CQ-TV 206

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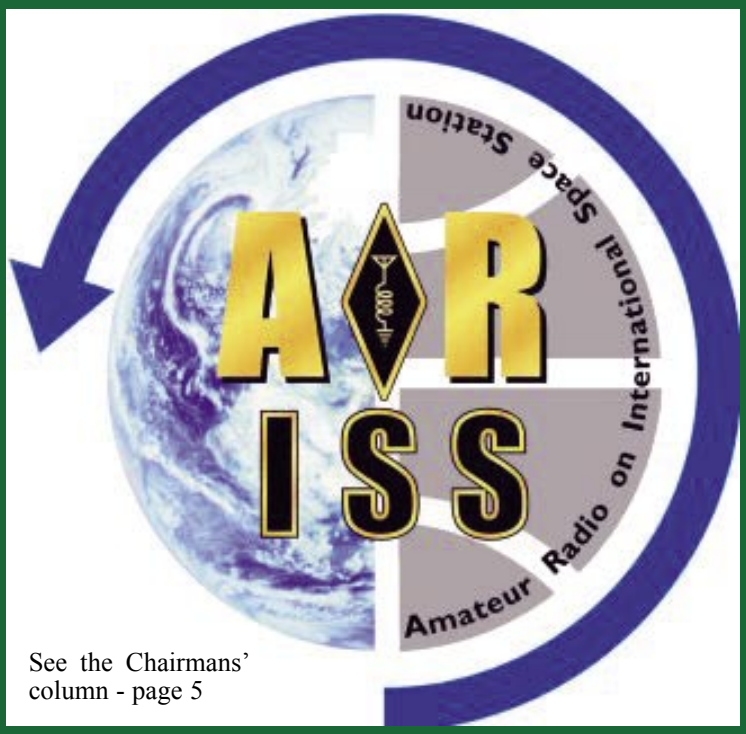
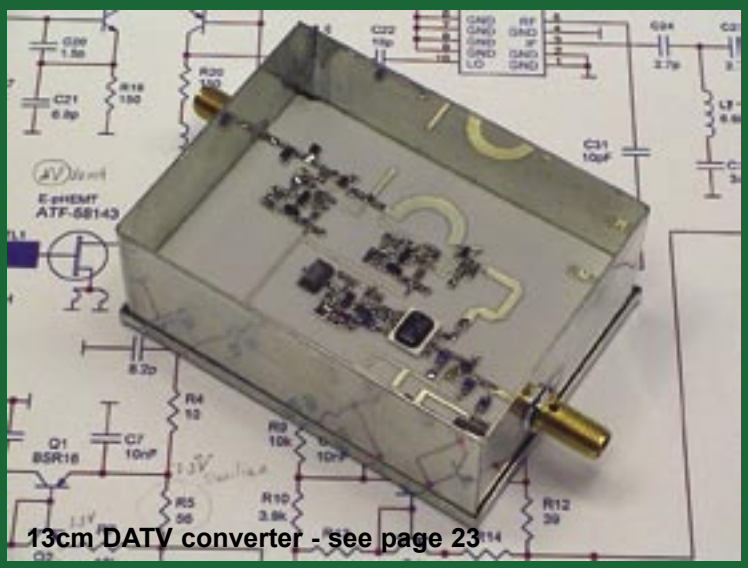
BATC



See the Chairmans' column - page 5



13cm DATV converter - see page 23

May 2004

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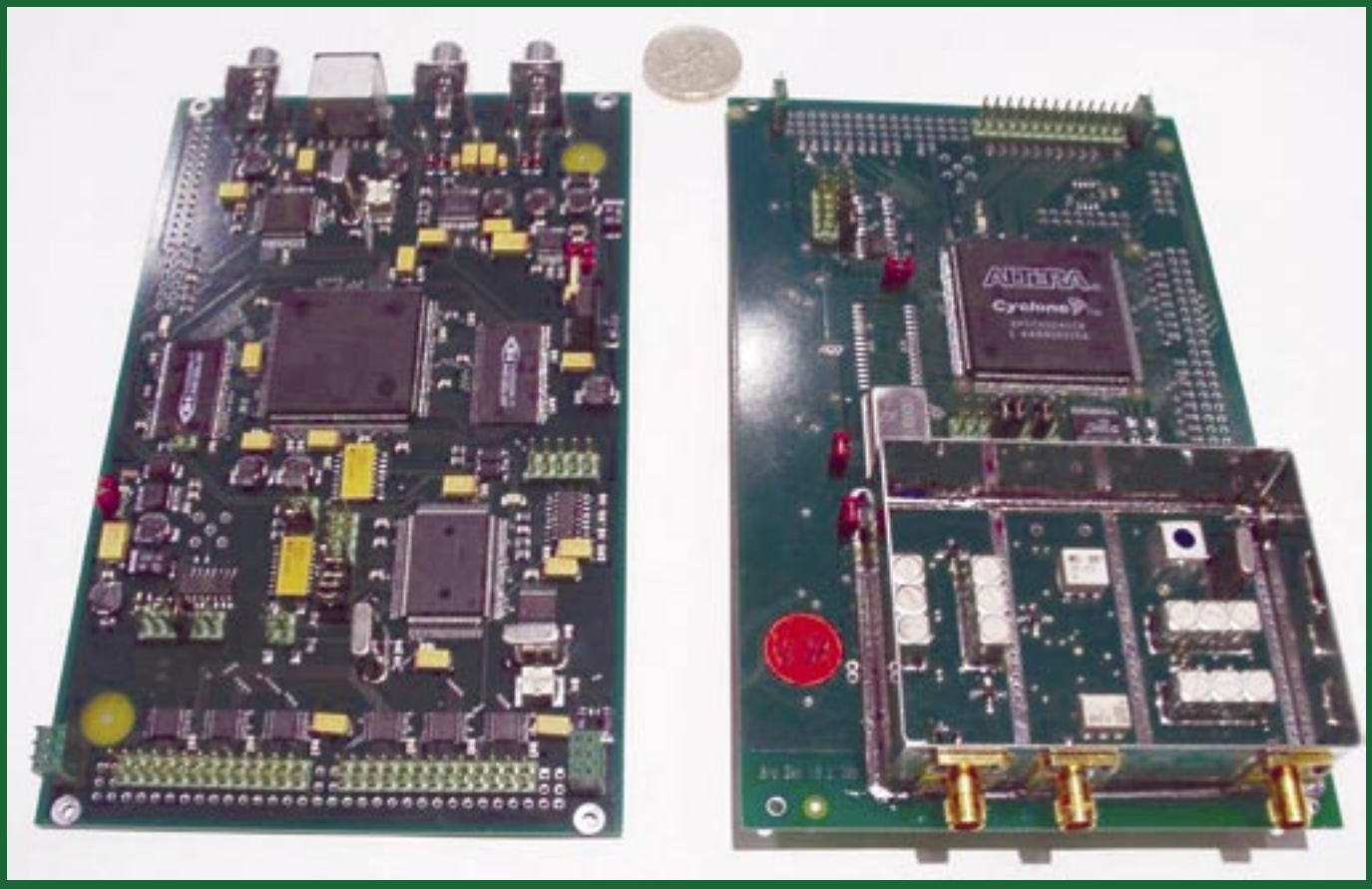

The DATV units, photographed by Graham Hankins at the recent committee meeting

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*
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- ►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*

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CQ-TV 206

Contents

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Chairman's Column

By Trevor Brown

DATV is on the move again. The Worthing repeater GB3RV is equipped and waiting for a "Notice of Variation" (NoV) to start operating. GB3HV is also equipped and has been radiating frequent transmissions. Reports are very encouraging; pictures received over a 50 mile path that would normally produce a P1 analogue picture are being viewed at P5

The long awaited DATV units, developed at Bergische University, Wuppertal, have arrived on my desk - you can see pictures of these units on the inside front cover Allan Robinson has been testing the units in QSPK mode on 23 cms and has nothing but praise. The amplification is however giving him a few headaches; what he thought were linear designs are producing spectrum re-growth and this could be a major headache for amateurs not equipped with an abundance of lavish test equipment. Ian Waters has been looking at using the modules on 70 cms in GMSK. Linearity should be less of a problem is this mode, but Ian has suffered an equipment failure, and one of the modules is back in Wuppertal being repaired. I hope that by the BGM we will have more information, and possibly pictures to demonstrate. The DATV modules are expensive at £511 for the encoder and the 70 cms transmitter card, and - although the BATC has funded three of these modules and two BATC members have funded their own - it is felt that these costs are at present beyond amateurs. Whilst I don't disagree, can I point out the obvious - any new electronic device on the market is initially expensive and the price always reduces later. If - as BATC - we wait to experiment, then, yes, we would not have had to invest so heavily, but also others would have done the experimental work and set the standards. With 100 units being produced at Wuppertal, this experimentation is taking place throughout Europe and I feel it important that BATC be part of this process, and that we will be able to participate from an informed position on the use of DATV.

To re-enforce this, Graham Shirville has just attended an ARISS meeting at the ESA-ESTEC complex in Holland. This is to discuss an outline concept for a box to be mounted externally on the space station the International Space Station, that would be fed with 28V dc and would incorporate a 2.4GHz DATV (DVBS?) transmitter, fed from either a 1.2GHz FM ATV receiver or an on board camera(s) with text overlay (maybe with GPS data). The camera would be earth facing to show clouds and light pollution and maybe a second steerable camera to show the outside of the space station.

The Project Selection & Use Committee supported the concept in principle and has asked Graham to work with other interested parties to refine the project before the next meeting in October.

ATV repeater 'NoV's are starting to move a little with the issue of those for:-

- GB3WV Cornwall - 23cms (1249MHz in and 1310MHz out)
- GB3FV Wisbech - 13cms in and 23cms out
- GB3FT Newbury - 2388 in and 2440 out
- GB3TZ Luton - 2388 in and 2440 out
- GB3DH Derby - 2388 in and 2440 out

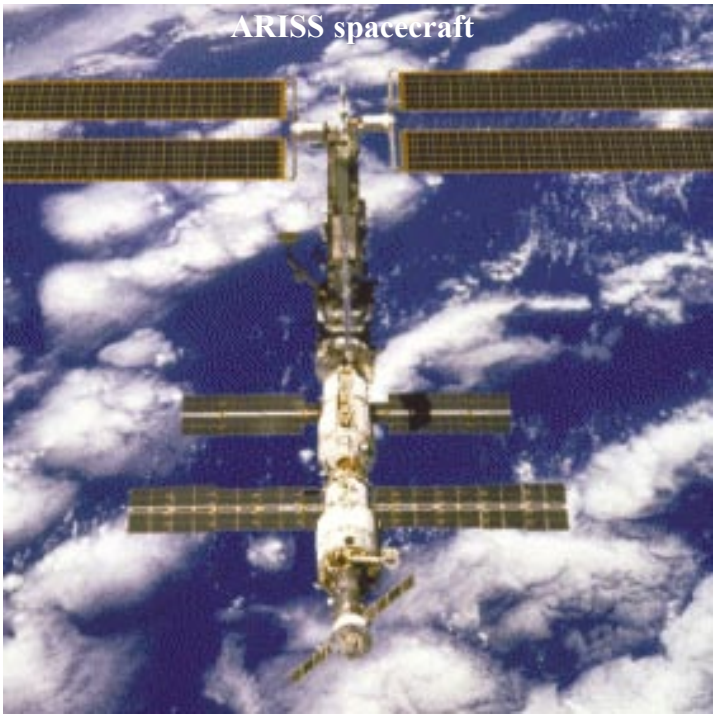
So it seems that some are coming through and that there is no blanket ban!

We still need to understand how the CAA are thinking in relation to 23cms, and hope that the new OFCOM regime may enable a closer relationship to be developed.

Can I remind you that we are still presenting a Black Box Camera Company character generator for

the best article in each issue of CQ-TV. The winner for the last issue was Steve Anderson, for his non mechanical NBTV monitor

We have received a suggestion from Kevin Ravenhill (*see the letters page*) that the club should consider a cyber membership scheme. Cyber members would not receive a printed copy of CQ-TV, but would be able to down load an electronic copy from the website. In return they would pay a reduced subscription. The committee have discussed this proposal at length, and hope to be able to implement such a scheme in the near future. Initially it would be restricted to overseas members, who often suffer postal delays. As soon as the software is in place this will become an option for overseas subscription renewals



ARISS spacecraft

Letters and Emails

From: Kevin Ravenhill [kevin.ravenhill@ukonline.co.uk]
Sent: 26 January 2004 11:38
To: editor@cq-tv.com
Subject: CQ-TV subscriptions

Dear Ian

Since you were complaining of a dearth of subject matter for the CQ-TV letters page I thought I'd take pity on you!

I'm not sure if this question has been asked before, but has the BATC considered offering a reduced-rate membership option with CQ-TV supplied in electronic downloadable form only? It seems a logical thing to do, given that it's already put on the website for members to download if they wish. I'm sure the costs of publishing and posting CQ-TV in paper form are considerable and make up a large proportion of the membership fee. I would personally prefer electronic format as my bookshelf space is already quite limited and getting smaller as time goes by.

As an example, EPE (Everyday Practical Electronics) now offers online subscritions at around £7 per year as opposed to £31 for the paper version. I'm not suggesting that the BATC could achieve this sort of price reduction as economies of scale etc. are quite different - but I wonder how much interest there might be amongst both existing and potential members?

Best regards

Kevin, G1HDQ

Reply to letter from Kevin, G1HDQ

The Idea of an electronic membership does have some merit, and if the club survives it may be where we will end up at some distant point in the future. A lot depends on if the new electronic members are extra, or instead of a traditional paper membership.

The problem is the paper CQTV needs economies of scale, it costs little more to have say 1800 printed compared with 1400. Time was that we had over 2000 UK members and this was good from the scale point of view, we are now down to about 1200 members (Early March 2004) and I am worried about this. You will see from the accounts that we made a loss in 2003, and I am concerned over the fall in subscription income and the rising cost of sending out CQTV. In an Ideal world we need a lot of new members. I don't propose an increase in subscriptions at this time, but it is not far away.

We have tried various methods of recruiting new members, Mail shots, Rallies, professional exhibitions, new application forms inside CQTV. At one rally we even gave away over a thousand CQTVs in the hope of generating some new interest in ATV and therefore potential members. One of the things we haven't tried is to offer a free subscription year to any member who signs up 2 or 3 new members, would this work? What is needed is a committee member to fill the post of recruitment manager. It would be their job to send out promotional material, write adverts follow up leads and respond to enquiries. At the BGM in May we will be, I hope, electing some new committee members. If you feel you might be able to help please contact the chairman ASAP and we will get you proposed at the meeting.

I wonder how many extra members we might be able to recruit to an electronic format? It might have great potential as a worldwide format. It would be virtually instant delivery and save the cost of the airmail surcharge (£6.00). Members should be aware that the electronic CQTV is a very big file. Personally I am a paper person, I like to read CQTV over breakfast.

Looking at the success of the various ATV TX and RX systems offered for sale, I do believe that there are a lot of potential members out there, in the whole world as well as the UK. It may be of interest to our UK members to know that about 25% of our members are overseas, so the British in our name perhaps ought to be "World". However "British" has been there for over 50 years and I think it ought to stay.

After the formal BGM there will be a members discussion forum of some sort, so if you have any suggestions this is the best place to air them.

Brian Summers Hon. Treasurer BATC

Shuttleworth 2004

Events

Saturday evening, May 8th
Drinks:
At the bar from about 7.30 Late bar applied for.

Evening meal:
Hot dinner menu, the 'full monty', starter/main course/sweet/cheese board/tea/coffee.

Price is about 23 UKP per head, served in the Manor House. Currently choice of menus but we need to narrow this down. Choices will be sent to those booking and preferences taken in a few weeks time.

Payment to Shuttleworth College on the night, or to BATC in advance.

Can't guarantee the free air show that we had last time, but you never know!

Bookings to Paul or Jill Marshall asap.

Sunday, May 9th:
In the Lecture Theatre:
' History and Highlights of IBC' by the BATC President. Michael Cox
'VT formats and Production techniques' by the BATC Chairman, Trevor Brown
DATV by Ian Waters
BGM Reports (Full BGM agenda to follow shortly)
Election of committee
Award presentations
In the Russell Hall:
Trade stands
Demonstrations of cameras, DATV etc.
Trade stands, contact: the Chairman, Trevor Brown

Outside:
Full size OB truck 'Tyne Tees' (actually ex Yorkshire) as featured in 'The Royal'

Full refreshments available all day

Nearby attractions include The Shuttleworth Collection and The Swiss Garden are open as usual

BGM Agenda

Chairman's Report
Treasurer's Report
Election of Committee
Members not requiring re-election in 2004:
Pat Hellen
Richard Parker
Paul Pitts
Mike Ferriday
Trevor Brown
Paul Holland
Dave Lawton
Dave McQue
Ian Pawson
Graham Shirville
Graham Hankins

Members requiring re-election in 2004:
Peter Delaney,
Brian Kelly,
Paul Marshall,
Bob Platts,
Brian Summers

President:
Mike Cox appointed in 2000, normally for 4 years minimum

Election of Officers
Appointment of Auditors
Close

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Email: g6nhg@gb3wb.com

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Blue Screen Chroma Key or CSO

By Mike Cox

From the early days of cinema, producers sought the ability to separate an artist from their background, and to put in a new background image. Early experiments involved putting the artist in front of a background, usually blue, and using a filter in the camera, expose a second strip of film to use as a mask in subsequent editing.

Wembley in 1960 for instance, there was only one special effects system on a trolley, which had to be booked and shared round 3 studios. It is hardly surprising that the colour separation technique did not catch on.

Film people call this technique "Blue Screen"; BBC people call it Colour Separation Overlay [CSO], while everyone else calls it Chroma Key. This is the term I shall use.

for a projected David Nixon series. I took a working unit into Teddington Studios on the following Monday for testing. It worked and after an iteration or three became the COX 154 Chroma Key module, which was standard in the few hundred or so x41 series of vision mixers.

The basic theory to accept is that Colour Difference signals are used to derive the key signal. Go to the equation for the

Fig. 1 presenter against blue flat

Fig. 2 new background replacing blue

Basic Principles

This philosophy was carried on experimentally with black and white television, with a second camera and appropriate filter used to produce a key signal to be used in a special effects system. In those days, few studios had any effects; at Rediffusion studios at

The arrival of colour in 1969 revived interest in the technique, which took off from then. I recall being phoned by Stuart Sansom [Chief Engineer of Thames Television] on a Thursday early in 1970 and asked if I could come up with a prototype Chroma Key unit

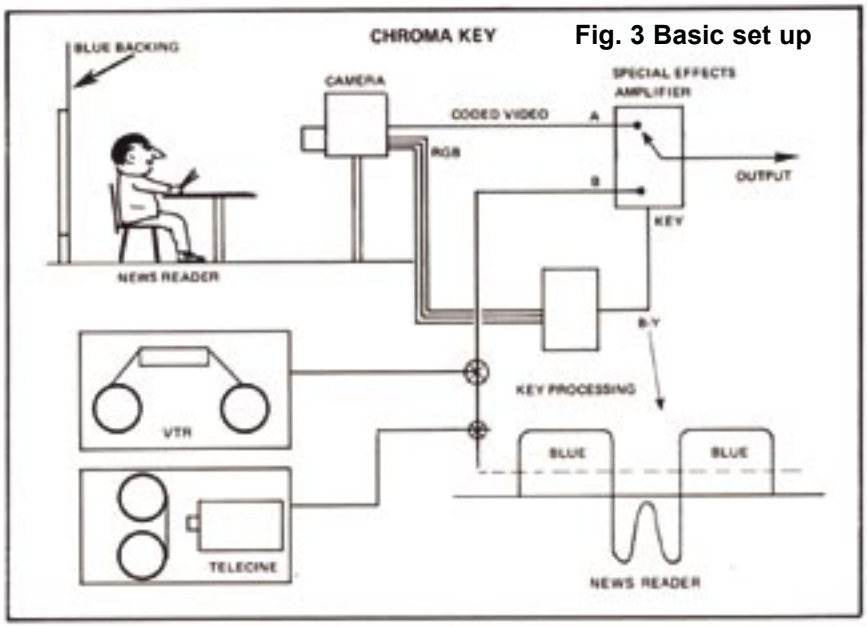


Fig. 3 Basic set up

luminance signal [Y], which is common to all colour encoding systems, be they PAL, NTSC, MPEG or HD, with maybe slight changes in coefficients;

EY = 0.30ER + 0.59EG + 0.11EB., (1) where for a white or grey object, ER = EG = EB, 0 < 0.7 volt

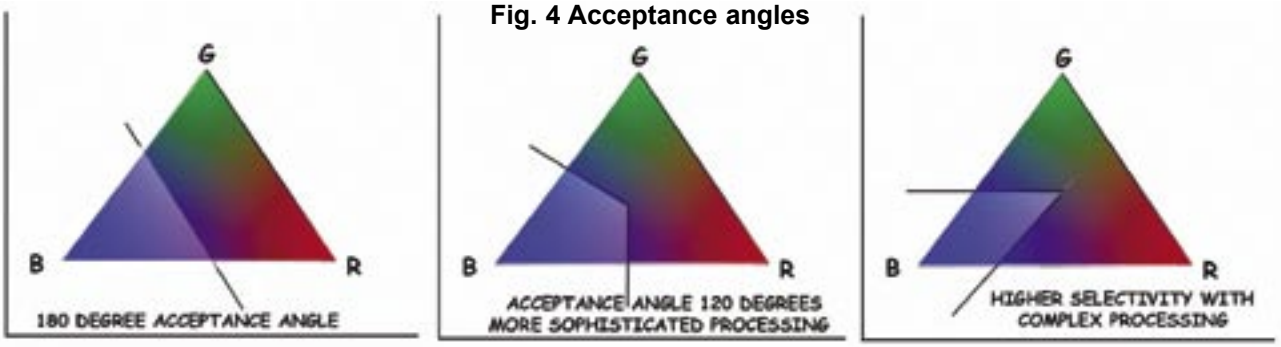
The corresponding colour difference signals are:-

EB – EY = 0.89EB – 0.59EG – 0.30ER (2)

ER – EY = 0.70ER – 0.59EG – 0.11EB (3)

People have asked me from time to time why they cannot just use the output of the camera blue channel as a key signal. I usually ask them in return what happens if the presenter is wearing a white shirt? The output of the blue channel will be at peak on the shirt, and the presenter will appear hollow-chested. However, look at either of the colour difference signals. For a white or grey object, these signals are

Fig. 4 Acceptance angles



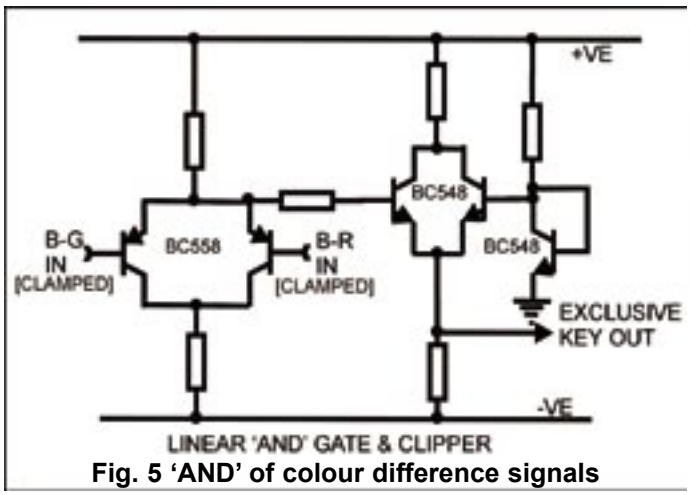


Fig. 5 'AND' of colour difference signals

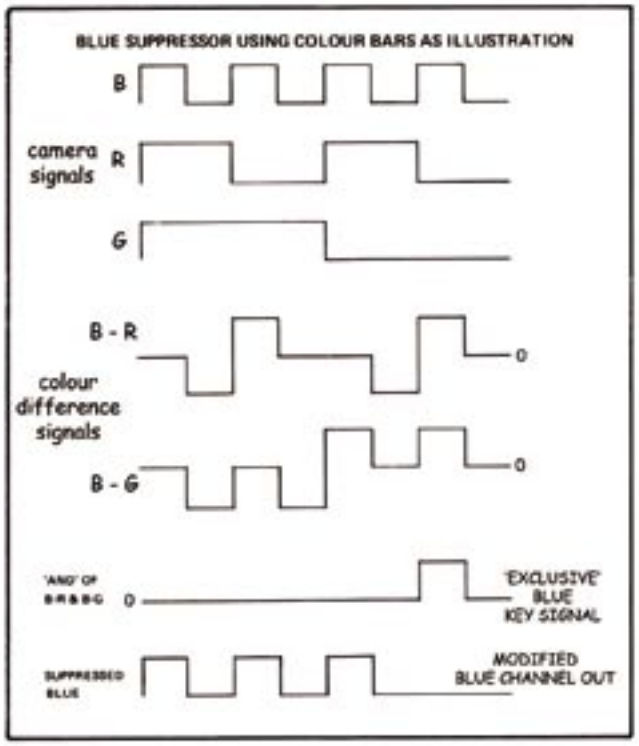


Fig. 6 Key Colour Suppression

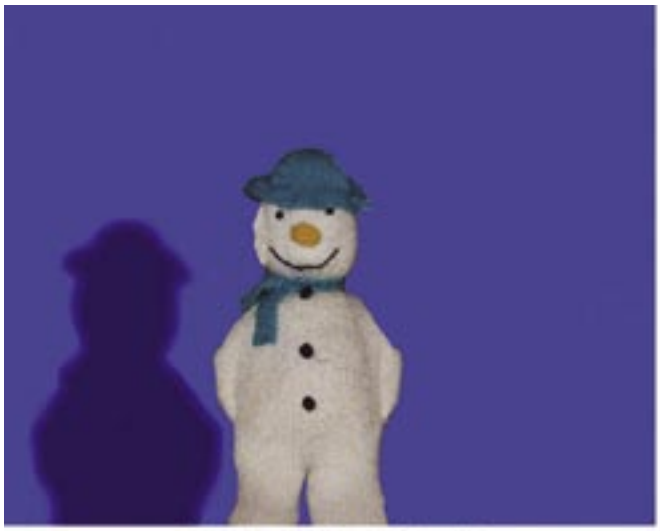
zero, so the presenter's shirt will not be a problem.

