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JANUARY 2006

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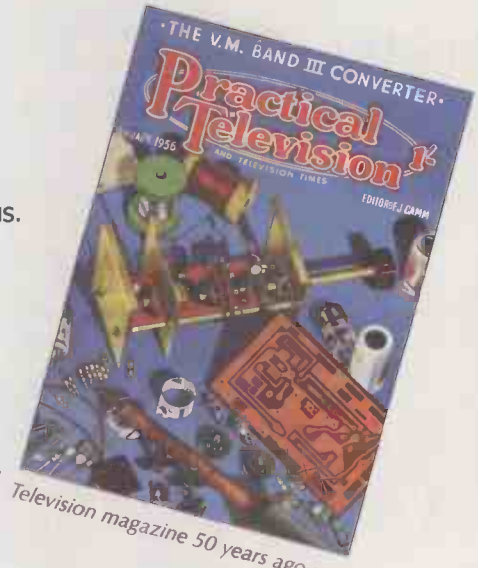

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NEXUS
MEDIA COMMUNICATIONS

NTL's dilemma

How quickly can a company go from being a City basket case to splashing out millions on takeovers? At the time of Television's going to press, the NTL board was to decide if it would raise raise its bid for Virgin Mobile after the latter's rejection of £817 million.

Virgin Mobile rejected a 323p offer and is holding out for nearer to £4 a share. Sir Richard Branson, with his 72 per cent majority, said only £25 million stood between NTL and a deal, but that is apparently coded talk for an extra £100 million on the offer price, £25 million of which would go to institutional and smaller shareholders.

The mooted Virgin Television company would provide quadruple-play TV, broadband and fixed and mobile telephony. Sir Richard is reported to have given NTL a verbal agreement to accept the deal for his stake and said that he would take the bulk of the proceeds in NTL shares.

If successful, a merger of NTL-Telewest and Virgin Mobile would create a group with some nine million customers. In the meantime, Virgin Mobile shares shot up to 361pbefore settling back to 355p.

So now it remains to be seen which side blinks first, but in the meantime, BSkyB is planning a new mobile phone television service in response. Premium subscribers to the Sky satellite TV service will be able to download news and sports clips to their mobile phones.

Ouch, gremlins!

I have had some interesting letters and emails about the last issue of Television from some readers who rightly suspected that gremlins crept into the production process. I hope they will see that we have taken steps to redress two key issues: more fault reports and a better typeface. Some readers want more letters, while others want fewer. I will always try to print as many letters as readers want to send in.

I enjoy and welcome lively feedback from my readers and want to offer you the chance to write fault reports in the style that have made Television magazine so unique. Go on! Get your name up on a page. The rate is a 'princely' £50 per printed page, which may include images, so get those digicams out!

Forced to go digital

Ofcom has predicted that the total non-voluntary cost to UK households of the government's switchover policy is estimated to be around £572m.

An estimated 60-75% of UK households are expected to have voluntarily converted all of their equipment prior to switchover. Of the rest, the majority are expected to have only one set and/or one VCR needing conversion.

The lowest cost of converting equipment at switchover will be around £25 for a set and £80 for a VCR.

Typical non-voluntary costs for TVs and recorders in households containing an average collection of reception equipment are therefore estimated to range from £26 to £153.

Where set top aerials are used, around 50% of them are expected to need replacement at a cost of £20-40 per household - bringing the range of cost for these households to £46 - £193.

For households requiring a new roof aerial a further cost of around £125 will be experienced however this only applies to an estimated 2% of households.

The additional power consumed by the digital equipment required in the home due to switchover will peak in 2012 but will then fall of as older set top boxes are replaced with newer units which consume less power in both operating and standby modes.

This obviously concerns me as a viewer, but I hope my readers will eventually profit from the switchover.

NTL offers £817m for Virgin Mobile

NTL has offered to pay £817m for Virgin Mobile.

NTL, which is already in the process of merging with cable rival Telewest, said it planned to use the Virgin brand across its empire of internet, television and telecoms services if successful.

If it goes ahead, the takeover would create a major competitor to Rupert Murdoch's BSkyB, which as reported last month, offered £211m for broadband provider Easynet.

