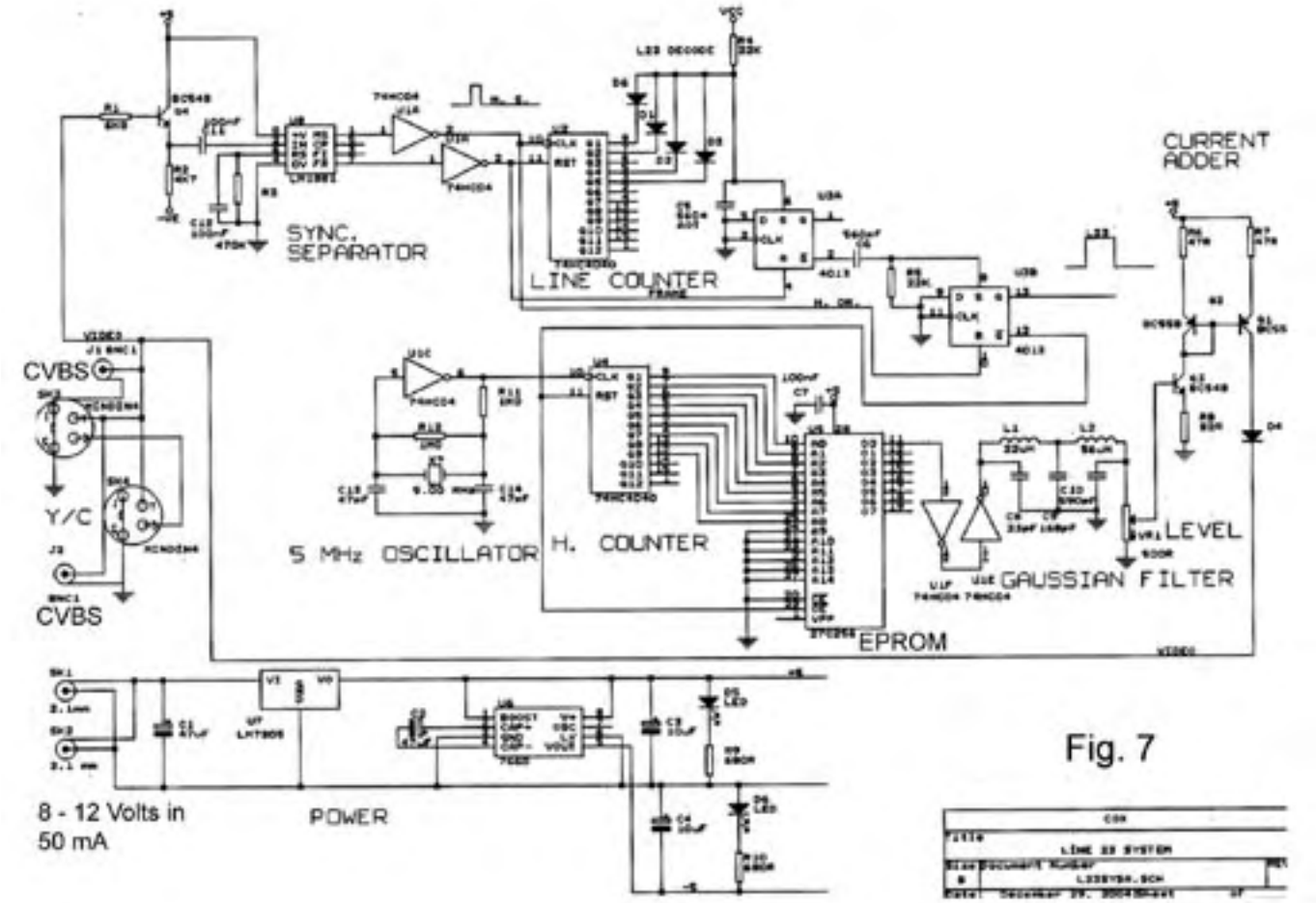


Fig. 7

signal during line 23. This is then used to enable a counter [U4, 74HC4040] clocked by a 5 MHz oscillator output, and also as the output enable of the EPROM. This is turn is addressed by the counter, and is programmed with the required code to enable 16:9 operation. [FIG. 7]

The bit 0 output from the EPROM is buffered, filtered by a Gaussian filter and fed to the current adder [Q1 – Q3].

In the original experiment, a simple monochrome SPG was used as it was lying around. It used a Philips SAA1043 chip, with a 5 MHz clock oscillator locked to the input signal. This clock was used to drive the H. Counter [U4].

However, this seemed to be over complicated, and a second version was lashed up using a free running 5 MHz crystal oscillator around a 74HC04 buffer. This proved to work equally well, and so is the version shown.