Blue is commonly used as the keying colour because by and large skin tones have no blue content [if there is, maybe an ambulance should be called!]. However, green has been used, as has yellow. If the subject is a pack, for use in a commercial, then different colours may be chosen that do not appear in the pack. [Fig. 3 Basic System]

The traditional use of chroma key depends heavily on staging and lighting, and quality of the material for the key background. A felt type of material has commonly been used, as it does not tend to throw coloured light around the set. The process is not very efficient, as white light has to be used to avoid mis-coloration of artists' face tones. As the studio is normally white-balanced for 3200K colour temperature, there is not much blue component around.

Refinements

Later development involving processing of the colour difference signals gave 360-degree key axis selection, and variable selectivity. The original 154 Chroma Key module had 360-degree axis selection, but the acceptance angle



SHADOW ON BACKGROUND

MODULATING NEW BACKGROUND VIDEO

Fig. 7 Shadows

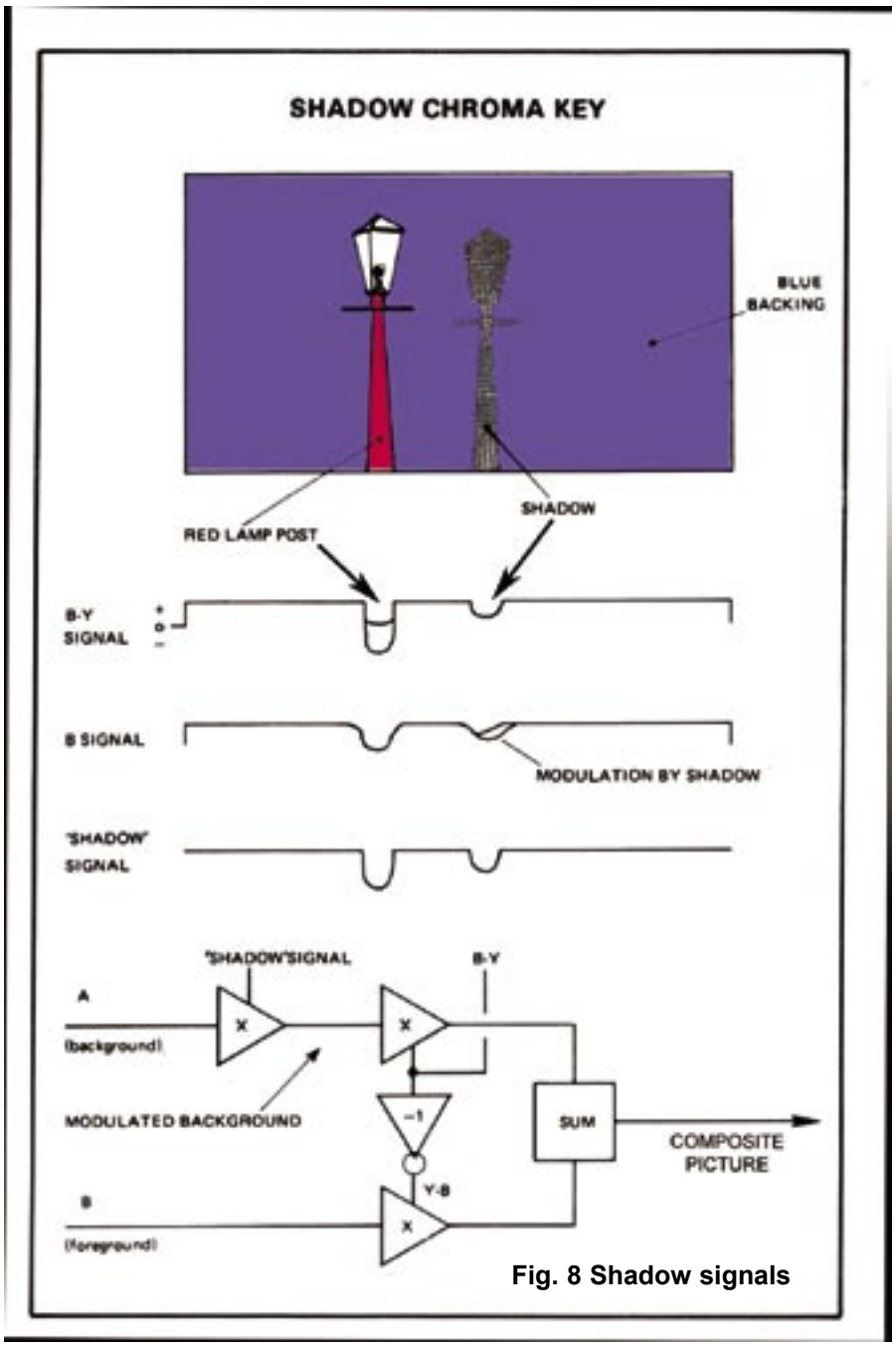


Fig. 8 Shadow signals

was 180 degrees, and it was difficult to discriminate against colours, near to the wanted colour.

Narrower acceptance angles can be achieved by using a Non-Additive Mix [NAM] of two colour difference signals of the form R – G, G – B, B – R and G – R, R – B, B – G. [See Appendix A for an explanation of Non-Additive Mixing, both positive and negative]

Even narrower acceptance angles result from use of "exclusive keying". For blue, the two colour-difference signals B - R and B – G are used. They are applied to a linear AND gate [Fig. 5] and give an output that is only high on blue parts of the scene. In a comprehensive Chroma Key processing system as might be used for shooting commercials, such an "exclusive blue" signal is used to suppress blue in the foreground camera signal. This can greatly reduce the effect of blue spill on presenters. Using other colour-difference signals allows other background colours to be suppressed.[Fig. 6]

Broadcasters began to use Chroma Key for drama. Artists perform in front of large key colour backgrounds or masking is used, and scenery, which may be models or photographs or even graphics, is keyed in. There are obvious cost savings in such an approach. Masking involves electronically extending, or curtailing the key, using the studio mixer's pattern generator, or a dedicated mask generator.

Unfortunately, the results frequently looked unreal, as if the artists had been cut out of cardboard. The pictures were shadowless, which real scenes seldom are.

Attention was given to modulating the keyed background according to shadows falling on the background.

[Fig 7 Done in Photoshop, by way of illustration]

Earlier, the luminance equation was quoted with its greatly unequal coefficients, [Eq. (1)]

To achieve shadow modulation with any colour, a new modified luminance equation is used: -

EM = 1/3 ER +1/3 EG +1/3 EB (4)

Note that no one colour dominates, unlike the original luminance equation (1) so that any appropriate background colour can be used. With processing, this signal is used to modulate the new background video, and adds shadows back to the scene. [Fig. 8]

Timing of the key signal is critical to avoid colour fringing on edges. Typically, fringing can show up around an artist's head, or clothing. Careful adjustment of any clip controls will help to minimise this effect, while some manufacturers have included adjustments that can move both edges of the key signal independently. All these techniques together with the "exclusive blue" technique mentioned earlier can be incorporated in a super chroma key processor. [Fig. 9]

One USA Company that makes very sophisticated Chroma Key units is Ultimatte. They even made special paint for the key background, optimised for their unit.

These units have the ability to key through glass and smoke, which requires extremely careful setting up with less sophisticated units.

Encoded Chroma Key

In the early use of Chroma Key, the key signal was usually derived from camera GBR signals at full bandwidth. Later cameras had PAL or NTSC encoders built into the camera, making access to the GBR signals difficult. Consequently, so-called encoded chroma keyers were developed. My old company produced the 231 unit, and we sold a number of these in NTSC form to Grass Valley for incorporation in their production

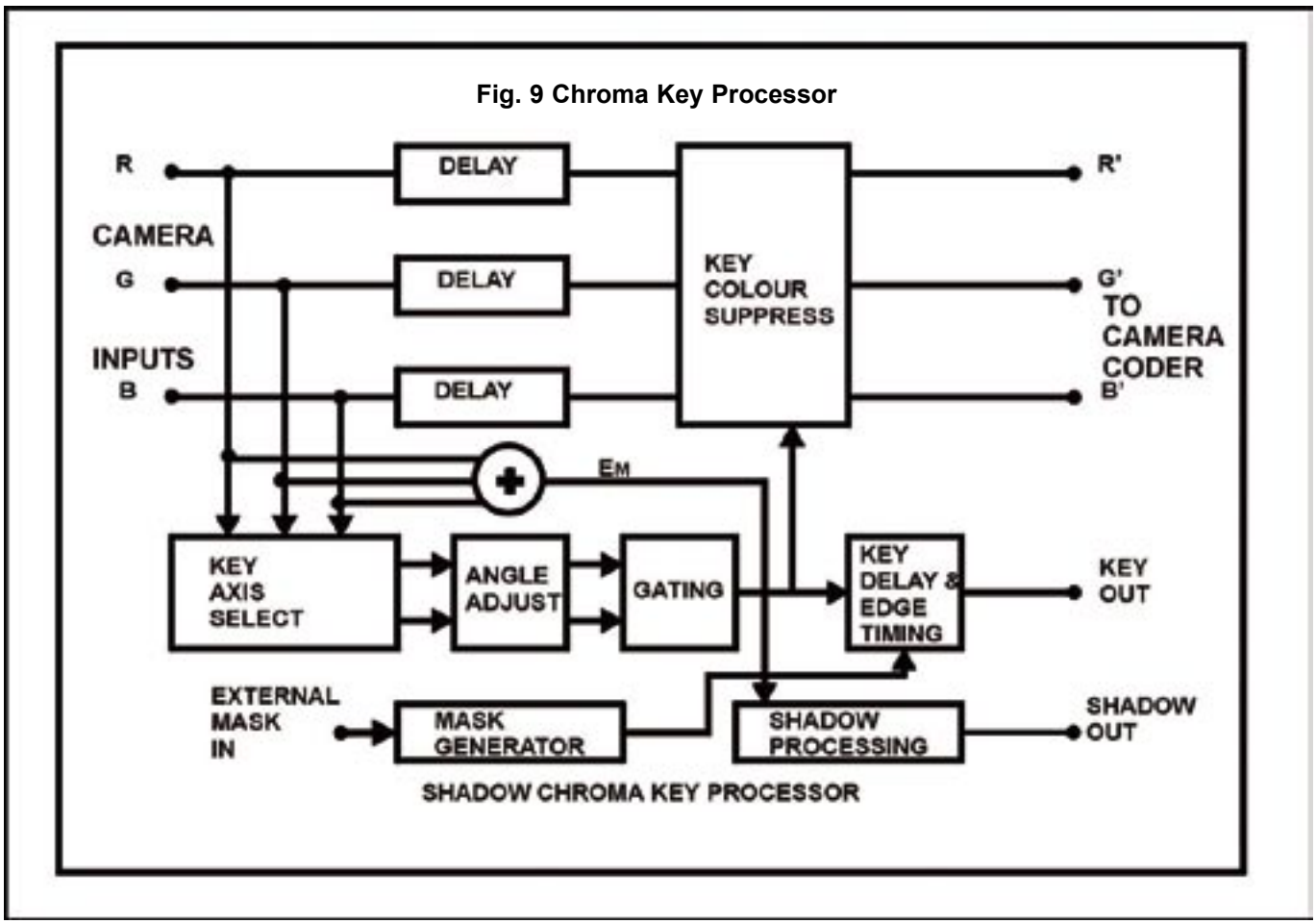


Fig. 9 Chroma Key Processor

switchers. The limited chroma bandwidth of PAL and even more so NTSC proved a severe limitation to the performance of these units.

Chroma Key and Virtual Reality [VR]

The recent development of virtual reality studios has required the artist to perform in a complete key background environment. Using paint or cloth for the studio floor and walls was not very satisfactory. The availability in the last few years of bright blue and green LEDs has led to a re-think of the staging of chroma key sets. The floor and walls are covered with a cloth studded with thousands of small glass beads. These reflect light striking them back along the incident path. This is similar to Scotchlite[tm], used for reflectors on jackets and road signs. A cluster of blue or green LEDs is mounted near the camera lens. The artist can then be lit optimally, without worrying about lighting the key background. Provision has to be made to vary the LED intensity to avoid overloading a particular channel in the camera. The colour of light reflected from the backing is defined precisely by the LED characteristics – blue ones emit at 470 nm, and green ones at 565 nm.

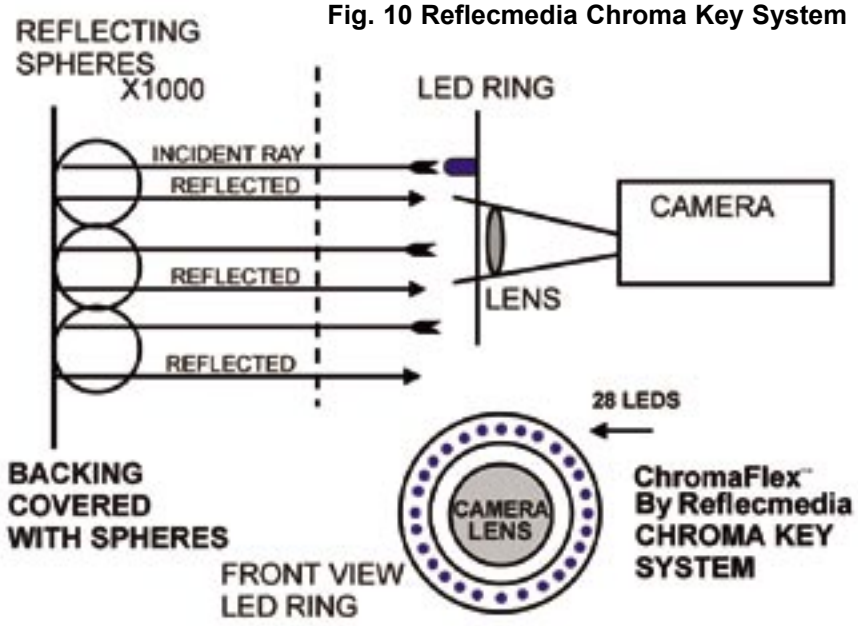


Fig. 10 Reflecmedia Chroma Key System

The results shown came from an extremely crude set up. An elderly JVC CCD camera with the blue LEDs mounted below the lens was used. Various lights were arranged to impinge on the 'presenter' who sits in front of a piece of the beaded material mounted on a sheet of MDF. The JVC camera PAL output was converted to SDI and fed into the SDI mixer [CQ-TVs passim]. The background video was off-air, being the Coronation Street omnibus edition, which is why Deirdre Barlow/Rachid appears to be scratching my ear. . The photo was taken from the 7" LCD transmission monitor on the SDI mixer. The Cb [digital B – Y] signal was used as the key.

One interesting point came to light; the emission angle of the LEDs is quoted as 15 degrees. The lens used on the

Fig. 11 Current mirror for LEDs

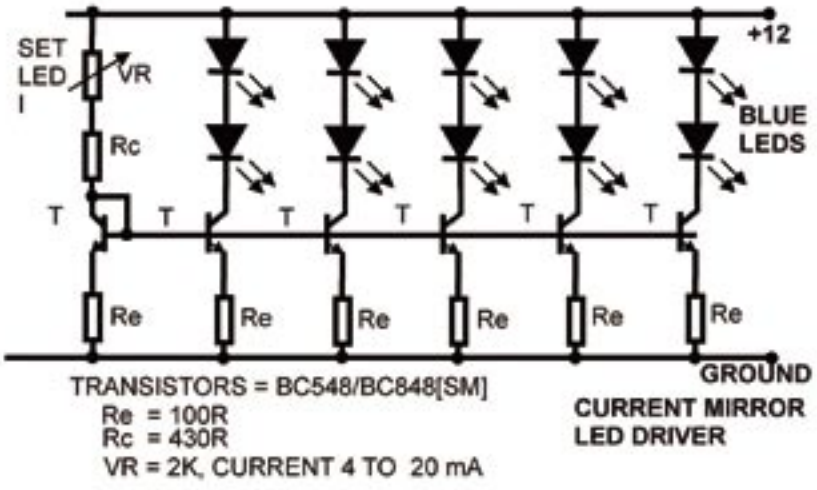


Fig. 12 Camera set-up

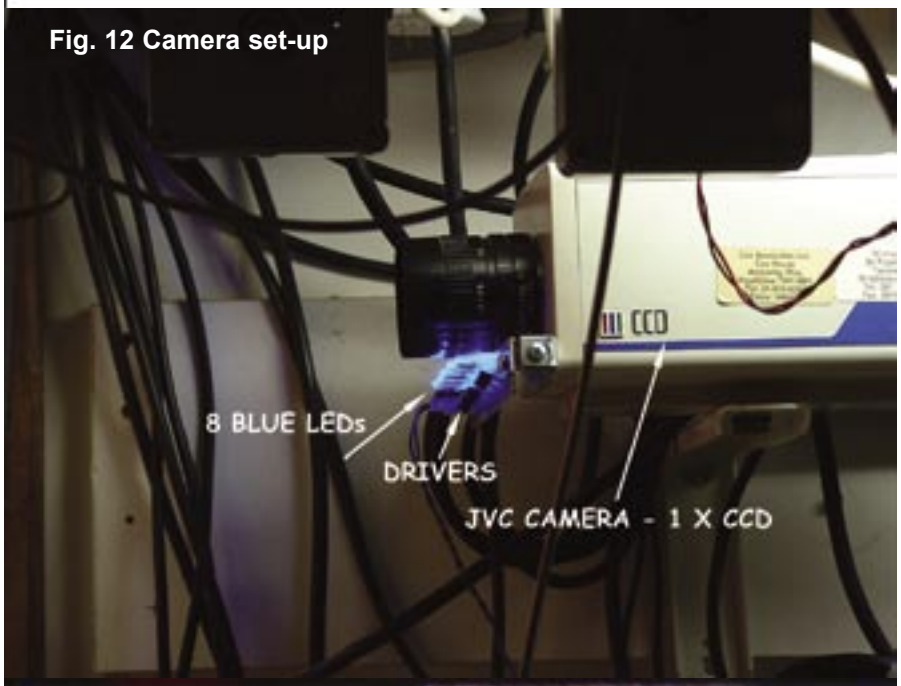
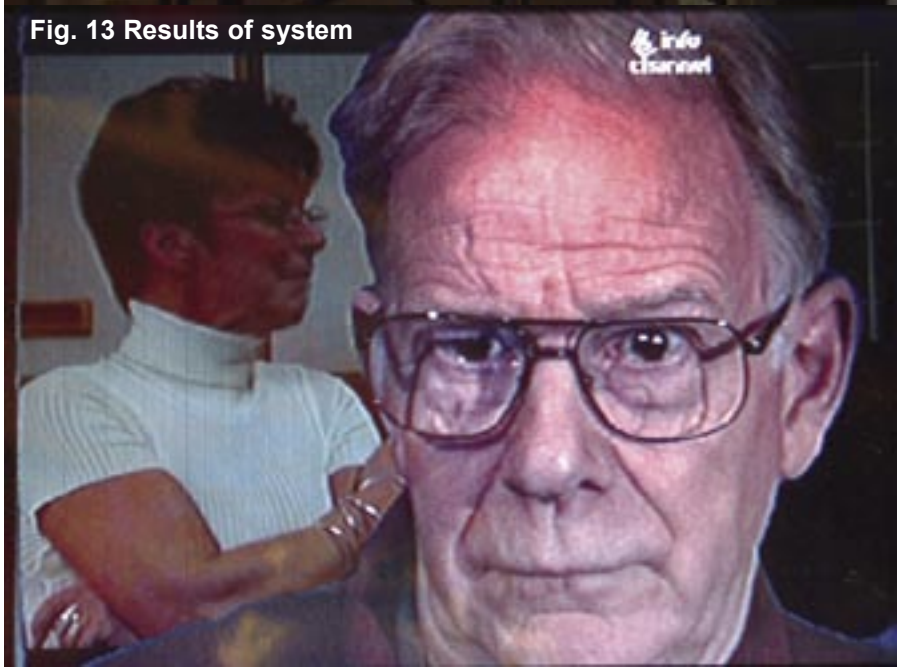


Fig. 13 Results of system



JVC camera has a focal length of 25 mm, which gives a close up view, as my lab is only 5 feet wide. I tried to use a wide-angle adapter, but this gave a blue hot spot, as the lens angle was now greater than the LED beam angle. A point to watch.

Infra Red location is one of the techniques used to precisely define the camera position relative to the VR scene. This position and lens angle information is fed to the computer that generates the background video. The presenter is thus precisely placed in the composite scene.

Shadows are not important in the original studio scene as they can be put into the computer-generated scene.

BBC Research Department at Kingswood Warren did much of the work on this technique.

Digital Chroma Key

Most digital studios use SDI or HDSDI for camera and source coding. Recovery of the original YPbPr signals from these is straightforward and at full bandwidth. Thus good Chroma Key can be obtained from the Pb and Pr streams. However, the chroma bandwidth is ½ that of the luminance. This is because the CCIR601 specification defines the sampling frequency of Y at 13.5 MHz [4] and that of Pb and Pr at 6.75 MHz [2], giving the notation 4:2:2.

For best results, 4:4:4 or even 8:8:8 sampling of the original GBR signals can be used.

Complex processing of colour difference signals can be achieved in real time using DSP technology.

There is no problem in getting pixel accuracy with digital processing.

Computer animation programmes such as Adobe 'After Effects' have plug-ins available such as 'Primatte Keyer'. This allows Chroma Key techniques to be used as part of the editing process. 'After Effects' and 'Photoshop' together form an excellent package for creating animated sequences for titles and the like.

