CQ-TV

220

Caption Contest

Here are the entries for last issues picture:

Dave Holden - G3WUN

"and here is a photograph of my tower and antennae at night"

"damn, the image intensifier has packed up"

Director to new assistant - " I said, LIGHTS, Camera, and Action"

Keith Davenport - G8INC

"CQ-TV 219's free gift is a picture to test your black level clamp"

Eric Edwards - GW8LJJ

"And here is a shot of the shack when the fuse blew!"

"Lights please!"

It was a tough decision, but by a narrow margin I declare Keith the winner - congratulations !

Please send in your suggestions for the image below, by email to editor@cq-tv.com or by post (see committee contacts for address)

Contents

Copyright © by the BATC and contributors.

Committee Contacts

President: Peter Blakeborough G3PYB
E-mail: president@batc.org.uk

Chairman: Trevor Brown, G8CJS
Club affairs, Videotape library, and Technical queries, especially relating to handbook projects. 14 Stairfoot Close, Adel, Leeds, LS16 8JR. Tel: 01132 70115
E-mail:chairman@batc.org.uk

General Secretary: Graham Hankins, G8EMX
General club correspondence and business. Library queries relating to the borrowing or donation of written material. Graham Hankins G8EMX, 17 Cottesbrook Road, Acocks Green, Birmingham, B27 6LE. Tel: 0121 706 7384
Email secretary@batc.org.uk

Hon. Treasurer: Brian Summers, G8GQS
Enquiries regarding club finances, Donations, and constitutional enquiries. 9 Prior Croft Close, Camberley, Surrey, GU15 1DE. Tel: 01276 677879,
Mobile 077 4029 1191
Email: treasurer@batc.org.uk

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

Contests: Dave Crump, G8GKQ
Email: contests@batc.org.uk

Club Liaison: Graham Shirville, G3VZV
And anything of a political nature, co-ordination of ATV Repeater licences. Birdwood, Heath Lane, Aspley Heath, Woburn Sands, MK17 8TN Tel: 01908 282292
E-mail: g3vzv@amsat.org

CQ-TV: Chris Smith, G1FEF
Anything for publication in CQ-TV magazine, except advertising (see below). Email preferred, or by post to: CQ-TV, 89 Wellington Street, Thame, Oxon OX9 3BW
Email: editor@cq-tv.com

Members Services: Chris Smith, G1FEF
See above for contact details

CQ-TV Advertising: Trevor Brown, G8CJS
14 Stairfoot Close, Adel, Leeds, LS16 8JR. Tel: 01132 670115 Members adverts for inclusion in CQ-TV should be sent directly to the editor at the above address, either by post or e-mail: adman@batc.org.uk

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

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

Advertising Rates

Size	Mono	Colour
Quarter page	£50	£75
Half page	£100	£150
Full page	£150	£200

If you would like to advertise in CQ-TV, then please contact our advertising manager: Trevor Brown, 14 Stairfoot Close, Adel, Leeds, LS16 8JR, England. Telephone: +44 (0) 1132 670115.
Email: adman@cq-tv.com

Deadlines

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

February	-	please submit by	December	31st
May	-	please submit by	March	31st
August	-	please submit by	June	30th
November	-	please submit by	September	30th

Please send your contributions in as soon as you can prior to this date. Don't wait for the deadline if you have something to publish as the longer we have your article, the easier it is for us to prepare the page layouts. If you have pictures that you want including in your article, please send them, in the highest possible quality, as separate files. Pictures already embedded in a page are difficult to extract at high quality but if you want to demonstrate your preferred layout, a sample of your finished work with pictures in place is welcomed. Please note the implications of submitting an article which are detailed on the contents page.

Editors Preamble

First of all, please accept my apologies for the late arrival of your CQ-TV, I could go into all the reasons for the delay, i.e. the change of editorship and how your esteemed Chairman's spam filter works (it deletes all incoming mail), but that would just be giving you excuses and I'd prefer to start on a more positive note!

Before I continue, I would like to extend my thanks to Brian Kelly for his hard work over the last year and I hope to at least do as good a job as he did in the future.

So, here I am again - for those of you who can remember that far back, I had a stint at the editors job several years ago. I'm guessing it must be a bit like childbirth this job, you forget the pain, otherwise you'd never do it again!!

I said I'd prefer to start on a more positive note, however that is proving to be more difficult than anticipated: articles submitted for inclusion in CQ-TV are at an all time low; interest in ATV is not what it used to be. With the advent of the Internet (some would argue) what's the point of going to all that trouble with transmitters, receivers, aerials, etc. when anyone with a PC, webcam and Internet connection can "transmit" moving pictures - you don't even need a license (although having worked in the Internet industry, personally I'd like to see that change!).

So what do you think? do you agree with the previous paragraph? Is it all the Internets fault? or are there other reasons? and what can be done about it?

Please send in your opinions, I'm hoping to resurrect the "Letters to the Editor" column in the next issue, as well as get more members adverts - remember it's free to place an advert to sell your equipment, or advertise your wanted needs in CQ-TV if you are a club member.

Next, I would like to make a plea to everyone who reads this magazine, not just club members - if you have anything that might be of interest to our readers, please send it to me. We are very short of new copy for the magazine and if you want the magazine to continue in it's present form we need fresh, interesting articles to publish. I hate filling pages with copy from other publications, but if no one sends in the copy, I don't have much choice!

Finally, as CQ-TV 220 will not be on your doorsteps until just before Christmas, I'd like to wish you all a merry Christmas and a peaceful and prosperous new year.

I look forward to hearing from you.

73
Chris Smith, G1FEF

Email: editor@cq-tv.com

Post: 89 Wellington Street, Thame, Oxon, OX9 3BW

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

The archive is constantly being updated as more of the old paper issues are converted to electronic format. Currently issues 1 to 134 and 161 to 216 are included along with a few odd ones. This DVD is updated 4 times a year, to include the current issue of CQ-TV.

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

The video section was prepared by Brian Kelly and contains videos from Bletchley Park 1999, one from Shuttleworth 2002 and one from 2004. The cost for this DVD is £5.00 for current members and £10.00 for non-members.

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

Chairman's Column

By Trevor Brown G8CJS

New Editor

First of all my apologies for a late magazine, Brian Kelly has officially stood down as editor, I am sure we would all like to thank him for stepping into the breach at the last BGM. CQ-TV editor is the most difficult task on the committee and most time consuming particularly when the copy is just not there to fill the magazine. I know, I did it for several issues before Ian Pawson took over.

Chris Smith, G1FEF has now taken over the role and this is his first issue, well almost, Chris was the editor before me and as such is a seasoned hand at writing the magazine.

For those of you that are old enough, (probably most of the club now) you might remember the I²C project that Chris was the brain's behind, and before

that the software conversions for Dmac BSB receivers to D2mac. Then for the really old members there was the club BBS where, if you owned the latest technology (a 1200 baud modem) you could contact the club via electronic means download software and leave messages for other members, all that remains from those pre internet days is one of the screens (see below).

Plea for help

If we are going to keep the club running then CQ-TV is a vital part, both for those who receive it in paper form and for the cyber members that download it.

The only way we can keep the magazine full of the sort of things you want to read is if you contribute articles, we are more than happy to re-draw circuits, when I say we, I mean of course the CQ-TV drafting team or Allan Robinson as he is better known. Chris will I know sort out your spelling and grammar he has

done it so often in the past for me.

Last but not least we are about to enter a BGM year, the last event was held in a church hall, we need a venue for 2008 and an organiser, if you would like to get involved in putting an event like this together then again we would like to hear from you.

Thanks

My thanks as always go to all the people who have contributed to CQ-TV: From designing circuits, writing software and put PCB's together. Without them we would not have the magazine we do today, and last but not least, thanks to our sponsor: Simon at the BlackBox Camera company for the caption generators he has donated as prizes for the CQ-TV caption contest

Send your articles, photo's, comments to: **editor@cq-tv.com**

Circuit Notebook 95

By John Lawrence. GW3JGA

Area Measurement of Irregular Shapes using a TV Camera

This may not be true amateur television, but most of the circuit techniques used here have applications in amateur and general video signal processing.

I have built several area measurement systems in the past, mainly for measuring plant leaves. This is a simplified version which could be used for measuring the area of any irregular shape, e.g. the area of copper on a PC

System

A monochrome video camera is mounted vertically, pointing downwards, perpendicular to and facing a flat work surface. A processing unit takes in the camera video signal and outputs a video signal to a video monitor.

The processing unit has three controls, 'LEVEL', 'CAL' and 'DOTTING' and is fitted with an analogue moving coil meter scaled 0-100.

Operation

In operation, a calibration piece of white paper, say 10cm x 10cm (area 100 sq cm) is placed on the (preferably dark grey) work surface and the height/zoom of the camera is adjusted so that the image roughly fills the monitor screen. The LEVEL control is adjusted so the white image appears dotted all over. The DOTTING control adjusts the intensity of the dotting for ease of viewing. The CAL control is then adjusted so that the meter indicates 100.

The calibration paper is now removed and replaced with any irregular shaped flat object to be measured, providing it does not exceed the 10cm x 10cm boundaries. The LEVEL control is again adjusted so that only the area of interest is covered with dots. The measured area is displayed in square cm by the analogue meter (a percentage of the 100 sq cm calibration sheet). A number of objects may be measured simultaneously and the sum of the individual areas displayed.

How does it work?

The circuit is shown in Fig. 1. It can be divided into three sections, a video clamp (IC1, TR1 & TR2), a video level comparator (TR3 & TR4), a free-running oscillator and gate (IC2) and a video amplifier (IC3). The waveforms are shown in Fig. 2.

The incoming video signal is a.c. coupled through C1 to the output amplifier IC3. Resistors R12 and R13 define a gain of x2 so that the output through R14 will produce overall unity gain into a 75R load. The input signal is also coupled through R2 and C3 to the sync separator IC1. The (burst/back porch) output of IC1 is coupled through C4, inverted by TR1 to drive the MOSFET TR2 which clamps the black level of the video signal to 0V at line frequency. This ensures that the black level is held constant irrespective of the video content.

The clamped video signal is fed to TR3 which, with TR4, form a voltage comparator. A reference voltage is fed to the base of TR4 from the potential divider formed by R8, RV1 & R9. Video signals exceeding the reference voltage cause a positive voltage output from TR4 which is fed to IC2a.

Gates IC2c and IC2d form a free-running oscillator operating at approximately 1MHz. The square-wave output from IC2d is taken to one input of IC2a. The other input is connected to the collector of TR4. When this goes high the square-wave (dotting) signal is passed to IC2b. The output from IC2b is taken through the DOTTING control RV3 and R11
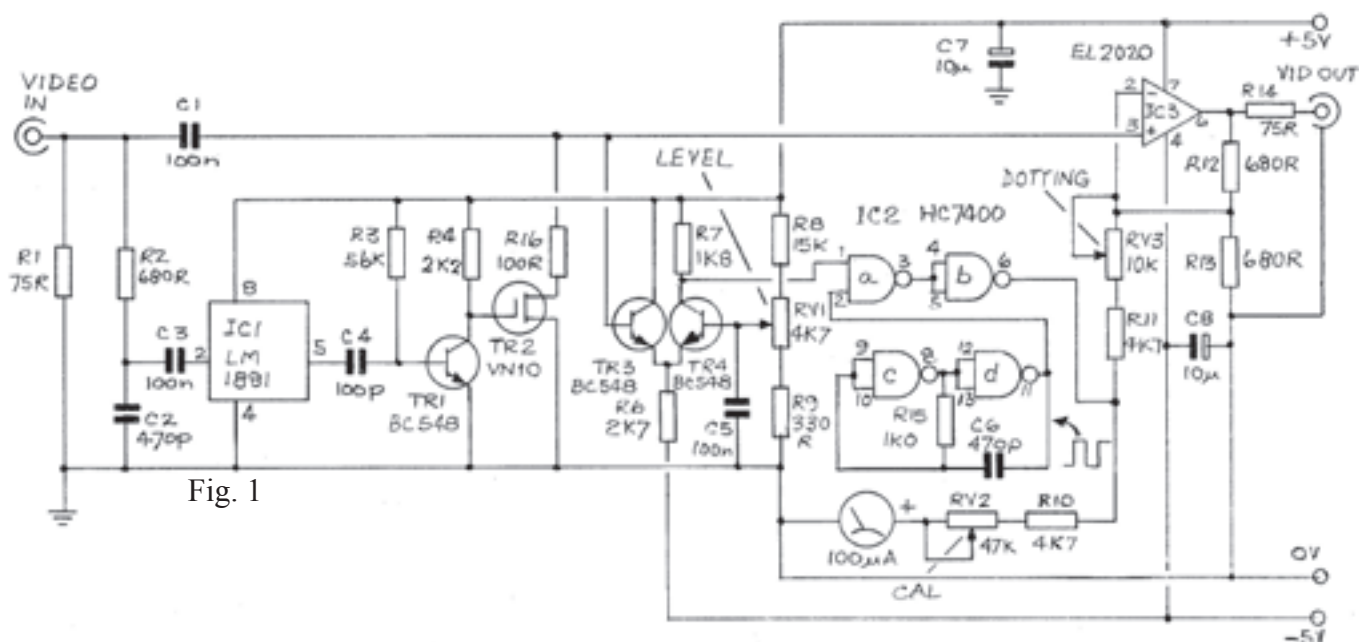
Fig. 1

to IC3, to provide the dotting which is superimposed on the picture. This indicates the area being measured.

The output from IC2b is also taken through R10 and the 'CAL' control RV2, to the moving coil meter. The dotting signal is a square-wave of fixed amplitude. The inertia of the moving coil meter integrates the number of positive half cycles into a current which is displayed by the meter. The current resulting from the dots produced by the calibration test piece (of 100 sq cm) is set by RV2 to give a full scale indication of 100 on the meter. The number of dots and thus the current caused by the unknown sample is indicated as a percentage of full scale indication, in this instance, directly in sq cm. An off-screen picture is shown in Fig.3.

Summary

The purpose of the dotting is to show the area being measured and allow adjustment of the LEVEL control so the correct area is selected. The CAL control allows the meter to be set to full scale when setting up. The DOTTING control adjusts the relative brightness of the dotting, for ease of viewing, but has no affect on the measurement.