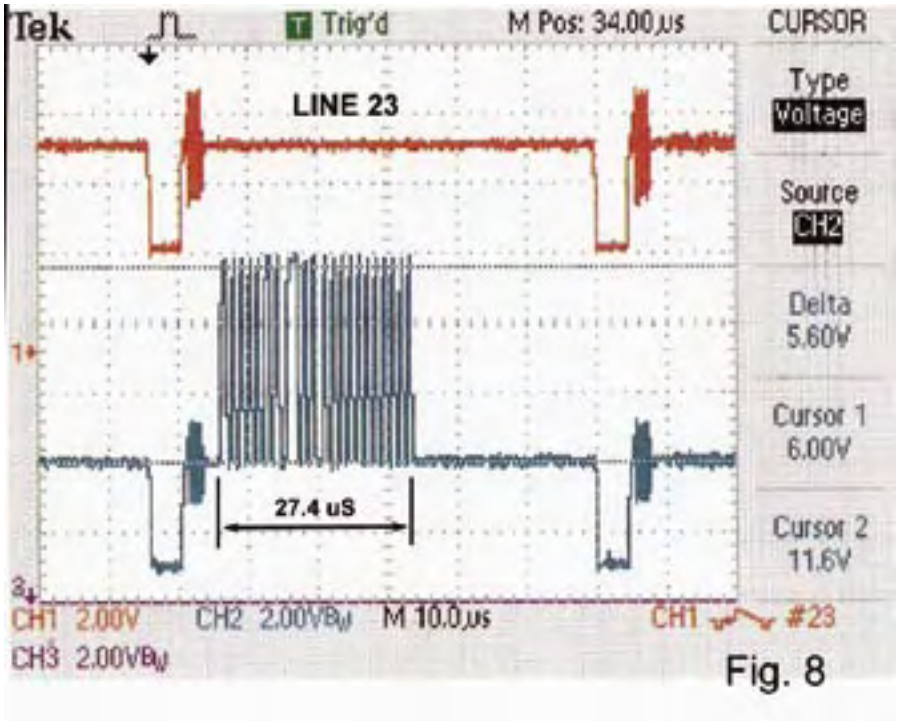


Fig. 8

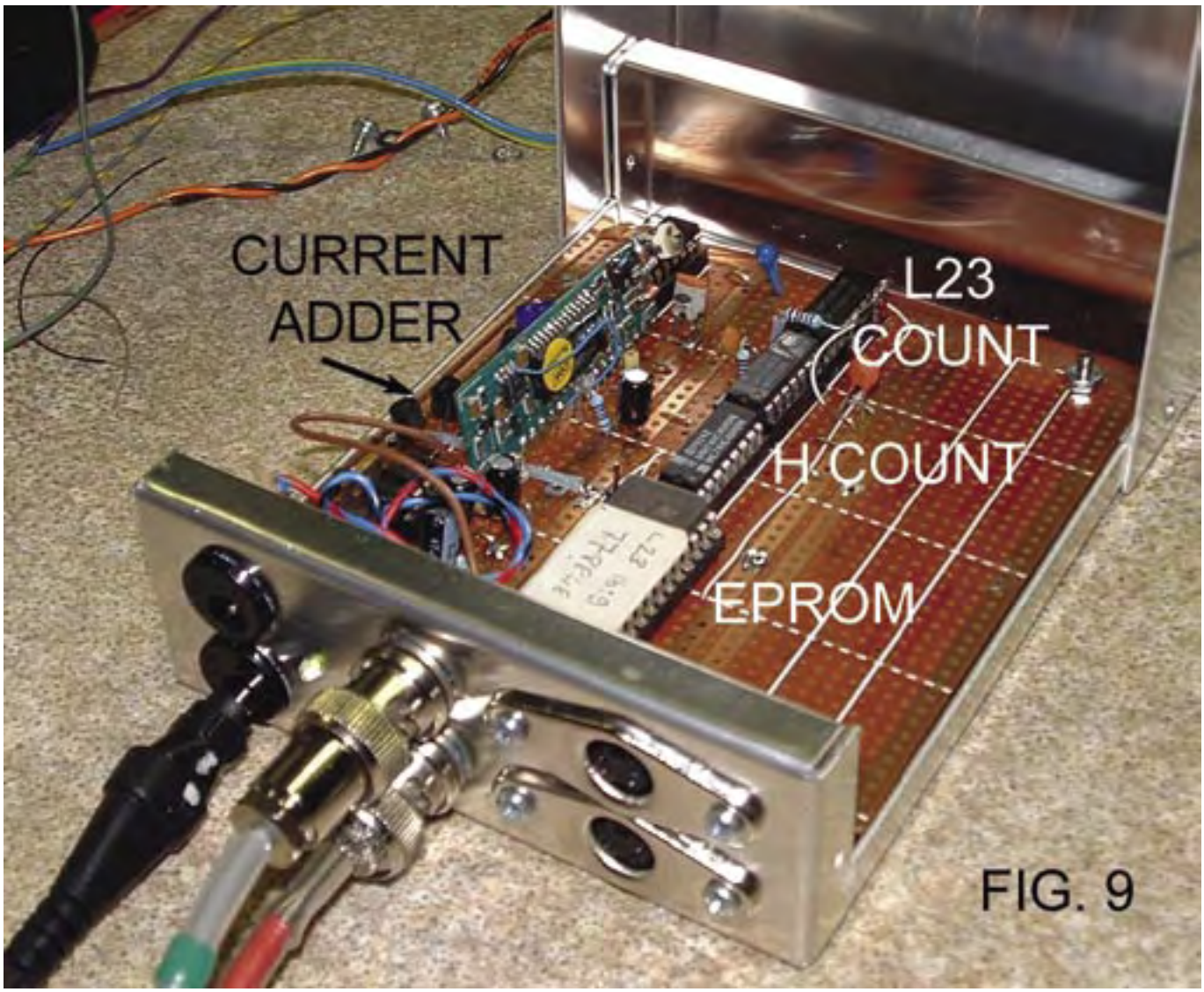
An EPROM seems also to be overkill, as only 500 bits are programmed, and only one output is used in a 256Kbit 70 nS device. The excuse, as always, is that they were to hand. An alternative would be a serial EEPROM.

Power comes via a 7805 regulator to +5 volts, and a voltage inverter [U6, 7660SA] provides a negative rail for the emitter follower driving the sync separator.

Fig. 8 shows the waveform of the device, with a blank signal above as reference.

The current draw of the complete unit is under 50 mA from an 8 – 12 volt dc supply.

A similar circuit can be used to add an ident. or call sign using Teletext type coding. The oscillator frequency may



need to be changed to 6.9375 MHz to suit text coding standards, or the 5 MHz oscillator can be used, and you can design your own coding system, using the run-in and start codes, followed by ASCII coded text characters. The line will need to be changed to 17 or 18.

Coding Method

The data line consists of a run-in section, start code, and followed by four data groups. [See Table 1 below]

Bi-phase coding is used, with one data bit period equal to 6 clock periods [1200 nS].

In this coding method, a "0" is represented by 000111, while "1" is represented by 111000.

The only data group that concerned me is the Aspect Ratio one. The others have all their bits set to zero. The Aspect Ratio wanted is 16:9 Anamorphic: - code is 1110.

If you have access to a programmer, it is very quick to enter in the data, remembering that to program bit 0 of the EPROM, a "0" is entered as 00, and a "1" as 01. Most programmers require Hexadecimal input.

Now that Digital Television is well established, the DVBS or DVBT box looks after the signalling and tells the display what to do. There is a signalling path in the SCART connector [pin 8].

Most Widescreen displays have various scan settings accessible through the remote control, with some having an Auto setting which will respond to external commands. However it all depends on operators setting the right flags at the play out centre. Quite often channels playing out archival 4:3 programmes forget this, and some strange stretched pictures result.

This has been a run-through of a fairly esoteric aspect of our technology. When a problem arises, it is nice to be able to find a solution. I can now bring various pictures as 16:9 into the Pinnacle system. An example is some of the graphics for the IBC Info Channel, which are created in PhotoShop at 960 x 576-pixel resolution.

Before they are transferred to video, they are re-sized to 720 x 576 pixels. The resulting anamorphic video is stored on the hard disc of my DPS

Table 1

Run-in	Start code	Group 1	Group 2	Group 3	Group 4
		Aspect Ratio	Services	Subtitles	Others
111110001110001110001110001111	000111100011110000011111	111000111000111000000111	000111000111000111	000111000111000111	000111000111000111
29 elements	24 elements	24 elements	18 elements	18 elements	18 elements

system. When played out on a 16:9 display, pictures have the correct aspect ratio. Now, thanks to the Line 23 adder [Fig. 9] pictures from the DPS system can now be brought into Pinnacle.

Fig.10 below shows the device connected into the system.

If any one wants a blown L23 EPROM to suit the circuit shown, let me know.

References

1. The PALplus Project: Conception to Introduction, R. J. G. Ellis, International Broadcasting Convention 1994 Proceedings, IEE 397, pp 8 - 19

2. Widescreen Signalling in the Studio and Production Environment, M. C. Connelly and R. C. Hopper, as above, pp 20 – 25.