Conclusion

This has given a quick taste of the subject of Chroma Key. I hope it may encourage some to research further. It is used so frequently in news programmes, children's programmes and elsewhere that the viewer is unaware of it. It has played an enormous role in feature film

Fig. 14 Further results with our snowy presenter, photographed from a Sony 9" CRT monitor

making where computer generated [CG] backgrounds are used. It is difficult to think of returning to a world where such techniques were not available.

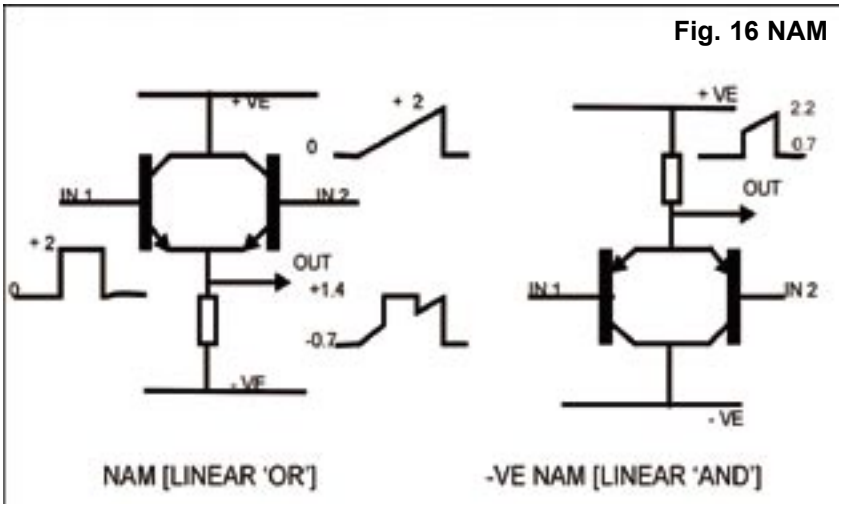
Appendix A

Linear 'AND' and 'OR' Gates

These will perhaps be more familiar as Non-Additive Mixers [NAM]. Fig. 16 shows the basic principle. Two NPN transistors with commoned emitters act as an 'OR' gate in that the higher of the two inputs dominates the output at the emitter. The assumption is that the signal levels are somewhat higher than the emitter window over which conduction passes from one transistor to another.

If PNP transistors are used, then the pair behave as an 'AND' gate.

Fig. 16 NAM



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1. Development of Operation Techniques using CSO IBC78 Conference Papers, IEE Conference Paper No. 166,

2. A Collection of Chroma Keyers, D. J. Bryan, International Broadcast Engineer, September 1980,

3. Linear Digital Matting, I. Brown, International Broadcast Engineer, January 1983,

4. Real-Time Compositing System of a Real Camera Image and a Computer Graphic Image, IBC94, IEE Conference Paper 397

5. A Versatile Camera Position Measurement System for Virtual Reality TV Production, IBC97, IEE Conference Publication No. 447, p 284

6. Virtual Sets For Real Productions, IBC2000 Conference Papers, p 583 [available from IBC Office, Aldwych House, 81 Aldwych, LONDON WC2B 4EL

Fig. 15 VR set at IBC – shows IR positioning devices on camera

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 20 - March 1954

"This edition is the first to be printed entirely by the Rotaprint system" began the Editor's letter. The format changed too, from separate pages to a folded and stapled magazine of eight pages (slightly over A5 size) plus the covers. The subscription was just 5/- per year.

There was more information on the Monoscope tube - with a list of 'recommended operating conditions :- "Heater 6.3V, 0.35 amps; 1st anode 950 volts; Final anode 1000 volts; Target 950 volts; Control grid 15-60V negative; Beam Current 0.5 - 1 microamps; Signal current 0.4 - 0.7 microamps p-p; Signal polarity Negative; Heater-Cathode volts 60V peak; Resolution Better than 600 lines; Focus coil 200 ampere turns." As supplied, these tubes are normally Test Card 'C', but other types are occasionally available on request ... are patterns: 'B' - a half tone pictorial subject (Kings College Chapel, Cambridge); 'D' based on the RTMA 525 line test chart; 'F' a geometric pattern of cubes and definition wedges; 'G' based on Test Card 'C', but for 625 lines, and with definition bars up to 5 Mc/s. Special patterns are made to order, so you might get a 'Normal Service Will Be Resumed ..' pattern!"

There was an informative article on 'That DC Component' "Members will already

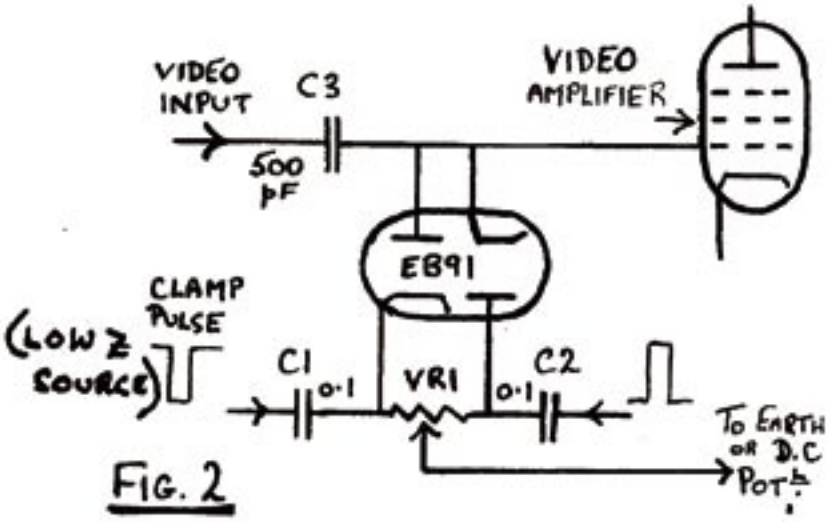
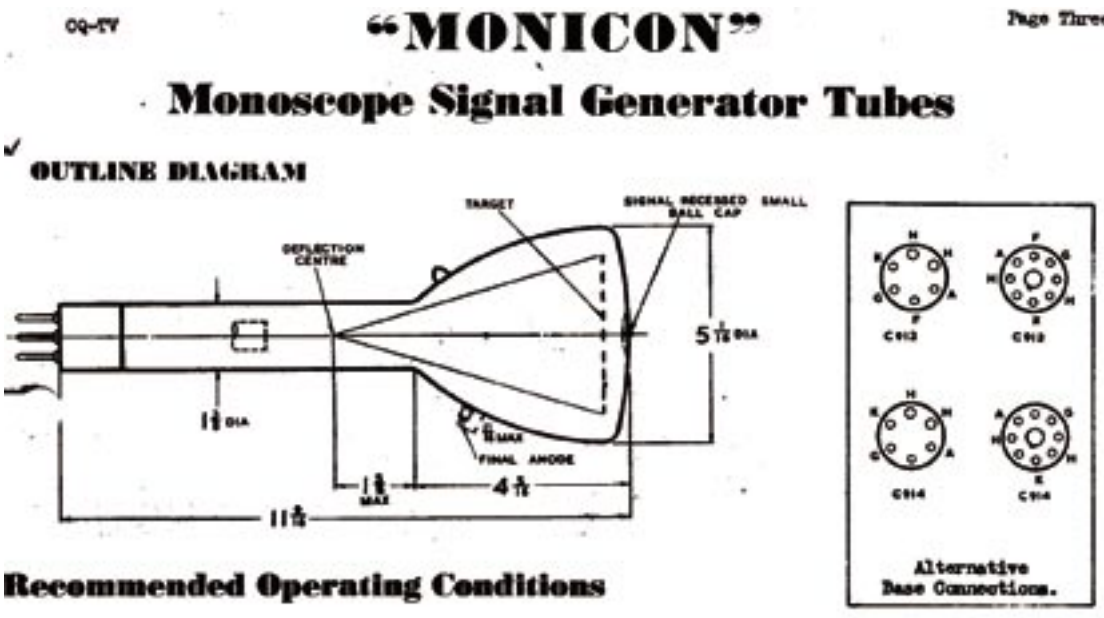


FIG. 2

be quite familiar with the application of DC restorers to television receivers, although it may not be quite so clear as to how we go about retaining the 'DC' component in the transmitter, nor even, perhaps, just why we bother about it at all". "If we could ensure that some portion of the vision signal, say black, was always at some particular level at the receiver CRT, then we could set the brilliance control and leave it alone; any further changes in brilliance would then be entirely due to the transmitted signal, provided this transmitted signal contains the information necessary to establish this Black Level." The article explains where and how the signal can be clamped, and shows a simple DC restorer, and "A very effective clamp circuit, originally given in CQ-TV no 15". "To conclude, then - if your blacks aren't black, or if you have clipping of the whites no matter what you do with the contrast controls, its DC trouble, friend, and that applies to the modulator and receiver as well."

Reports of *"What the other fellow is doing..."* included "Two of our regular stalwarts are now away doing their National Service. IAN WATERS (Ely) came back from a business trip to Cairo, and is now an Acs in the RAF near Lincoln. JEREMY ROYLE (Dunmow) is at the Army School of Surveying at Newbury in Berkshire. He manages to get home at frequent intervals to help RALPH G2WJ/T with the camera gear. Ralph's new high power 70cm TV tx is now in operation, running 40 watts input to an air-blown QQE06/40.... on one occasion G3BKQ at Leicester - 100 miles away - received a signal strong enough to resolve test bars perfectly satisfactorily. .... With a new length of camera cable, trips round the garden are being arranged for the summer!". "GRANT DIXON (Ross) sends in his usual comprehensive report. He was unable to afford an MW13/35, and so is still stuck for a 5" magnetic tube. URGENTLY required for his colour experiments. Must be white face." "John PLOWMAN G3AST (Luton) is MAD about gas tetrodes for linear scans - type 2050 1/- and good."


CQ-TV Page Three.

"MONICON"

Monoscope Signal Generator Tubes

OUTLINE DIAGRAM

Recommended Operating Conditions

Here is the News...

By Ian Pawson

There is now a whole new way to get news. It's called RSS

RSS is used all over the web. The BATC has its own RSS feed too now. RSS stands for Really Simple Syndication or Rich Site Summary. Why RSS? Here is a "nutshell history":

E-mail was the first good way to exchange ideas on the Internet, it's fine for one-to-one or one-to-many distribution, but it has its limits. The Web was the Next Big Thing. But it takes a lot of time to find the good stuff. Here comes RSS. It's more recent and delivers the content you want right to an RSS Reader. Having your own RSS Reader allows you to keep track of new content from your favourite sites.

Using these RSS readers, (you'll have to download a free one) you can view an aggregation of headlines and blurbs from dozens of different Websites. You add these Websites as channels. Every headline, in every channel, is linked back to the full article on the originating site.

RSS allows web site owners to make their content available in the RSS format, written in lightweight XML. That's why you often see an orange XML button indicating the RSS-feed option. Making web content available is also called "content syndication".

How does it work? You get a free RSS reader and you point it to the sites you know have good stuff. It checks them regularly and updates your RSS reader. Voila! No more web surfing for the data you need. Very smart and simple, you just check your RSS reader on a regular basis. RSS was originally designed for news sites (like us) to make their content available. Nowadays it's also heavily utilized by bloggers.

Here is just one example of an RSS Reader (for Windows), but there are many you can choose from: http://www.rssreader.com

Some examples of RSS Feeds, there are thousands more!

Windows XP Expert Zone Community: http://www.microsoft.com/WindowsXP/expertzone/expertzone.xml

BBC News - Technology - UK Edition: http://news.bbc.co.uk/rss/newsonline_uk_edition/technology/rss091.xml

Your very own BATC news: http://www.batc.org.uk/news.xml

And if you are interested, here is a link to the history of RSS: http://groups.yahoo.com/group/syndication/message/586

Have at it, it's fun and saves time!!

ATV News

Firstly great news! The first new ATV repeater NOVs for over 12 months have just been issued by the new OFCOM organisation!!

- GB3WV on Caradon Hill in Cornwall - keeper M0AVP with 1249 in and 1310 out, also the first UK cross band repeater
- GB3FV near Wisbech with 2390 in and 1312 out. Keeper M0CKE

Secondly a "word from the wise" it appears that some licensing people do watch TV repeaters. Sadly it has been noted that a number of users are failing to abide by the licence requirement to identify in sound and vision at least every 15 minutes. Pictures of empty shacks with no visual idents have been seen rather too often.....

I am still hopeful of further early news concerning the RV application for digital output and the five 13cms in band repeaters BH,DH,FT,KM and TZ.

Cheers, Graham, G3VZV

Subscription Rates

Years	Surface	Airmail
One	£15.00	£21.00
Two	£29.00	£41.00
Three	£43.00	£61.00

Please note that the **surface** rate covers postage within the EEC, airmail rate is **NOT** required

If your subscription is due before the next issue of CQ-TV, you will soon be receiving a letter containg a personalised renewal form.

We hope that you will continue to support the Club and we look forward to receiving your renewal by post or via our web site.

Satellite TV News

Paul Holland G3TZO

Sadly this edition of Satellite News is somewhat shorter than normal due to lack of spare time and to a greater extent available "news". Since the first days of this column I have aimed to include topical and useful information for those interested in acquiring Satellite delivered TV services.

In those early days each new satellite that managed to get airborne was the subject of much anticipation. I used to list the allocated transponder frequencies so that as each new channel sprung into life we could monitor its progress at first hand. The accurate acquisition of new satellites as the various orbital slots became occupied was something of an early challenge in aligning the necessary hardware in the garden. With the rapid growth of hardware at this QTH to 6 dishes it was a nice challenge to systems engineer and then re-engineer the various receive configurations.

With the introduction of digital services the arrival of a new channel, amid a universe of thousands of others, does not instil quite the same excitement that one felt when acquiring the seemingly exotic fair of say the French MCM music channel in D2Mac from the TDF satellite. I suppose we all felt a bit like pioneers in those days. Now with over 7 million Sky Digital dishes the pioneering days seem long gone.

The focus of interest for many satellite TV enthusiasts now is feed hunting. With many of the broadcasters still using unencrypted transmissions, and coupled with relatively low transponder costs, there are dozen of feeds available to monitor on a satellite near you.

I'm conscious that to fill a "News" column with nothing more than sightings of feeds may not be the best use of the Editors column inches. Perhaps some of you have some fresh ideas or input on what this column should or should not include. Please let the Editor or myself know what you think. Perhaps the time is right for a radical change of direction….

Transponder News

Hellas Sat 2 39.0 Deg E

Roy Carmen has reported feeds on 11.190 GHz (V) SR 6078 FEC ¾, 10.960 GHz (V) SR 3054 FEC ¾ and 11.016 GHz (V) SR 3255 FEC ¾.

Eutelsat W2 16 Deg E

UK feeds have been observed on 12.547 GHz (H) SR 6074 FEC 7/8 and 12.524 GHz (H) SR 2816 FEC 3/4

Hot Birds 13.0 Deg

TV Chile has replaced Mundovision on 11.304 GHz (H) SR 27500, FEC ¾. Voice of the Mujahedin TV has launched on 12.437 GHz (H) SR 27500,FEC ¾. Daystar TV has started on 11585 GHz (V) SR 27500, FEC 3/4.

Sirius 2 & 3, Astra 1A 5.0 Deg E:

A feed from RTC DSNG 1 has been noted on 12.639 GHz (V) SR 3000 FEC 3/4.

Thor 2A/Thor 3, 0,8 Deg W

TV 4 closed its analogue transmissions on transponder 11.389 GHz (H) at the end of March. This may come as a blow to those like me who find the odd analogue service useful for quickly identifying a particular satellite when aligning a motorised system.

Atlantic Bird 2, 8 Deg W

A feed showing the caption "CROATEL DSNG" was seen on 11.614 GHz (V) SR 6666 FEC 7/8.

NSS 7, 22 degrees West

Occasional news can be seen on 10.983 GHz (H) SR 5632, FEC 3/4 and on 11.035 GHz (H) SR 6111, FEC ¾.

For up to the minute news of changes visit the following two excellent sites; http://satcodx.com/uke/ and http://www.lyngsat.com/ whilst Stefan Hagedorn provides daily email updates of the changes which are taking place at http://stefan.hagedorn.de/transpon2.htm. For more detailed information on active feeds try http://www.satelliweb.com/.

Recent Launches

New Channels

Prospects for new channels in the UK

By 2007 there could be around 600-700 channels available on Sky Digital, according to Astra Marketing UK, which markets the Astra satellite platform operated by SES. Sky Digital had a total of 419 channels at the end of last year, 67 of which were radio stations. Channel launches on the Sky platform look set to continue at a rate of around 80 per year for the next few years, 60 of which will slip into new slots on the EPG with the remaining 20 replacing channels which will close down. However, the platform could face a ceiling because of capacity limits on the Astra system if the rate of channel launches exceeds that.

Capacity for new channels is obviously linked to bandwidth and with bit rates falling all the time less space is needed per channel. This is demonstrated by the fact that many existing channels now operate at around 2mbps where previously 4mbps was the norm. New compression techniques will shrink this further. Additional capacity will become available if SES-Astra's plan for two new launches at 19° E in 2006 stay on track. This will enable Astra to move existing capacity at the 19° E position to the UK digital orbital position at 28° E.

New service providers must meet an eight-point checklist before launching on the Sky platform. The aspirant channel provider must have a broadcast licence and an EPG contract, capacity and uplink contracts, must provide EPG schedules and a minimum of 12 hours of original programming, and have defined a conditional access template. Conditional access contracts and a subscriber management service provider are optional.

London TV to launch this summer

Due to launch on Sky Digital in early summer, the channel will be broadcast 24/7, and will comprise a selection of programmes suited to a range of age groups and interests, targeting both Londoners and visitors. London TV will provide reports and features on topics such as film, theatre, shopping and tourist sites.

New US-run news channel for Iraq launches

A US government-financed satellite news channel aimed at Arab viewers launched in mid February. Called Al-Hurra, it broadcasts from Washington but has studios in several capitals, including Baghdad. The channel is on Arabsat 2D at 26 Deg E, 11.661GHz (V) SR 27500, FEC 3/4 and on Nilesat at 7 Deg W 11.823GHz (V) SR 27500 FEC 3/4.

Euro1080

Europe's sole high definition service which launched on 1st January will be encrypted soon using the Irdeto conditional access system but will remain subscription free. According to the broadcaster they need a conditional access card to prove the amount of viewers receiving the channel. Cards will retail at around €200, and are programmed to last 5-10 years. HD capable Receivers appearing with UK retailers such as the Zinwell HDX 410- HDCA already have an embedded Irdeto CAM fitted. The main channel broadcasts from 20:00-24:00, repeated over 24 hours and by September will have fresh content every four hours. Both channels aim to avoid language specific content however from 2005 they will implement subtitling in German, Spanish and French.

Upcoming Launches

The launch table, above right, echoes my comments in the last issue of Satellite TV News with few scheduled launches for the European region this year. What launches do lie ahead are geared to providing backup to existing capacity and extended regional coverage rather to provide additional transponder capacity.

Date	Satellite		Location	Comments
0403	Eutelsat W3A	Proton	7.0°E	50 Ka & Ku tps co-located with Eutelsat W3
0408	Express AM 1	Proton	40.0°E	18 Ku and 9 C and 1 L tps will replace Express A1R
04 end	NSS 8	Zenit 3	57.0°E	36 Ku and 56 C tps will replaced NSS 703
0509	Astra 1KR	Ariane 5	19.2°E	32 Ku tps will replace Astra 1B and Astra 1C
05 autumn	Hot Bird 7A	TBA	13.0°E	38 Ku tps will replaced Hot Bird 1
05 late	Arabsat 4A	Proton	26.0°E	16 Ku tps and 24 C tp
06 early	Hot Bird 8	Ariane 5	13.0°E	64 Ku tps
06 early	Arabsat 4B	Proton	26.0°E	28 Ku tps
0608	Astra 1L		19.2°E	2 Ka tps and 29 Ku tps will replace Astra 1E

Launch Table.

Technology

New Multi-Beam Antenna

The Australian-based Commonwealth Scientific & Industrial Research Organisation (CSIRO) have designed a multi-beam antenna design that simultaneously communicates with as many as 20 satellites. This novel concept in antenna design offers a solution for those requiring either no switching time or concurrent reception from one or more satellites located at different orbital locations across a 38° field-of-view. The antenna can access up to 19 geostationary satellites simultaneously, in fixed or inclined orbits (option), over multiple frequency bands. It can replace a farm of conventional antennas, each communicating with a nominated satellite. The antenna consists of two reflectors in an offset Cassegrain configuration and an array of feeds, each viewing a designated satellite. Unlike the conventional antenna, which has a single focal point where the feed must be positioned, the antenna has a focal surface on which up to 19 feeds can be placed. In this antenna, the reflectors are specially shaped and strategically positioned to broaden the scan region along the geostationary arc. Within the scan region, an almost constant antenna gain is achieved. All the beams have a cross-polar performance better than –30 dB and sidelobes within the ITU recommendations. The antenna design offers a very compact structure compared to other Multi-Beam configurations currently available. The antenna can communicate simultaneously with a number of satellites within two degrees of each other, a separation small enough to operate with geostationary communications satellites well into the future. As the picture below shows you will not be picking one of these up cheaply at the next rally!

Pace Digiboxes

Pace Digiboxes received an over the air software upgrade in March. Early Pace Sky Digiboxes boxes were automatically upgraded to a new version of Sky's operating software and EPG. Other manufacturers' hardware will be upgraded over successive months. The enhancements are relatively minor and include the ability to control the box's RF1 and RF2 outputs independently to allow, for example, a main TV to show 16:9 broadcasts and a second TV to show 4:3 letterbox format broadcasts. Among the other changes is the introduction of seven - day ordering of Sky Box Office events.

Recent Launches

Eutelsat W3A

Eutelsat successfully launched its W3A communications satellite in Mid

March aboard a Proton rocket from the Baikonur Cosmodrome. Lift-off of the Proton launch vehicle carrying the 4.2-ton satellite took place at 04:06 local time. In less than 10 minutes, the three-stage Proton vehicle supplied by International Launch Services (ILS) finished its climb into space, leaving the Breeze M upper stage to continue the mission for the next nine hours. The Breeze M's engine underwent five burns to place the EADS Astrium-built W3A satellite into a transfer orbit. The satellite was separated from the launch vehicle at 08:16 GMT. Signal acquisition of the satellite including reception of telemetry after separation was established immediately by Fucino earth station (Italy). W3A's on-board apogee motors will enable the satellite to reach its location in geostationary orbit where it will undergo in-orbit tests.

W3A will be positioned at 7 Deg E, currently occupied by Eutelsat's W3 satellite. In addition to enhancing the coverage of Europe provided through W3 and extending reach into sub-Saharan Africa, W3A will provide Skyplex and a Ka-band capability. W3A is the largest satellite ever launched for Eutelsat. It is designed to serve Europe, the Middle East and North Africa through a high power footprint optimised for direct-to-home pay-TV, video exchanges, VSAT networks and broadband services. Through a new Ku-band beam over sub-Saharan Africa, W3A will also strengthen and diversify Eutelsat's capacity for regional African communications and for connectivity between Africa and Europe for VSAT corporate networks, GSM trunking, broadband services, voice over IP, video contribution and distribution.

W3A has a payload of 58 transponders of which 50 can be simultaneously operated. There are 35 Ku-band transponders for Europe, the Middle East and North Africa, which will replace the full range of services currently carried by W3. This capacity can also be used in conjunction with Eutelsat's Skyplex on-board processing facility, which enables individual digital carriers to be uplinked to the satellite and multiplexed on-board. Up to eleven of the 35 transponders can be connected on the downlink into the widebeam over Europe, North Africa and the Middle East, or into a high-power beam optimised for southeast Europe and Turkey and reaching south into Ethiopia and Somalia.