NTL would also be the first provider to offer its customers so-called 'quadruple play' services against its rivals' triple play offerings.

Sir Richard Branson's Virgin Mobile has more than four million customers and until Monday had a value of nearly £790 million. An offer from NTL would value its shares at 323p.

Branson is expected to sell his 71% stake in Virgin Mobile to NTL, and then take a 14% stake in the enlarged company.

City analysts believe Vodafone or Orange could counter-bid, providing they are not blocked by the Monopolies and Mergers Commission.

Together, NTL and Virgin Mobile would have a market capitalisation of about £4.5bn and would reach an estimated nine million customers in the UK.

In October, when NTL announced its long-awaited merger with cable competitor Telewest, it said the combined companies would have revenue of £3.4bn.

A proposed merger between broadcasters NTL and Virgin will put them in a "powerful position" to challenge BSkyB for Premier League television rights.

Recently, a four-year dispute between the Premier League and the European Commission over the sale of TV rights was finally resolved.

The league had previously agreed to end BSkyB's monopoly on coverage of Premiership matches and have now convinced the EC the rights for the 2007-2010 seasons can be sold in a way which gives other broadcasters a fairer chance to bid.

The 138 live matches will in future be sold in six packages each of 23 games and no single broadcaster will be allowed to buy more than five - meaning a maximum of 115 games.

Henk Potts, analyst at Barclays Stockbrokers, said: "NTL's position was already strengthened with the merger with Telewest.

"To put in the brand of Virgin and to have a company that has a huge range of products and distribution channels has got to put it in a very powerful position.

"The one area they will have to work on is content and BSkyB has already proved it can build a multi-billion pound business with the right content. One of the keys to its success has been football."

Thomson buys a third of Canopus

Thomson has signed an agreement to acquire a third of the issued and outstanding shares of Canopus through a private transaction with Chairman and CEO, Hiroshi Yamada (pictured right with Marc Valentin, president of the Grass Valley business within Thomson), and members of his immediate family.

Canopus is a Japanese leader in high-definition desktop video editing software.

Thomson also disclosed that it would launch a public tender offer for the remaining Canopus shares.

The value of the private transaction combined with the pending tender offer would represent approximately €91.3 million on an equity value basis.

Canopus had net debt, including debt secured on real estate owned by Canopus, of €5.2 million, as of August 31, 2005. Total Canopus revenues for the 12 months to August 31st 2005 were €50 million of which €40.5 million were in the core ProAV and video editing positions.

Taken with the discussions with Thalès on Thalès Broadcast & Multimedia (broadcasting and IP-TV), this transaction completes Thomson's external initiatives for its Grass Valley Broadcast & Networks business.

Pocket-sized DVB-T receiver

Micronas has launched MicStickD, a production-ready reference design that enables watching and controlling live DVB-T broadcasts on USB 2.0-equipped desktop and notebook PCs.

The design is built around a Micronas DRX 3975D COFDM (coded orthogonal frequency division multiplexing) demodulator, a Microtune MicroTuner MT2060 digital TV tuner and a Cypress EZ-USB FX2LP controller.

Samsung's $45bn R&D plan

Samsung Group, South Korea's biggest conglomerate, has unveiled a $45bn investment plan over the next five years that it said was aimed at boosting its research and development capabilities.

The bulk of the company's new investment in R&D will be made in its 13 'growth engines' including high-capacity memory chips, next-generation display devices, mobile telecommunications and digital TVs.

Toshiba licences Honeywell LCD technology

Honeywell is granting a license to Toshiba and Toshiba Matsushita Display Technology to use its patented LCD technology in certain products.

The technology increases the brightness of images and reduces the appearance of certain interference side effects on LCDs.

HDTV drives lighting for 2006 FIFA World Cup

The 2006 FIFA World Cup will feature new TV broadcasting technologies such as high HDTV and the 16:9 wide-screen format, setting very high standards for stadium lighting.

Eight of the 12 arenas for the World Cup will showcase Philips' latest expertise in the field of lighting.

Until the late 1960s, stadium floodlighting was not excessively bright. It was not until the introduction of colour television that the lighting requirements increased substantially in terms of not only brightness, but also colour temperature and colour rendering.