3. ETSI Specification ETS 300 294 – September 1997

4. Teletext information – section 16.6.1, Television Engineering, Vol. 2, published by Royal Television Society, 1985, ISBN 0-7273-2105-6

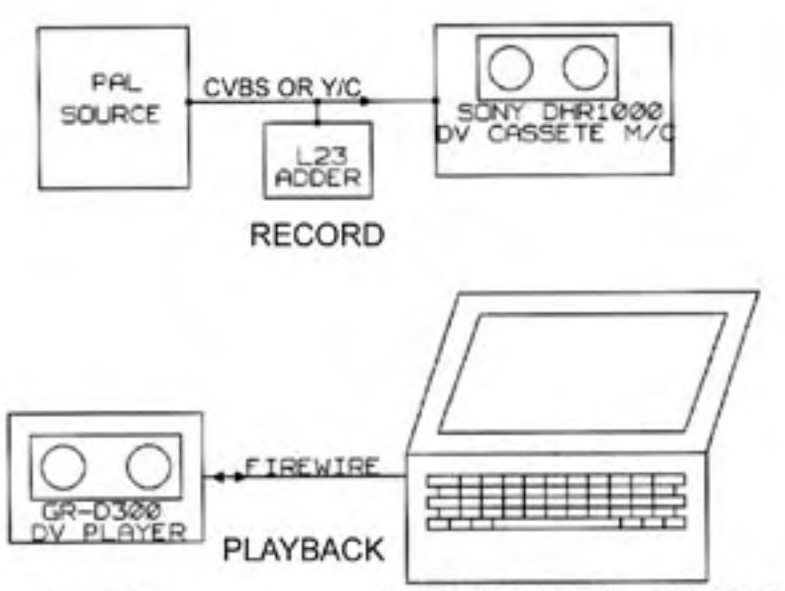


Fig. 10
DEVICE IN USE

The IEE John Logie Baird Memorial Lecture

1st JUNE 2005

Wednesday at 7pm

Electric and Musical Industries Ltd (EMI) Contribution to the Development of Television 1931 to 1978

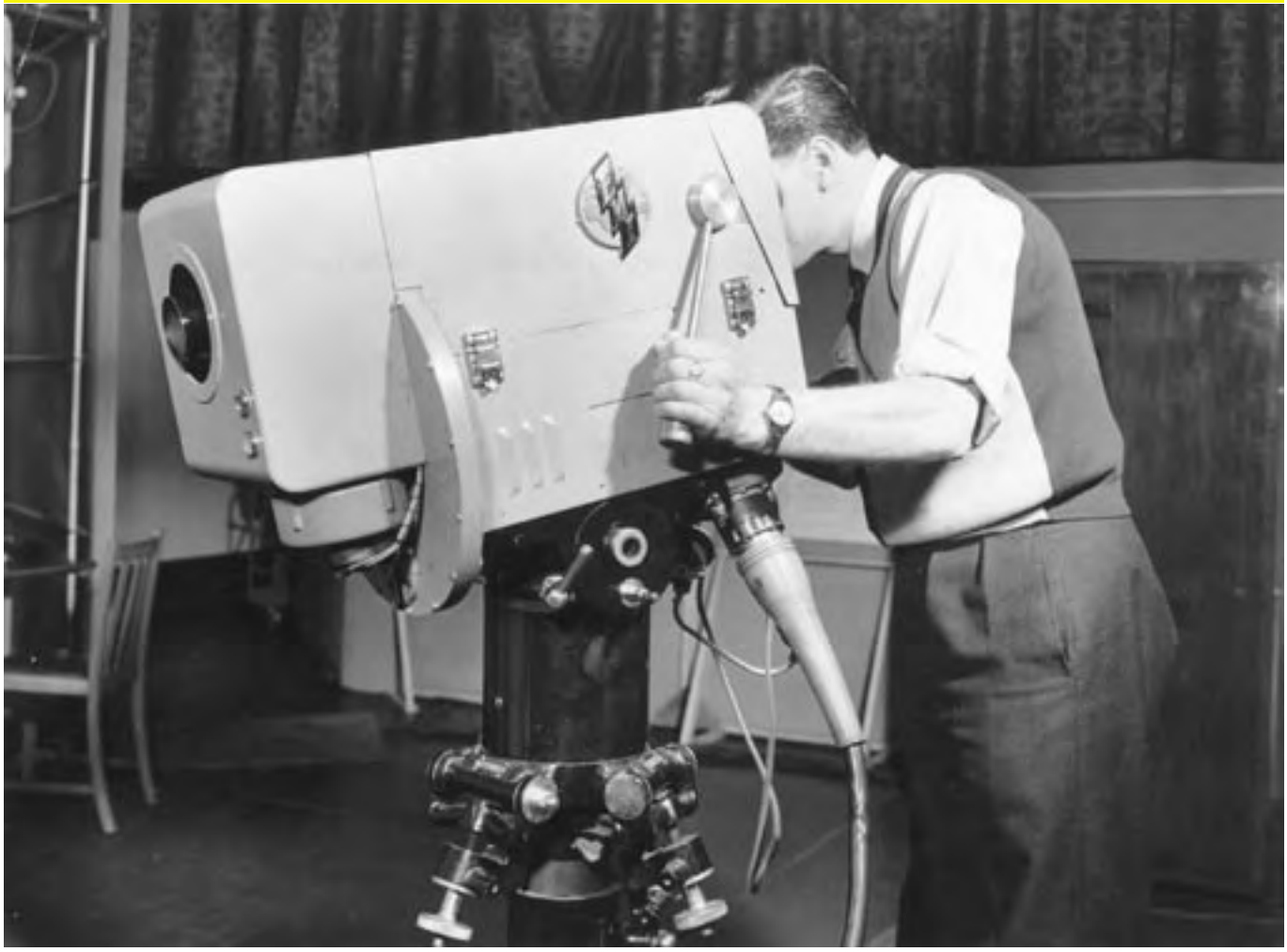
THE DREAM TEAM THAT INVENTED PRACTICAL TELEVISION

In April 1931, two companies, the Gramophone Company (HMV) and the Columbia Graphophone Company, whose businesses were based on the recording and reproduction of gramophone records but who were also already interested in television, merged to form Electric and Musical Industries Ltd (EMI). One of the first projects of the combined research laboratories was the development of an all-electronic television system. To do this, EMI assembled one of the finest groups of engineers and scientists in an industrial company the world has ever seen. People such as Shoenberg, Blumlein, Condliffe, McGee, Lubszynski and White. Their work caused the famous scientist, Lord Rutherford of the Cambridge University Cavendish Laboratory, to say 'they are carrying out almost pure laboratory physics and then applying it directly to industrial work.' When they started their television work at EMI the state of the television art was mechanical scanning at 30 lines and a bandwidth of 5KHz; when they finished it was 405 lines and 3 MHz. In developing electronic television they had also invented the circuits that are still widely used today in electronic designs. How this was achieved and how EMI progressed the development of television, through telerecording, 1000 line systems, transmitters, aerials and colour until they withdrew from television equipment design in 1978, will be told. This will be an audio-visual presentation, much of which has not been seen before by the general public.