It will provide 12 new Ku-band transponders over Europe, the Middle East and North Africa providing additional capacity for broadband services and which can also be used with Eutelsat's Skyplex on-board processing facility. Up to eight transponders are available for two-way communications between Europe and Africa. Six are forward-link transponders providing communications from Europe to Africa and two are return link transponders for communications from Africa to Europe. Communications over Africa are in the Ku-band and over Europe in Ka-band, with switching managed by the satellite. This is ideally suited for access networks with hub stations in Europe and terminals in Africa. Applications for this capacity include broadband Internet access, WAN/LAN interconnection, voice over IP, distance-learning and other videoconferencing services for businesses, government and aid agencies.

Up to 3 Ku-band transponders are provided for regional telecommunications in sub- Saharan Africa, also with possible access to Skyplex. The existing W3 satellite that launched in 1999 with an expected performance of 14 years will move from 7.0 Deg E. It will however, continue in full commercial service at an orbital location which to date has not been advised.

W3A Vital Statistics

- Spacecraft: Eurostar E3000
- Main body dimensions:
- Height : 5.8 m
- Length : 2.4 m
- Width : 2.9 m
- Solar Array Span deployed: 35 m
- Launch mass : 4,250 kg
- DC Power / End of life: 9 600 W
- Operational lifetime: 15 years +
- Orbital position: 7.0 Deg E
- Frequency bands Ku and Ka
- Number of transponders: Full payload of 58 Ku-and Ka-band transponders (50 operational simultaneously)
- Coverage: Europe, Africa, Middle East

Express-AM22

Express-AM22 was launched into orbit in late December and began operation on March 9. The satellite located at 53.0 Deg E carries 24 Ku-band transponders and has a 12-year lifespan. The satellite offers communications and broadcasting services across Russia, CIS countries, Europe, the Middle East, and North Africa. The Russian Satellite Communications Company who operate Express AM 22 have leased 12 transponders to Eutelsat.

Off Air

Feeds from Baghdad can still be seen on Eutelsat W1. This caption for AP Television News was spotted on 10.970 GHz (V) SR 4167 FEC 5/6

A feed from Asian broadcaster New Channel was captured on Telstar 12 12.608 GHz SR 19279 FEC 2/3.

Post Bag

Roger Bunney has written providing further information and background on the Coship receiver mentioned back in CQTV 204. Roger says "The latest thing in the "sat zapping" arena of reception relates to receivers. We had of course the RSD that you just enter a frequency and it finds the SR and FEC. Now we have the "blind search" receiver that you enter say 11.200 GHz as 'low' and 12.450Ghz as 'high' and the receiver will scan low to high across the band logging all signals. Any TV signals found are then listed by frequency and Symbol Rate and can be stored in memory. I am using the third version of the Coship 3188C model, the earlier one had no modulator but the 2 later ones have system B/G/I/K UHF modulators. The Coship can tune between 10.700 GHz through to 12.750 GHz in whatever chunk you wish and can scan in 3.0 MHz steps. In fact it has wide and narrow steps but I'm uncertain what the steps are, the narrower one will take longer for a scan. As it tunes up the band there is a band-check scan menu, so at any time you can see where the receiver has tuned. It will display PID's, signal levels, SR etc on the info menu but doesn't the display FEC. Apart from the Coship there are other receivers that can do a blind search such as the Satworks and Innovia receivers. The receivers are made in China and cost about £12.0 if you call in at the factory (it is rumoured). They are not currently available in the UK due to the demand probably being only for enthusiasts and as yet I am unaware of any sourcing from Europe. To sell in Europe they need the CE marking which means tests that cost ££££ and no retail firm is willing to pay for the cost of accreditation for the CE marking. My receivers came in a package of 6 units, which come in for "experimental use" or "not available for commercial sale".

Since Roger's letter I have spotted that the Satellite Superstore webs site are advertising availability of the Coship 3188C from March 04 onwards. Check out the relevant page on http://www.satellitesuperstore.com/enthusiast.htm

Reader Brian Bambury wrote querying how to repaint a black mesh 60cm satellite dish white without effecting reception. I'm most of us have given this issue some thought over the years. There are a couple of things to remember when choosing paint for a dish. Firstly, don't use a metallic paint –as this can reflect too much sunlight onto the LNB and could damage it. For the same reason the paint you use should be matt, not glossy. Also you need to use paint suitable for outside use, normal household emulsion will wash off in no time! Something like matt car paint should work fine. Make sure you use lead free paint for your own safety. Make sure you prepare the surface of the dish before painting to wash off any dust & dirt and remove (and seal) any surface rust. Don't paint the LNB cap!!

Belated thanks to Greg G3UGJ who sent me a copy of the Aviation Week Aerospace Source book published by McGraw Hill. As you would expect this publication provides a wealth of information on the Aerospace industry generally but also some very interesting data on satellite launches and commercial satellite operators.

Finally thanks to Roy Carman who has provided many of the feed sightings listed above.

Conclusion

That's it again for this edition. As indicated in my forward above it is important to have your news and views on the column to make sure it stays interesting and relevant to BATC members. As usual the contact details are the same; email via paul.holland@btinternet.com or phone to 01948 770429.

Circuit Notebook - 84

By John Lawrence GW3JGA

A Field Pulse for 'The Simplest Pattern Generator'

The CMOS 4060B (14 stage ripple-carry binary counter/divider) has been the basis of a number of waveform generator circuits. A version described by Terry Bond [1] in CQ-TV 138, page 34, as 'The Simplest Pattern Generator' has a minimum number of components and generates a TV line staircase waveform which is quite adequate for a quick check that ATV kit is working. A version of this circuit by John Cronk GW3MEO [2] was built into his 23cms ATV transceiver to provide a local signal source and was described by him in CQ-TV 181, page 74.

In essence, these circuits are the same as that shown in the top half of Figure 1. The first stages of the 4060 are used to make a 4MHz oscillator using a crystal or resonator. Outputs are available from each of the divider stages, Q3 to Q13. By taking the outputs from Q5, Q6 and Q7 and 'summing' these through resistors having a 4-2-1 weighting, a staircase waveform is generated. The lowest step provides an effective line sync pulse which is followed by seven equal steps up to peak white. The waveform is shown in Figure 2.

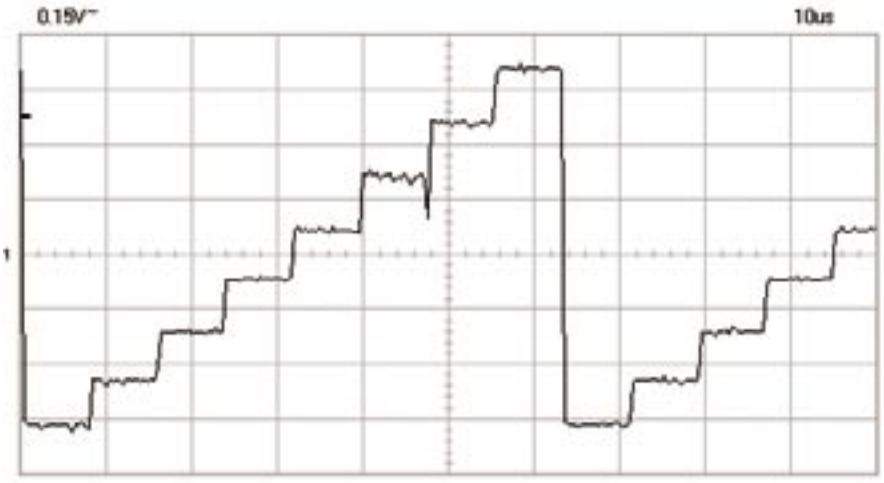


Figure 2 -The Line Waveform

However, this signal does not contain a field synchronizing pulse, which may make it unsuitable for some purposes. The lower half of Figure.1 shows a simple field pulse generator which, when connected to the staircase generator, as shown, removes the pattern for about 3 lines forming a single broad pulse, as shown in Figure. 3.

The field pulse generator consists of a free-running (50Hz or 60Hz) oscillator formed by two NAND gates (4011) followed by a pulse narrower circuit using the remaining two NAND gates and a transistor to couple to the staircase generator. RV1 is adjusted so that the bottom of the broad pulse and the line sync pulses are aligned. RV2 is adjusted to provide either a 50Hz or 60Hz field frequency.

This arrangement is an improvement on the original circuit and increases its usefulness. It is not suitable for feeding systems which require a full field sync signal to be present.

The sampling 'noise' on the waveforms shown in Figures 2 & 3 is due to using an inexpensive P.C. digital oscilloscope adaptor and is not present on the waveform. Honest!

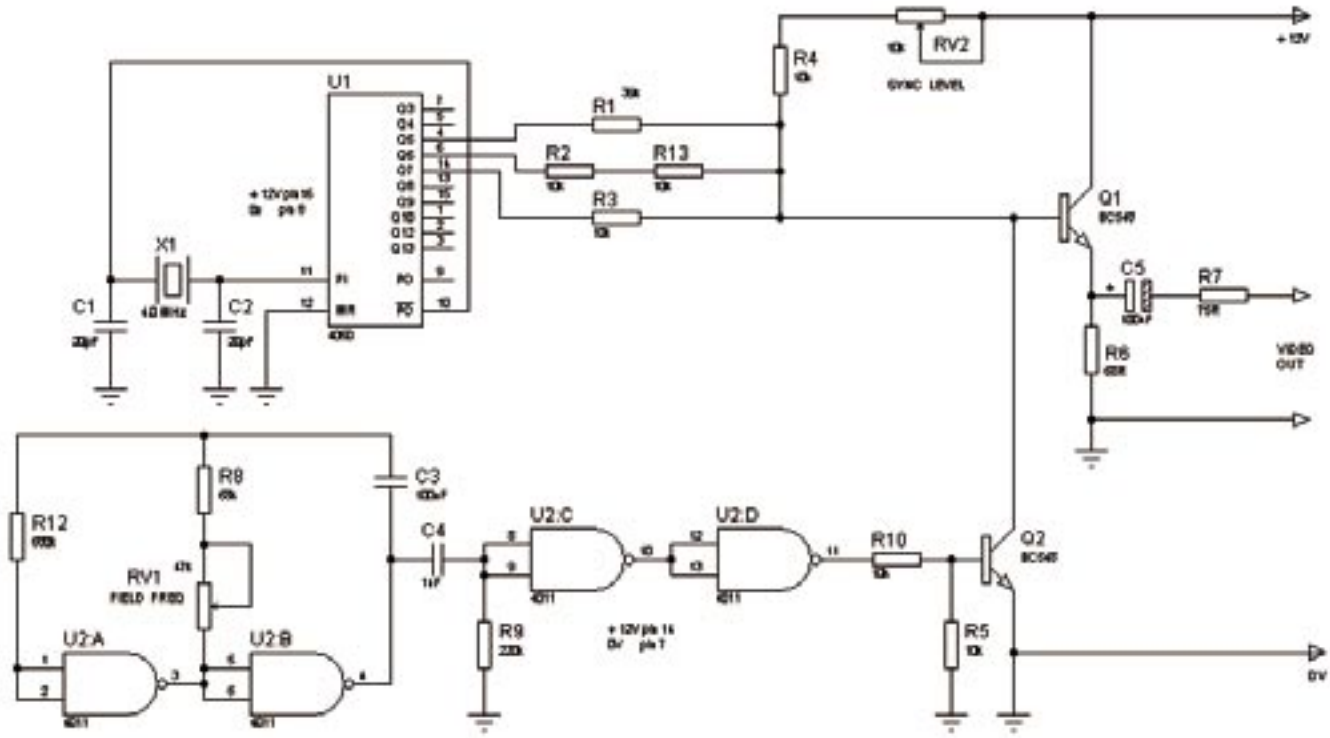


Figure 1 - Staircase Generator

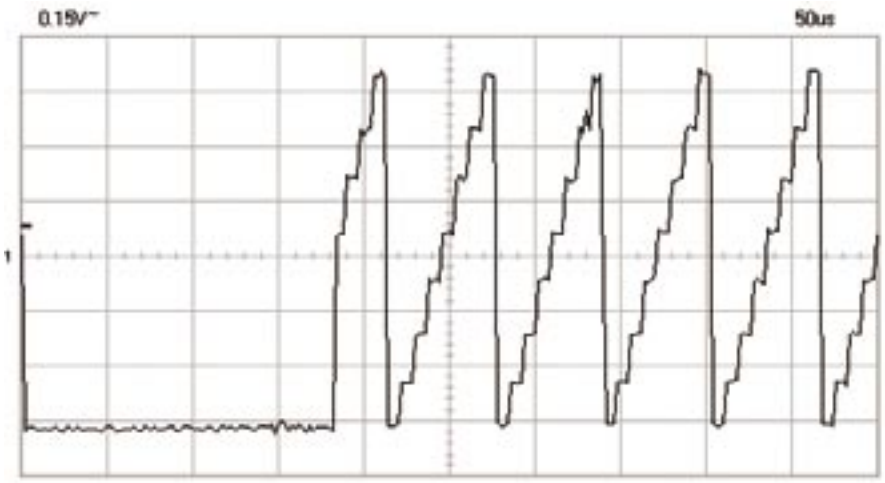


Figure 3 - Frame waveform

References

[1] The Simplest Pattern Generator Terry Bond, CQ-TV 138, p.34

[2] 23cms TV Transceiver John Cronk GW3MEO, CQ-TV 181, p.74

[3] Digital-to-Analogue Converters Don Lancaster, CMOS Cookbook, p.288

[4] Astable circuits using CMOS gates Don Lancaster, CMOS Cookbook, p.225

Digital ATV and my place in the gene pool

By Brian Kelly.

There is much discussion on the future of ATV. I have to say, that if past prophecies had come true, ATV would have been dead and buried and forgotten many years ago. Instead we find ourselves at the dawn of a whole new digital video era with boundless possibilities open to us. Of course there are those who are content with their existing lot, are closet technophobes or believe that old dogs can't learn new tricks. Equally, there are those who laugh at the thought of someone using large glass bottles, connected to lethal voltages and so thirsty for power they glow red hot. I suppose that wherever you sit on the electronics time-line you can look both backward and forward, it's just that what happened in the past has a comforting 'I survived that' feel about it whereas the future seems like a dark horizon, retreating at ever increasing speed into the distance. I am perhaps fortunate in that I grew up with the glass bottles, siezed the advantages of solid-state electronics and I still haven't stumbled while moving into digital times. I suppose I'm not sitting on the time-line, it's more like I'm surfing along it.

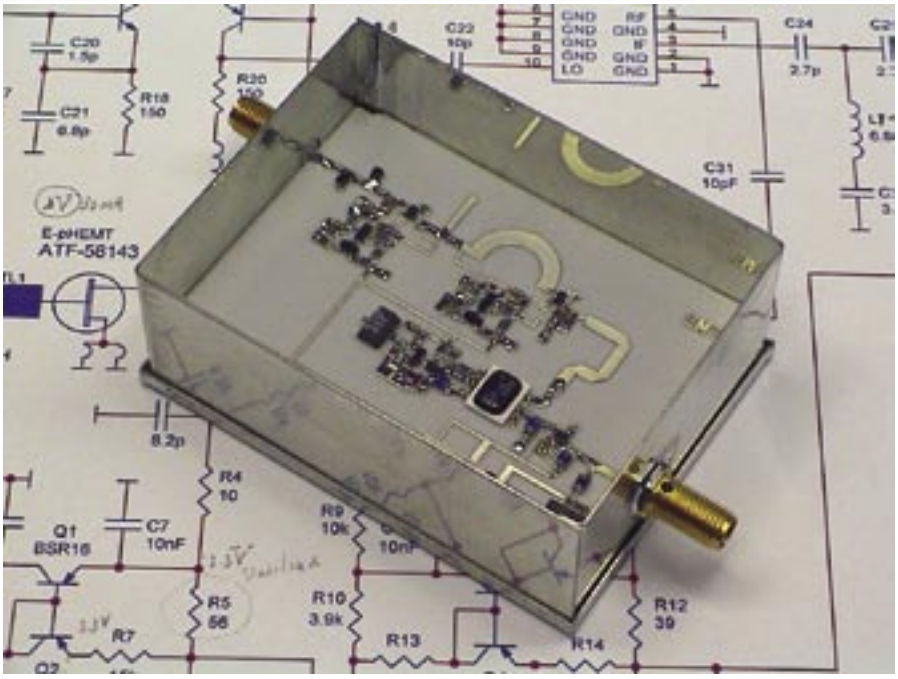
I have worked in the electronics industry for more than 30 years, in that time I have worked closely with many college and university students, on 'work experience' schemes or as graduates entering full-time work. Despite their higher education, and no insult to any individual is intended, I don't think a single one would have been able to build a crystal set or explain how it worked. On the other hand I have also worked with people who have no academic qualifications but are 'time-served' in the industry and I have great confidence that all of them would easily complete the same task.

The point I'm trying to make is that it makes no difference what you perceive your skill level to be or what your background is. We are all guilty of saying 'I can't do that' in the belief that someone with greater skills can do it easily. It simply isn't true and I would guess that the vast majority of ATV enthusiasts are far more competent than they think and can speedily adapt to digital technology if they would only lose their inhibition.

Digital is not complicated, think about it, how can a branch of electronics that only has two voltage levels be difficult to understand. Surely older techniques with their infinite number of voltage levels, and strange concepts like reactance, inductance and impedance must be more complicated. Granted, digital does require a different kind of thinking but to dismiss it as 'beyond me' is being very short sighted.

13cm DATV converter

By Hans Bruin, EMT



As a result of enormous growth in mobile telephony, there is a strong increase in power density, and components and circuits need to be adjusted in order to function properly under these circumstances. Amplifiers are needed with a high third order intercept point combined with a well chosen filter method. An excellent amplifier is the ATF-58143, introduced in April 2003 by Agilent Technologies Inc. Its most important properties are: high dynamic range, low noise and single-voltage operation. A suitable candidate for the intermediate frequency is Agilent's ABA-53563, a 3.5 GHz broadband monolithic amplifier. The local oscillator is fitted with a SAW resonator. The frequency generated is highly stable, comparable with crystal stability, and has low phase noise. This last feature is especially important for amateurs experimenting with digital modulation techniques. An MCA1-42 was chosen as mixer, a double balanced type from the "Blue Cell" series from Mini-Circuits.

The circuit-diagram

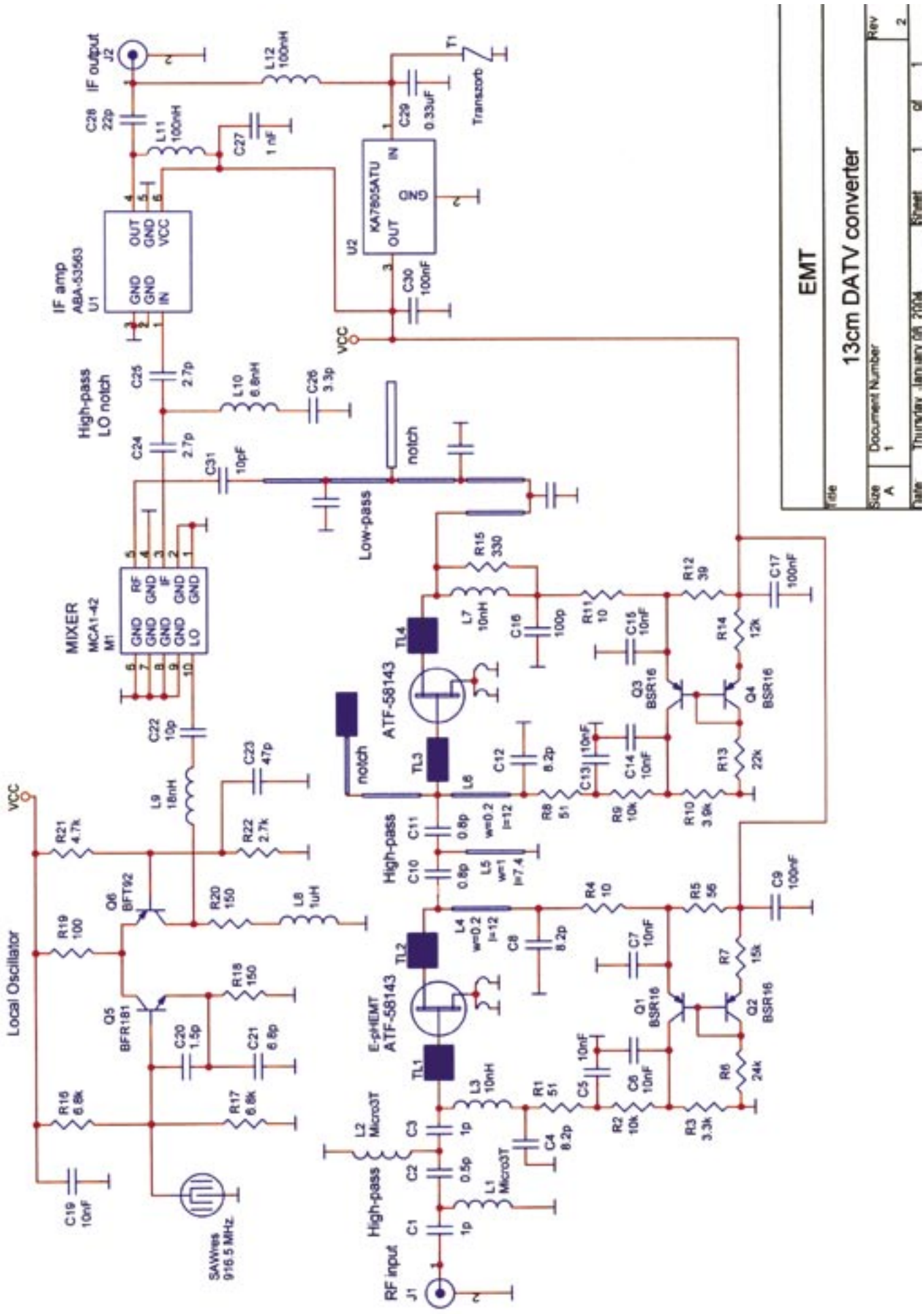
An important requirement for the converter is no deterioration of reception on 13 cm whilst transmitting on 23 cm. Because of this, the first FET must be preceded by a suitable filter. Attenuation must be as good as possible on 23 cm and lower frequencies; in addition filter-loss on 13 cm must be minimized in order to preserve a low noise factor - these requirements can be met by a high-pass configuration. Let's have a look at the circuit-diagram: C1, L1, C2, L2 and C3 form a five pole high-pass filter. L1 and L2 are miniature air coils; manufacturer Coilcraft uses a transmission line model for these 'Micro Springs' and gives measured values for each coil.