Today's standards, for which Philips drew up guidelines together with FIFA, go much, much further.

This set an enormous challenge for the lighting designers of the World Cup football stadiums in Germany.

Philips has installed the lighting in 8 of the 12 arenas: Hamburg, Hanover, Cologne, Leipzig, Nuremberg, Gelsenkirchen and Stuttgart as well as Munich's new arena. Here, Philips has installed the ArenaVision floodlighting system, which has proven its worth at many international sporting events.

ArenaVision was used at football's 2002 World Cup in South Korea and Japan and 2004 European Championship in Portugal as well as at 28 of the 33 venues for the last Olympic Games, including the Olympia stadium in Athens.

Approximately 55 per cent of all football stadiums worldwide feature Philips lighting.

In almost all the new sports arenas that have been built in recent years, the lighting installation forms an integral part of the building shell and the stadium roof.

The ArenaVision lighting concept also makes provision for specific lighting of the stands – this lighting is not as bright as that for the pitch, but it is nevertheless bright enough to show the flags and banners, the fans and their emotions.

Modern floodlights are much smaller and lighter than their predecessors and are therefore easier to integrate into the stadium.

An additional advantage is that the arc in most modern Philips lamps is only 25 mm in length, which means that the light beam can be controlled more effectively and that the lamp creates less spill light, enabling HDTV, digital image transmission or super slow motion to be produced.

The new stadium in Cologne is illuminated by 210 floodlights with a 2150W rating.

This means energy consumption of almost 450kWh.

The old Müngersdorfer stadium was equipped with some 400 floodlights of the same rating and the power consumption was 800kWh.

Tektronix acquires Vqual

Tektronix has acquired Bristol-based Vqual, a provider of software tools for analysis, test and optimization of compressed digital media.

Vqual's compressed video analysis technology, combined with Tektronix' transport stream and baseband technology, will deliver content analysis.

Founded in 2002, Vqual has worked with Tektronix for the past year and recently introduced the first fully automated content analysis solution for file-based, MPEG compressed video for customers throughout the broadcast chain.

Tektronix acquired Vqual for approximately $7.0M dollars plus an earn-out contingent on certain conditions in the purchase agreement. Vqual's 14 employees will join the company.

"We believe that combining Vqual with our Video Test business enables us to grow our leadership position in this market," said Todd Biddle, Vice President, Tektronix Video Product Line.

"For more than a year, Vqual and Tektronix have had a successful relationship providing technology and expertise to thoroughly test compressed video quality. Now customers will benefit by getting this technology and expertise from one source."

Biddle: "A successful relationship."

Consumers 'unimpressed' by mobile TV says research

A survey has revealed that, despite the increasing number of mobile phones available with multi-media functions and the industry attention currently being given to mobile TV, consumers are significantly more likely to use home computers than mobile phones to consume multi-media content.

The Olswang Convergence Consumer Survey and Summit 2005 of 1,500 13-55 year old UK consumers discovered that 44% of respondents said they would watch TV and films on their home computer.

Consumers are less excited by the prospect of mobile TV. The mobile phone is the most popular gadget in the UK with 97% of consumers surveyed owning a handset and 65% identifying the mobile phone as their most desired gadget.

Only 17% of those respondents who own mobile phones, want to watch TV content on their mobiles with 70% saying they don't want to watch TV on their mobile phone at all.

Consumers have been put off mobile TV because they believe they will need to buy a new phone to view the content.

They also believe the phone will be too expensive and that the picture and sound quality will not be of a high standard.

Given that mobile TV is most likely to be consumed for short periods of time, often while consumers are on the move, unedited short-form content appeals to consumers with 51% of current users opting to watch music videos and 40% watching news and sport.

Enser: "There can be no 'one size fits all.'

At least once a month, 15% of the survey's respondents are already downloading movies over the Internet, with 13-29 year old males being the most active downloaders.

Given the current lack of legitimate movie download services in the UK, it is certain that most of this current download activity is illegal says Olswang.

Eighty percent of key decision makers from leading media, music, entertainment, telecoms and IT companies saw piracy as a very or quite significant threat to the potential new revenue streams offered by convergence.