Presenter: Norman Green

The IEE Lecture Theatre, Savoy Place, London WC2R 0BL

EMI Colour Camera 1953



Circuit Notebook 86

By John Lawrence GW3JGA and David Ellis Jones GW8PBX

3cms Input Indication and Switching for the BATC I²C Repeater Control System

GB3TM

GB3TM is our local 23cms ATV Repeater and is located on the North East corner of the Isle of Anglesey in North Wales. It has been operational since July 1994 and serves the North Wales Coast and under lift conditions EI, GI, GD, also G along the Lancashire coast.

Input is on 1249 MHz and the output is on 1316 MHz. It uses the BATC I²C logic control [1] and when in beacon mode it displays a sequence of captions including two news pages. When a valid input signal is received, the logic switches over to repeater mode and re-transmits the incoming video and audio signals. There are certain points in the sequence of captions where the response to a valid signal is immediate; otherwise there may be a delay of up to 30 seconds until the display of a caption has been completed. A block diagram of the 23cms repeater prior to 2004 is shown in Fig.1

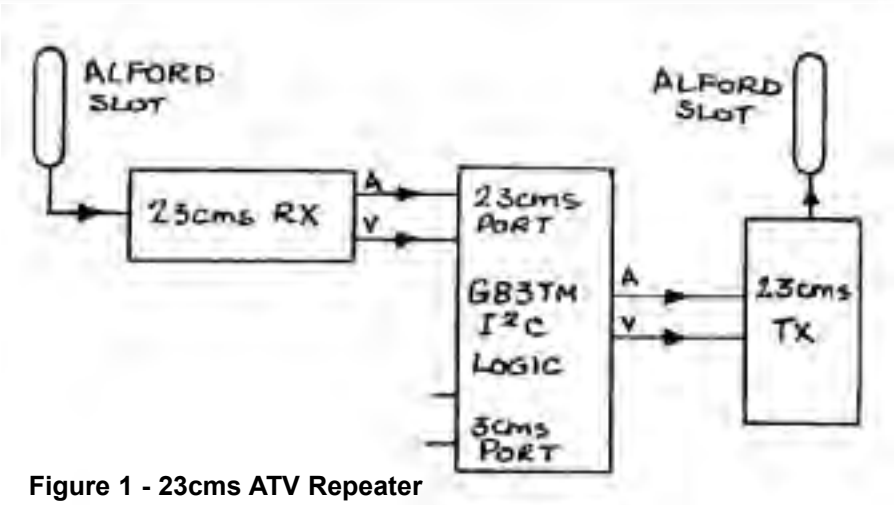


Figure 1 - 23cms ATV Repeater

BATC Logic

The BATC I²C logic control has two audio/video inputs, one for 23cms and one for 3cms. The logic detects which input carries a valid video signal and switches this input through to the output and to the 23cms transmitter. In the event of both inputs being valid, the first one which becomes active takes priority, until it drops out, at which time the other input is switched through to the transmitter.

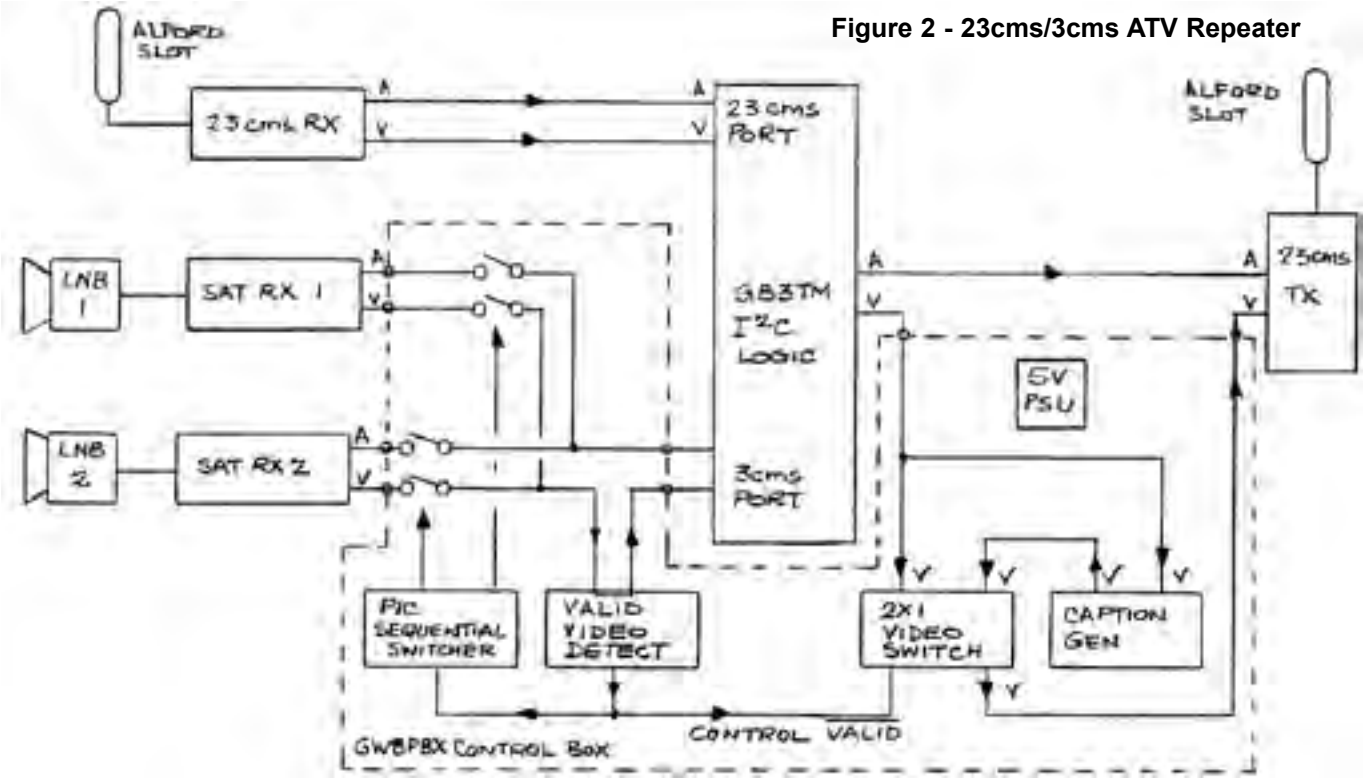
3cms Receiver

In 2004 an experimental 3cms receiver was installed on site (and connected to the 3cms input of the I²C system) to determine the possible service area on this band. It consisted of a conventional satellite receiver and an open-ended LNB. Tests were carried out using simple 3cms Gunn diode transmitters with PW dishes [2] and by monitoring the return signal on 23cms. Because of the logic delays in switching over to repeater mode on 3cms it was difficult to beam the transmitting dishes on to the repeater. It was necessary to swing the dish very slowly or the correct direction was passed before the signal was re-transmitted. It was decided that an immediate indication of a valid 3cms signal was necessary. See 'Immediate indication of 3cms Signal' below.