A calibration piece of 100 sq cm was chosen as an example, but virtually any size could be measured by changing the camera distance/zoom settings or by using a microscope. An optical colour filter may be used on a monochrome camera to enhance specific areas for independent measurement. In my early experiments this allowed a brown diseased patch on a leaf to be measured separately from the whole leaf and displayed as a percentage. If a colour camera is used, a 47uH choke should be connected in series with R16 to allow the clamp to operate correctly.

The dotting signal from IC2b could be counted and displayed digitally, with gating, counting, display, storage and reset using conventional logic or a microcontroller. Field scan timing could be obtained from IC1.
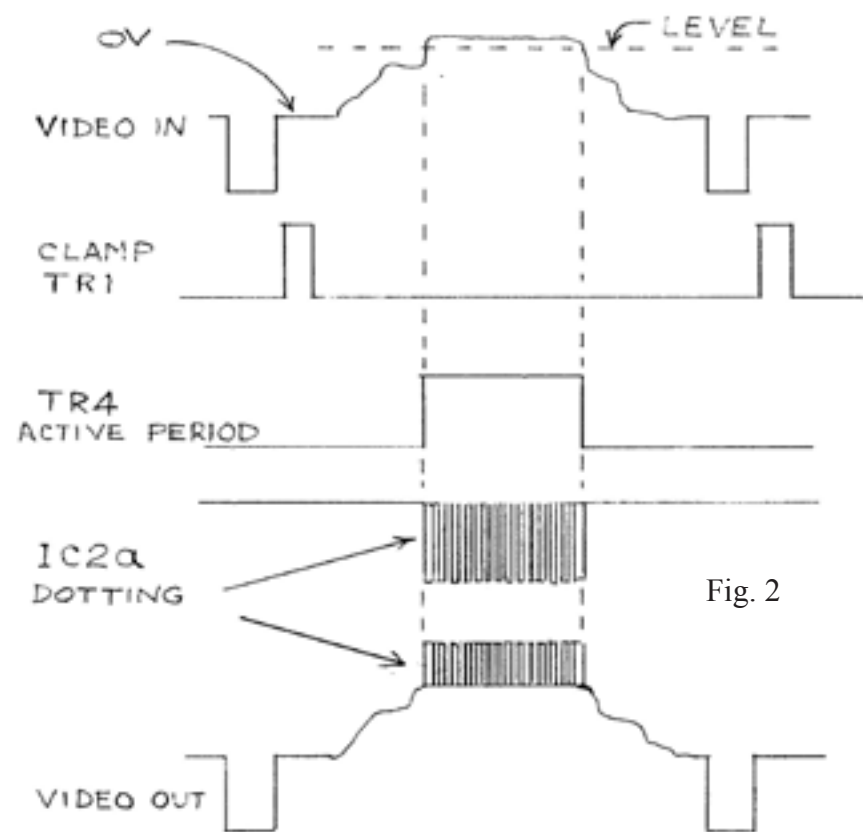
Fig. 2

Note:
IC2 pin7 = 0V, pin 14 = +5V.

Fig. 3

Video and Audio over CAT5

By Mike Cox

Introduction

For a change, this piece is pretty solidly analogue, although I cannot guarantee that it will not trespass into digital territory in say Part 2 [Ed. Permitting]

What is CAT5 cable? It is the cable commonly used for networking in IT installations, and there are thousands of miles of it in use around the world. Variants include CAT5e and CAT6, with slightly better performance.

It is very cheap compared with coaxial or screened audio cables, and uses very cheap, crimped on connectors. [8P8C, often called RJ45]

FIG. 1
CABLE AND CONNECTOR

The cable consists of 4 twisted pairs, with either stranded or single core 1/0.52 conductors with an outer wrap. [Fig. 1, 2] It may have a screening braid, in which case it is called STP or FTP; or it may not have any screening, in which case it is UTP. Stranded conductors are used for patch cords, and solid core for building installations.
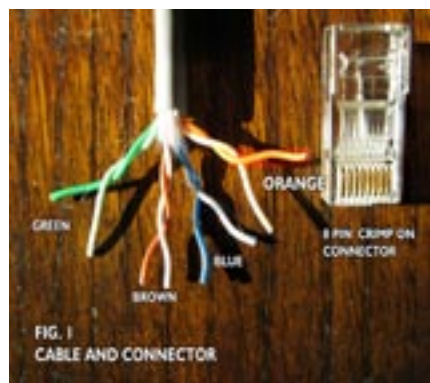
The twist is such as to give each pair a characteristic impedance of 100 ohms, and as it a pair, should be driven balanced. With balanced drive, crosstalk between pairs is very small.

Applications for this technology are numerous, ranging from sending Y/C and stereo audio in a domestic environment, to very long runs sending RGB to remote computer displays.

Before we leave the subject of the cable itself, there are some drawbacks, which get irritating on long runs when used with high-resolution computer displays.

The cable manufacturers only guarantee the delay skew between pairs to around 45 nS in a 300-meter run. If the display is say 1920 x 1200 pixels at 60 Hz, the H time is 14 uS, which makes each pixel 7.3 nS wide. So a 50 nS skew in a colour pair will shift that colour about 6 pixels away from its fellows – rather noticeable and objectionable, particularly with text. It needs correcting, and it will not surprise you to hear that several manufacturers make three channel skew correction chips. [See below]

Back in the standard definition world, a skew between Y and C of 45 nS is probably as good as any VCR or Pal decoder, so we need not get too worried about it for now.

FIG. 2
CONNECTOR COLOUR CODE

RJ-45 JACK
EIA/TIA 568B STANDARD
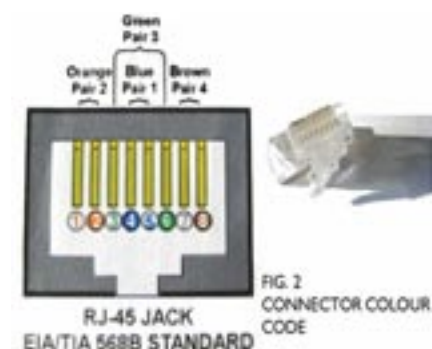
A Simple CAT5 TX and RX Card Set. I am going to concentrate on a simple Y/C and stereo TX and RX card, built using parts lying around in my CD [CQTVs passim]. There are proprietary units available on the market, but where is the fun and sense of achievement in that? You may also wonder why we are bothering with Y/C, which is after all a subset of PAL. Many items of AV equipment have Y/C inputs and/or outputs, and often, small displays only have CVBS inputs. Domestic security cameras will probably be using PAL long after analogue switch-off.

For satisfactory Y/C performance, the card needs a bandwidth of 6 – 7 MHz, and should not be too difficult to set up. It should be satisfactory for a run of 100 meters or more. The levels involved are standard 1 volt video for Y, 0.3 v burst amplitude for the C component, and –10dBm for the two audio channels, approximately 1 volt peak to peak.

TX Card

Our first need is to produce a balanced sending amplifier that will deliver 1 volt peak to peak into the terminated cable, which we have said, has an impedance of 100 ohms.

Most high speed or video op amps have single ended outputs. There are some exceptions to this but they are expensive, and not very likely to be lying about. So we have to bring two op amps together so that they produce balanced outputs from a single ended source. The simplified arrangement I have come up with is shown in Fig. 3, omitting such things as decoupling capacitors. I used this because I have some old boards with many EL2020s on, but
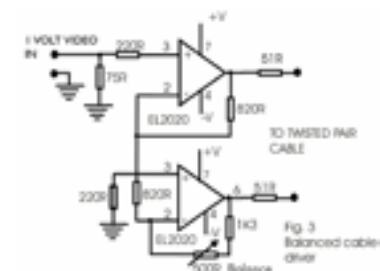
the same arrangement can be used with quad op amps such as CLC5644, when one chip will do for both Y and C send amplifiers. The 500R pot is to set the balance of the two outputs. A simple way to do this is to attach two 1K0 resistors in series across the two outputs, and monitor the junction of the 2 Rs. Adjust the balance control until the signal cancels. An identical circuit is used for the C component.

A very similar circuit with appropriate values is used for the two audio channels, this time using a TL074 quad op amp. To reduce current demand, the audio feed resistors are 330R, giving an approximation to 600 ohm line driving. Power comes from a 12 volt supply, with a 7805 to provide +5 volts. The op-amps are floated between 0 volts and +12 volts, with the +5 volt rail providing a pseudo-ground. Consequently all

outputs are ac coupled to the CAT5 cable. Current draw is 60 mA at 12 volts.

Rx Card

The opposite operation needs to be carried out, i.e. turn a balanced signal into a single ended one for use. Additionally, in the Y/C channels, gain and response equalisation needs to be carried out if the cable is long. Cable HF loss is 20 dB at 10 MHz for a 1000 ft [305 m] run of CAT5e cable. I measured the flat loss of a 1000 ft run at just under 3 dB.

The specification for the cable quotes a dc loop resistance of 59 ohms for a 1000 ft run, and capacity of 14 pF per ft. The specimen I have measured agrees with these figures.

Fig. 4 shows the principle of a receiver using a Philips NE592 [similar to LM733].

Because of the two pins which define the gain, it is relatively simple to correct for cable loss, both flat loss and HF loss. There is one drawback of the NE592;

FIG.4 BALANCED CABLE RECEIVER

the output dc offset. It is around 2 volts when run on +/- 5 volts rails. Accordingly it was decided to use a simple emitter follower as the output stage, with a red LED in series with the base of the transistor. The 1.4 volts forward voltage of the LED together with the base-emitter voltage of the transistor of 0.6 volts compensates for the dc offset. Thus the dc on the output if roughly zero, depending on picture APL.

Prototype Card Set

The transmitter and receiver have been built up on single-sided copper-clad laminate. There is a quick and dirty way to simulate a PC board, which I have used many times. Lay out the board using Boardmaker or similar PC package; print it out.

Then stick the board print to the cut-to-size laminate, using Pritt or similar PVA adhesive. Using a centre punch, mark the centres of the pads. Remove the paper template. Then drill out the holes with a 1mm drill. Clear all non-ground holes with a 2.5 mm drill. Components can then be inserted and wired, often using component wires as track. You now have a neat ground plane board ready to test. The cost is the time involved in drilling and wiring. If you need to make more, you have the layout and can get a pc manufacturer to make you one or more.

FIG. 5 TX CARD

FIG. 6 RECEIVER CARD

FIG. 7 CARDS AND CABLE UNDER TEST

FIG.8 Y Channel 305 m of cable
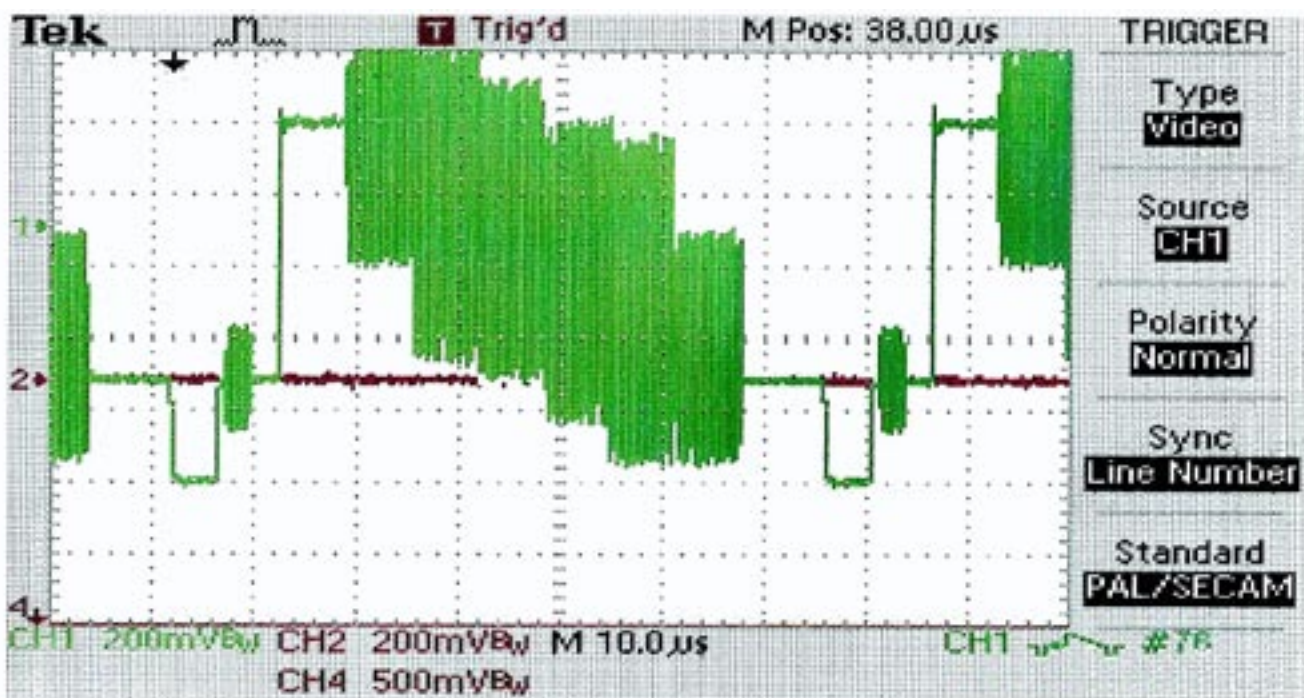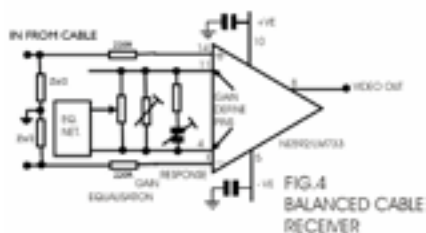
Figs. 5, 6, 7 show the TX card, the RX card, and the two cards on test with the box of CAT5e cable [305 m.]

So far, video [Y/C and CVBS] and audio arrive at the receiver outputs, gain can be set to correct for cable flat loss, and the only remaining task is to calculate the equalising network needed for CAT5e cable. The networks are plug-in cards so that they can easily be changed.

A first stab at it has produced satisfactory equalisation for CVBS colour bars

fed into the Y channel. [See Fig. 8] A similar result is obtained by feeding bars into the C channel only.