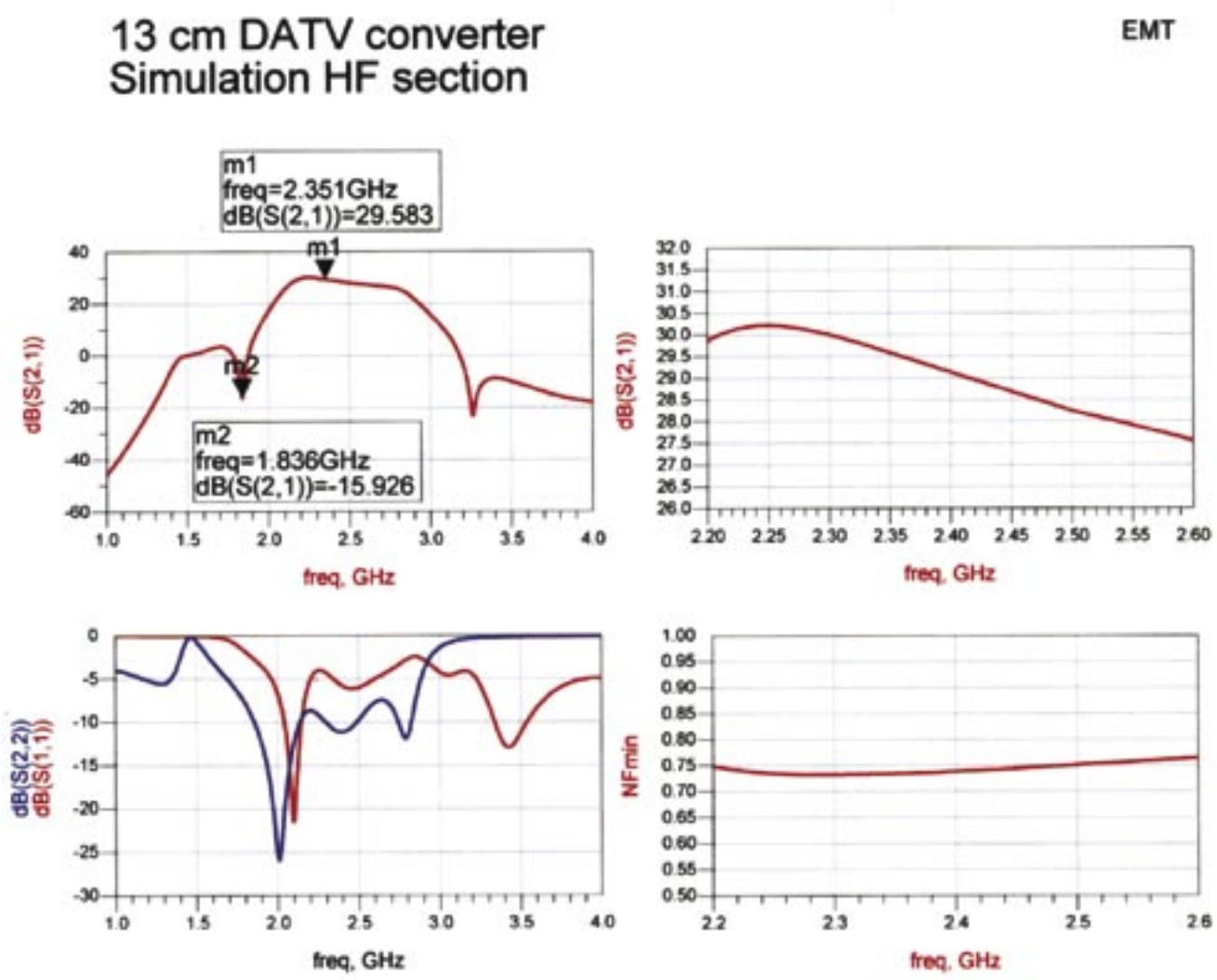
Simulations executed using Agilent's Advanced Design System 2003A (ADS) indicate less losses for these air coils than a microstrip version of the inductances.(using Rogers RO4003 laminate with a dielectric thickness of 0.51 mm.) Frequency dependent behaviour of the earth-connections for the coils (0.4 mm. via's) was observed using Momentum, the Electro Magnetic Simulator of ADS. The result was saved as an S-parameter file and used in the simulation of the converter circuitry. C1 - C3 are Johanson C-series tight tolerance chip capacitors. The S-parameter modeling data measured by Johanson is also used in ADS. The first FET, Agilent Technologies's ATF-58143 is an enhancement mode pseudomorphic high electron mobility transistor, in short: E-pHEMT. When biased at Vds=3V and Id of 30 mA, this device is specified as having an output intercept point (OIP3) at 30.5 dBm and providing 19 dBm output power at 1 dB compression. The ATF-58143 has a low typical noise figure (0.5 dB) and provides 16.5 dB associated gain at 2 GHz. Contrary to a depletion mode pHEMT pulling maximum drain current at Vgs = 0 V, an enhancement mode pHEMT pulls nearly zero drain current, whereas maximum drain current is achieved at Vgs = +0.5 V. This allows dc grounding of the source leads and yet requires only a single positive polarity power supply. An active biasing method provides stable drain to source currents over a wide range of temperature variations.

Q1 and Q2 with their associated components set the gate of the first ATF-58143 on such a positive voltage that exactly 30 mA drain current is achieved at 3 V.

Although this circuit does not act as a true current mirror, because of R5 and R7, the current through R5 will be stabilized if the voltage drops across R5 and R7 are kept identical, thus stabilizing Ids and Vds. Transistor Q2 is configured as a PN junction (base and collector tied together). This helps temperature compensate the emitter-base junction of Q1.

A similar bias circuit sets the second ATF-58143, again at Vds = 3V, but the drain current is now stabilized at 40 mA. In order to achieve unconditional stability for these two gain stages, feedback is implemented by making the source leads somewhat longer. Too much lengthening causes a gain peak at higher frequencies and possible instability, besides too much gain reduction at the wanted frequency. The stability margin for the second stage is increased by placing R15 parallel to L7. After the first gain stage, a second high pass filter is placed as an additional buffer, rejecting unwanted signals. The following notch absorbs signals in the 1.85 GHz region (base stations for mobile telephony). A 1mW (0 dBm) input signal on 1.3 GHz will be only -22dBm at the mixer input. A weak signal on 13 cm, though, will be amplified almost 29 dB with a noise figure of 0.75 dB. The second gain stage is followed by a low-pass filter connected to the passive mixer. Frequencies above 3.2 GHz are attenuated more than 30 dB. This helps to suppress mixing products that could otherwise be present at the IF output. The oscillator circuit delivers about +7 dBm to the double balanced mixer. The SAW resonator is actually designed for remote control and data-link transmitters on 916.5 MHz. It would have been nice to have a 1 GHz LO-frequency, but this frequency is not





available. Q5 is configured as a Colpitts oscillator. The voltage divider R16/ R17 provides the optimal dc voltage at Q5's base. Q6, a buffer in grounded base configuration, uses the series tuned circuit L9 / C22 to match the mixer's impedance. Again, a voltage divider R21 / R22 takes care of the optimal dc voltage at the base of Q6. The resistance value of R20 sets the dc bias point, while R20 together with L8 realizes a higher collector impedance on 916.5 MHz. At the MCA1-42 mixer's output port, the LO level drops to -15 dBm due to the 22 dB L-I isolation. A further attenuation of this unwanted product to a level of -42 dBm is obtained by the following combined high-pass / notch filter formed by C24, C25, L10 and C26. The I.F. frequencies are amplified by Agilent's ABA-53563. This silicon rf ic amplifier provides a nominal gain of 21.3 dB and P1dB of 12.5 dBm at 2 GHz; dissipation is 230 mW (5V, 46 mA); noise factor is specified as 3.6 dB; frequency response is flat to 2 GHz and the -3 dB point is reached at 3.5 GHz. Although internally closely matched to 50 ohm, the output port of the ABA-53563 can be connected to a 75 ohm system without problems. Return loss will be 14 dB (VSWR 1.5). T1, a transzorb, prevents damage by peak voltages above 28 V and wrong polarity of the power supply. U2, a 7805, regulates the input voltage coming from the satellite receiver. This voltage is allowed to be anywhere between +8 V and +18 V.

Ref.: Agilent Technologies

1 A Low Noise High Intercept Point Amplifier for 2 GHz Applications using the ATF-58153 PHEMT, Application Note 1352

2 Agilent ATF-58143, E-pHEMT GaAs FET Low Noise Amplifier Design for 900 MHz Applications, Application Note 1375

3 Agilent ABA-53563 3.5 GHz Broadband Silicon RFIC Amplifier, Application Note 1347

For further information and completed units contact: Rob Boom GIE T.V. homepage: http://www.gietv.com

Contest News

By Richard Parkes G7MFO

I would like to apologise for the lack of results in CQ-TV last month, I was hoping to get the final International results to print, but are still awaiting them.

Due to work commitments and college courses the contest news is going to be very short this edition.

Congratulations go to the Severnside Television Group for the first place during the International last year.

The dates for the next two contests are as below; the times for the International might change to 1200 UTC Saturday to Sunday a full 24 hours! I will update the web site when I have got further information on this from the other 'European' contest managers.

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

Contest Calendar 2003

Summer Fun 2003 (Joint European) Saturday June 12th – Sunday June 13th

IARU International ATV Contest 2003 Saturday September 11th – Sunday September 12th

All from 1800 UTC Saturday to 1200 UTC Sunday

Fast Scan ATV all Bands.

IARU ATV Contest 2003 (BATC Results) 13/14 SEPTEMBER 2003

70 CM Section 1

	Place		Call	Points	Locator	Nb Qso	Dx	Km	
	1		G8GKQ	307	IO91TP	2	G8GON/P	235	
	2		G6COL/P	35	IO93RG	1	M0HHF	35	

23 CM Section 1

	Place	Dep	Call	Points	Locator	Nb Qso	Dx	Km	
	1		G7ATV/P	10526	IO81QG	25	G4YTV	327	
	2	78	G6COL/P	4526	IO93RG	17	G7ATV/P	263	
	3		G8GKQ	1960	IO91TP	6	G4UVZ	205	
	4		GW4NOS/P	1682	IO81FP	7	F4BWI	354	
	5	64	G3RMX	20	IO93UV	1	G4YTV	5	

13 CM Section 1

	Place	Dep	Call	Points	Locator	Nb Qso	Dx	Km	
	1		G6COL/P	5845	IO93RG	8	G7ATV/P	263	
	2		G7ATV/P	4475	IO81QG	6	G6COL/P	263	

3 CM Section 1

	Place	Dep	Call	Points	Locator	Nb Qso	Dx	Km	
	1		GW4NOS/P	1420	IO81FP	3	G7ATV/P	76	
	2		G7ATV-P	1050	IO81QG	2	GW0NOS	76	
	3		G6COL/P	990	IO93RG	4	G7ATV/P	55	
	4		G3RMX	50	IO93UV	1	G4YTV	5	

General Section 1

Place	Call	70 CM	70 CM	23 CM	13 CM	3 CM	1,5 CM	0,7 CM	Points
1	G7ATV/P			10526	4475	1050			16051
2	G6COL/P	35	35	4526	5845	990			11396
3	GW4NOS/P			1960		1420			3380
4	G8GKQ	307	307	1682					1989
5	G3RMX			20		50			70

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41 I²C VDU PCB	£10.00	£0.43		
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44 SAA5243PE Teletext IC	£14.70	£0.30		
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81 I²C 27256 EPROM	£9.70	£0.30		
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10 I²C Relay PCB	£6.50	£0.43		
9 PCF8574A Input expander IC	£4.70	£0.43		
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69 5.0MHz crystal	£3.25	£0.30		
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75 BATC equipment label (6)	£0.25	£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		
CQ-TV Back Issues: The following issues are still available. Please circle those required: 142, 143, 144, 147, 150, 153, 154, 156, 158 159, 162, 163, 164, 166, 167, 168, 169, 170, 171, 173, 174, 175,176, 177,178, 179, 180, 181. 182, 183, 184, 185, 186, 187, 188,189, 190, 191, 192, 193, 194, 195, 196, 197, 198, 199, 200, 201, 202	£1.50		
Special Offer: Any four of the above issues	£5.00		
203, 204, 205, 206	£3.75		
The BATC CD	£5.00		

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PLEASE MAKE CHEQUES PAYABLE TO 'BATC'.

RS-232C Powers and Reads 8-bit switch matrix

By Dhananjay Gadre, IUCAA, Pune, India

The circuit in Figure 1 provides a remote menu-selection switch matrix for PCs. It connects a linear, 8-bit switch to the RS-232C port; the RS-232C signal pins provide the circuit's frugal power requirements. You can easily modify the circuit to read more switch inputs. The heart of the circuit is a 74HC165 8-bit, serial-output shift register. It's important that you use either this register or a similar one from a low-power IC family. The shift register has eight parallel-input pins that receive their drive from an 8-bit DIP-switch matrix.

A low-going input pulse on the load-input pin transfers the 8-bit parallel inputs into the shift register. Subsequently, the bits shift out at the appearance of a high-going pulse on the clock-input pin. The serial-input pin on the shift register connects to 5V, but you could also use it to cascade multiple shift registers. The TX and RTX signals drive comparators IC2A, IC2B, and associated components. The TX and RTS signals from the RS-232C line generate the load and clock signals for the shift register. The outputs of the LM324 slew rather slowly. The 74HC14 Schmitt-trigger buffers in IC3 square up the waveshape of the load and clock signals to the shift registers.

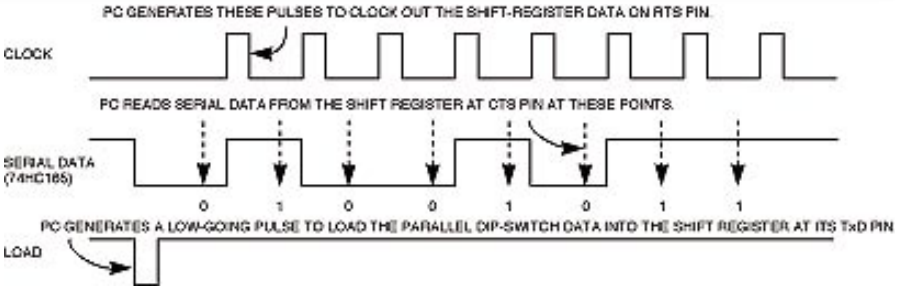


Figure 2 - Because the op amps in Figure 1 slew slowly, the PC must generate a slow clock to read the switch matrix.

Comparator IC2C translates the serial output of the shift register to RS-232C levels. The CTS input of the RS-232C line reads this output signal. Diodes D1 through D6 and capacitors C1 and C2 generate the ±VCC supplies for the comparators. A 78L05 regulator generates 5V from the +VCC line for IC1 and IC3. Figure 2 shows how the PC reads the switch matrix through the RS-232C port. The signals shown are those that appear at the shift-register pins. The clock pulses have a 2-msec width and 5-msec period. Listing 1 gives a sample program that controls the switch matrix.

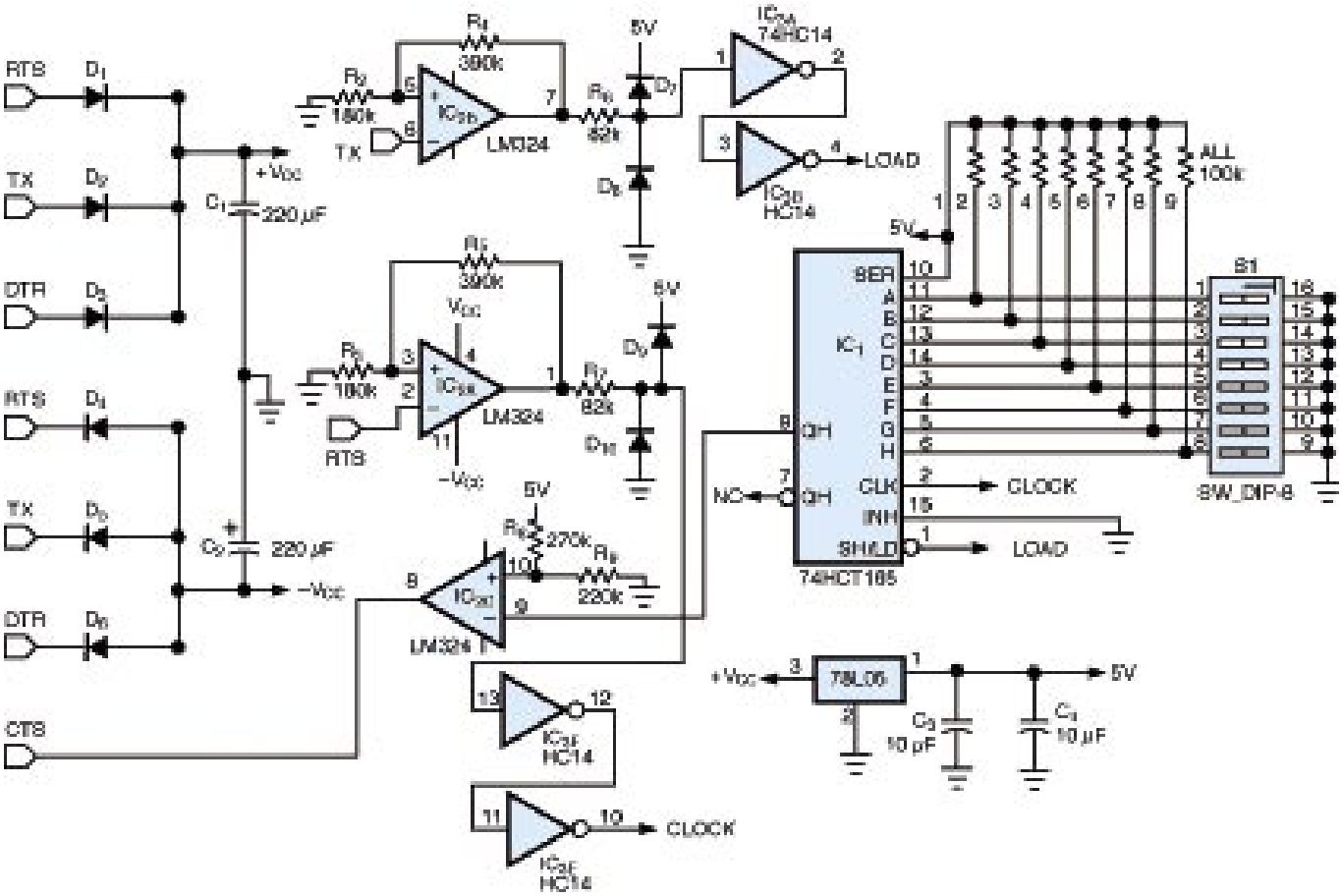


Figure 1 - You can use a PC's RS-232C port to power and read a remote-menu selection-switch matrix.

An Outside Broadcast Truck for the 21st Century? Maybe...

By Mark Bloor

The control room

About March of last year it was becoming apparent that my existing OB truck with its traditional concepts and tube cameras really wasn't suitable for the sort of jobs we were doing and so it was time for a rethink..... The arrangement (at the time) followed the usual broadcast practice - component vision mixer, component monitoring in engineering and PAL in production, with the camera preview monitors B&W. Additionally there was a fairly simple PC for graphics and titles.

Originally the unit had been built for TVS for the beginning of the 1982 franchise. The vehicle was based on a Bedford TK chassis, with the coachwork by Gowrings, the electronics by Sony. I believe this was Sony's first foray into OB vehicle manufacture and was used in much of their early publicity. Indeed, I have some of the original literature showing the actual vehicle and the TVS opening film and ident. Anyone who has the original TVS ident with the biscuit brown OB truck flashing its lights, that is my vehicle. The cameras were BVP 300 with Sony colour and Cotron B&W monitors. The vision mixer was a GVG1600, with a Neve 24 channel audio mixer completing the ensemble. This was all removed prior to my getting the vehicle.

So where to start? Well cameras seemed a good place 6 CCD widescreens would have been nice, but as this is an expensive "hobby" and not a full time business I didn't think spending £50K on cameras was acceptable, so I looked around and from various sources managed to locate, over a period of some months, Sony DXC 537 with CA537 backends. Yes I know they are industrial, but to be honest the difference between broadcast and professional (as far as subjective pictures are concerned) is price!! So having got the cameras I needed to interface with Sony CCU, utilising the very many metres I had of Hitachi camera cable.

In Editing mode

This presented the first issue. Sony use low voltage high current feeds to the cameras; the Hitachi and JVC arrangement is to use high voltage low current, so I had to feed high voltage (150V) up the camera cable. This was achieved by using the 12 volts out of the CCU to operate a switch mode power supply, which feeds 150V up the camera cable - at the far end this necessitated an interface box to step down to 12V for the Sony cameras. As I had to make cable adapters it was not too much of a problem to fit the PSU into the same box... it just got bigger. The incidental advantage is that I have enough power to operate the studio lenses and viewfinders at the camera without having to use a battery for the lens - eat your heart out Sony! The viewfinders and lenses were recycled from my Hitachi cameras, plus some additional acquisitions.

The next issue was vision mixing. SDI would be nice indeed, following on from our illustrious President's articles on SDI and his vision mixer. Trevor Brown and I did rough out an SDI mixer, trying to circumvent the problems of the obsolete chips and making an SDI encoder. Indeed I was ready to prototype one, but the chips required have to be bought in significant numbers and are expensive.

The Sony DXC 537 camers

Trevor and I calculated it would cost £1300 to buy the minimum number of serialiser chips.... I then found several companies that make SDI encoders for around $300, so it would have cost more to make than buy!! Back to the drawing board. Some of you may remember I wrote an article some time ago on Newtek's Videotoaster- since then I have got the SX8 and RS8. The SX8 is a 24 input switch. As this gives the option of an eight input vision mixer (with the option of PAL, Y/C and component) 3D DVE's and DSK why not use it... well Bill Gates springs to mind, but things are getting better with 2K and XP pro.

During testing things had seemed stable so it seemed sensible to proceed. As the first thing the VT3 (aka Video Toaster) does is to convert the incoming video to CCIR 601, it was effectively giving me an SDI vision mixer - the cables to the SDI encoders effectively being some 6 feet longer than they would have been had I used standalone encoders and an SDI mixer! In other words there is a pair of "agile" SDI encoders which are switched to encode the required vision source. In addition, I got DVE's and a DSK plus disk based recording, with an ANALOGUE output to tape, which is now the backup! How things change. VT3 comes with the Aura paint package and Lightwave, so you can do your own 3D DVE's and 3D graphics as well as traditional 2D ones. Moreover, it also has an excellent editing package, so once the material is on disk (as uncompressed 601 or MJPEG or DV compressed formats - indeed any software capable codec you have on your PC) you can edit and dump out to tape under RS422 control. The material can be converted to MPEG2 for DVD authoring, all in the comfort of the OB unit. Having a PC also means, as happened last week, if someone turns up with a computer disk with material on that they want to include in the programme (live in this case), it can be "sucked in" and loaded onto a virtual DDR (Digital Disk Recorder), which can have a playlist loaded and - as soon as the button on the mixer panel is hit - it auto runs!

So what of the problems with a "computer based" system? Firstly there is currently no PAL preview out, so you either need a scan converter to produce PAL or you need a SXVGA monitor in production. As VT3 uses dual head display, I originally scan converted the 2nd head out, on which I had dropped the PV display. However, to facilitate editing and viewing some of the icons, I am changing this as I write to 2 VGA monitors in production.

As there are certain adjustments in VT3 which belong in engineering, I have a VGA for the primary display in engineering, with a keyboard and trackaball attached to the PS2 ports; the VGA feed has to go through a VGA DA (150 meg bandwidth!!) to feed both monitors.

In production you need the keyboard, mouse and mixer panel. As all of these are fed from the USB port, a simple powered hub will feed them all (it needs to be powered, as the mixer panel consumes 500mA), moreover the USB run is too long without the use of repeater hubs. This has proved to be very satisfactory, once I got rid of the brand new and defective powered hub intermittent of course!!

The next area to consider was SPG's. As I currently use a Seltech 110, there didn't seem much reason to change. However, as VT3 produces an output which is broadcast in spec and independent of its input, I could use this for my reference feed (even though VT3 will synchronise inputs it is still better to genlock the sources where possible). I do however still need syncs for my COX PV matrix and vector and waveform monitors, plus the RGB sequential switch, which

The adapter box

The production area

I use to parade YUV - which it does very well despite being designed for RGB and 23 years old!!

I have therefore decided to use VT as my reference and gaining some 5 U of rack space in the process, to recover the required syncs etc I use a shootView pulse regenerator.

The final area to consider change in was production. I think B&W monitors are fine for cameras; however I seem to get increasing flack over them not being colour. Also, to be fair, they were in need of capacitor replacement - very very poor LF!