Dual Receivers

Because of the location of GB3TM, with rising ground and the Irish Sea to

Figure 2 - 23cms/3cms ATV Repeater



the north, the most likely direction of a 3cms signal would be from the East, South or West. To cover this area, two LNBs were installed; each covering about 90 degrees and each having a satellite receiver, thus providing two audio/video receive channels, both on 10.340GHz.

The A/V signal from each receiver is taken to an A/V switching unit [3] to sequentially sample each receiver's output (East – South, South – West) at about 1 second intervals. The output from this switching unit is taken to a Valid Video Detector [4]. On receipt of a valid signal from one of the receivers, the switching sequence is halted and the valid signal is passed to the 3cms input of the repeater logic system. If the signal drops out then the switching sequence resumes. If a valid signal is received on both receivers then the receiver capturing the signal first, holds it.

Immediate indication of 3cms Signal

So far, so good. The valid 3cms signal is taken to the 3cms input of the repeater logic. To provide an instantaneous display of, for example '3cms Active', use is made of a second A/V switch and a Caption Generator [5]. This second A/V switch is controlled by the Valid Signal Detector to switch between the "straight" video from the logic unit and the same video but with caption inserted. When any 3cms activity is detected, the '3cms Active' caption is carried by the video line to the transmitter and so appears immediately over any pictures being transmitted, as shown in Fig.3.

In due course, the repeater logic senses the 3cms input signal and switches this through to the 23cms transmitter in the usual way, the '3cms Active' caption remains in the picture until the 3cms signal drops out.

Construction

The various parts of the circuit are built on separate circuit boards and the complete system is housed in a die-cast mega-box, as shown in Fig.4. The 5v regulator on the caption generator has been removed as a stable 5v supply is provided within the box.

Future modification - Emergency bypass

A relay is to be incorporated to switch the output of the logic unit directly to the transmitter input in the event of a power failure in the box. This will bypass the box completely, allowing the repeater call sign and standard 23cms operation to continue in the event of such a failure.

Figure 3 - '3cms Active' Display

References

[1] An Intro to the I^{2}C Book - Trevor Brown G8CJS, CQ-TV 152 p.18

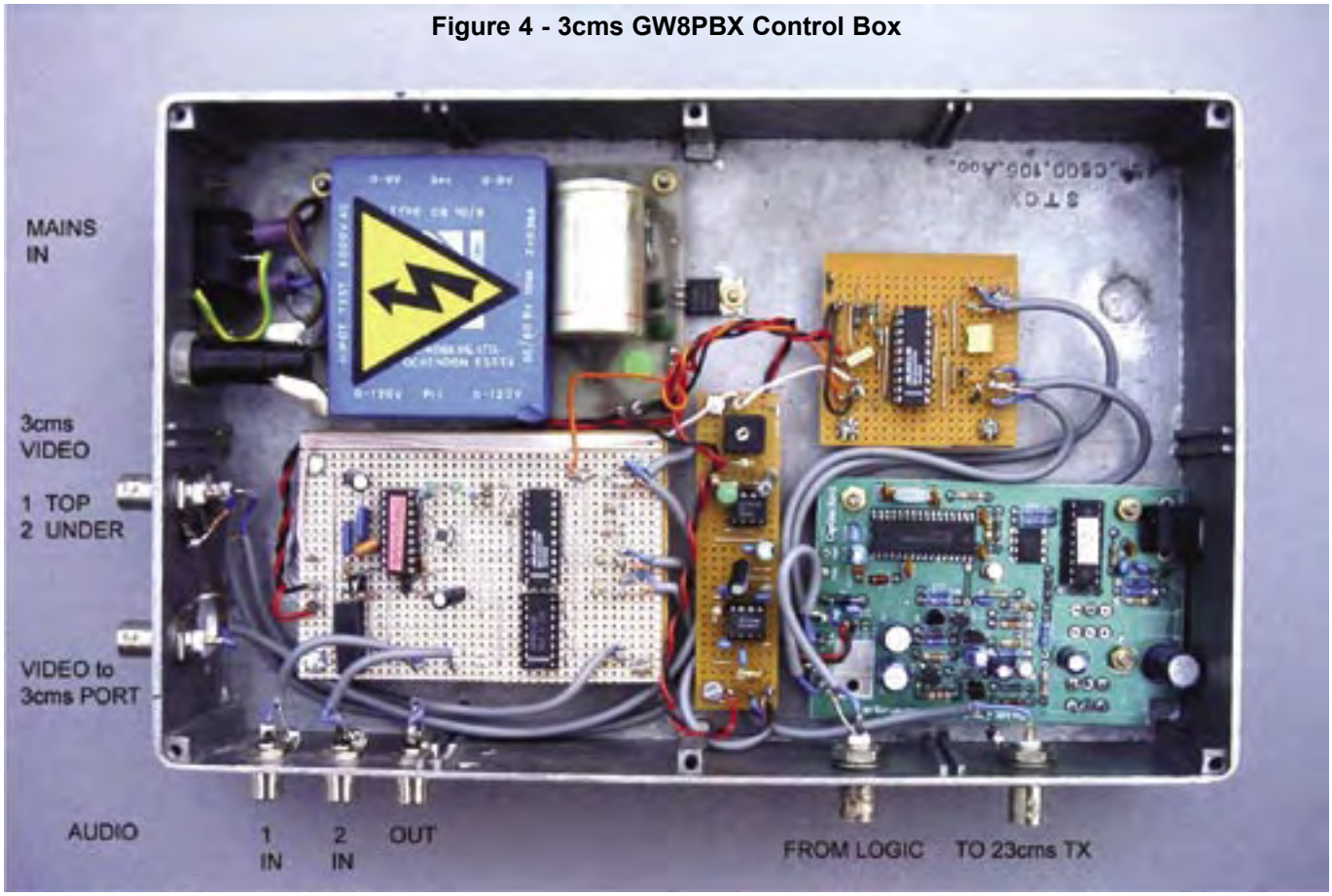
[2] 10th Anniversary for GB3TM - CQ-TV 208 p.25

[3] A/V Switcher - Circuit Notebook 85, CQ-TV 208 p.35

[4] Video Detector - Circuit Notebook 83, CQ-TV 204 p.39

[5] A Low Cost Caption Generator - Steve Drury G6ALU CQ-TV 201. p.23

Figure 4 - 3cms GW8PBX Control Box



A Dish on 23cms!

By Brian V Davies, GW4KAZ.

Well not quite, I was looking to build a simple antenna for 23cms portable work. I came across a design in the UHF Compendium by DJ9HO, which seemed interesting and not too difficult to build - a twin Quad with a stated gain of 11dB. Having read and studied the design, I decided to look for suitable materials to build the antenna.

Fig. 2

The original design called for 25 cms square PCB material for the reflector and a means of support for the driven element, with the element itself made of 4mm diameter copper wire. I did not have the above to hand, so in amateur radio, improvisation is the name of the game.