There was no easily measurable crosstalk from the Y channel, fed with bars, into the C channel. Similarly no crosstalk can be heard on the audio channels. Skew between Y and C channels measures 45 nS, just within specification. This is with the cable in its box. Doubtless this may change when the cable is unrolled, as the pairs may move relative to one another.

It may be necessary to use the receiver with a display having only CVBS inputs. Accordingly, the Y and C components are resistively added and fed to an output amplifier [EL2020] to give a standard 1 volt PAL feed.

Power is provided by a 12 volt supply. On the card, the -5 volt rail is provided by a dc-dc converter, and +5 volt rail by a 7805 regulator. Current draw is 160 mA at 12 volts, probably within the spare capacity of a display.

Figs. 9 and 10 show the circuits of the receiver card.
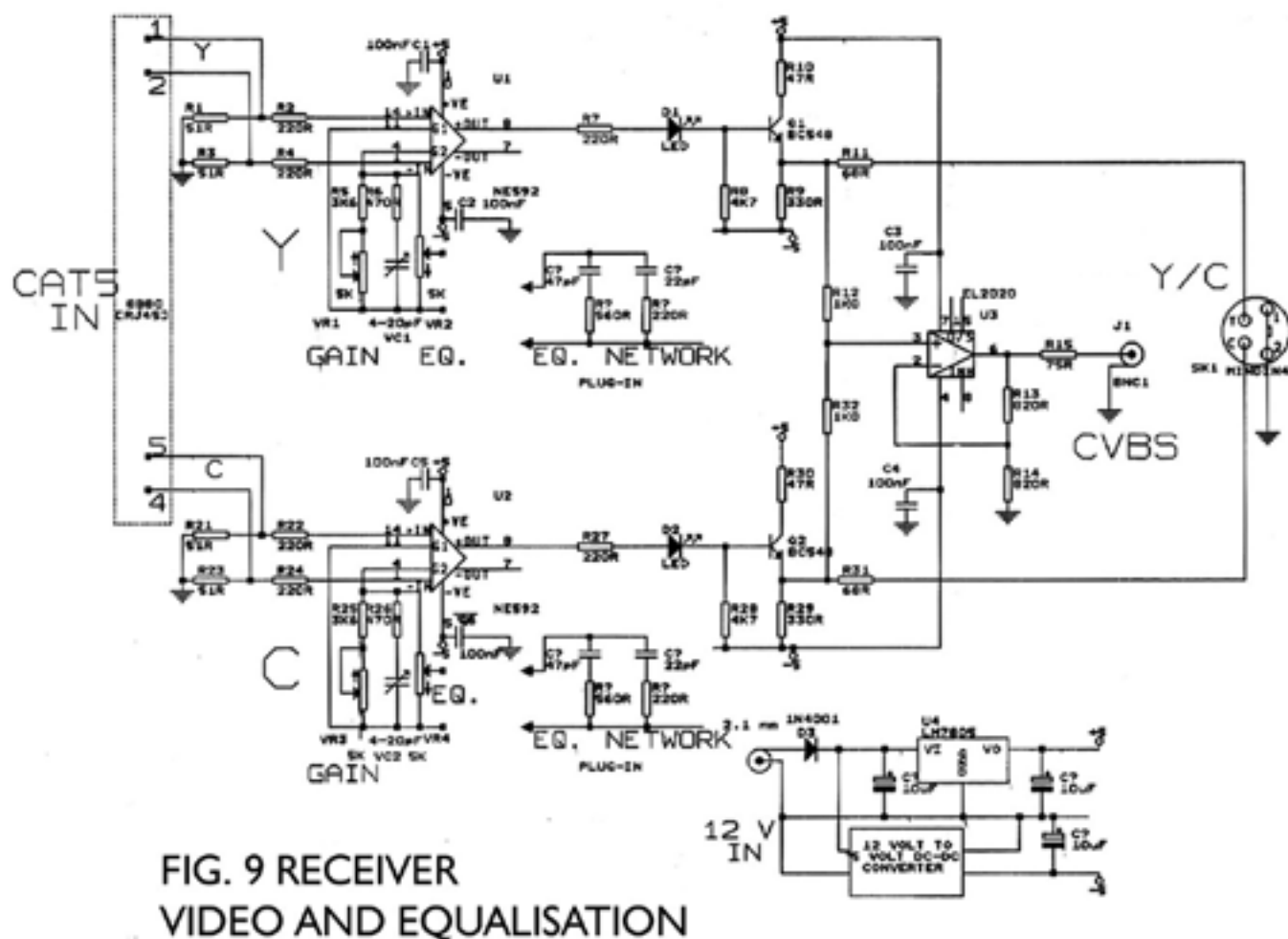
FIG. 9 RECEIVER VIDEO AND EQUALISATION

Other Applications

CAT5e cable has 4 twisted pairs. It can obviously be used for feeding remote VGA displays, as mentioned above.
It could also be used to feed video and audio from a remote CCTV camera, with the other pairs used for control of pan, tilt and zoom. Or by the phantom techniques mentioned below, video and audio from two cameras

In the simple application described earlier, phantom techniques can yield another two pairs, which could be used for low bandwidth control signals. [Fig. 11]

At some time in the future I shall have a go at sending SDI signals over CAT5. There is no good reason why it should not travel 100 metres or so.

Various Useful Chips

Intersil EL9115 provides skew correction for 3 channels, which is ideal for remote VGA links.
National Semiconductor offers the LMH6551, a very wide bandwidth unbalanced to balanced amplifier suitable for driving 100-ohm cable.
Google is a useful source of information on these and others.
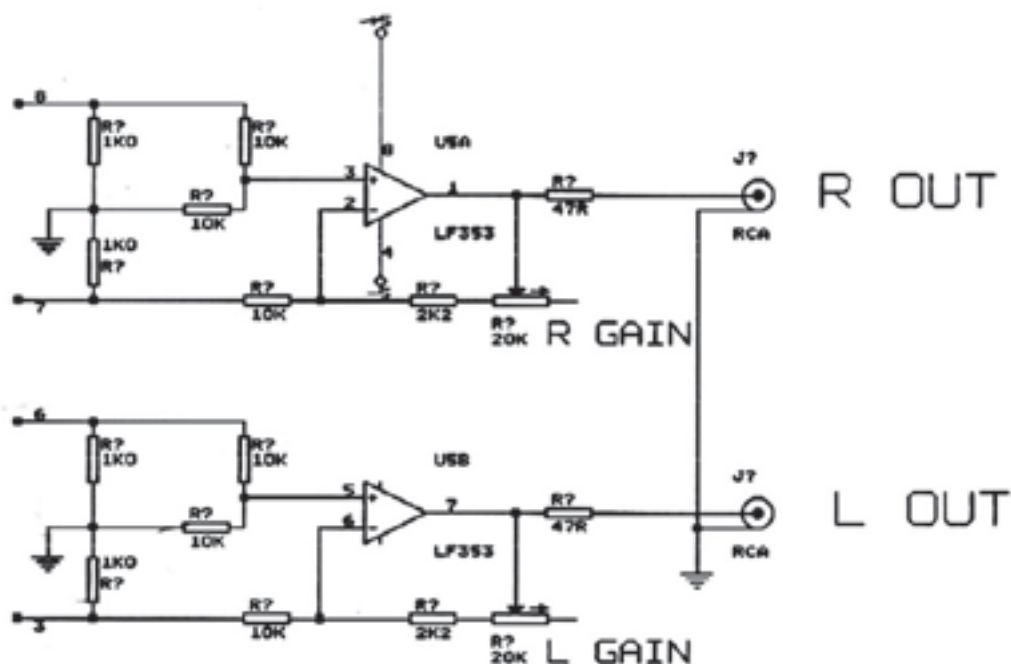
FIG. 10
RECEIVER AUDIO

Sources of supply

CAT5/6 cable is widely available at prices from £30 for a 305 m box of UTP cable to perhaps three times that price for exterior grade STP cable.

Connectors are available from Rapid Electronics, Maplin's, CPC, Farnell or RS. Rapid offer a cheap crimp tool, suitable for cutting and crimping connectors [stock no. 86-0220]. Rapid also do a range of inexpensive patch cords, useful for going from a wall outlet to a receiver or transmitter card.

Rapid Electronics
        www.rapidonline.co.uk
Maplin's
        www.maplins.co.uk
CPC
        www.cpc.farnell.com
Farnell
        www.farnell.co.uk
RS
        www.rswww.com

And many more
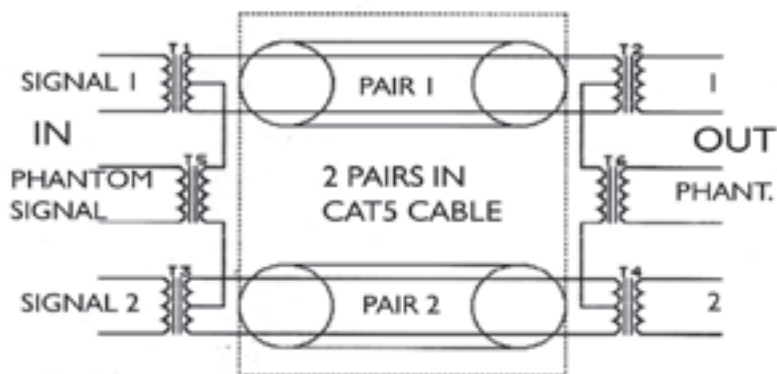
FIG. 11 PHANTOM CONNECTION TO GIVE THIRD SIGNAL BETWEEN 2 PAIRS. TRANSFORMERS ARE SHOWN FOR SIMPLICITY. WITH 4 PAIRS, TWO PHANTOM CIRCUITS CAN BE USED

Final Thoughts

I hope this makes sense. It has been a very instructive project, and very satisfying when it works.

When I find the masonry drill, I shall start installing some CAT5 runs around the house. One word of warning – make sure you don't plug your computer Ethernet output into the receiver, particularly if there is a valuable speaker connected to the audio out!

        Good luck.

DATV at UK Microwave Round Table

The Martlesham Radio Group organised a Round table on 10th/11th November in support of the UK Microwave Group.

The meeting is primarily aimed at amateurs interested in microwave, but a wide range of topics is covered including a talk on DATV progress in the UK.

ATV users are significant users of the microwave spectrum for analogue transmission and the advent of digital compression techniques offers not only improved video and audio quality, with prospect of occupying significantly less spectrum.

The talk was given by Peter Blakeborough G3PYB on behalf of the BATC and included a demonstration of a low delay narrow band video coding at 1.58Mbit with QSPK modulation offering approximately 2MHz spectrum occupancy.

The practical system demonstration at the talk was based on a 70cm RF platform but the same modulation scheme has been proven on a 10Ghz platform using a DRO down converter ahead of the FTA digital satellite receiver. No jitter problems were seen on the 10Ghz system running at 2Mb/s.

Recent DATV tests completed using the same equipment include a 10Ghz test from the Hogs Back to G8ADM in Stanmore (approx 50Km) and more recently a 70cm test from Walbury Hill to Stanmore (approx.100Km). In both cases BER reports were very low, and considerable path loss margin remained.

The talk was base on a power point presentation to be made available on the WEB page of the Martlesham Radio Society) and covered a number of active digital repeater stations, individual station digital experiments and sources of the more difficult digital equipment.

Noel Mathews G8GTZ added to the talk by describing the basics of I/P streaming for ATV with some clips from the "Satman" multiscreen WEB page hosted by Camstrem.

Further reading:
http://www.mrs.bt.co.uk/

IBC Report – 40 Years on

By Mike Cox

Having attended every IBC there has been since the first one in 1967, as visitor, exhibitor or part of the organising team, it is interesting to reflect on the changes in technology over this period.

Back in 1967, colour television was starting in France, West Germany, Russia and the UK [BBC2 regular service from December 1967].

Cameras were bulky 3 or 4 tube devices, and video recorders used 2-inch tape, and were equally bulky. [CQ-TV 188, p25] They were made by Ampex, EMI, Fernseh, Marconi, Pye, and RCA, all of whom exhibited at that first IBC. Where are they now?

Displays were almost universally direct view CRT, with rectangular shadow mask tubes starting to get around. Professional [Grade 1] monitors were 17 inch, and were tricky to converge and grey scale track.

At IBC 2007, there were only a very few CRT displays on show, mainly for HD professional use [JVC]. The rest were all plasma or LCD.

Cameras

Cameras are moving away from moving parts, with Panasonics P2 compact flash card system now well established, and Sony entering the field with their XDCAM EX. [FIG 1]

This camcorder [PMW-EX1] uses SxS Pro memory cards, providing 2 x 16 GB of storage, which gives 100 minutes of HD recording at 35 Mb/s.

Thomson/Grass Valley have their Infinity camcorder, which was used successfully for the IBC TV News transmissions at breakfast time each day.

Panasonic have entered the domestic market with a range of HD cameras recording AVCHD format onto SD cards. [Currys have the HDC-SD5EG

Fig.1 Sony PMW-EX1 HD camera with flash memory

for £799.99 if any one is interested, complete with 4 GB SD card]

If someone had said 40 years ago that you would have a camcorder [no one had thought of the word then] capable of recording HD pictures that would fit in the palm of your hand, you might have sent for two doctors, and a section of the Mental Health Act.

The zoom lenses of 40 years ago were very large and had a range of around 4:1. Even a simple pocket still camera today has a range of 3:1, and with resolution well beyond current HD practice.

Also remember that 40 years ago, Integrated Circuits were limited; although RTL and TTL logic chips were around, there were few op amps, so cameras and video processing circuits used discrete transistors. Computers were few and far between, and had very limited capability.

Now that HD is becoming established, many are turning their attention to 3D HD.

Fig.2 NHK hi-speed camera

SMPTE is holding a one-day Conference on Stereoscopic Production in New York on October 23rd. While many players are using spectacles to separate the left and right images [polarised, some with field switching controlled by infra red from the display], Philips were showing their WOW display. This uses an LCD panel with a lenticular screen in front such that by sitting in front of the display the left eye see the left image, and the right eye the right image. It appears to work, although moving around affects the illusion somewhat.

I saw in the IBC Big Screen, a 3D presentation of a U2 concert recorded in Brazil.

The effect was mostly fine, but went peculiar when there was a dissolve between two cameras. My eye-brain combination couldn't work out what was happening. This presentation used polarised spectacles. When I checked later, each lens seemed to be polarised in the same direction.