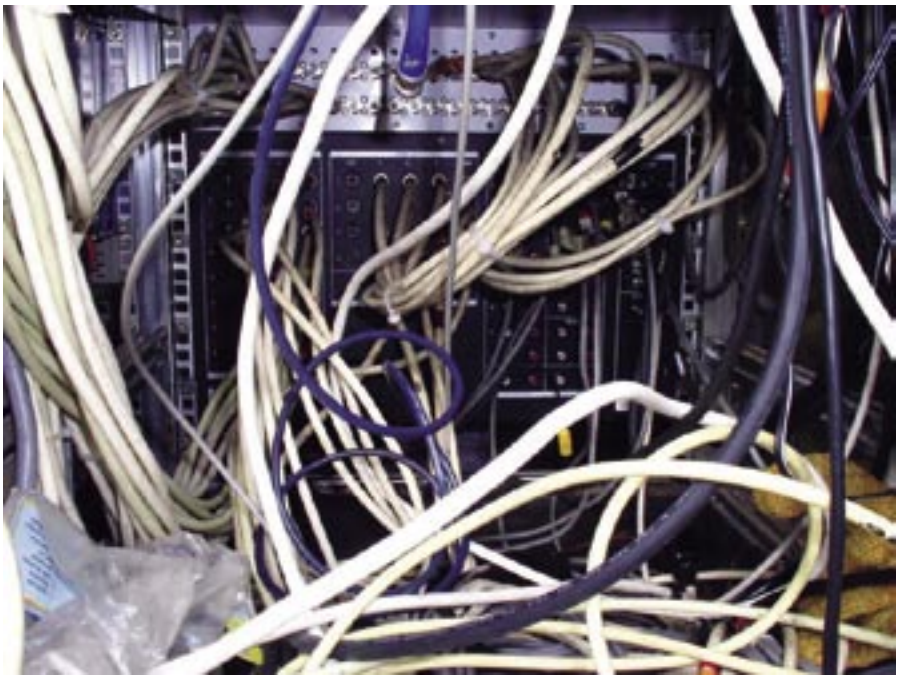
As I had a number of spare Melford colour monitors, I experimented with these and a quad split screen device. This seems adequate for the job, no cut-off, no perceptible delay and all real time and I get the additional benefit of on screen ident of each source. This has resulted in my monitor stack shrinking and even with 14" Melfords underscanning, each individual picture is the equivalent of a 7" screen for each of the cameras.

There is one remaining "problem" using VT3, - delay. It is significant and as most of our recent forays have utilised large (LED type) displays 4 metres plus) and DMD projectors, which also introduce delay, the talent stops moving but carries on for perhaps150mS on screen and if you are covering singing it can look, especially with the LED type screens, as though they are very poorly lip syncing! This also makes for interesting sound arrangements in the OB unit. You really need to switch between VT3 out and live in, depending on what you are doing sound wise.

What other advantages did VT3 give me? In these days of computer media, import and export is simple - even Powerpoint presentations can be imported and turned into "video". These can be played from the virtual tape machines (DDR) on cue and if you set the next shot on the PV bank it will automatically cross-fade to it at the end or DVE to it. As I mentioned before, as soon as you cut to the DDR it plays, so no more additional tape operators!! There are even limited automated audio mixing facilities, as VT3 has 2 mic and 10 line inputs on the breakout box. With the addition of an ADSL line to the truck I can stream video cut on VT3 in real time to an internet audience!! Recording straight to disk is useful as it avoids the need to pour the tapes into the computer for editing, thus saving time. The editing package with VT3 will handle mixed formats on the time line without rendering and all the effects and layers are real time up to the limits of the PC, including 2 and 3D DVE's and colour correction. Finally if you have a DV cam and firewire cable, multiple instances of it (i.e up to the limit of the number of firewire connections you have) can be assigned onto the mixer and cut and effected in real time, though there is a fair amount of delay due to DV latency.

Since starting this article we have used the truck for some 7 "OBs". The last one was basically the equivalent of a 3 hour news magazine programme. The material arrived the night before - a mixture of hi-res photographs from the newspaper, DVD, VHS and material on a firewire disk. The material had either to be digitised or otherwise acquired. It then had to be edited - in the case of the video material into a series of half a dozen inserts, each of a couple of minutes duration. These were played back into the show, with sound, using a DMD video projector. Straight after the insert it was back to a roving presenter interviewing the winner.

The photographs had to be edited as a montage to a piece of music, as the newspaper's photographer was receiving recognition for his many



Well and truly 'wired'

years of service. These video sequences were loaded into a virtual VTR as a playlist and brought up as a source on the mixer (virtual patching of course!). There were also a whole series of sponsor logos which we had to resize and adjust to a suitable aspect ratio. These were loaded into a second DDR (virtual VTR) and again patched up to the vision mixer, to be used this time as a slide file. So before we even considered the "mixer" function of VT, it had been used as an acquisition device, a broadcast graphics paint package, a time-line based editor and 2 uncompressed D1 VTRs, plus slide file. We could then set up the cameras - the inputs to VT, which as I have mentioned basically has 2 agile SDI encoders switching between cameras. Set up can be achieved automatically with the cameras set to BARs providing you know what type they are! It is then just a matter having 2 people run 1 computer, though with more time it is possible to automate the play out of the virtual VTR on a clip by clip basis, so theoretically the director/vision mixer can run the whole show! On the camera front, we had 2 cable linked roving cameras, 2 on tripods and one RF linked for total freedom of movement (except for the RF nulls).

I guess the question everyone is now asking is, did it crash? The answer is a qualified "yes", I loaded up 40 2000plus by 2000plus pixel JPEGS, and everything ground to a halt. So I forced a reboot. From then on, everything worked without any problems and it was hectic; for over 3 hours everything from 1 PC - full bandwidth component video from 5 cameras, 2 D1 virtual DDRs and a slide file plus downstream key.

Setting up

A rear view of the VT computer

*(Since the OB I have repeated the above and left VT to get on with it after a couple of minutes, plus all the images were resized so it didn't crash - it was just doing a lot of thinking. I also checked the swap file.. it was 1.9GB!!!)

What did we learn? Having a computer based digital truck does help; there is no way we could have done what we did with traditional equipment. It is also a double edged sword. People assume we can cope with just about anything they throw at us, including a VHS tape 10 minutes before the off! The ability to edit in the truck is a great boon, but also creates a bit of a bottleneck as everything, and I mean everything, has to go through 1 piece of equipment. Given what we were doing, I have decided that we need a second VT3 with networking between the 2 machines. This would allow one to acquire and edit, whilst captions could be created on the other, or vice versa. It also gives us the ability to send 2 different feeds, one say for a recording without captions slides etc. and a second feed to the projector with all the captions stills etc superimposed over. What I have not yet done is pushed the final part of the setup, recording on the PC as well. The reasons for this are twofold. First, the PC is only a dual 1.7 GHz Xeon - the specification suggested is dual 2.6 GHz Xeons. Secondly, the material needed to go elsewhere for editing, so tape was used. This is another reason for a second machine - it can also be used to record on plus I'm a chicken and didn't want to push my underrated system to the limit.

What for the future? We need to have the following permanently available:- a VHS player, a DVD player, a small computer network between machines plus a spare network input for a laptop to transfer files. I have also incorporated into both of the VT3 machines a multiformat card reader - I think this one covers all current removeable media even microdrives. Front mounted USB and firewire connections are a must, plus suitable connecting leads added to the usual BNC, Musas and XLRs. The current ability for all to create multi-media (e.g. Powerpoint presentations) opens lots of opportunities to incorporate them into a presentation, and people expect it. It is no use explaining that the aspect ratio is wrong, or the number of pixels is too high, they just want to see it as video…. after all its just the same as far as they are concerned. Their computer TV (monitor) connected to the ubiquitous and all pervading PC shows video so why can't you? Again, there is no point trying to explain about overlay of video in a PC display!!

Finally, VT has one final trick up its sleeve. You can accquire NTSC video (by changing the preferences). The resulting file can then be resized to PAL and, with the preferences changed back, played out as PAL - all in realtime. What it cannot do is take NTSC live video in and output to PAL and vice versa; it must be recorded first, and resized from the original format to the destiantion format, though this is all done in real time!!

Active Filters for Video

Originally, video filters were passive LC circuits surrounded by amplifiers. Smaller, more efficient designs can currently be achieved by combining the amplifier with an RC filter. Sensitivity analysis and predistortion methods developed in the 1960s have, moreover, over-come the poor performance that gave early video filters a bad reputation.

High-performance op amps and specialized software for the PC enable the design of wide-bandwidth active filters, but those advantages do not address the requirements of any specific application. For video filters, the particular application and signal format add nuance to each circuit design. The two major video applications follow. Antialiasing filters: These devices are placed before an analogue-to-digital converter (ADC) to attenuate signals above the Nyquist frequency, which is one half the sample rate of the ADC. These filters are usually designed with the steepest possible response to reject everything above the cutoff frequency. For ITU-601 applications and others, such performance is achieved using analogue filters combined with digital filters and an over sampling ADC. For applications such as PC graphics, very little filtering is required.

Reconstruction filters. Also called (sinx)/x or zero-order-hold correctors, these filters are placed after a digital-to-analogue converter (DAC) to remove multiple images created by sampling, though not to remove the DAC clock. Reconstruction filters are seldom as selective as anti-aliasing filters, because the DAC's hold function also acts as a filter - an action that lowers the required selectivity, but introduces loss in the response. The available video formats are RGB, component video, composite video, and RGB PC graphics.

All applications and formats require a video filter to be phase linear, a condition specified by the parameter called group delay (delay versus frequency). The degree of phase linearity required depends on the application and the video format. For example, anti-aliasing filters and component formats are more tightly specified than are reconstruction applications and composite video. Requirements for the various applications and formats are specified by NTSC, PAL/DVB, ITU, SMPTE, and VESA.

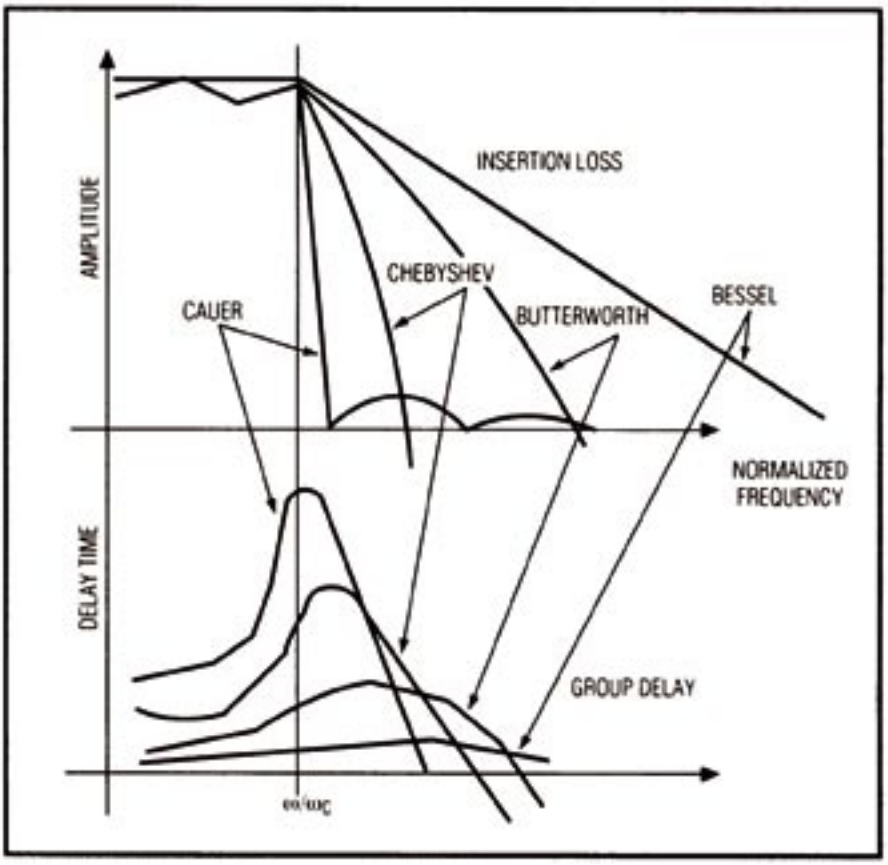


Figure 1 - Amplitude and group delay vs. frequency for various filter types are normailsed to a 1-rad bandwidth

This article compares different filters to determine the optimum design for a given application or format. Rauch and Sallen-Key realizations are compared for their GBW-to-cutoff ratios, using pre-distortion and element sensitivity techniques to achieve accuracy in the design.

Those filters to be considered are:

- An ITU-601 anti-aliasing filter
- A 20MHz anti-aliasing and reconstruction filter
- An HDTV reconstruction filter

Filters and their characteristics

Whether used for anti-aliasing or reconstruction, the filter must have a low pass characteristic to pass the video frame rate. One should, therefore, be wary of AC-coupling. Low pass filters are categorized by their amplitude characteristic or by the name of the polynomial that describes it (Bessel, Butterworth, Chebyshev, or Cauer). Figure 1 shows these characteristics normalized to a 1-rad bandwidth. Typically, a filter with the best selectivity and the minimum number of poles (to minimize cost) would be chosen, but the additional need for phase linearity limits the available choices.

Phase linearity and group delay

A filter's phase linearity is specified as envelope delay or group delay (GD) versus frequency. A flat group delay indicates all frequencies are delayed by the same amount, which preserves the shape of the waveform in the time domain. Thus, absolute group delay is not as important as the variation in group delay. A separate specification called channel-to-channel variation, which is specified as "time coincidence," should not be confused with group delay.

Though not desirable for video, how much group-delay variation is acceptable, and why? The answer depends on the application and the video format. For example, ITU-470 specifies group delay very loosely for composite video. However, ITU-601 specifies it tightly to ensure generational stability, both for MPEG-2 compression and to control phase jitter before serialization.

Table 1. Component sensitivities including BW and Q predistortion formulas (Sallen-Key realization, ω_0 = 1rad/sec)

Sensitivity Function S_x^y	Gain K = 3 - 1/Q (R1 = R2 = C1 = C2 = 1)	Gain K = 1 (R1 = R2 = 1)	Gain K = 2 (R1 = C1 = 1)
$S_x^{\omega_c}$ (x = R1, R2, C1, C2)	-1/2	-1/2	-1/2
$S_K^{\omega_c}$	14	50	10
$S_{R1}^{\omega_c}$	4.5	0	4.5
$S_{R2}^{\omega_c}$	-4.5	0	-4.5
$S_{C1}^{\omega_c}$	9.5	1/2	5.5
$S_{C2}^{\omega_c}$	-9.5	-1/2	-5.5
S_{R1}^{Q}	-9/14	N/A	-1/2
S_{R2}^{Q}	9/14	N/A	1/2
ω_c (actual)	ω_c (design)[1 - 1/2(3 - 1/Q)^2]ω_c / GBW]	ω_c (design)[1 - ω_cQ / GBW]	—
Q (actual)	Q (design)[1 + 1/2(3 - 1/Q)^2]ω_c / GBW]	Q (design)[1 + ω_cQ / GBW]	—

Table 2. Component sensitivities including BW and Q predistortion formulas (Rauch realization, ω_0 = 1rad/sec)

Sensitivity Function S_x^y	Gain K = 1 (R1 = R2 = R3 = 1)	Gain K = 2 (R1 = 1, R3 = H_0, R2 = (H_0 / 1 + H_0))	Gain K = 3 (C1 = 1, C2 = C1 / 100)
$S_x^{\omega_c}$ (x = R2, R3, C1, C2, $S_{R1}^{\omega_c}$ = 0)	-1/2	-1/2	-1/2
$S_K^{\omega_c}$	1/3	1/3	1/3
$S_{R3}^{\omega_c}$	-1/6	0	0
$S_{C1}^{\omega_c}$	1/2	1/2	1/2
$S_{C2}^{\omega_c}$	-1/2	-1/2	-1/2
S_{R1}^{Q}	1	1	1
S_{R2}^{Q}	-1	-1	-1
S_{R3}^{Q}	1/6	0	0
ω_c (actual)	ω_c (design)[1 - 3ω_cQ / 2GBW]	—	—
Q (actual)	Q (design)[1 + 3ω_cQ / 2GBW]	—	—

So, what filter characteristics are considered necessary to ensure phase linearity? The group-delay curves in Figure 1 show a peak near the cutoff frequency (w/wc = 1). That is a problem caused by the steep phase change near the cutoff frequency. To get an idea of scale, a 3-pole, 6MHz Butterworth filter has a group-delay variation of 20ns—25ns over its bandwidth. Increasing the number of poles or the filter's selectivity increases that variation. Other, more exotic filters[2] used to minimize group-delay variation include Bessel, phase approximation, Thompson-Butterworth, and LeGendre. Nevertheless, the Butterworth characteristic is most often used for video.

Group-delay problems with component video

All formats and applications are sensitive to group-delay variation. The degree of sensitivity depends on the number of signals and their bandwidths. Composite NTSC/PAL has only one signal, with group delay specified in ITU-470. Those requirements are easily met. RGB and component video each have multiple signals. The RGB signals have equal bandwidths while component-video signals do not, making group-delay matching easy with RGB, but difficult with component video.

Because Pb and Pr signals have half the bandwidth of the luma (Y) signal, their group delay is double that of the Y signal[3]. One solution is to slow down the Y signal by adding delay stages. Another solution is to equalize bandwidths by doubling the sample rates of Pb and Pr, which raises the 4:2:2 sampling rate to 4:4:4[4], allowing the signal to be treated as RGB. The additional Pb and Pr samples are discarded during anti-aliasing or averaged in reconstruction applications.

The other component-video format, S-VHS, can be somewhat confusing. The Y channel is the same as in YPbPr, but the chroma signal (C) looks like it should be bandpass filtered rather than low pass filtered. As for YPbPr signals, bandpass filtering causes group-delay and timing problems and, therefore, should not be implemented. Unless analogue encoding is done, Y and C can be low pass filtered with the same filter. S-VHS is more forgiving of bandwidth than of problems caused by trying to equalize the delay. S-VHS is typically seen in reconstruction applications, for which the main concern is correct timing between Y and C.

Choosing an op amp

After choosing a filter characteristic, the next step is to implement it with an actual circuit. The most commonly used, single-op-amp circuits are the Sallen-Key configuration in non-inverting form and the Rauch configuration in inverting form. An important consideration for op amps operating in the wide bandwidths of video applications is the minimum gain-bandwidth (GBW). Video signals are large, typically 2Vp-p, so the large-signal GBW is referenced. This parameter is not to be confused with the 2Vp-p 0.1dB GBW, which is much lower.

For filter circuits, how much larger than the filter's cutoff frequency does the op-amp GBW have to be? For a Rauch (inverting) filter, the phase argument of

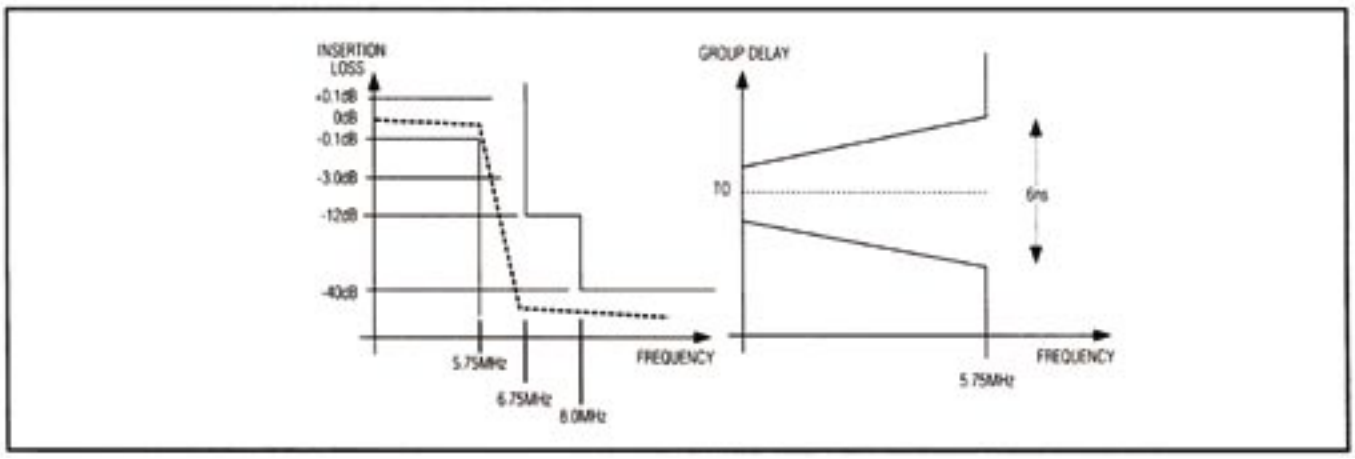


Figure 2 - This template illustrates anti-aliasing requirements in accordance with the ITU-R BT.601-5 standard

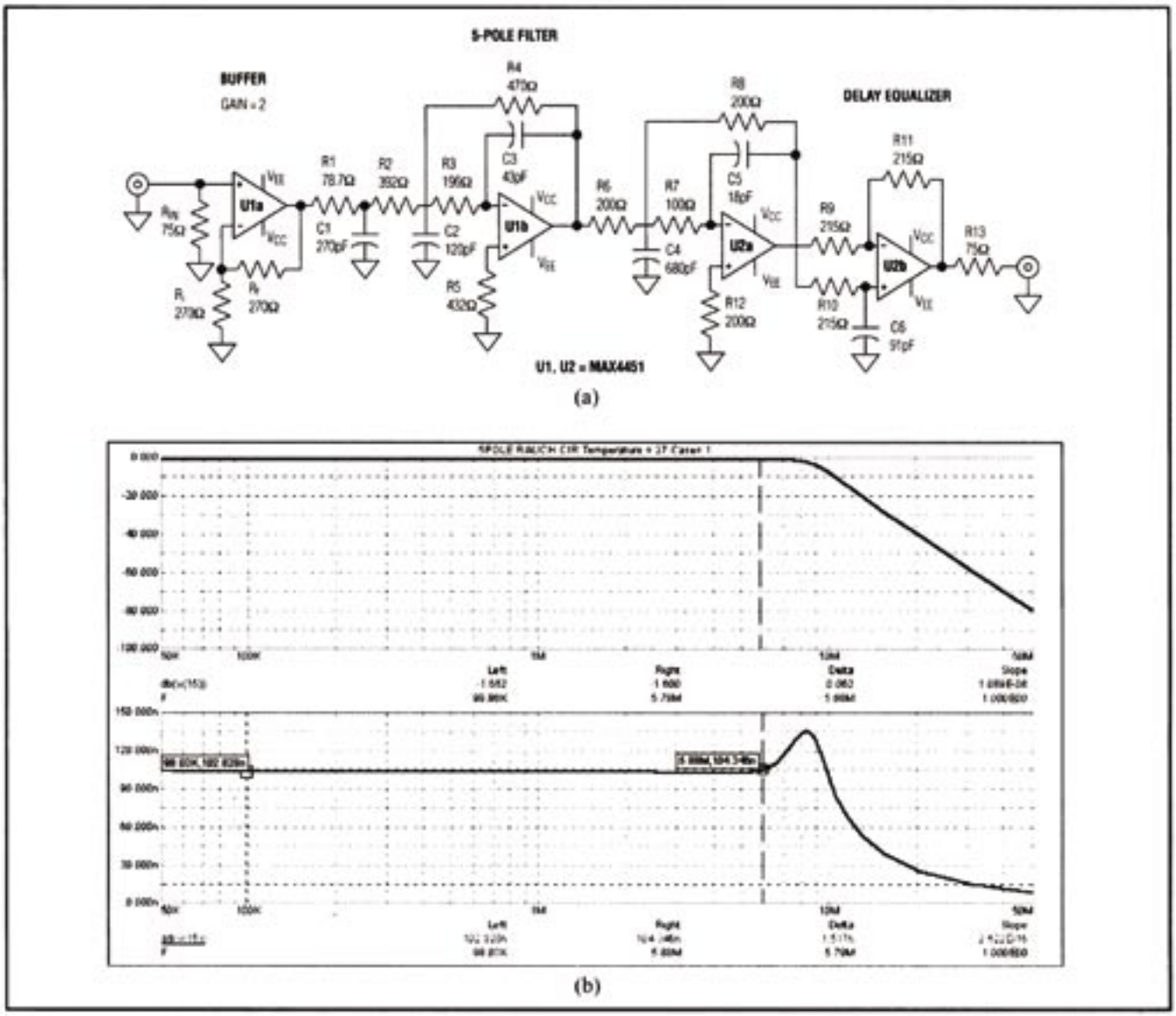


Figure 3 - This schematic (a) and output response (b) represent a 5-pole, 5.75MHz Butterworth filter for ITU-601 anti-aliasing, using a Rauch circuit with a delay equaliser

the characteristic is: Arg[K(lw)]inv = -(wc/GBWrad)(1+RfIRi) (Eq 1)

For a Sallen Key (non inverting) filter: Arg[K(lw)]noninv = -(wc/GBWrad)(1+RfIRi) (Eq 2) where Rf and Ri are the gain-set resistors in ohms, GBWrad is the op amp's gain-bandwidth product, and we is the filter's cutoff frequency in radians per second. Set the gain by introducing values for Rf and Ri[5], and solve for (wc/GBWrad). A unity-gain Rauch circuit has Rf/Ri = 1, and a Sallen-Key circuit has Rf/Ri = 0. Thus, for the same phase error, a Sallen-Key requires half the GBW of a Rauch circuit. As the required gain increases, they converge and leave little advantage for the Sallen-Key in terms of GBW, but other issues must be considered as well.