First the reflector. Various bits of aluminium were looked at, and indeed would have done the job, but eventually from the xyl's kitchen came a pie dish! This has a diameter of 300mm, with a 30mm edge, which looked good - the raised edge giving the reflector some strength. I had some 2.5mm diameter copper wire; a length of 50cms is required to form the driven element. To support the driven element, I used a standard electrical plastic conduit end box. It was ideal for the job, in providing support for the driven element plus a terminating box for the connection between the coaxial cable and the driven element. One other piece of electrical equipment was used - a compression glad. This clamped on the coaxial cable, and held the reflector to the back of the conduit box. All this was formed into a twin quad antenna for 23 cms.

The quad was formed into a double diamond shape from the 2.5mm dia copper wire, as fig 1. The sides of the diamond are 6cms, with a suitable gap in the centre to connect the coaxial cable. I found it easier to form the complete twin quad from one length of wire. Start the formation at the centre where the element is connected to the coaxial cable. After forming to shape, you should have the two open ends of the element such that they can be soldered to the braid of the coax, with the centre conductor of the coax connected to the other common point of the twin quad. The cable was soldered directly to the element, and covered with hot melt glue to keep moisture out. This was the first step complete, with the coaxial cable being of any required length, and terminated preferably with an N type connector. However do not fit the N connector yet, as the coax needs to be fed through the cable gland!

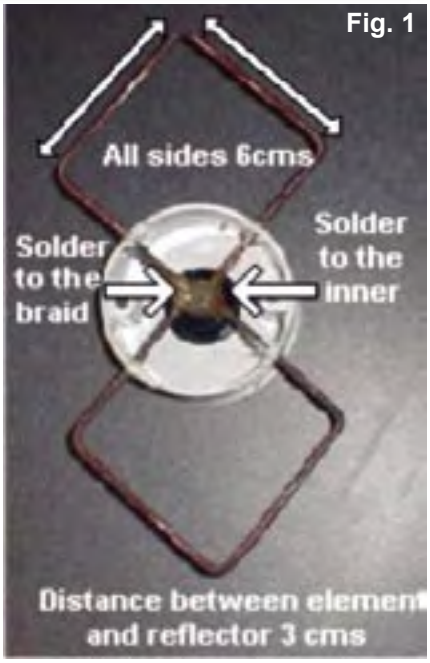


Fig. 1

Next find the centre of the pie dish, (or whatever material you use for the reflector), drill a hole 20mm at this point, which will allow the cable gland to pass through. If the conduit box has no 20mm hole on the back, then a hole needs to be cut in this also! Fig 2. Now feed the coaxial cable through the gland, conduit box and reflector. Pull the coaxial cable through until the driven element is flush with the end of the conduit box, and complete the fitting of the compression gland. Before you tighten the gland, it is advisable to recess the driven element into the open end of the conduit box. With the element in place, mark where the element touches the plastic box, and either cut into the box a few millimetres so that the element is recessed into the

Fig. 4

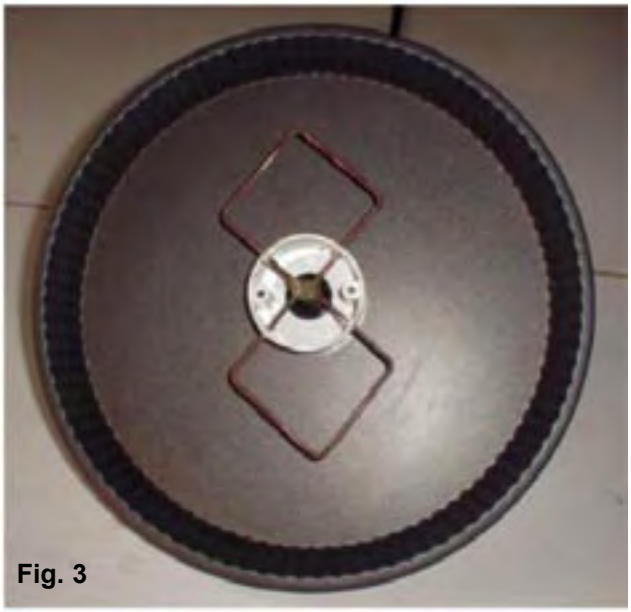


Fig. 3


Fig. 5

box, or just heat the element sufficient to melt the plastic, this will help to keep the element in place and possibly help in reducing the ingress of water. Check that the element is recessed enough so that the lid of the box rests perfectly. The sides of the conduit box are usually about 3cms, which is the distance between the reflector and driven element! It may also be advisable to drill a small hole in the bottom of the conduit box; this will allow any water to drain out. Fig 3 & 4. This done, the cable gland can now be closed as tightly as possible, and the antenna is completed. Fit the N connector and test out. If all is well it should give a good account of itself. Mine does work!

Fig 5 shows my complete portable receive system, Maspro satrx converted to 12v dc operation, band pass filter (look-though) so that I can see my own signal through GB3TM and the "dish antenna". The twin quad orientated as shown is horizontally polarised.

I scaled this design to 13 cms, with the driven element sides of 3.3 cms, distance between driven element and reflector 1.65 cms, with the reflector being 13.75 cms square. With this version, I simply tinned the braid, and soldered the PCB reflector to the braid; this antenna also works well, and can be fitted into a plastic box for weather protection. Fig 6.

Fig 7 shows the connection of the driven element to the coaxial cable.