However, while a significant proportion of the survey base is already downloading movies illegally from the Internet, it is these illegal downloaders who are the most willing to pay to consume content on new platforms, and 43% of movie downloaders said they would be prepared to subscribe to watch music videos on their computers and portable devices.

The challenge for TV and film sectors is to follow the lead of the music industry in developing and marketing legitimate online services that are sufficiently attractive for downloaders to capture this willingness to pay.

They also need to start thinking of these pirates as their future sources of revenue.

Olswang's survey suggests that consumers are not loyal to any particular category of service provider when it comes to buying content on new platforms.

John Enser, media partner at Olswang, said: "What consumers want varies dramatically from home computers to mobiles so new innovative services have been forced to cover many bases.

"There can be no 'one size fits all' approach to offering entertainment to users."

News in brief

Entone has collaborated with HP on the launch of a video-on-demand (VOD) server that provides single-server throughput of over 100 Gb/s.

It delivers over 27,400 simultaneous MPEG-2 video streams at 3.75 Mb/s per stream or over 50,000 MPEG-4 streams at 2 Mb/s per stream.

Imagination Technologies has announced its PowerVR MSVDX HD-video core, enabling HD-DVD/Blu-ray decode and HD-Broadcast reception.

It supports up to 1080i/1080p and 2048x1,024 resolutions and a range of standard decoders including: H.264, WMV9, VC1, MPEG-2, MPEG-4, DivX, and JPEG.

Samsung claims to have developed the world's largest transmissive TFT LCD with sufficiently high resolution to display digital television content.

The seven-inch VGA-standard display uses a transparent plastic substrate that is thinner, lighter and more durable than the conventional LCD glass panels used today.

Tandberg Television has announced that PCCW's now Broadband TV has chosen its compression solutions for a world-first roll-out of HD over DSL.

The deal will make now TV Asia's first advanced encoding HD operator, as it deploys HD encoding solution for MPEG-4 AVC. The now Pay-TV service launched in 2003.

BBC and BSkyB in HDTV launch plans

BSkyB claims that Britain's first HDTV service is due to launch early next year with four new satellite channels.

Viewers who sign up to the broadcasts will get a picture quality five times better than conventional television and the sort of surround sound currently found in cinemas, BSkyB said.

The package will include Premiership football, rugby, cricket, movies and American dramas such as 24 and Bones.

It could also include the BBC's coverage from next summer's football World Cup finals.

BSkyB's Brian Sullivan said that the company was close to announcing a launch date and price for the four-channel deal of sports, movies, arts and Sky One.

The BBC has started trial HD broadcasts and is already filming series such as Bleak House and Rome using high-definition cameras.

The BBC plans to 'simulcast' highlights of BBC 1's peaktime schedule, including major drama, documentaries and sport shows, in high definition from the middle of next year on satellite and cable.

It will also launch a trial of HDTV broadcasts via Freeview, the free to air digital service, using spare capacity in the London area.

Seetha Kumar, who coordinated pan-BBC events such as the recent Africa Lives season, has been appointed as head of HDTV.

Big budget natural history series, including the forthcoming Planet Earth, and sporting events will also be filmed in the format and the BBC has pledged to move all its production to HD by the end of the decade.

To take advantage of the higher quality pictures, viewers will need an HDTV-ready television set.

They will also need a cable or satellite set top box capable of decoding the high definition signal.

The Digital Television Group said that a third of the 5.5m TV sets sold in the UK in the past year are already capable of receiving the next-generation broadcasts.

Cable operators NTL and Telewest will follow suit, initially offering HDTV programming delivered on demand rather than live broadcasts.

Broadcasters are unlikely to be able to launch high definition channels on Freeview until after 2012, when extra capacity will be freed up by the switch from analogue to digital television.

Countries like America and Australia are already broadcasting HDTV services.

Duracell brand evaluates AFP

Broadcast Marketing has launched a system that enables brands to measure the cost effectiveness of Advertiser Funded Programming (AFP).

The tool will be implemented with agencies, and initially with one of its key clients, Duracell. EVA is an online evaluation and reporting system that customers can use to obtain information on their AFP properties.