Fig.3
Basilisk at
500 frames/sec.

Fig.4
Kinoton Litefast LED display

Fig. 5
Coolux 4 projectors onto sphere
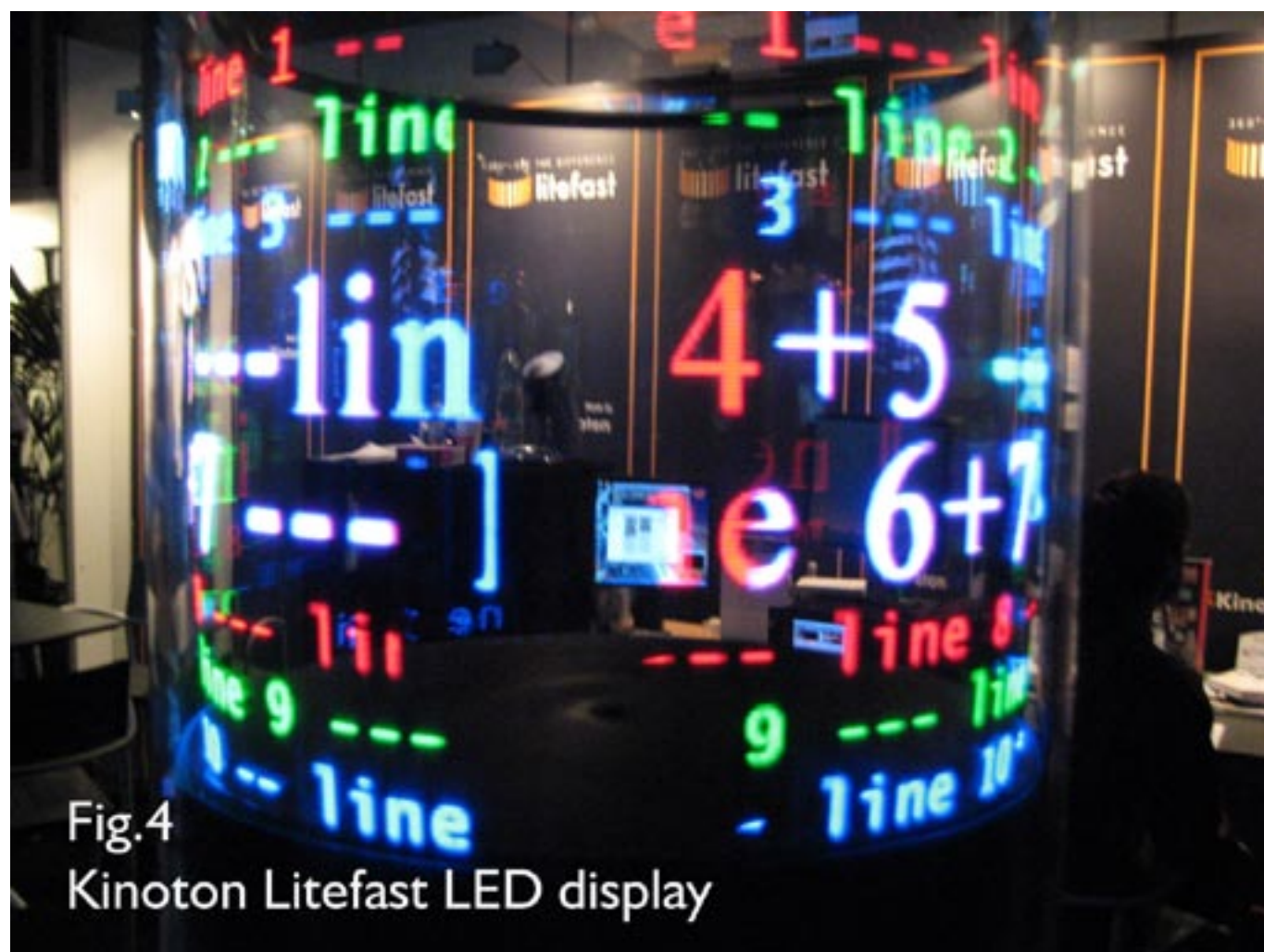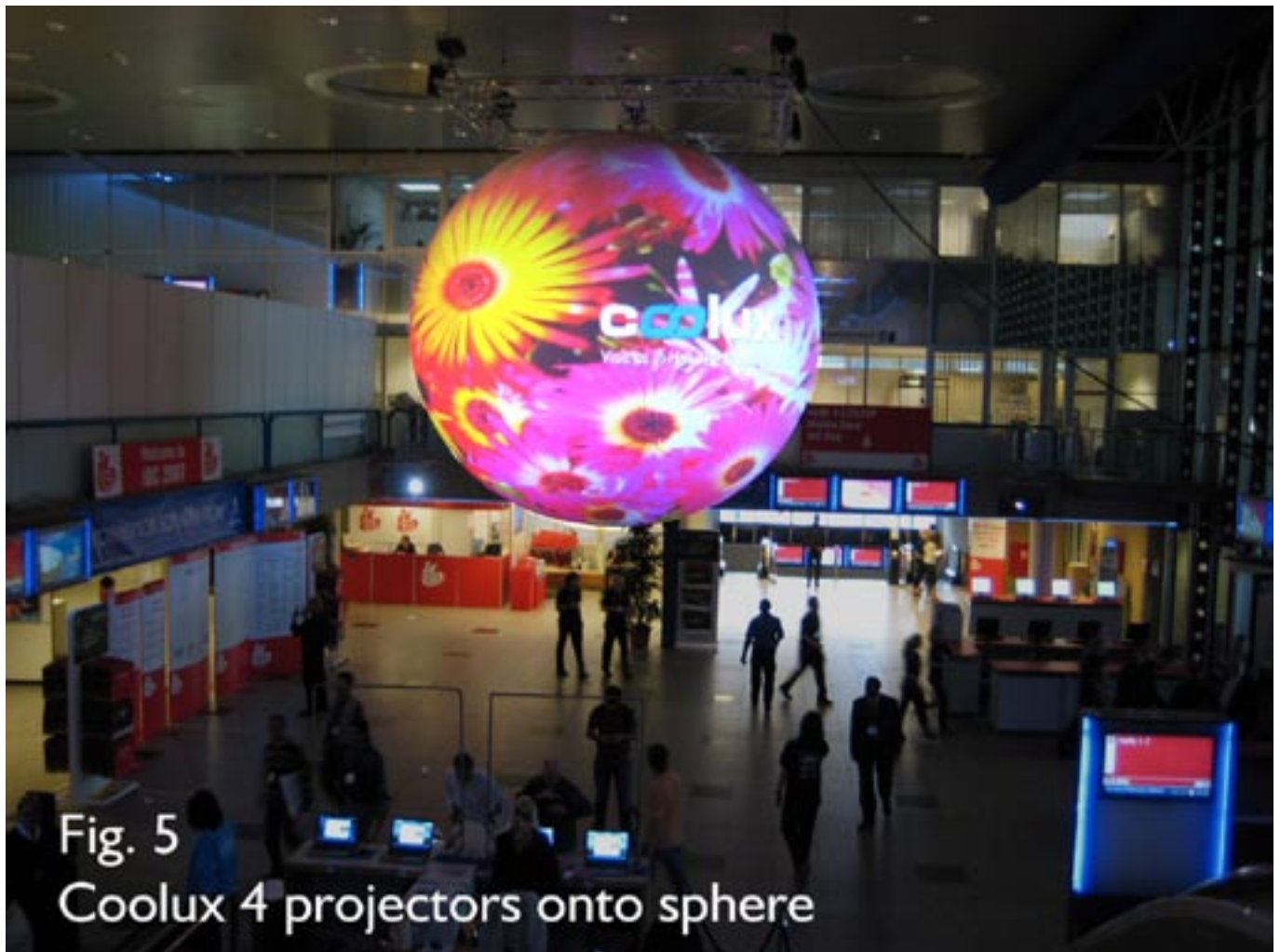
Ultra High Speed Acquisition

You may recall that last year [CQ-TV 216 p17], I mentioned the NHK 8K camera, that used 16 HD-SDI links between camera and CCU. SMPTE is now considering the system as an SMPTE standard.

This year, NHK showed in the New Technology campus their Ultra High Speed Camera system. This is capable of running up to 1000K frames/second. [Fig 2, 3] The camera uses a special 300,000 pixel CCD with integral storage for 144 frames. It is portable, looking like a rather tubby ENG camera from a few years back.

A question comes to mind whenever NHK is mentioned. They have the same license fee funding system as we do in UK. How is it that the BBC does not produce the same spectacular results as NHK? NHK was responsible for starting work on HD in 1964, and their work on the perception of high-resolution images

Fig. 6
Use of Picture Frame displays

Fig. 7
104 inch Panasonic display

led to laying down a specification which is broadly the HD system used today. They decided on 1125 lines, 60 Hz, with a 5:3 aspect ratio.

NHK had to design and build all the equipment, as there was no commercial source until later. NHK also did pioneering work on plasma displays, showing a 20-inch colour display in 1987 and leading research work with industry to produce a 40-inch display in 1998.

NHK started an experimental HD transmission using the quasi-digital MUSE system that they developed in 1991, and this system was only switched off a year or so ago, being superseded by an all-digital system.

Maybe NHK had a better relationship with Japanese industry than did the BBC with British industry, or maybe the BBC was Birted into touch in the 1990s.

Fig. 8
Large OB [for Paul Marshall to restore in 15 years]

Fig. 9
Small OBs

Displays

Apart from conventional displays, Kinoton showed a novel approach with its Litefast display. This is a bar of LEDs, which rotates inside a cylinder. Rotation is equivalent to field scanning, and as it rotates traces out a picture or signage information. [Fig 4]

Another interesting display was from Coolux. This used 4 projectors to completely map an image onto the surface of a sphere, in this case a balloon. [Fig 5]

The usual LED displays were in show; with some fine displays with 3 mm pitch LEDs, capable of near HD results.

Sony now has a range of Grade 1 LCD monitors to show, and one range is specifically designed to give good results with interlaced inputs, interesting when there is a push for Progressive picture capture, with 1080p being promoted heavily as the format of the future.

An interesting use of "Picture Frame" displays, now available very cheaply, was by Telex.

They were using them on the side of their stand to show logos of their customers. [Fig 6]

Panasonic showed a 104-inch display, which was wonderful. [Fig 7] Maybe they should get together with the building industry so that such a display could constitute a wall in a house, although

may have some impact on a confused picture.

IPTV is growing as broadcasters make their back catalogues available for download.

There is concern that in the UK, the basic IP infrastructure will not be able to support the load on it when BBC's iPlayer takes off.

Other Bits

OB trucks were there in quantity. Almost every broadcaster and his dog had a HD truck on show. There was a theory in the early days of HD that because of the 16:9 aspect ratio and the higher

Fig.10 Sony HDV recorder/player

waterproofing would be needed for an outside wall!

IPTV and Mobile TV
Well supported IPTV and Mobile TV Zones were held. These are topics generating great interest among a number of well known players.

Sad though that my report last year mentioned BT's Movio service to mobiles which was about to start, and is now about to close for lack of support. The recent EU thrust on the use on DVB-H as the European system

resolution, fewer cameras were needed to cover say a football match. Not a bit of it. The trucks on show could have 20 or more cameras, plus others in tenders alongside. Most now have expandable sides to accommodate the sideways control galleries on board. [Fig. 8] Will Paul Marshall re-build this in 15 years time?

Elsewhere in the Outside Exhibit area were the smallest possible: a small BMW motorbike and a Smart Car from a Czech company. [Fig 9]

Fig. 11
IBOC/HD Radio

Info Channel

The Info Channel performed well over the six days of the show. This year, because of the power of the Aston 7 CG used in conjunction with an Aston Red CG, the SDI mixer was left behind. The SDI Router did an excellent job of routing signals around the area, and as a Transmission Switcher. We also had use of an EVS server, which considerably eased the workload on the crew. [Fig. 12, 13]

Final thoughts

IBC has grown over 40 years from a modest show in a London hotel to completely filling, and more, one of Europe's larger Convention Centres.

To go with your HDV camcorder, you might like one of the new Sony HDV recorder/players with integral display. [Fig 10]

On the National Public Radio stand in the New Technology Campus, this diagram was on show, indicating what is happening to the radio FM spectrum in the USA. [Fig 11] HD Radio, as it is called, is the buzzword. The "HD" has nothing to do with High Definition. It is meaningless. It is also called IBOC [In Band, On Channel]. A digitally modulated sub-carrier sits high up in the FM carrier, and is either a replica of the FM channel, or it can be a completely different channel, or with lower bit rate, 2 channels. For further information, Wikipedia has a good article on IBOC, DAB, DRM etc

Fig. 12
Info Channel HQ

Fig. 13

This growth was driven by the industry getting bigger, but also by the enthusiasm of the people from the industry who organised IBCs over the years. It is now, apart from NAB, the show for the manufacturing side of the media industry. It is hoped that this spirit will continue long into the future whenever and wherever IBC is held. I have many happy memories of the show and the people involved with it.

It is my last show involved with the IBC Info Channel, but this does no mean that I have hung up my soldering iron. Any future writing that the future Editor is kind enough to accept may be less about SDI, but perhaps more about general things.