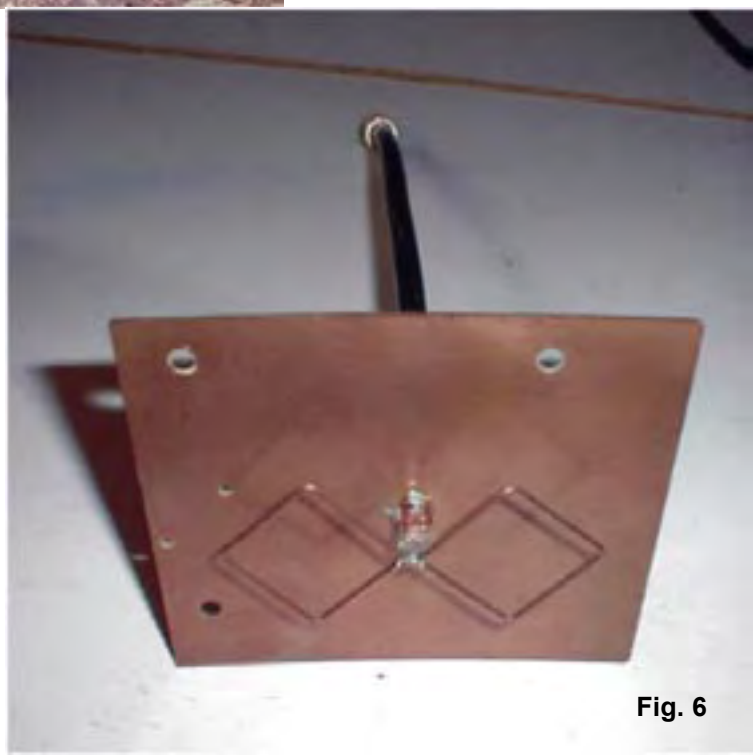


Fig. 6

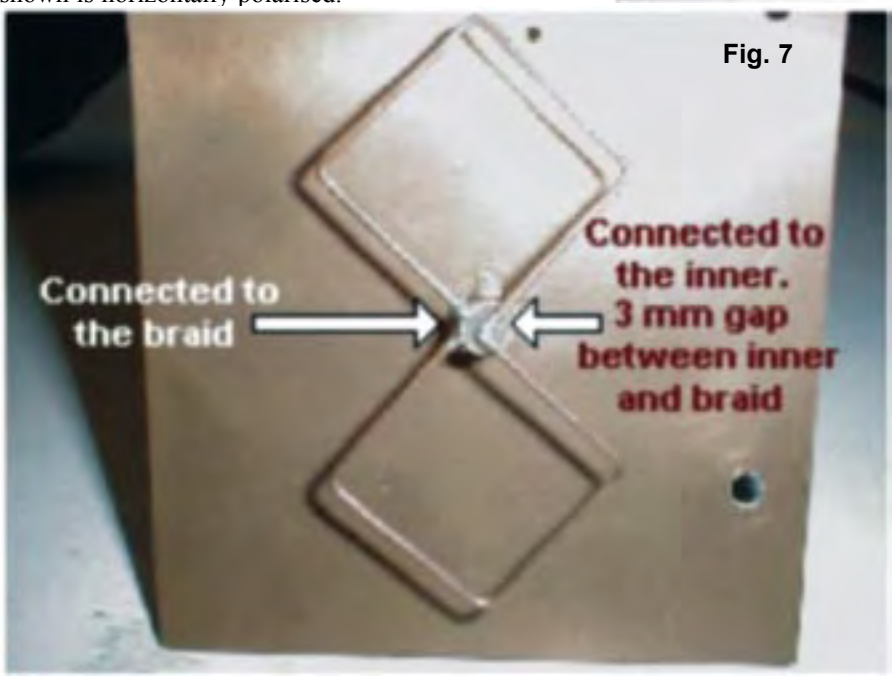


Fig. 7

References:

Twin Quad antenna, UHF Compendium, DJ9HO

Maspro conversion to 12v, CQTV 183, GW3JGA.

Band pass filter, CQTV: 190 &196

Garth RF Filters, http://www.gw4kaz.cymru1.net, http://www.bvdavies.org.uk

My Email address: gw4kaz@cymru1.net

ATV meeting Ulm (southern Germany)

By Klaus Welter, DH6MAV

Digital repeater operation and linking on 10 GHz was a main theme in Ulm on Sept. 24 in 2004. On a bright and worm Octobre Sunday more than 60 visitors from up to 150 km away came together. Rolf DL6SL welcomed them at ten o`clock am, and Ewald DK2DB sent best regards from the VHF/UHF/SHF manager of DARC, Hellmuth DF7VX. Then he explained the new restriction to 5 Watt ERP between 1248 and 1263 MHz in Germany for single stations and repeaters (some of them were shut down already). Originator is the military - no objection possible. Ewald suggested maximum power on the rest of the 23 cm band.

Ethernet reused

Next was Stefan DG7NDV presenting his digital broadband linking ideas via ethernet network cards. Centering on ATV repeater DB0SCS in Nuremberg he is using FM satellite TV receivers as RX (baseband output needed). Maybe the IF has to be modified. In order to reduce the bandwidth requirement the ethernet card crystal 20 Mhz is to be replaced by an 8 MHz type. Now the 3,2 MHz rate fits to nearly every FM-TV TX, but the overall rf bandwidth of 30 MHz is advisable only for direct 10 GHz links. Maintenance is possible with only an oscilloscope to view the eye pattern. If using a Hauppauge video card you need a video vox circuit to avoid PC crashes caused by random rf noise! Stefan got much applause for his ideas and for his juvenile enthusiasm. More details see at www.atvlink.de

Green power

For Thomas Kalmeier DG5MPQ electricity is green - he explained the alternative power supply at the Hesselberg relay DB0HTG near Noerdlingen (southern Germany). It is the only possible solution at this site - first design calculations were 1 KWh for the PR-digipeater and 0,5 KWh each for Phone and ATV repeater every day. Goal was to get power security at least 48 weeks a year, indeed the 800 Ah lead accumulators have been empty only for 30 hours. Current supply is coming from two photovoltaic constructions and a wind energy - pardon, wind control application. To call it “wind energy generator” was not approvable - that`s another class. A propeller of 115 cm diameter can only work as measuring device, even if it delivers 400 to 600 watt...

Thomas warned to erect such devices within residential areas, because it sometimes generates a terrifying noise - especially to the dismay of unaware wanderers...

Gained experience

There is much know-how embedded in the photovoltaic construction - with every degree kelvin lower efficiency rises by 0,4 percent. In cold times that gaines a lot - if the power output is too high, ventilation is added which helps to reduce moisture in the bunker containing the whole installation. The panel`s angle has been reduced from 65 to 33 degrees in order to reach an optimum in winter time. Power ouput data are recorded every minute and made available via Internet - we saw it live on the beamer screen. Thomas estimates about 75 percent overall power from the panels and the rest from the wind energy - pardon, wind control application. ATV repeater DB0HTG is linked to DB0SCS, a Windows-based video splitter connects 11 video inputs to 8 outputs.

Fibre optics wanted

Peter DL2GMP proved his sporty ability by reporting his climb to the top of a 175 m transmission tower inside the glass reinforced plastics shell carrying 20 kg of baggage. ATV installations at the “Höchsten” repeater are placed in a white part of the shell which Peter rates better for the GHZ antennas than the red parts because of attenuation effects. Now Peter is surching for 8 pairs of fibre optic cables 200 m long, his e-mail is DL2GMP@darc.de

DARC funding Digital ATV repeater

Guenter DL9SA calculated the expenditures for the DATV repeater Reutlingen DB0FMS to 3000 Euro as a first measure, and DARC promised 1050 Euro. Guenter sees following advantages in DATV: max. four “programmes” within one 16 MHz channel, ecxcellent video quality, more range, new experimental incentives - but also

Digitale Linkstrecken mit wenig Aufwand erzeugt: Stefan, DG7NDV

some disadvantages: viusal sight needed, temporal delay, echo effects on the callback channel. Delay is caused by the (MPEG) compression, and rf bandwidth of 10 MHz should make no problems. It`s even possible to be more narrow...

Low audio data rate

Horst DL2GA is the new person in charge of DB0QI in Munic. In parallel to the FM-TV output on 1276 MHz with 10 Watt there is a DATV output on 1247 MHz with 3 Watt. While experimenting with data rates they reduced audio streams to 64 instead of 192 Kb/s in order to get along 4 “programmes” into a QPSK channel of 7,5 MHz bandwidth with -38 dBc “shoulders”. The four video signals are 1. analog input DB0QI, 2. link from DB0TVM (Munic Olympia Tower), 3. link from OE2XUM (Salzburg, Austria), 4. Quad split 1 - 3 plus indoor camera and a test pattern. Range of analog and digital outputs are equal - but think of smaller bandwidth and less power with digital ATV...