Pre-distortion, bandwidth, Q, and element Sensitivity

Anything less than an infinite GBWrad/wc ratio causes the closed-loop poles of a filter to move. That is why an actual filter often exhibits a lower bandwidth (wc) than does the paper design[6]. This can be compensated for by increasing the design bandwidth, which is known as pre-distortion. Formulas for the Sallen-Key and Rauch circuits (listed in Tables 1 and 2) allow us to calculate a design bandwidth that provides the actual bandwidth needed. Component tolerance must then be taken into account.

To determine component tolerance, a sensitivity function is needed: S_x^y gives the ratio between a change in the value of part X and the consequent change in parameter Y. For example, Table 1 shows that the Q in a Sallen-Key circuit (vs. a Rauch circuit) has a large sensitivity to variations in Cl and C2. That means a Sallen-Key is less tolerant of parasitics than is a Rauch. The point is that S_x^y lets the effect be predicted, and then the design can be created accordingly. Next, some typical designs are considered.

Design of anti-aliasing filters

For anti-aliasing filters, selectivity is determined by a template for ITU-601 like the one in Figure 2. The specified bandwidth is 5.75MHz ±0.1dB, with an insertion loss of 12dB at 6.75MHz and 40dB at 8MHz, and with a group-delay variation of ±3ns over the 0.1 dB bandwidth. Such performance is too difficult for an analogue filter alone, but 4x oversampling modifies the requirements to 12dB at 27MHz and 40dB at 32MHz.

Using software or normalized curves[8], one can find that a 5-pole Butterworth filter with -3dB bandwidth of 8.45MHz satisfies the requirement for selectivity, though not for group delay. For the latter, a delay stage is needed, for which the important op-amp parameter is the 0.1dB, 2Vp. bandwidth[9]. That number should be used in equations 1 and 2 to get an accurate design. A schematic for this application, with curves showing its gain and group-delay characteristics, is based on 4x oversampling (Figures 3a and 3b). PC video is considered next. VESA does not specify templates for anti-aliasing or reconstruction filters. The XGA resolution (1024 x 768 at 85Hz) has a sampling rate of 94.5MHz and a Nyquist frequency of 47.25MHz. For >35dB attenuation at the Nyquist frequency, a Rauch realization of a 20MHz, 4-pole Butterworth filter (Figures 4a and 4b) is used. Again, the MAX4450/4451 are chosen for their excellent transient response and large-signal bandwidth (175MHz at 2Vp-p).

Reconstruction filters

Reconstruction filtering after a DAC is among the more poorly understood applications. Some designers think reconstruction filters are introduced to remove the sample clock, but nothing is further from the truth. When a signal is sampled, the samples are composed of multiple recurring signal images centred on harmonics of the sample clock. A reconstruction filter removes all but the baseband sample. If the anti-aliasing filter has served its purpose, the DAC output looks like image A in Figure 5, and then all samples to the right of it should be removed. Thus, reconstruction is similar to anti-aliasing except that, because each sample exists only for an instant, the DAC holds each for one clock period, thereby creating the familiar staircase approximation to a sloping line.

The hold function corresponds to a digital filter whose characteristic[10] is similar to that of a Butterworth or Bessel filter (Figure 6). Notice that the response is decreased by 4dB at half the sample frequency. The second objective of a reconstruction filter is to restore that loss, which requires an amplitude equalizer like the circuit shown in Figure 7a. The equalizer is based on a delay stage and has a response like a Bessel filter. It can be designed from the DAC sample rate (Fs). Figure 7b shows the DAC's frequency response with and without an amplitude equalizer. Like the delay stage, it can be included in any reconstruction filter. The hold response also has a pole centred on the sample clock, which completely removes the clock. Nevertheless, most reconstruction applications refer to clock attenuation as a figure of merit. Now that the function of a reconstruction filter is understood, one can be designed.

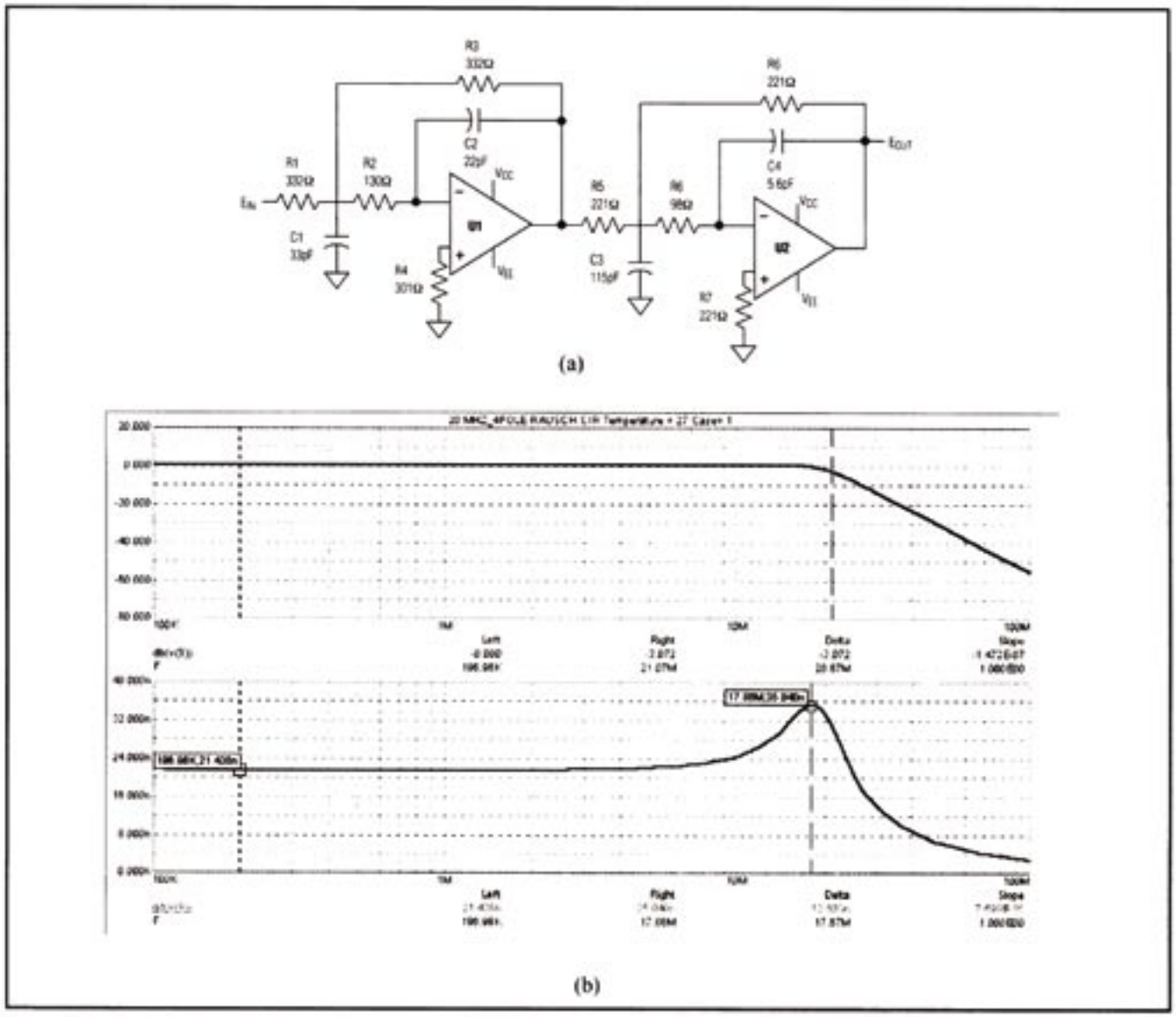


Figure 4 - This schematic (a) and output response (b) depict a 4-pole, 200MHz Butterworth filter for XGA graphics anti-aliasing, using a Rauch circuit

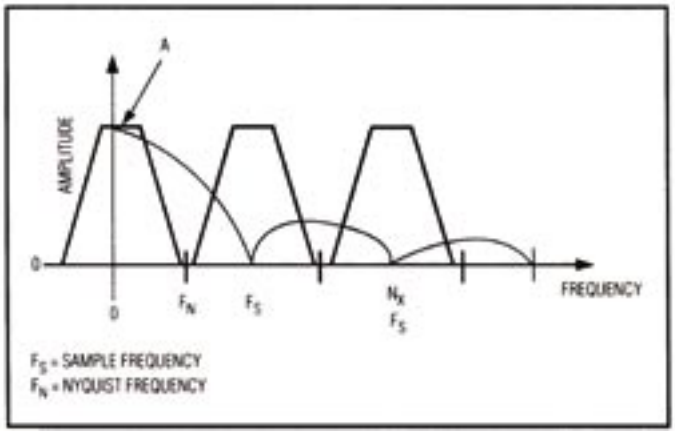


Figure 5 - A typical DAC output spectrum is shown in terms of the sampling sampling (Fs) and Nyquest (Fn) frequencies

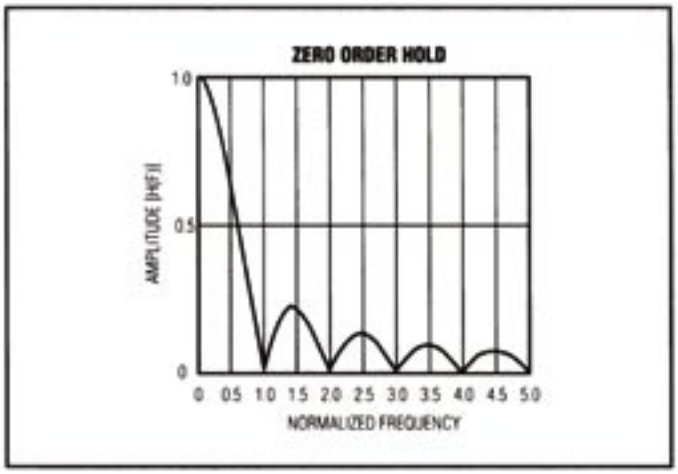


Figure 6 - The "hold" function of a DAC produces a (sinx)/x response with nulls as multiples of the sampling frequency

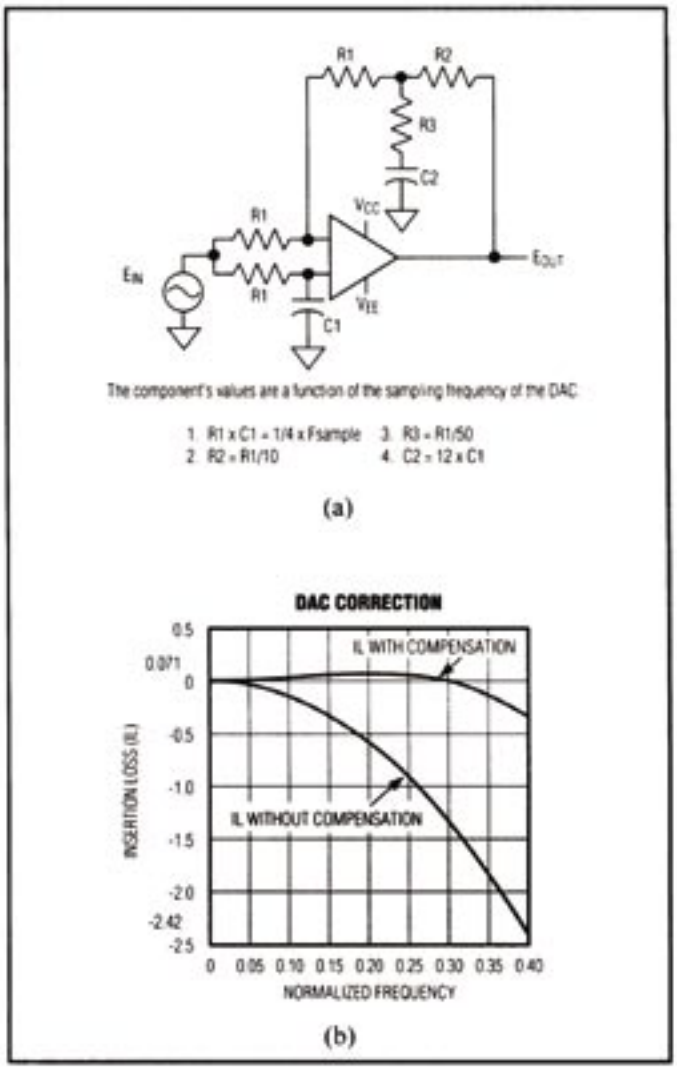


Figure 7 - A DAC output (a) is hhown with and without (sinx)/x correction provided by an amplitude equaliser circuit (a)

The most common requirement for NTSC/PAL reconstruction is an attenuation of >20dB at 13.5MHz and >40dB at 27MHz, where we depends on the applicable video standard. A 3-pole Butterworth with Sallen-Key configuration is chosen for two reasons. First, its gain (+2) drives a back-terminated cable. Second, the group-delay variation can be adjusted to optimize performance without a delay equalizer. (Figures 8a–8d show NTSC and PAL designs, including gain and group-delay characteristics.) These applications usually include digital amplitude correction for the DAC, which can easily be added, if necessary. Illustrating a circuit for XGA, a 20MHz, 3-pole Butterworth filter in the Sallen-Key configuration includes the Figure 8 circuit for amplitude correction (Figures 9a and 9b). Complementing the anti-aliasing filter of Figure 4, this filter has a gain of +2 to drive a back-terminated 75Ω coaxial cable.

The last application is a reconstruction filter for HDTV. Based on the templates in the SMPTE 274 and 296M, it has a centre frequency of co, = 0.4 x FS = 29.7MHz. Amplitude correction for the DAC is usually included, but group-delay compensation must be added. The resulting 30MHz, 5-pole Sallen-Key filter (Figure 10) has >40dB attenuation at 74.25MHz, as well as a group- delay stage with a +2 gain to drive a back-terminated 75Ω coaxial cable.

Practical aspects of active video-filter design

Whether filters are designed by hand, with the aid of software, or with a combination of these approaches, the actual response may not be exactly what is wanted. One cause is the discrepancy between a calculated response and the actual response obtained using standard component values.

That error can be minimized by choosing standard (5%) capacitor values and deriving resistor values from them. The reason is practical - capacitors with 1% or 2% tolerance can be acquired, but only at 5% values, although resistors that combine 1 % values with 1 % tolerance are available. Such components give the best approximation and the most precise amplitude response.

Once built, a filter can be unstable and oscillate. In that case, short the input to ground and see if it continues to oscillate. If it stops, the impedance is too high. Lowering the design impedance should eliminate the oscillation. If it continues, note whether the oscillation is near the filter cutoff frequency or just below. In that case, the oscillation is probably due to components or parasitics. If the oscillation is above the cutoff frequency, it is probably due to the op amp or the circuit layout.

Good layout seems an art, but it is based on a few simple principles. It is important to have a clean supply voltage and a solid ground, meaning filtration with low-ESR capacitors and sometimes

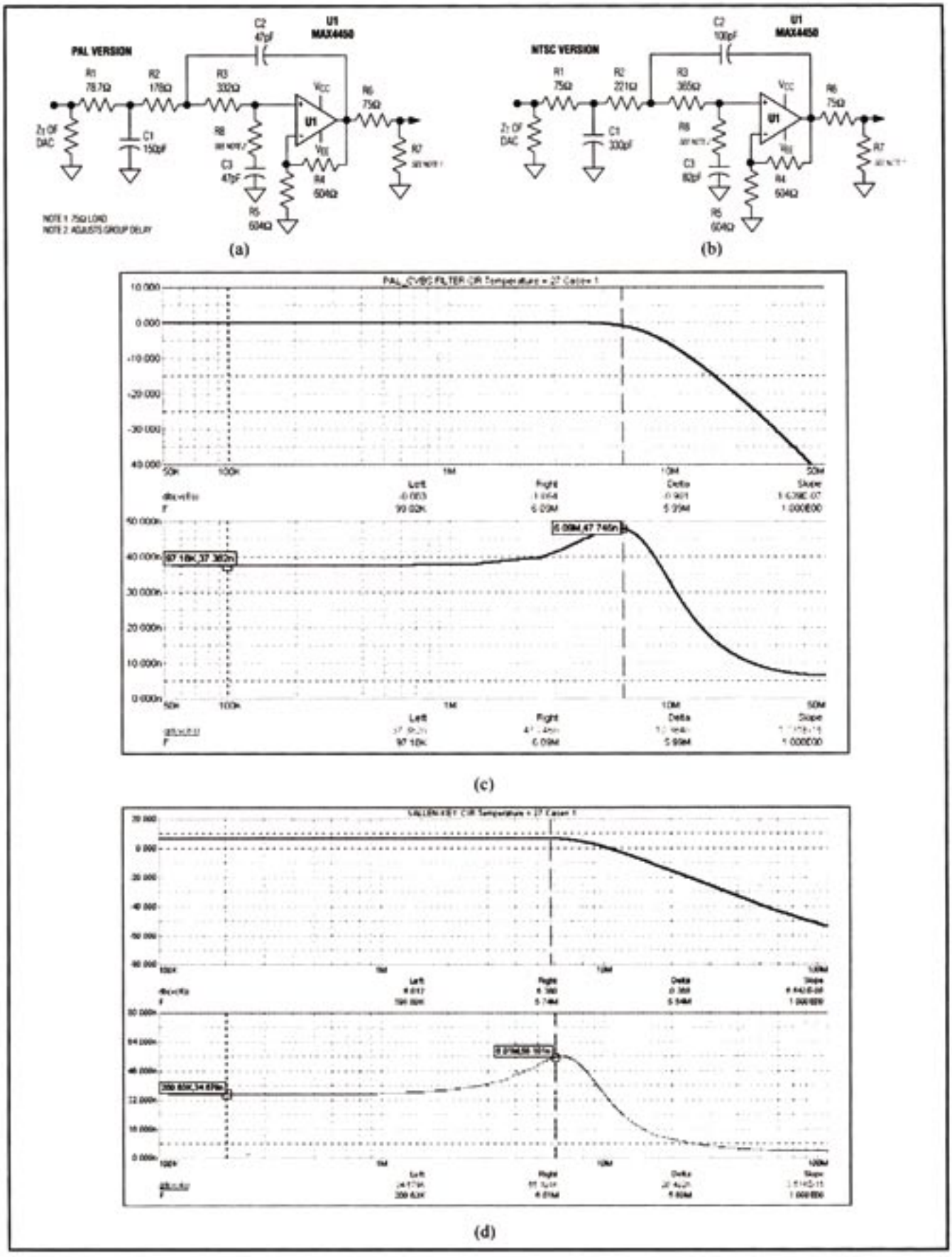


Figure 8 - For reconstruction filters with group-delay adjustment, the PAL version (a) has the amplitude and group-delay response shown in (c) and the NTSC version (b) has the amplitude and group-delay response shown in (d)

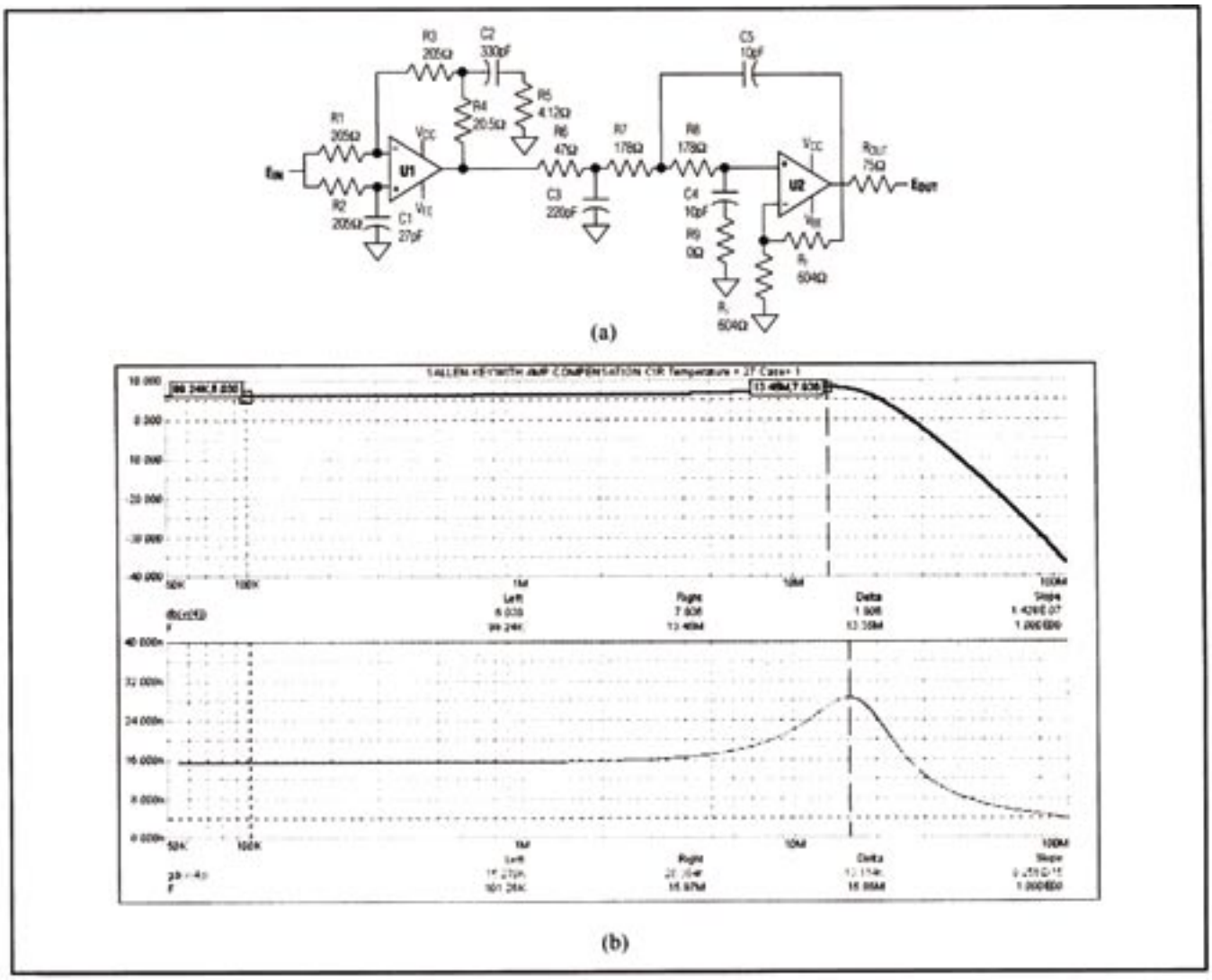


Figure 9 - This 3-pole, 20MHz Butterworth filter for XGZ reconstruction (a) includes (sinx)/x compensation. Its response is shown in (b)

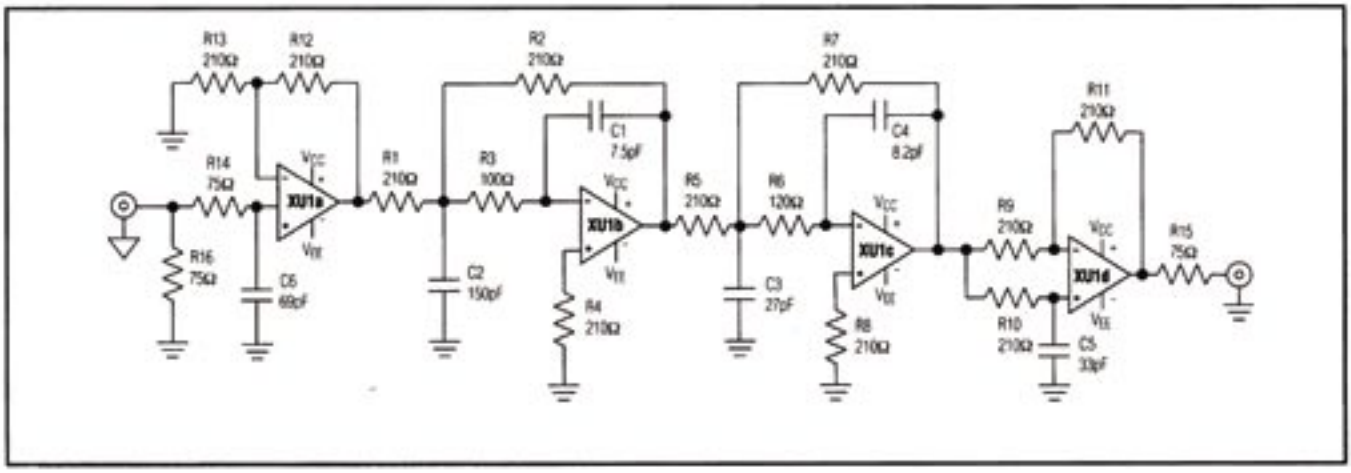


Figure 10 - 5-pole, 30MHz reconstruction filter for HDTV includes amplitude correction for the DAC

with a regulator. The loop formed by the bypass-capacitor connections must be small, or the resulting parasitic inductance will resonate with the capacitance. A good ground plane is essential to good analogue design, but as bandwidth increases, it may add parasitic capacitance that can detune the filter. To avoid that problem, remove the ground plane beneath the offending part(s) and traces.