Treasurers Report

Income and expenditure account

At 31st December	2005	2006
Income		
Subscriptions	13,720.15	11,988.54
Members services	3.15	26.16
Publications surplus	266.87	102.60
Advertising	193.00	150.00
Bank & Building society interest	917.41	1,069.13
Rally or Covention surplus/loss	0.00	-190.35
Donations received	11.13	99.50
Postages, Airmail	36.00	108.00
Miscellaneous	5.00	10.23
	£15,152.71	**£13,363.81**
Expenditure		
CQ-TV printing	8,034.42	6,485.00
CQ-TV postage	4,240.91	2,517.33
CQ-TV production	253.21	99.83
General Office expenditure	12.99	1.69
General Postage	217.63	52.50
Internet Web Site expenses	305.47	294.60
E- Mail, ISP expenses	179.88	164.89
RSGB affiliation fee	42.50	44.00
Committee meeting attendance exps.	0.00	0.00
Insurance & legal	147.00	0.00
Rally attendance	78.00	68.00
Recruitment	21.00	152.03
Adverts and publicity & Projects	41.00	0.00
Donations made	341.12	0.00
Bank charges, mainly "VISA" costs	265.64	296.75
	£14,180.77	**£10,176.62**
Surplus for the year	**£971.94**	**£3,187.19**

Notes for 2006

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

Fixed assets

Office equipment Additions	91.82	0.00
Less Depreciation	-91.82	0.00

Current assets

Stock: - Members services	1907.13	1,788.35
Publications	55.00	0.00
Back issues of CQ-TV	300.00	250.00
Nationwide Building Society	138.48	140.82
Halifax Bank	10,765.66	10,967.57
GiroBank Alliance & Leicester account	281.95	608.95
Bank of Scotland current account	17,652.52	18,489.30
Bank of Scotland investment a/c	30,540.58	31,174.48

Less Current liabilities

Subscriptions received in advance	14,634.69	13,225.65
	£47,006.63	**£50,193.82**

Represented by accumulated fund

Balance brought forward	46,034.69	47,006.63
Loss / Surplus	971.94	3,187.19

Balance carried forward	**£47,006.63**	**£50,193.82**

I have examined the books and records of the British Amateur Television Club and confirm that the balance sheet and the income and expenditure account are in accordance with those books and records.

Mrs. T. Rees   Brian Summers
Ducklington Oxon   BATC Honorary treasurer
                                 11 September 2007

AGAF ATV Meeting 2007

By DL4KCK

On a sunny evening on May 4th the first guests arrived in Wehningen/Elbe (eastern Germany), while the team around Guenther DM2CKB had already prepared the hall at the "holm" inn for lectures on Saturday morning.

There were video cameras and a direction console where Rolf DJ9XF mixed video and sound for transmission via a 10 GHz link by Harry DG1SUL to the digital ATV repeater DB0EUF near Lenzen. The small parabolic dish on a tubing mast was fine tuned in elevation by an adapted electric drill. On a big CRT monitor we were able to view the repeater´s digital output and sometimes via its linking DB0HEX on Brocken mountain.

For the first lecture at 10.15h Guenther welcomed more than 40 guests, while the "lady´s program" took some wifes out to a trip in the Elbe meadows in a covered wagon. Wilfried DJ1WF and Tom DL9OBD from Hannover showed a powerpoint presentation of their latest laser beam ATV (400 THz) record of over 83 km distance. They brought an older laser ATV RX version for show which confirmed their years of experience in this unique branch of ATV.

Then Guenter DL9GMX showed his handicrafts enthusiasm on the big screen and got a warm applause, but because of multistoried buildings nearby he was not able to receive DB0HEX directly, so he constructed a private link repeater for both directions on a fire watchtower in the woods near his QTH. That needed a solar panel power supply and many LNB amplifier modifications, and after relocation of DB0HEX a changeover to DB0EUF. For a laugh he ended with a picture of his mobile ATV antenna - a 2m mesh parabolic dish mounted at the rear of his small car!

Rainer DM2CMB demonstrated automated radiation pattern and spectral measurements with his laptop computer and a network analyser "HFM91" using different antennas. An old noisy rotor turned around while the live measuring curve appeared on the monitor screen. He provided some hints on short wiring between rf instruments and explained the advantages of his homemade rf pads. All the time live video with call sign and text captions was transmitted to DB0EUF.

After a lunch break Iwo DG0CBP (ATV manager of DARC) described recent proceedings at his high altitude repeater DB0HEX on the Harz mountains, where he made the first test transmissions with SR-Systems´ digital ATV modules. Pictures of icy aerials

and outside video cameras proved the harsh winter conditions, but after a crash of a big commercially constructed dish the repeater team had to accomplish a relocation from the telecom tower to a lower building nearby. Under a huge fiberglass dome they were able to utilize some old 4 m parabolic dish antennas for ATV links i.e. to DB0EUF and to Schneekopf mountain.

Uwe DJ8DW gave an overview on DATV developments in Wuppertal with 4th generation boards including multiplexing of 5 programs, USB connectors and joystick control with a small LCD. This controlling feature is also part of a new variable up-converter for the 23, 13 and 9 cm band. The long awaited 70 cm GMSK receiver boards are progressing - Willi DF5QC has finished 14 rf modules, while 4 digital modules are ready for testing sessions. In a short discussion about "what next, in ATV?" Uwe described several activities around the new restrictions on telecom tower locations all over Germany.

During the ATV meeting Uwe met for the first time face to face with another leading DATV developer, Torsten DG1HT from Hamburg (his repeater DB0DTV, well known for its excellent live web interface, went QRT because of the DFMG restrictions). They discussed a better compatibility of both DATV TX systems (AGAF and SR-Systems) concerning GMSK modulation. Juergen DJ7RL and his wife came from Kiel and presented a new video CD in SVCD format with tips for ATV newcomers called "First Steps", which was suggested by ham radio friends from Finland. A following version will include the topics digital ATV, construction tips, antennas and laser ATV. E-Mail: jschaefer@ki.tng.de

In the concluding AGAF convention Heinz DC6MR was re-elected as chairman and Karl-Heinz Pruski as manager, while Uwe DJ8DW wanted to act only provisionally as second chairman, waiting for "fresh blood" as successor. After approval of a change in statutes the present members elected Uwe DJ8DW as the new president of AGAF e.V. He wants to maintain contacts to german authorities and amateur radio groups and to improve relations to foreign partner groups.

Translated from TV-AMATEUR 145 with permission.

An ATV pioneer of the early days

By Urs Keller, HB9DIO

If you talk about ATV pioneers in Switzerland, there is one above all: Hansruedi, HB9TJ. He gained his knowledge as a radio and TV technician, but was also interested in aviation and its electronic devices. This lead him to establish his own company AVIONIC in 1966.

Like many successful radio amateurs HB9TJ started with homebuilt transceivers and worried about administrative matters like a license only later. This resulted in confiscations and confrontations with regulative authorities, the PTT. In those days it was good manners to talk personally before judiciary took place, and the authority was aware of their limited technical knowledge. So Hansruedi was asked by the director in St. Gallen himself to sit his radio amateur license exam, in order to recover his confiscated equipment. On May 29th 1956 Hansruedi got his callsign HB9TJ.

With a spreading television service in Switzerland and without any regulation on the mode "Amateur TV" Hansruedi had to build his own TV equipment. ATV was totally unknown in HB9, but as a first TV reception confirmation the

PTT contacted HB9TJ in 1958 and asked for a license document. Considering TV transmissions impossible for noncommercial people they had not prepared any rules for ATV modes! Like a real pioneer Hansruedi found a way to institute ATV in HB9 legally and sat a written and oral exam - after having defined baseline parameters and examination points as a contractor of the PTT experts. No authority representative was able to do this. In 1961 first formal ATV licenses were issued in HB9 as a supplement resulting in double license dues.

Hansruedi is also an enthusiastic collector of TV station equipment and measuring instruments, his ATV studio in a building at the Bern-Belp airport is reminiscent of commercial studios in the 1980's. During a swiss TV program called "Amateurs" in 1973 from a Zurich TV studio his black-and-white signal from Bern was broadcast live over PTT links, genlock signals were fed back to HB9J via telephone lines. This transmission produced a wide notice for the ATV scene in Switzerland
Video stream download at:
www.hb9f.ch/verein/movies/HB9TJ.mp4

From March 1976 HB9TJ was in colour, even before the swiss parliament studio.

In 1986 the 1. EATWG meeting (european amateur television working group) was held near Basel, and Hansruedi gave a lecture about the first IR laser beam ATV transmission (1976 in his garden) and demonstrated his (homebuilt) equipment which had bridged 5 km distance already.

After installation of ATV repeater HB9F on "Pitz Gloria" mountain (2973 m ASL) at the end of 1997 HB9TJ got knowledge all around the area, and also the author got aware of Hansruedi's talents. During an automobile exhibition in the year 2000 radio amateurs were able to present their hobby, and the main attraction were live ATV transmissions from the Bern airport over ATV repeaters HB9F, HB9EBS and F1ZFN to the fairground in Basel.

Some years later the call HB9TJ vanished from the ATV screens for some time, as Hansruedi had to undergo medical treatment (back operation) with severe consequences. After convalescence on 24.2.2007 Hansruedi Schaer was honoured as honorary member of USKA and a pioneer for ATV in HB9. His gratitude goes to his wife Nelly, who has been by his side for 45 years now and supports all experiments in a substantial way.

Translated from TV-AMATEUR 146 with permission.

Nonanet (UK) Limited are a UK Internet Services Provider

We specialise in providing bespoke hosting solutions, some of our services include:

- Web design
- Programming
- Consultancy
- Web hosting
- Email services
- DNS hosting
-

We also provide SMS send and receive (short and long codes) services

Contact us on: 0870 446 1011 or email: sales@nonanet.co.uk

Special Offer: *Free web hosting account for any club member !!*

Colourful Times (reprise)

By Andrew Fremont

It was interesting to read 'Colourful Times' in your August 2007 issue, because I more or less started from where it ended. I joined Marconi's (then MWT) as an apprentice in 1958 and the camera shown (or one of the same design) was being demonstrated in the canteen on my first day.

By the time I joined the colour development group three and a half years later the camera had been redesign to the more angular one shown in the photograph. This was still a 3 x 3" Image-orthicon design and was definitely a three-man lift. It was never produced in any significant quantities. The picture was taken during the demonstrations that had been set up to aid the selection of the UK colour TV system. One camera was operating in RGB and the second used YRB. We also had an experimental 3 x 4 ½" image-orthicon design (even heavier and thirsty on light) and a cobbled together YRGB camera, made from a Vidicon RGB camera and a black and white one modified to use a Plumbicon.

The latter was a real pig to keep in register, not only because the baseboard was somewhat too flimsy but also because the two camera systems were in no way related and drifted as they pleased. Display for the guests was via one of the large TV projection systems. The high voltage circuitry of these was mounted in an oil bath; messy if there were problems. (Sadly the model in the photograph was later killed in an air crash over Paris).

The article mentioned effects of the Earth's magnetic field. With the yokes being parallel and the high field strengths used for the large tubes one would not expect a significant effect. However a later plumbicon based design with the jokes mutually at right angles did show problems. This was particularly evident in a New York studio that was next to the subway (Underground!). It was also seen in the Gulf region where the earth's field appears to be higher than elsewhere. In this case registration errors could occur on panning. One can add µ metal screening cans all round but there has to be a hole for the light to get in. Some of the earlier cameras picked up medium-wave radio if sufficient care was not given to screening the head-amplifier coupling. I can remember, in a state of some desperation, wrapping the whole tube in aluminium foil. Obviously it could not work like this but it did help in finding the source of the problem.

With the rapid expansion of colour services in the 60's and early 70's it was a busy but interesting time but for me the real interest came with the push to digital telecine in the late 70's. It was a major struggle, given the technology of the day, but well worth the effort when we succeeded.

Contest News

By Dave Crump

Congratulations to Phil, G8XTW, John, G8ADL and Arthur G4CPE for winning the UK Section of this year's IARU Contest using the G4DDC/P Callsign. They operated from Dunstable Downs and managed to prove just how much activity there is within 40 miles of that site. I will publish the European Results in the next CQ-TV.

CONTEST CALENDAR 2008

1800 UTC 22 March - 1200 UTC 23 March - BATC Repeater Contest
1200 UTC 7 June - 1200 UTC 8 June - BATC Summer Fun Contest
1800 UTC 13 September - 1200 UTC 14 September - International ATV Contest
1800 UTC 6 December - 1200 UTC 7 December - BATC Repeater Contest

Thanks also to Rob M0DTS, Eddie G0HEV and Clive G4FVP for entering as a team under the M0DTS/P callsign, and, last but not least thanks, to Roger GW4NOS and Geraint GW0NDZ.

Although I only received 3 entries, I was pleased at the level of activity this year. It would be great if every station that participated would submit a log; I will be reprinting paper log sheets to encourage entries in the future, so please send me an SAE if you would like some.

The next contest is the March Repeater Contest – please make an effort to support your local repeater. Rules on the web site.

Please note that I have allowed 24 hours for the Summer Fun Contest in June; this will enable the portable stations to work in daylight on Saturday and Sunday.

Although I am still living in the USA, I can be contacted through e-mail (contests@batc.org.uk), or through my BFPO address: Wg Cdr D G Crump, Mailbox Number ACT, BFPO 63, London.

IARU International ATV Contest 2007 (8-9 Sep) UK Results

23 cm

Place	Call Sign	Points	Locator	QSO	DX	DX Loc	Km
1	G4DDC/P	1068	IO91RU	11	G8ACT	JO01DT	57
2	GW4NOS/P	648	IO81FP	3	G1IXF	IO81RL	71
3	M0DTS/P	396	IO94LI	1	G0DPS/P	IO93AP	99

13 cm

Place	Call Sign	Points	Locator	QSO	DX	DX Loc	Km
1	G4DDC/P	1000	IO91RU	8	G4FEV	IO92RG	46
2	M0DTS/P	990	IO94LI	1	G0DPS/P	IO93AP	99

3 cm

Place	Call Sign	Points	Locator	QSO	DX	DX Loc	Km
1	GW4NOS/P	330	IO81FP	1	GW0ROL	IO81JK	33

Overall UK Results

Place	Call Sign	70 CM	23 CM	13 CM	3 CM	Total Points
1	G4DDC/P	-	1068	1000	-	2068
2	M0DTS/P	-	396	990	-	1386
3	GW4NOS/P	-	648	-	330	978

Do you have an opinion relating to ATV?
Do you have any ATV equipment for sale?
Are you looking for some ATV gear?
Have you designed any ATV gear recently?