Same story with DB0OFG (Hornisgrinde, Black Forest), which Klaus DC1GS tested at home before installation on site. He produces a 1 Mb/s programme, a middle class and

Hannes, DC9MD, widmet sich dem Stereo-Standbild

Im Süddeutschen mit Magnetwirkung: Das jährliche Ulmer ATV-Treffen

a 5,2 Mb/s broad programme, which results in -40 dBc shoulders before the PA and -30 dBc after it - sufficient for him. The analog output of DB0OFG is at 1278 MHz, the digital at 1291 MHz - to reduce problems for receivers he lowered the power output on 1278 MHz by 10 dB.

Darko OE7DBH installed an ATV repeater on Valuga Mountain with an output on 10450 GHz directing to Germany, and Utz showed us some pictures from there. Peter DB2CC reported that DB0IV in Augsburg will relocate to a new site on a high building with antennas 124 m above ground. Construction pictures are available under www.db0iv.de

Hannes DC9MD had brought an eye catcher, his red-green-3-D color pictures produced astonishing spatiality using 3-D spectacles. For the photos he took two digital NIKON cameras, where the synchronous activation is a demanding task. The overlay of both color extracts is made with a PC program called "Anamaker", surch for it at Google...

In the end the event`s organizer Rolf DL6SL reported about the state of the local ATV repeater DB0ULD in Ulm and closed the session, but afterwards some eyeball QSOs were seen with coffee and cake, and the presence of vendors like ID-Elektronik and eisch-electronic was used for shopping.

Reprinted from TV-Amateur 135, http://www.agaf.de, translations: Klaus, DL4KCK

Lazy days. OB van displays are really hard work. Time for a kip? Picture by Dicky Howett

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69 5.0MHz crystal	£3.25	£0.30		
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The Amateur TV Compendium (155gm) The BATC handbook featuring construction articles on video units, 24cm and 3cm ATV, a Digital Frame Store, and much more.	£3.50		
The Best of CQ-TV (150gm). A compilation of the best construction articles from CQ-TV's 133 to 146	£3.50		
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ATV Repeater Valluga 2809 m ASL

By Darko Banko, OE7DBH

In June 2003 I asked for permission for a repeater site at Valluga Mountain in the Austrian Alps and got the callsign OE7XSI with the help of OEVSV in April 2004. With three mounting actions under co-operation of several radio amateurs the ATV repeater besides a voice- and a packet-radio node was installed in a 19 inch rack. Since September 2004 it is on duty much to the delight of german and austrian amateurs.

Technical data:

QTH Valluga summit 2809 m ASL, near St.Anton am Arlberg, horizontal sight from nothwest to north

TX QRG 10450 MHz FM-ATV, transmitting nonstop 250 mW into a 20 dB horn antenna, vertical polarisation,

1. direction to Friedrichshafen, Germany (Lake Constance)

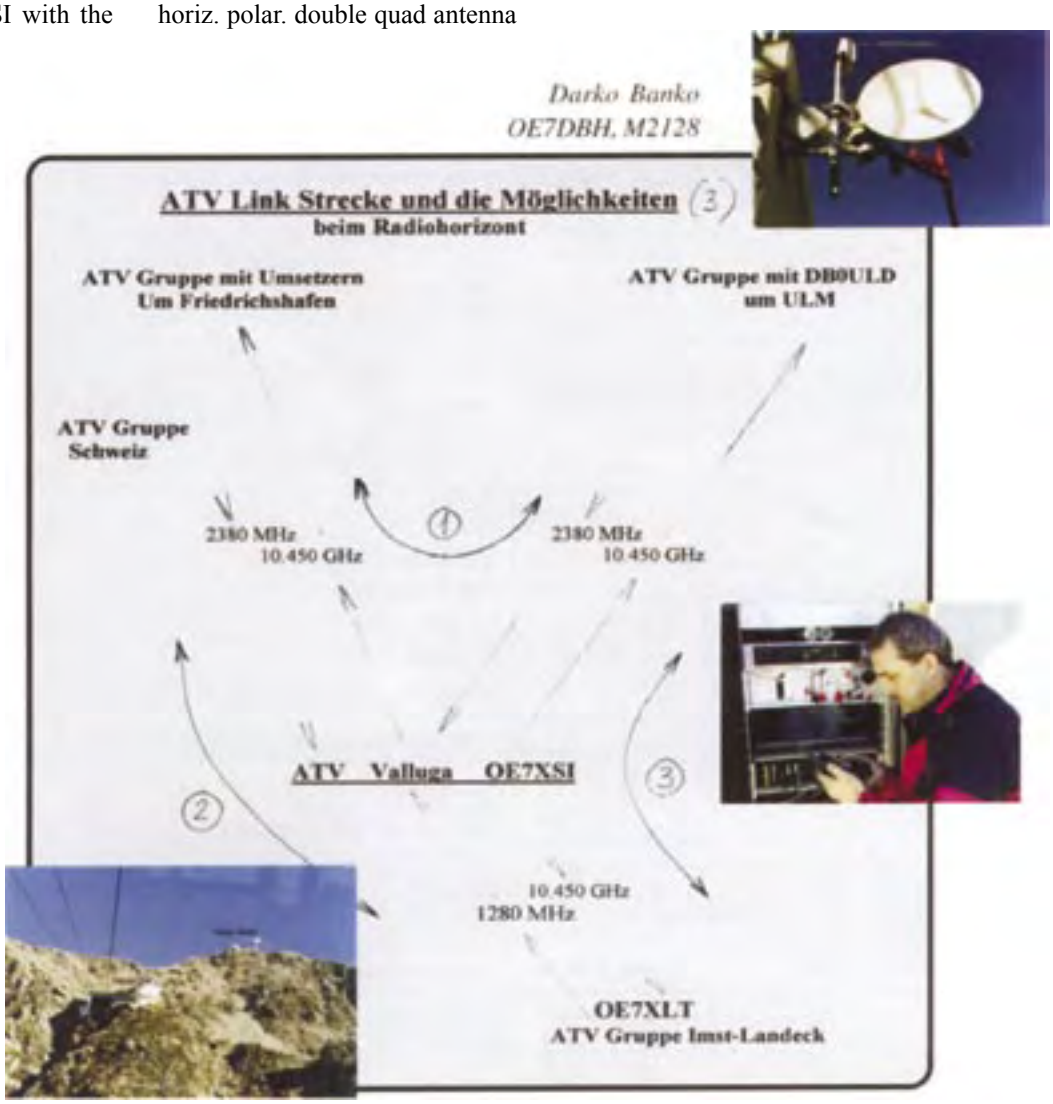
2. direction to OE7XLT near Landeck (Tirol) - sound subcarrier 6,5 MHz

TX/RX control via DTMF on 2 m (request via e-mail oe7dbh@tirol.com)

RX QRG from Germany 2380 MHz, horiz. polar. 8 element group antenna - sound subcarrier 6,5 MHz

RX QRG from OE7XLT 1280 MHz, horiz. polar. double quad antenna

Reprinted from TV-Amateur 135, http://www.agaf.de, translations: Klaus, DL4KCK



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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.*

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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.

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