References

1 A filter response drops by -3dB at the cutoff frequency.

2 Taylor and Williams, Electronic Filter Design Handbook, McGraw Hill, ISBN 0-07-070441-4.

3 Ibid.

4 The 4:2:2 sampling originally indicated the number of times the

colour subcarrier was oversampled. ITU-601 replaced the subcarrier frequency with 3.375MHz. The 4:2:2 is sampled at 13.5MHz and 6.75MHz, respectively.

5 For the non-inverting case, Rf/Ri = 0. For the inverting case, Rf/Ri = 1.

6 E.J. Kennedy, Operational Amplifier Circuits: Theory and Applications.

7 Defined by H.W. Bode in Network Analysis and Feedback Amplifier Design (D. Van Nostrand, Princeton NJ, 1945).

8 Taylor and Williams, op. cit.

9 MAX4450/5 1 data sheet is available at www.maximic.com .

10 The Sinc function in mathematics is (sinx)/x. A similar article appeared in the June 2003 issue of the EDN.

Reprinted from the Dallas Maxim Semiconductors Engineering Journal volume 49

An updated version of this article can be found at http://www.maxim-ic.com/appnotes.cfm/appnote_number/2159/ln/en

Not to be tried at home

By Ivan Dalised.

While digging in the bottom of my tool box the other day I can across some very old ICs. They were so old they had thin metal tinsel like wires instead of pins. Curious to know if they survived the impact of tools being dropped on them, I decided to test one of them. Using the Internet I found an archived data sheet for one of the ICs, it was described as an op-amp type 709. I carefully bent its legs alternately up and down to make space for solder joints and copied the application note circuit.

When I powered it up it centred its output pin at exactly half the supply voltage just like it was supposed to so I assumed it was working. Then I noticed that my 13cm receiver was being wiped out by interference from somewhere. That somewhere turned out to be my op-amp. Fascinated by my new found signal source I connected my camera to the non-inverting input of the chip. I was amazed to see a perfect colour picture on the screen. The data sheet said it only worked up to 200KHz so I was well outside its bandwidth. I had another two 709 chips so I unsoldered the first one and substituted the second. This time nothing happened but I did notice a dent in the top of the first chip that wasn't there in this one. Having nothing to lose, I took a hammer and hit the second chip. I broke one of the resistors in two but when I changed it, there was a perfect picture again.

The first time may have been a fluke but twice is nearly an impossibility. I substituted chip number three and being carefull not to cause more damage this time, I again whacked it hard with a hammer and again a picture appeared. Has anyone else seen this phenomenon? The chips were dated 1972 and I used a 2 pound ball-pein hammer if anyone else wants to try it. I used the ball end of the hammer as the other end was too blunt and would have broken all the other parts.

BATC Accounts 2001 - 2003

THE BRITISH AMATEUR TELEVISION CLUB

Balance sheet at 31 December	**2000**	**2001**	**2002**	**2003**
Fixed assets				
Office equipment Additions	282	360	490	1,021
Less Depreciation	282	360	490	1,021
Current assets				
Stock: - Members services	2,288	2,215	2,079	1,996
Publications	380	265	103	132
Back issues of CQ-TV	1,000	500	300	300
Nationwide Building Society	10,131	10,353	133	134
Halifax Bank	0	0	10,411	10,515
GiroBank current account	119	2,162	2,977	749
Bank of Scotland current account	17,980	20,633	23,899	21,677
Bank of Scotland investment a/c	30,040	30,040	30,040	30,040
Less Current liabilities				
Creditors and accruals	1,027	704	704	0
Subscriptions received in advance	20,131	18,721	19,631	20,876
	£40,780	**£46,743**	**£49,607**	**£44,667**
Represented by accumulated fund				
Balance brought forward	35,279	40,780	46,743	49,607
Surplus / Loss	5,501	5,963	2,864	-4,940
	£40,780	**£46,743**	**£49,607**	**£44,667**

Brian Summers
BATC Honorary Treasurer

2001 to 2003 BATC Treasurers Report

Preamble

I do not normally include a treasurer's report in CQ-TV, as I present it at the BGM, but it looks as if I will not be able to attend this year due to work commitments, so here it is.

Year 2001

Not too much to report here, we had a big surplus in 2001, almost embarrassingly large. This came about because of a recent subscription increase plus the move to a cheaper printer. I revalued some members' services and Publication items to reflect a more realistic value, hence the losses for those departments.

Year 2002

Again, a more modest surplus, CQ-TV printing and postage up a bit and subscription income down a bit. The small loss on the Shuttleworth BGM and convention was as expected. It was not a trading event, and was never intended to make any money.

Year 2003

Things have come home to roost a bit in this year. Setting aside the money spent on the DATV modules, as this is an exceptional item. Our real loss is more like £2200. Look at the figures, here are a few reasons: -

1. The cost of CQ-TV printing continues to rise.
2. The cost of posting CQ-TV is up a lot, due to the new arrangements for posting.
3. We invested some funds in upgrading the CQ-TV production software.
4. Reduction in interest on investments.

THE BRITISH AMATEUR TELEVISION CLUB

Income and expenditure account at 31 December	**2000**	**2001**	**2002**	**2003**
Income				
Subscriptions	18,751	18,840	17,893	16,513
Members services	109	-185	18	3
Publications surplus/loss	195	-241	30	223
Advertising	1,324	2,199	2,779	984
Bank & Building society interest	1,563	1,602	1,055	728
Rally or Covention surplus/loss	368	490	-346	-205
Donations	12	53	24	31
Postages, Airmail	244	183	206	54
Miscellaneous		5	0	0
707				
	£22,571	£22,941	£21,659	£19,038
Expenditure				
CQ-TV printing	10,954	11,121	11,739	12,627
CQ-TV postage	4,058	3,686	4,345	5,553
CQ-TV production	495	348	633	1,155
General Office expenditure	70	127	82	50
General Postage	336	385	416	485
Internet Web Site expenses	498	471	295	401
E- Mail	0	95	165	165
RSGB affiliation fee	23	23	41	41
Committee members expenses	85	160	0	0
Insurance & legal	105	105	115	126
Rally attendance	171	25	163	58
Recruitment	39	77	301	226
Adverts and publicity & Projects	0	132	151	2,790
Miscellaneous expenses	10	21	14	0
Bank charges, mainly “VISA” costs	226	202	335	301
	£17,070	£16,978	£18,795	£23,978
Surplus for the year	**£5,501**	**£5,963**	**£2,864**	**£-4,940**

Notes

The figures in ‘Income’ for members services, publications, the rallies and conventions are the net contributions or loss to club funds.

In 2001, I marked down the value of the old CQ-TV’s to reflect their real value, also in that year we rationalized members services old stock, clearing out many items at bargain prices. Members should also note that the Conventions held in 2002/3 were meetings, not rallies and therefore not profit generating events.

Most of the figure of £2790 in “Projects” is for the DATV modules and is an exceptional item of expenditure. So allowing for that our real loss for the year is more like £2200.

5 A worrying falling trend in subscription income. Encouragingly, the Subs in advance figure is up. I think this is a good sign.

6 In 2003 CQ-TV accounted for 103% of our income.

Postscript

I am very reluctant to recommend increasing the Subscription from its current amount of £15.00, as I feel that this would not help to retain members, the net increase in income therefore being small. I would however, recommend changing the subs in advance discounts to reflect the increase that will happen at some future point. Historically we have kept the cost of subscription constant, with occasional larger increases rather than a lot of small changes. The last increase was 4 years ago. I expect that the increase will be £3.00, making the Subscriptions £18.00 per year. This could happen in 2005 or 2006; a lot depends on the number of members in the club, see letter elsewhere.

I would recommend that at the BGM the meeting set the maximum subscription level to be £25.00, to allow for that increase when it happens and still have some in reserve for emergencies. Any member who wishes to have more details should contact me. See address on page 4. E-mail preferred.

Brian Summers Hon Treasurer BATC 7 March 2004

Television Cameras I Have Known

Dicky Howett casts his memory back ever such a long way.

In the days before I collected television cameras, I appeared in front of them. In fact I reckon I've been photographed over the years by more television cameras than I now actually own, the first occasion being way back in 1952, when I was just a spotty nip in short trousers.

Back in those knee-freezing days, each year the radio and TV industry mounted at Earls Court (or Olympia) those fabulous entertainments know as The Radio Show. Oh, the colour and gaiety if it all! The miles of stands, each displaying proudly the latest television or radio product. (Acos, Arrell, Chald, Dynatron Kolster-Brandes, Nera, Pam, Pilot, Stella, Telemax, Valradio and naturally not forgetting White-Ibbotson. How those walnut-bodied names even now trip off the tongue). And of course only the niggardly would fail to mention those wonderful extra special side-shows: a tv studio, a radio studio, a celebrity stage, the Army, the Air Force, the Navy, even radio controlled models, all there in abundance to help flog Bakelite boxes full of red hot valves.

A genuine 405-line image off-screen in 1961. A seemingly somnolent Dicky Howett in the Juke Box Jury audience

1954 Radio Show souvenir catalogue. No doubt worth a few pound notes on eBay these days

And thus in 1952 in such heady surrounds was I was first shot by a television camera. On that memorable occasion I found myself beside a BBC Radio Show marquee installed along the legendary 'Television Avenue'. The BBC marquee had a Marconi Mk 2 405-line camera fixed on a tripod shooting the assembled rubberneckers. There was also an interviewer with a microphone, linked to a tape recorder. The Marconi camera silently swept a monochromed eye across us as we all clustered around, goggling at the monitor. The interviewer 'vox popped' the audience and when it was my turn I gabbled something incomprehensible. At the finish the interviewer replayed the audio (no VT in those wondrous times) and we all stood transfixed, unable even to recognise our own voices, (let alone our curiously alien black and white television faces), all of which was entirely true of the days before easy home recording.

A little time elapsed before my next TV camera encounter. In 1962 the BBC transmitted of a Saturday evening, Juke Box Jury which was a highly popular US-imported confection of dumbed-down proportions. I got into the studio audience and, if you recall, the gimmick of the show was that the 'audience' starred as the camera panned whilst the record played. Very cheap TV, but very effective. And suddenly there was I full-face before the viewing millions, courtesy of a Marconi Mk 4 which zoomed right up to me (I was sitting in the front row). Miraculously, I managed to preserved this shattering five-second event on film, mainly because, as the show was recorded in advance on the new-fangled 'quad' video tape process, I just sat at home the following Saturday in front of my TV, my box brownie poised, snapping away.

Another ten years and we move to an EMI 203. This camera was a 1960s 'compact' 4 ½" Image Orthicon, of which the BBC had 30 or so, stationed exclusively in London studios. In 1972 a few examples of this camera type were still bumbling around odd corners of the BBC, in particular, Studio G, Lime Grove, shooting such things as

A slimline Dicky Howett at Anglia TV in 1983 promoting a comic whilst propping up a Marconi Mk 9.

BBC Breakfast television. But suddenly I hear cries of incredulity out there. Not BBC Breakfast TV in 1972 and not monochrome cameras still at Limey Grove! Well both actually.

In the early 1970s, the BBC maintained a few monochrome studios, (just for old time's sake) where they produced stuff for the Open University or for purposes of staff training. This is where 'Breakfast TV' and me enters the picture. It was a dummy show, mounted at LG, put on for the benefit of director training. A sort of end of term party-piece. The programme (closed circuit fortunately) was wittily entitled 'Seven Up' and featured a busker, a weather man, an interview couch plus me as a 'spot' cartoonist. I must confess that the director had tried for Bill Tidy, but by some chance in a million, (or at least a few hundred) ended up with yours truly.

So there was I, at my easel, awaiting my cue, ready to draw an 'instant' comment on the days' news. The EMI 203 loomed. I was cued. I froze. The director screamed. Well, not actually at me, but it's funny how loud a cameraman's headset can sound, even from quite a few feet away. Suddenly, I raced through my rehearsed piece and gabbled to a halt some minutes early. This performance can best be characterised by the well-known term 'cold sweat'.

But that wasn't the end of my TV career. A mere 8 years later I was once again in front of the cameras, this time before a clutch of Link 110s in Studio Seven at BBC Television Centre. The programme was that highly popular precursor of all current Saturday morning junk TV, Multi Coloured Swap Shop. In 1980, this was the 100th show and was (as always) hosted by the affable and now curiously obscure Noel Edmunds. On that particular occasion I was-once again- drawing cartoons, live and dripping. To this day I still have a three hour VHS copy of the entire programme. (That cassette must be worth an absolute fortune by now).

But we tenacious TV performers don't remain immobile for long. Three years later and there I was again at Yorkshire Television, this time in front of the venerable EMI 2001. It was 1983 (and for reasons that will soon become apparent), I made my merry way to Leeds and YTV Studio Two, to record a 'special' for the popular Calendar magazine series. To explain; at that time, I contributed to Marvel Comics, and so on that rather tenuous basis I appeared for almost 25 minutes, chatting, sketching and joking around. The doughty studio EMI 2001s lasted without a breakdown until the very end of the programme (even though the cameras were on their last legs, having worked manfully in Studio Two for 13 years!) Despite all that, the Calendar series is still quite popular, so I hear tell.

Moving slightly forward in the same year and Marconi Mk 9s. This time to record a spot at Anglia Television's fine studio centre in Norwich for their early evening 'regional' slot. I was on the programme because, well, at the time I lived in Chelmsford and that's just about East Anglia, so why not? The late anchor Graham Bell did the interview and after the recording I asked the cameramen (even then they all looked about twelve years old) what their favourite camera was and they said the Philips LDK 5. Well, I did ask....

Multi-Coloured Swap Shop in 1980 and the 100th programme, hence the background balloons.

Dicky Howett draws breath on YTV's Calendar Tuesday programme. The well-behaved audience are pretending to be interested.

In 1988 I rushed headlong into a ITV marathon, (remember them?) again at Anglia TV and again Marconi Mk 9s but later, a significant change occurred. Let's see if you can spot it. That same year I was in the Liverpool dockside studios of Granada Television, (the guys who now own just about the whole of ITV) appearing live as a film reviewer (don't ask) on the 'This Morning' prog. This also was the first time I'd used Autocue which I found very easy to manage, as well as totally reassuring. Unfortunately, (but not surprisingly) my television film review career lasted precisely one programme but I noticed that the dinky blue-painted studio cameras were very small and strangely foreign-looking. Yes, you spotted it, Japan had finally taken over the TV camera world and the cameras were none other than Ikegami 323s (portable version).

Well, let's face it, by the end of the 1980s the signs were in the paddy fields, and it all went down the (rice) pan from then on (at least as far as British TV camera-makers were concerned). So there we have it. My life in front of the Television Camera. Nowadays, more often than not, I'm behind the camera filming some dotty pop promo or supervising a 're-creation', but the same old urge is there, to jump up and strut in front of television cameras. Is there no cure?

Anorak camera list.

MARCONI MK 2. This was the final version (1951) of the Marconi 3"-inch Image Orthicon 405-line camera design, based originally on the 1946 RCA TK 10A camera blue-prints. Mk 2 picture quality typically 3"-inch I.O. but much better than its RCA precursor.

MARCONI MK 4. World-beating high quality 4½" Image Orthicon camera channel. Lots and lots sold everywhere. Some still running privately (and probably forever).

EMI 203. Direct competitor to the Marconi Mk 4, and used mainly in the UK. First sold to Italian RAI TV in 1960 to cover the Rome Olympic games. Bought also by AR-TV to equip Studio Five at Wembley The EMI 203 camera was capable of very good monochromatic pictures. The present writer has one which still works, so there.

LINK 110. Unattractive-looking boxy all-British TV 3-tube colour camera which was designed as a sort of cut-price EMI 2001. The Link 110 found favour mainly in BBC studios (although I hear tell that the engineering staff were none too delirious with it) but all told, I gather that the pictures were pleasant enough.

EMI 2001. The almost legendary 4-tube colour camera which cameramen swore by and engineering staff, at. This camera lasted in studio production well over twenty years (something of a record perhaps?) Very sharp pictures (see current DVDs of classic programmes) but the images could display a yellowy cast if the light level dropped. The camera had a troublesome viewfinder. The words 'blow' and 'up' spring to mind.

MARCONI Mk 9. Final camera gasp of Marconi Broadcast. (A Mk 10 was designed but never put into production). The Mk 9 was a compact camera with an integral offset zoom package. However, the Mk 9 picture-quality suffered from over-enthusiastic use of the aperture corrector (See anything from LWT during the 1980s).

IKEGAMI 323P. What can one say? 1980s design. Three Matsubita 18mm tubes. 600 lines horizontal (at least). I've got eight Ikegami cameras which fire up within seconds and scant minutes later produce cracking images. Nuf said.

Electronic CQ-TV

This quarter's settings for access to the electronic versions at www.cq-tv.com/electronic are -

Username: amember **Password:** cyber

Deadlines

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

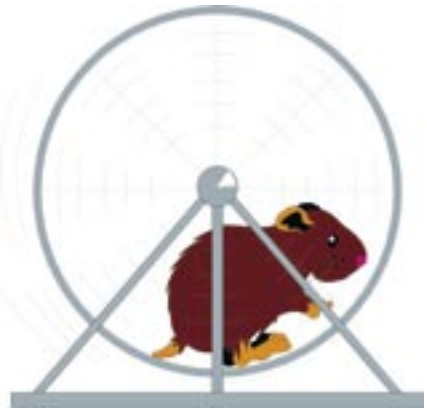
February	*30th December*
May	*30th March*
August	*30th June*
November	*30th September.*

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

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

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

Commercial adverts should be sent to Trevor Brown, the advertising manager, at 14 Stairfoot Close, Adel, Leeds, LS16 8JR. Tel: 01132 670115. Email: adman@cq-tv.com. Members' sales and wants should be sent to the Editor. Email: editor@cq-tv.com



CQ-TV Commercial Advertising Rates

Size	Mono	Colour
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Full page	£150	£200

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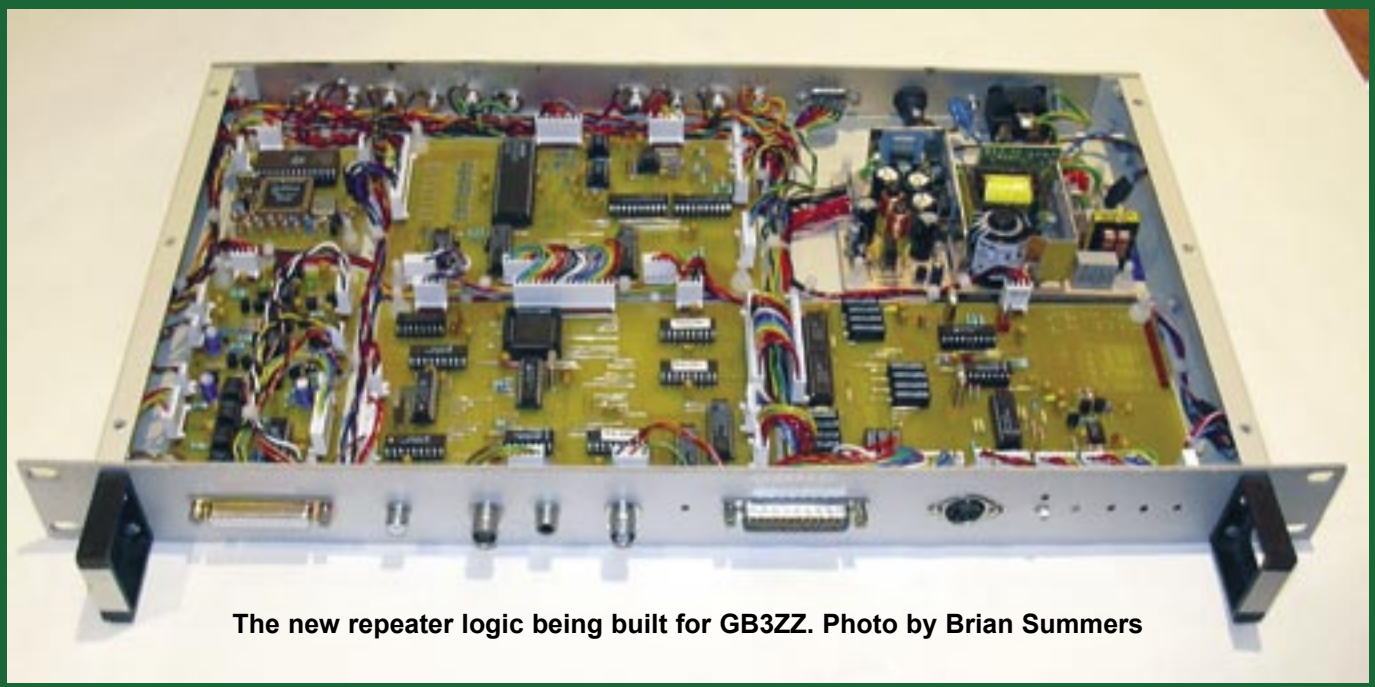
Index of Advertisers

At the recent committee meeting, the Chairman stops talking long enough (10mS) for a picture to be taken Photo (and caption) by G Hankins



The new repeater logic being built for GB3ZZ. Photo by Brian Summers

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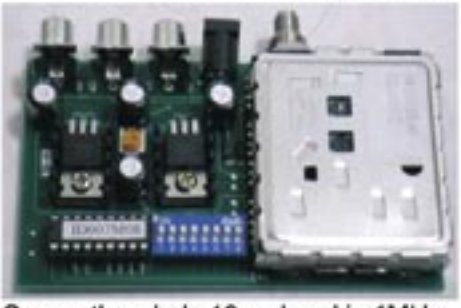

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