Contact the Editor, email today: editor@cq-tv.com

IARU Region 1 ATV Contest Results 2007

70cm - Section 1

Pl.	Call	Points	Best DX	QRB
1	F9ZG	7824	F1IIG/P	664
2	F6ANO	4879	F1AHH	426
3	F3YX	4320	F1AHH	386
4	F1CIA	3856	F8KHO	365
5	F1IIG/P	3265	F9ZG	664
6	F8MM	3144	F5AGO	277
7	F1AHH	3143	F3YX	426
8	ON4SH/p	1524	PE2TV	189
9	PA1DYK	1198	ON4SH/P	145
10	F6CIU	1130	F6ANO	177
11	PE1JMZ	983	PE2TV	162
12	PE2TV	882	ON4SH/P	189
13	PA2RIK	824	ON4SH/P	166
14	PA3DZA	487	PE1JMZ	135
15	PA1AS	407	PA2DYK	121
16	PA2MRT	333	PA1DYK	68
17	PAØZR	306	ON4SH	180
18	F1FFE	198	F1IIG/P	99
19	PE1EBX	152	PA2MRT	44
20	PA3DLJ	142	PA3DZA	60
21	PD0AJE	118	PA2RIK	32
22	PE1OFO	116	PA1DYK	54
23	PE9KKM	108	PA1DYK	37
24	PE1RKM	84	PA2RIK	40
25	PE1RXK	24	PA1DYK	24
26	PA1PAS	22	PA1DYK	17

13cm - Section 1

Pl.	Call	Points	Best DX	QRB
1	ON4SH/p	9965	PE1OFO	192
2	PA2RIK	7390	ON4SH/P	166
3	PA1DYK	7230	ON4SH/P	145
4	PA9DX	6415	ON4SH/P	136
5	PA3DZA	6255	PE1JMZ	135
6	PE1EBX	5705	ON7SH/P	158
7	F6ANO	5170	F9ZG/P	294
8	PE1OFO	5005	ON4SH/P	192
9	F1IIG/P	4100	F5UNZ	106
10	PE1RXK	4040	ON4SH/P	123
11	F9ZG	3380	F6ANO	294
12	F1CIA	3115	F6ANO	227
13	PH0TV	2980	PA9DX	73
14	PE1RKM	2915	ON4SH/P	148
15	F3YX	2065	F9ZG	241
16	PE2TV	1990	PA1DYK	61
17	PE1RLF	1075	PA2RIK	37
18	G4DDC/P	1000	G4FEV	46
19	F8MM	1000	F6ANO	70
20	F1FFE	990	F1IIG/P	99
21	M0DTS/P	990	G0DPS/P	99
22	PA1AS	925	PA3DZA	57
23	PE1OMB	860	PA1DYK	51
24	PE9KKM	765	PA1DYK	37
25	PA1PAS	565	PA3DZA	65
26	PD0AJE	555	PE1EBX	61
27	PA3DLJ	410	ON4SH/P	29
28	DK7UP	340	DF4PN	34
29	PE1OLR	50	PE1OMB	5

23cm - Section 1

Pl.	Call	Points	Best DX	QRB
1	ON7BPS/p	13612	PE1DWQ	264
2	F9ZG	11448	F1IIG/P	664
3	ON4SH/p	8190	PE1DWQ	241
4	F6ANO	7230	F5AGO	298
5	F3YX	6448	F1AHH	386
6	F1IIG/P	4894	F9ZG	664
7	PA9DX	4684	ON7BPS/P	168
8	F8MM	4654	F5AGO	277
9	PA1DYK	4418	ON7BPS/P	168
10	F1CIA	4020	F1AHH	254
11	PA2RIK	3540	ON7BPS/P	176
12	PA3DZA	3450	ON7BPS/P	102
13	PE1OFO	3354	ON7BPS/P	209
14	PE1RXK	2914	ON7BPS/P	144
15	PE2TV	2912	ON7BPS	202
16	PE1EBX	2762	ON7BPS/P	176
17	ON4DPP/p	2640	PA1DYK	131
18	PH0TV	2064	ON4SH/P	176
19	PE1RKM	1878	ON7BPS/P	167
20	PE1JMZ	1636	ON7BPS/P	192
21	PA1AS	1348	PA9DX	123
22	PE1AXM	1276	ON7BPS/P	193
23	PA2MRT	1202	ON7BPS/P	208
24	G4DDC/P	1068	G8ACT	57
25	PE1RLF	1028	ON4SH/P	177
26	DK7UP	1004	ON4SH/P	120
27	PE1OLR	912	ON7BPS/P	118
28	PA1PAS	856	ON7BPS/P	167
29	PA3DLJ	816	PA3DZA	60
30	GW4NOS/P	648	G1IXF	71
31	PE9KKM	416	PA1DYK	37
32	ON7ARQ	400	F1BM	62
33	F1FFE	396	F1IIG/P	99
34	M0DTS/P	396	G0DPS/P	99
35	PE1OMB	344	PA1DYK	51
36	EB5YF	212	EA5TP	20
37	EA5FDW	88	EB5YF	15
38	EA5TP	52	EA5FDW	8

3cm - Section 1

Pl.	Call	Points	Best DX	QRB
1	F1IIG/P	2945	F5UNZ	106
2	F3YX	860	F6ANO	56
3	F6ANO	730	F3YX	56
4	F1FFE	495	F1IIG/P	99
5	GW4NOS/P	330	GW0ROL	33
6	PA2RIK	310	PA3GLL	37
7	F8MM	300	F3YX	30
8	PE1EBX	265	PE1ACB	53
9	PA2MRT	110	PE1ACB	22
10	PA1AS	50	PA3AOK	5
11	PA1PAS	25	PE1RKM	5
12	PE1RKM	25	PA1PAS	5

1.5cm - Section 1				
Pl.	Call	Points	Best DX	QRB
1	F1IIG/P	600	F1CDI	60

23cm - Section 2				
Pl.	Call	Points	Best DX	QRB
1	F1AHH	1733	F3YX	386

Section 1 (overall)

Pl.	Call	Points	70cm	23cm	13cm	3cm	1.5cm
1	F9ZG	22652	7824	11448	3380		
2	ON4SH/p	19679	1524	8190	9965		
3	F6ANO	18009	4879	7230	5170	730	
4	F1IIG/P	15804	3265	4894	4100	2945	600
5	F3YX	13693	4320	6448	2065	860	
6	ON7BPS/p	13612		13612			
7	PA1DYK	12846	1198	4418	7230		
8	PA2RIK	12064	824	3540	7390	310	
9	PA9DX	11099		4684	6415		
10	F1CIA	10991	3856	4020	3115		
11	PA3DZA	10192	487	3450	6255		
12	F8MM	9098	3144	4654	1000	300	
13	PE1EBX	8884	152	2762	5705	265	
14	PE1OFO	8475	116	3354	5005		
15	PE1RXK	6978	24	2914	4040		
16	PE2TV	5784	882	2912	1990		
17	PH0TV	5044		2064	2980		
18	PE1RKM	4902	84	1878	2915	25	
19	F1AHH	3143	3143				
20	PA1AS	2730	407	1348	925	50	
21	ON4DPP/p	2640		2640			
22	PE1JMZ	2619	983	1636			
23	PE1RLF	2103		1028	1075		
24	F1FFE	2079	198	396	990	495	
25	G4DDC/P	2068		1068	1000		
26	PA2MRT	1645	333	1202		110	
27	PA1PAS	1468	22	856	565	25	
28	M0DTS/P	1386		396	990		
29	PA3DLJ	1368	142	816	410		
30	DK7UP	1344		1004	340		
31	PE9KKM	1289	108	416	765		
32	PE1AXM	1276		1276			
33	PE1OMB	1204		344	860		
34	F6CIU	1130	1130				
35	GW4NOS/P	978		648		330	
36	PE1OLR	962		912	50		
37	PD0AJE	673	118		555		
38	ON7ARQ	400		400			
39	PA0ZR	306	306				
40	EB5YF	212		212			
41	EA5FDW	88		88			
42	EA5TP	52		52			

Progress report on the ATV project for the ISS

By Graham Shirville

At the time of writing it is expected that the new European Columbus module will be launched on Shuttle Atlantis to the International Space Station in early December 2007. There has been a three year campaign to collect sufficient donations   to finance the manufacture of antennas for two bands. Each antenna will be identical and each will cover both L-band uplinks (1260-1270MHz) and S-Band downlinks (2400-2450MHz).

These antennas have now been manufactured and fitted underneath the module so that they are facing the earth. Since there is little room left between the module and the shuttle cargo bay doors, the ARISS antennas will be patches which only project a few millimetres. These patches will be fixed to the external Meteorite Debris Panels (MDP) which protect the hull of Columbus.

On the conical end of the module, where it attaches to the ISS main structure, feedthroughs have been installed for the coax feeds to the antennas. These debris panels with the antennas installed can be seen in this photo on the right.

It is expected that there will be a number of educational outreach projects that will be made possible with the equipment.

More pictures of Columbus on the front and rear covers.

The development team for this work includes the following amateurs:

Gaston Bertels -ON4WF;
Oliver Amend - DG6BCE;
Florio dalla Vedova - IW2NMB;
Paolo Pitacco - IW3QBN
Graham Shirville - G3VZV;
Dave Mann –G8ADM;
Carlos Eavis,- G0AKI;
Jason Flynn – G7OCD;
Christophe Mercier;
Wolf-Henning Rech - DF9IC

Columbus Lab Attached to Harmony Node
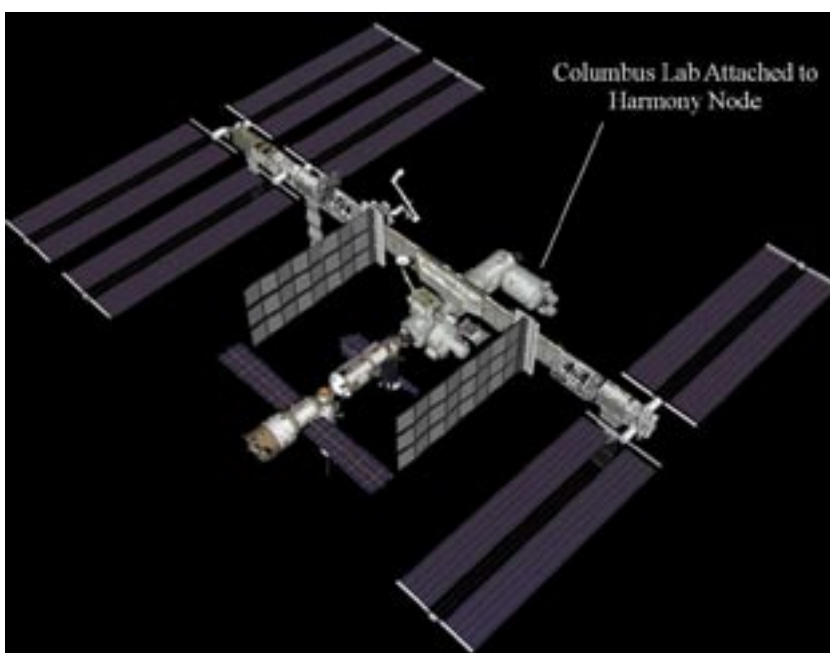
Members Services

All prices in UK pounds (£)		Each	P&P	Qty	Total
Camera Tubes, Scan Coils, Bases & Lens Mounts					
3	One inch Vidicon base	£1.20	£0.30	....	....
4	2/3 inch Vidicon base	£0.80	£0.30	....	....
6	XQ 1271 vidicon	£41.00	£5.00	....	....
Video and I²C Circuit Boards/Components					
7	Sync pulse generator PCB	£14.00	£0.43	....	....
40	I²C CPU PCB	£10.00	£0.43	....	....
41	I²C VDU PCB	£10.00	£0.43	....	....
43	SAA5231 Genlock IC	£8.80	£0.30	....	....
44	SAA5243PE Teletext IC	£14.70	£0.30	....	....
45	PCF8583 Clock IC	£7.00	£0.30	....	....
39	LM1881N Sync separator IC	£3.50	£0.30	....	....
81	I²C 27256 EPROM	£9.70	£0.30	....	....
38	PCF8574P Input expander IC	£4.70	£0.30	....	....
10	I²C Relay PCB	£6.50	£0.43	....	....
9	PCF8574A Input expander IC	£4.70	£0.43	....	....
RX, TX and SSTV PCB's and General Components					
47	70cm up converter PCB	£13.50	£0.43	....	....
50	108.875 MHz crystal	£8.20	£0.30	....	....
68	4.433618MHz crystal	£3.25	£0.30	....	....
69	5.0MHz crystal	£3.25	£0.30	....	....
86	24cm solid-state amplifier PCB	£10.50	£0.43	....	....
Stationery & Station Accessories					
73	BATC blue diamond clutch pin badge	£1.75	£0.30	....	....
74	BATC cloth badge	£4.00	£0.30	....	....
75	BATC equipment label (6)	£0.25	£0.30	....	....
76	BATC square windscreen sticker	£0.10	£0.30	....	....
78	BATC test card	£0.50	£0.43	....	....
79	BATC reporting chart	£0.10	£0.43	....	....

Total goods and postage - amount enclosed   £.………........

PLEASE MAKE CHEQUES PAYABLE TO 'BATC'.

BATC Publications

Publication	Each	Qty	Total
An Introduction To Amateur Television (225gm)	£2.50	....	....
The latest handbook full of detailed information on how to set up your ATV station, plus lots of new video and RF construction projects.			
The BATC handbook featuring construction articles on video units, 24cm and 3cm ATV, a Digital Frame Store, and much more.			
The Best of CQ-TV (150gm)	£3.50	....	....
A compilation of the best construction articles from CQ-TV's 133 to 146			
CQ-TV Back Issues:	£1.50	....	....
The following issues are still available. Please circle those required: 185, 186, 187, 188,189, 190, 191, 192, 193, 194, 195, 196, 197, 198, 199, 200, 201, 202, 203, 204, 205, 206, 207, 208, 209, 210,211,212,213,214,215			
Special Offer: Any four of the above issues	£5.00	....	....
216,217,218,219	£3.75	....	....
The BATC DVD	£5.00	....	....

All publications can be ordered, with a credit card, via our online shop - www.batc.org.uk

Video mixer for disposal

The BATC has a very nice component vision mixer that was donated to the club last year. We would like a member with a real use for it to provide a good home for it. This could be as a purchase or a loan with an option to purchase.

Legal bit: The BATC would not be responsible for its condition, maintenance or any liabilities arising from its use.

The component (1) mixer has 4 channels with cuts, mixing, and horizontal or vertical wipes, and there is a DSK (2) as well. There are 2 sets of outputs and a preview row output. It is of recent construction using modern components and it is built into a plastic case with sloping panels. The BNC connectors are on the back along with the mains power input. It is entirely self contained. The inputs should be genlocked (3) and correctly timed for correct operation.

A Photocopy of the instruction manual with circuits is included. I have given the mixer a brief test with a pal signal, as I have no component signals easily to hand, and all seems OK.

If you are interested and have a real use for this mixer please contact me, Brian Summers BATC Hon Treasurer:

Telephone: 01276677879

Email: treasurer@batc.org.uk

(Please note this email address is deluged with spam so if you receive no reply I may have accidentally deleted your email, in which case please try again or phone!)

Notes

(1) Component: a video signal comprising separate Luminance, R-Y and B-Y colour difference signals with separate sync as an option.

(2) DSK: Down Stream Keyer for caption insertion

(3) Genlocking is a way of ensuring that signals are correctly timed so that mixing can take place without any disturbance.

(4) There is a very good glossary of video terms at: - http://www.tek.com/Measurement/programs/301891X312610/ you have to fill in a small form but it is worth the effort.
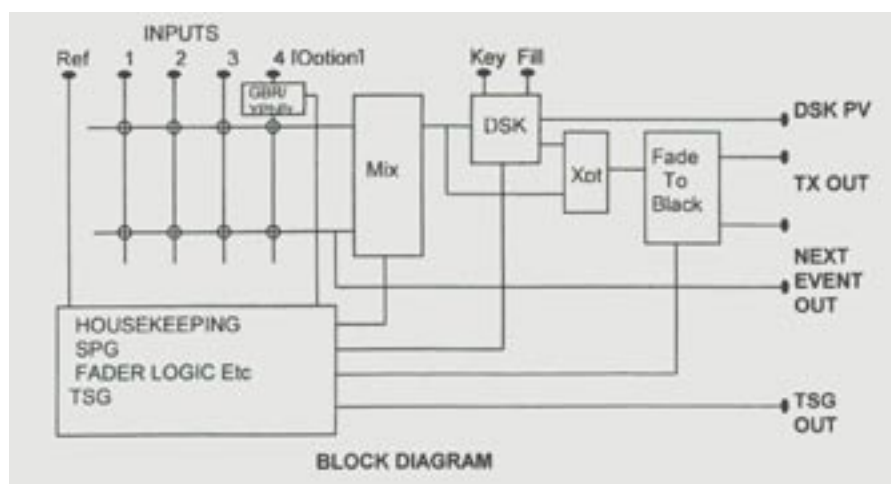
The Pre-War Corrie and Other Things

Dicky Howett rummages through the Radio Times

Via the delights of eBay, I acquired recently, the first 26 editions (from Jan.8th 1937) of the Radio Times special 'Television' supplement. This modest publication (available only in the London area) featured television-related articles, advertisements and the weeks tv listings. Goodies included, 'Home Affairs-Good Building', 'Table Tennis', 'Dress Design', 'Cabaret From The Grosvenor House and 'The Western Brothers'. But the highlight of the week for May (12th) 1937 was the television broadcast ('transmission by the Marconi-EMI system') of the coronation of King George VI and Queen Elizabeth. Apart from the fact that air time was being entrusted to a brand new and unblooded outside broadcast rig (complete with three fixed-lens Emitron cameras and an experimental microwave link-albeit as a back up), what was unprecedented up until then was that this television broadcast was scheduled to run a whole hour!

Since the BBC television service began in November of 1936, daily airtime was just two hours, with one hour in the afternoon and another in the evening (no Sunday broadcasts). Average individual programmes lasted 15 minutes. (It was thought that programme lengths shouldn't overstrain the viewer, with 20 minutes as a maximum. (Indeed, as a prerequisite, the original Baird intermediate film system-abandoned in early 1937- could only run at 20 minutes before it spluttered out of celluloid and hypo). Most television programmes were studio based with outside broadcasts a rarity. Camera cable length was a total of a 1000ft so apart from just poking the camera lens out of the window, any alfresco shooting took place within the grounds of Alexandra Palace. One intriguing 'outside/inside broadcast' occurred during the coronation week. Leslie Mitchell and George Robey took a live 'Tour Of The London Television Station' (May 15th 1937). This programme, repeated in the evening, ran again for another whole

hour and showed various examples of sweated BBC tv life including visits to the transmitter hall, reception desk, restaurant, make-up room, control room and studios. A great shame that no vision was ever recorded, (as this was indeed the only fully operational television service in the world, transmitting electronically on a scheduled basis to the home fireside). Even a movie record would have been valuable, but such is hindsight and also at the time, the lack of any viable video recording technique. As a third best, a few unexciting photos of the 'Tour' appeared later in the Television Supplement.

But who was watching all this ground breaking stuff? Television receivers were expensive. Top models could be 120gns, (the actual price of a small new car), but there were options of cheaper sets (60gns) or easy '£1 a week' payments. However, television was initially for the well-off (the programmes were aimed at those who visited nightclubs, mannequin stores, played table tennis, watched ballet or enjoyed 'The White Coons Concert Party'). The majority of 'televiewers' had to be content to watch the 'small screen' in department stores or at 'Radio Shops' in places such as Ealing, Esher, Coulsdon, Edgeware or Burnt Oak, grubby noses pressed against windows. A survey, printed in the March 26th edition of the Television

Supplement described several responses from the lower orders. Two 'gas fitters' were 'frankly sceptical', refusing to believe that what they were watching was 'direct' television, but instead a film. Some 'Cockney' ladies thought the picture 'too good' and now 'we shan't have an excuse to go out to the pictures, nor indeed get rid of the men on Saturday afternoons either' An American viewer declared, ' This is the swellest publicity thing I've seen for years! If we can put over sponsored television.........' Perish the thought. The conclusion of this admitted unscientific 'survey' revealed that although the actual programmes were not to every taste, the technical quality of the pictures was universally praised even though it was noted that tv receivers were still too expensive, the screen size too small and the hours of transmission too short. Those factors combined, I think we can agree, a 'golden age' never to return…………...?

How things change - now we have cheap tv's, huge plasma displays, hundreds of channels, transmitting 24/7. All changes for the better................? <ed>

Members Ads

It would be nice to hear from members who have kit for sale, or are looking for something ATV related.

Adverts to members are free of charge, so please email your advert to:
editor@cq-tv.com

or post your advert to:
CQ-TV, 89 Wellington Street, Thame, Oxon, OX9 3BW

WANTED

Urgently wanted - articles for CQ-TV 221 - Get published, it looks great on the CV and you will sleep better at night, knowing you are contributing to your clubs future!

FREE TO GOOD HOME

Fifty years worth of television magazines free of charge if collected or at postage costs, please contact:

G A Couzens G3NTA
47 Holmstead Ave
Whitby
N. Yorks
YO21 1NA

Tel: 01947 602975

FREE TO GOOD HOME

Sony SEG 200p
Sony MD1200p
Sony junction box

All circa 1982 and unused (believe it or not). I don't want to bin it but would like it to go to a good home, some documentation with it also.

Rod, ei7df:
Email: rod.walsh@nuim.ie

Crystal Locked Audio Sub-Carrier - Revisited

By Richard Carden VK4XRL

Way back in CQ-TV number 173 a crystal locked audio sub-carrier was presented by Bob Platts G8OZP.

The unit works extremely well, although I did make some slight value changes in the LP Filter and pre-emphasis circuits.

One thing that I wanted to do was to switch the sub-carriers on and off for transmitter alignment. A few ideas came to mind however these were dismissed in favour of a very simple solution requiring a cut in the PCB and adding a resistor.

The 4060 IC? Has a reset pin, pin 12 which allows the oscillator to be switched OFF or ON. With pin 12 as shown in the circuit wired to ground, the oscillator is switched ON all the time. However if we now cut the track between ground and pin 12 and insert a resistor (around 1K) between pin 12 and +12 we can then wire a switch to pin 12 to ground, this pin thereby switching the sub-carrier generator ON and OFF.
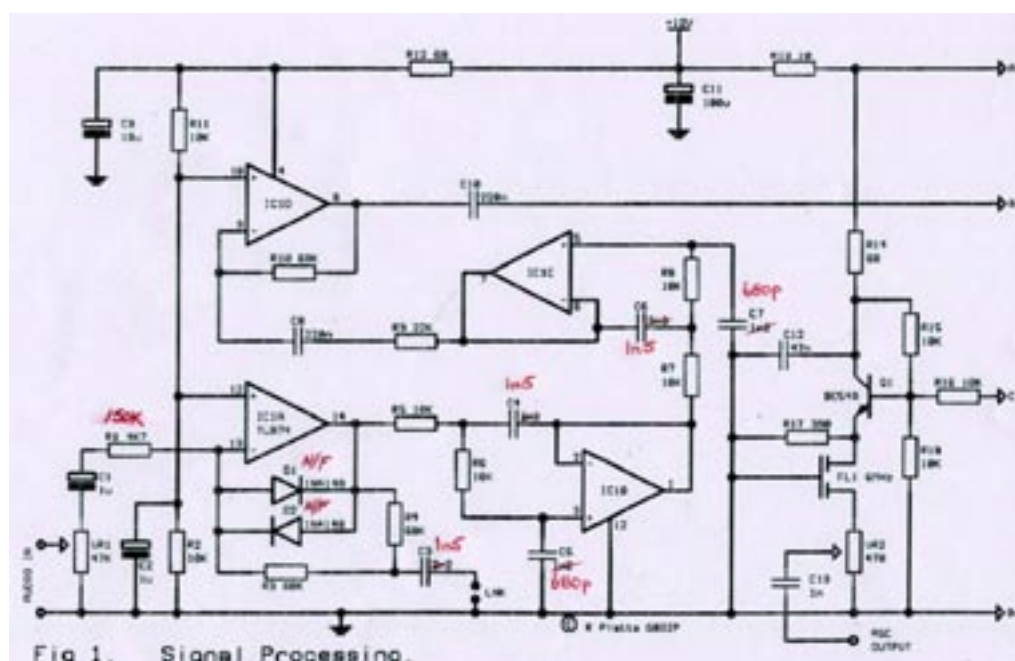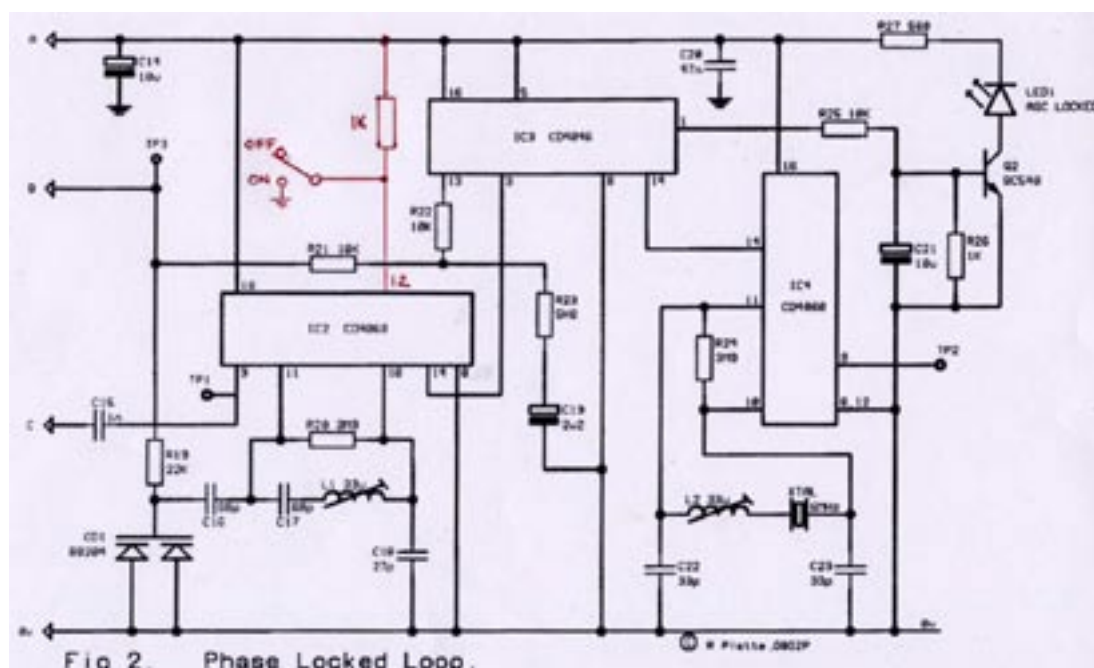

Fig 1. Signal Processing.

Fig 2. Phase Locked Loop.

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

By Peter Delaney

CQ-TV 34 - "Autumn 1957"

The main articles in the autumn of 1957 were about some of the special displays put on by the Club. The World Scout jamboree attended by 35,000 Scouts from all over the world had been held from August 1st - 12th, and the Birmingham Group of BATC members put on a public demonstration of amateur television at Sutton Park.

There was one 'live' camera, made by George Flanner, which reliably provided pictures throughout the 12 days. Other picture sources included a monoscope unit made by Malcolm Sparrow and telestill caption scanners. A telecine each afternoon showed film shot that morning around the camp, which was processed and scanned from the negative. One of the problems encountered was the RF from the seven amateur transmitters and their aerial farm located close by. The photograph shows the set up within the tent, with the slide scanner far left, whilst on the right is the live camera in the 'studio',

and the 16mm telecine projector far right. Along the front of the display were two camera tubes - a photicon image iconoscope and a staticon for comparison.

The other event had been the Dagenham Show - described as "the biggest ever assembly of amateur television equipment anywhere". No less than 6 cameras were in use, and the equipment stretched around 3 walls of a 40 ft x 40 ft marquee. 11 TV sets were loaned by Philco - together with suitable isolating transformers. 'Matilda' arrived on the Saturday, with Ian Waters and his camera as well, making the total BATC 'crew' up to 30 people. In addition to the 6 cameras, there were 2 monoscopes, a slide scanner, and a vision effects amplifier. Apparently, "positive and negative pictures, upside downers and split pictures with one chap talking to himself reversed, or someone's head on somebody else's shoulders all went down very well". The pictures from the photicon cameras were so good that they "had to keep fading up captions to say that this was amateur TV and not the BBC!" Some of the pictures from 'Matilda' were transmitted back from several miles away, but were excellent, even when on the move. The pictures show the general set up, with the control equipment for the 'Matilda' OBs, and a close up of the master sound and vision mixers.

Amongst the technical articles, was a circuit for a monoscope camera, built by Jeremy Royle. It was noted that Jeremy made the monoscope plates for the tube manufacturer, so 'he knows what the results should be like'. (Turning Back the Pages in CQ-TV 206 for CQTV20 include a diagram and a description of the monoscope tube). V1, V2 and V3 were a sync separator, driving V4 and V5, the field output stage, whilst the line output was V12 and V13. V6 to V11 formed a video amplifier, with blanking applied to the grid of V9. It was said that a resolution of over 600 lines could be achieved, "with perfect grey scale rendition". Another page was devoted

to attenuators, explaining the decibel unit, and how to calculate values for T and o networks.

The "What the other chap is doing" pages included Brian Partridge, who burnt out 'all his transformers' as the HT and LT power supply switches were not interlocked, and the Yeovil Amateur Television Society, whose TV equipment, tape library, CQ-TVs etc were destroyed when the motor rewinding firm above their clubroom had a fire in their wax dip bath. Mike Cox, in Beccles, had just got married, but was still finding time to miniaturize some of his pulse generators, and experiment with transistor circuits. Other news came from members in Australia, New Zealand and Italy. Eric in Australia pointed out that TV conditions there were "quite unlike those in Europe - he and Warren and a couple of viewers are the only TV people for about 3000 miles"

A MONOSCOPE CAMERA
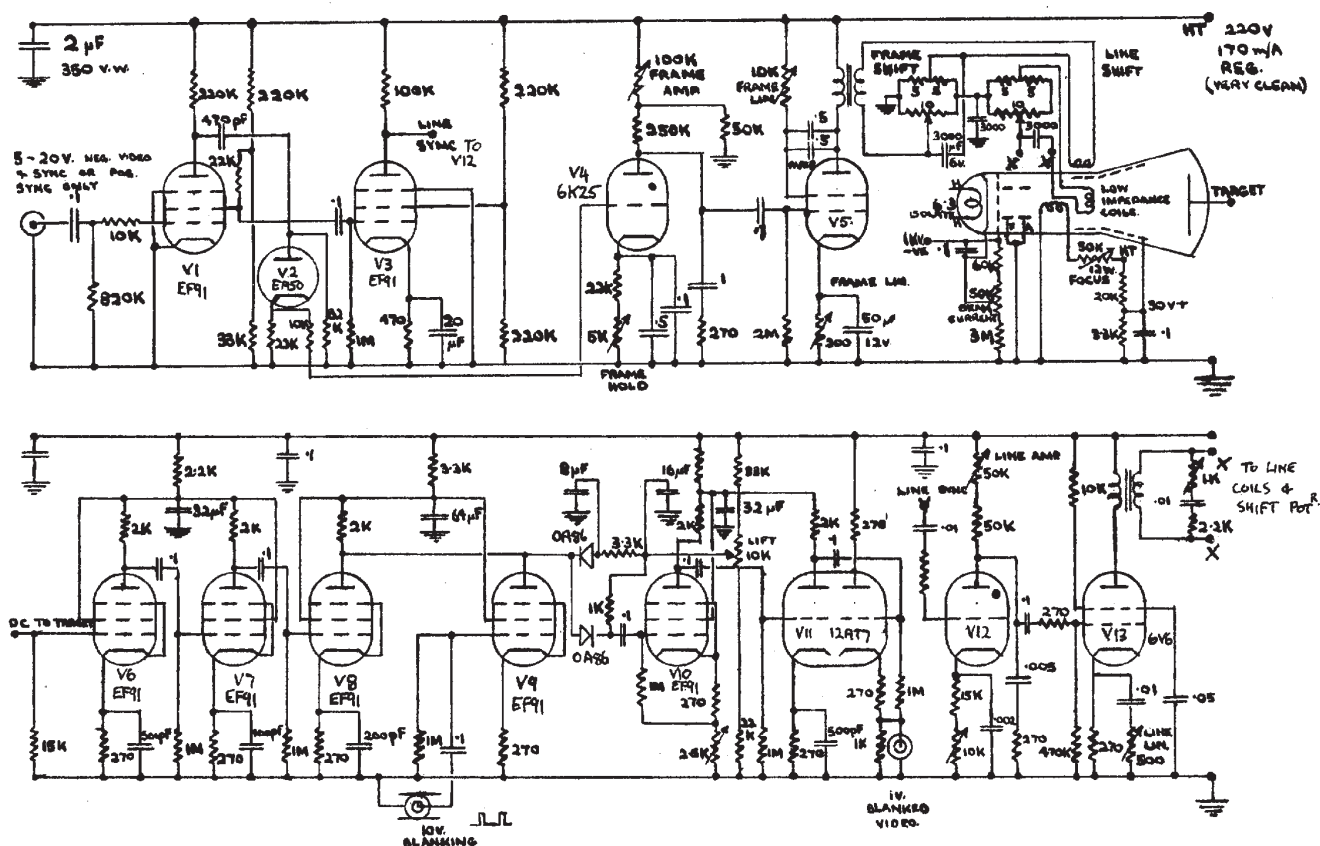
Hi Again !

By Graham Hankins G8EMX

So, two names re-appear in CQ-TV and welcome back to Chris Smith, taking over as CQ-TV editor from Brian Kelly who, after a years sterling service, had to bow to the pressure of other commitments.

Chris and I have now exchanged several emails and in one of the early ones he asked if I could manage a regular column, as I used to do until some years ago. As I am willing to help out in any way I can, that suggestion was fine by me! In the other mails, we 'bounced' ideas about input from the repeater groups (you all know who you are!), supply of basic hardware for ATV and info. for the ATV beginner.

Ok, hands up, guilty as charged m'Lud! I have not been personally active for a long time. My home QTH was never in the best place for amateur radio or ATV and although I did go up to a local 'high spot' a few times, this was a considerable undertaking as I took a caravan, which is, incidentally, where I am writing this now. So, earlier this year, I managed to sell that poor QTH but am temporarily renting an r.f. worse one! During the move, much of the household content was shifted into the caravan (a very handy store-room sometimes) then into a temporary hovel. It was during this shuffling that I broke my ATV antenna.

What ATV operations I had done were made with that well-known beam, the Severnside Group's yagi, which was always advertised in CQ-TV and sold from the Group's table at the bigger rallies, but the adverts stopped, and other than a few home-brew designs in past CQ-TVs (sorry, I am not REALLY into building antennas) nothing else seemed to be conveniently available. So I put '24cm ATV antennas' into Google and was taken straight to the Waters and Stanton web site. There I found the SHF-2328 SHF Design 23cm Yagi 28-element 15.4dBd gain. The company showroom was in Hockley, Essex and I just happened to be putting the caravan in London for a month. A swift drive over there one day and the antenna was in the back of the car. Job done. Incidentally, of course I DID phone W and S before the trip – the phone was answered immediately; that's because W and S have four positions (two at weekends) permanently answering calls and processing orders.

A similar lack of ATV kit applies to ATV receivers. Analogue satellite receivers are now very few and far between, rally tables used to have piles of them, but not now. Bob Platts G8OZP used to market a nice little 'Dove' kit, but not now. Giles G1MFG used to market a modular receiver, but not now! What is a boy to do? Go to **www.13cm.co.uk** those modular boards are there, bought one a few weeks ago. The same place has the transmitters too. Incidentally, these receivers are much improved with a few modifications, sometimes referred to as the "well-known" Platinum mods. Well, they were certainly not 'well-known' to me, until I found:
www.sbszoo.com/ve6atv/platinum/mods.htm

Talking of 24cm transmitters, I still have two of the Worthing/Solent units, both built from the kits at the time; also, a 2W TX supplied by one Andy Parnell G8SUY of the Kent Television Group. This was available as a kit with surface-mount components or ready-assembled. I Don't know if this is still available, as Andy was unwell last time I heard.

So, if we do some adding up, that's a receiver, three transmitters, an antenna, oh yes, and two camcorders. No real excuse for not being active then, eh, what?

Having mentioned rallies (oh yes I did, way up the page – pay attention!) other than back-issues of CQ-TV I have had very little else to fill a table. So some new hardware to show, or to sell, would be great for rallies in '08. My most recent was Donington, always fairly busy and on for two days.

This is an excellent chance to meet and talk to visiting members; one of those was Dave G8TNE, who in turn contacted Howard Chapman G3NZL of the Solent Club for Amateur Radio and Television (SCART – thank heavens for acronyms) who sent a copy of the club's newsletter 'In Sync'. This included a mention of an agc circuit that appeared in CQ-TV 172 and the usual problem of sourcing a specialist component:

AN302 Video AGC
Frank G0LFI now has the AN302 AGC chips, so please contact him g0lfi1@ntlworld.com if you said you were interested. The AN302 can maintain constant video output (therefore deviation) under most conditions and Eric, GW8LJJ summed up its effectiveness in CQ-TV 172:

"Once built, you will wonder how you ever managed without it."

So, to all the ATV Repeater Groups: please don't keep your ATV news to yourself – let CQ-TV, and hence all other BATC members know too! I used to get, through the post, newsletters from Severnside ('P5') the 'HV set ('Line Out'), SCART's 'In Sync' and do still get by email 'LENS' from the Leicester Repeater Group (GB3GV).

Then there is the RSGB Callbook, ATV repeater groups do list the callsign of a Repeater Keeper in the Callbook – yet some of these are 'Particulars Withheld' in the lookup section. The R.K. is the 'public contact' for repeater info. so could I ask all the ATV Groups to keep in touch with me please? CQ-TV needs your news, your developments, your new ideas, your – everything! If Repeater Keepers could send me just their Email address (not even for publication, just for communication), that would be great! My email address is g8emx@tiscali.co.uk and postal address 84 Shirley Road, Acocks Green, Birmingham, B27 7NA. Or, caravan on Pitch 62, Chertsey site, West London for two weeks!!

73 to all, for now, de Graham G8EMX.

As some of you may know, although I have retired, I still do some work for BBC Outside Broadcasts. Most of the work is on the CMCCR when it does golf programmes. Here are a few of my snaps

This is the engine room end of the CMCCR (Colour Mobile Central Control Room) with clipboards in hand are (left to right) George Bowler, Me (Brian Summers), Jeff White and Dave Roberts. In the background is the jackfield with about 2000 Musa jacks!


Outside view of the CMCCR with the double expanding sides, the other side only expands once. From the right, the cables are camera triax, Video circuits, power and the black cable drums are fibre optics.

Here is the production control room with the vision mixer and the monitor stack, about 90 in all. The mixer has 64 input sources and 16 additional channels of DSK, there are a lot of graphics in Golf.
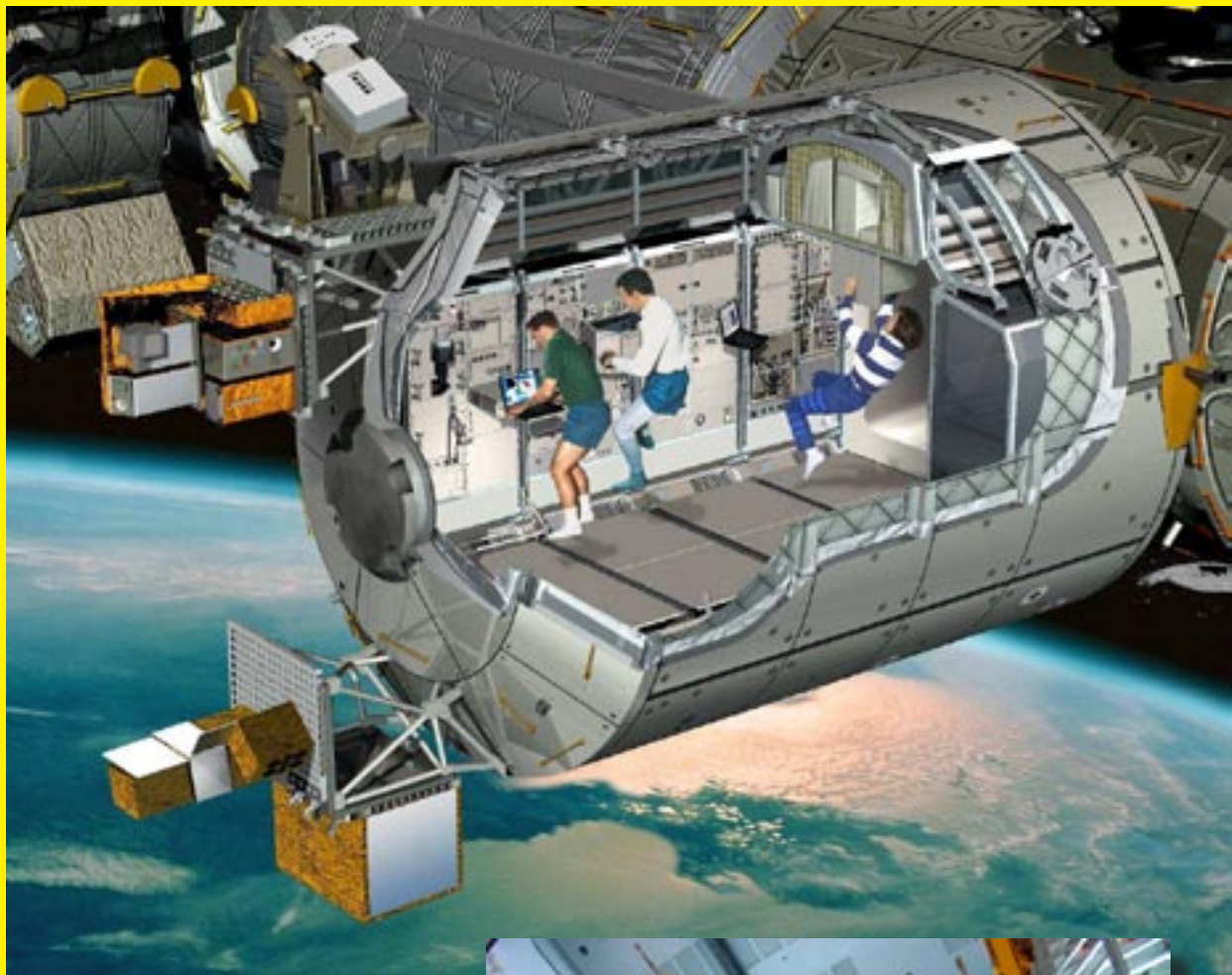
STOP PRESS

At the time of going to press, the shuttle launch had been delayed until January due to a fuel gauge failing for the second time in four days.