This could include a report of the TV stations that have already broadcast their AFP, or are currently doing so, as well as the media value of those broadcasts. EVA will also track and report the commercials that are broadcast within each program, and assign values to marketing and online activities.

Duracell's newly launched Supreme Nickel Metal Hydride (NiMH) batteries.

Duracell is using EVA to determine the effectiveness of its 'Explorations' Series I, II and III TV broadcasts.

The programmes first launched in 2003 and are said to be the only global branded factual content series currently on air, featuring stories about how science is changing our daily lives.

Distributed via cable and satellite, 'Explorations' enjoys a potential reach of more than 500 million households worldwide in 200 countries and 27 languages.

It is also available through terrestrial channels in 70 markets.

Grass Valley beefs up recorder

Grass Valley has updated its Turbo Intelligent Digital Disk Recorder with support for the HDV-2 format, expanded QuickTime import features, and an Ethernet Socket interface for the AMP protocol.

The Turbo features in live event systems as well as fixed media facilities that are reducing their reliance on videotape for A/V presentations.

Turbo users will now be able to load HDV-2 material via FireWire from Sony HDV camcorders and VTRs or HDV files from NLE systems.

Turbo support JVC's HDV-1 format. Users will also be able to import Quick Time H.264-encoded content and using the Advanced Media Protocol (AMP) over the new Ethernet Socket interface, developers can more easily control a Turbo with the Ethernet protocol from non-PC devices.

HP in Blu-ray spat

Blu-ray will not use Hewlett-Packard technology, sparking fears of the company quitting from the group led by Sony and Panasonic.

Hewlett-Packard favours software that has been adopted by a rival standard developed by Toshiba and others.

Negotiations over the architecture of the rival DVD technologies have been primarily between the Hollywood studios producing the content for the discs and the player manufacturers.

Microsoft and Intel have formally backed Toshiba's more computer-friendly HD-DVD standard.

IEE showcases tomorrow's TV technology

Boris Sedacca reports from Savoy Place on a two-day multi-stream conference from IEE's recent Multimedia Week.

Visual media production commonly makes use of developments that are at the convergence of image and video analysis with computer graphics.

Three major events were combined for the first time:

- CVMP 2005 - 2nd IEE European Conference on Visual Media Production,
- From IT to HD 2005 - Visions of Broadcasting in the 21st Century and
- EWIMT - 2nd European Workshop on the Integration of Knowledge,Semantic and Digital Media Technologies

Image analysis has widespread application in visual media production including editing, annotation and special effects.

New techniques in visual scene analysis are now commonplace in media production to combine synthetic and real elements. Emerging new delivery platforms, like e-cinema, high-resolution displays for the home and interactive media, are asking for new approaches.

François Pitié of Trinity College

CVMP showed how these techniques are used in current media production and discussed their future influence on common practice. It brought together practitioners in media production from film, broadcast and games with researchers in imaging and graphics.

CVMP provides a European forum for discussion of the latest research advances and state-of-the-art industry practice in content production and post-production.

From IT to HD 2005 updated delegates on subjects such 1080p, HDV applications in acquisition, post production and transmission, projection systems, pixel issues, distribution, content protection, new recording formats for HDD and solid state.

EWIMT addressed integrative research targeting the engineering of new knowledge-based forms of digital media systems.

It intended to bring together those forums, projects, institutions and individuals engaged in research aimed at the integration of knowledge, semantics and low-level multimedia processing, and link them with industrial research and development engineers who could exploit the underlying emerging technology.

Colour grading

François Pitié of Trinity College in Dublin described a method for grading the colours between different images or shots.

The first stage is to find a one-to-one colour mapping that transfers the palette of an example target picture to the original picture. This is performed using an original and parameter free algorithm that is able to transform any N-dimensional probability density function into another one.

The proposed algorithm is iterative, non-linear, has a low computational cost and is shown to converge.

Applying the colour mapping on the original picture allows reproducing the same 'feel' as the target picture, but can also increase the graininess of the original picture, especially if the colour dynamic of the two pictures is very different.

The second stage of the method is to reduce this grain artefact through an efficient post-processing algorithm that intends to preserve the gradient field of the original picture.

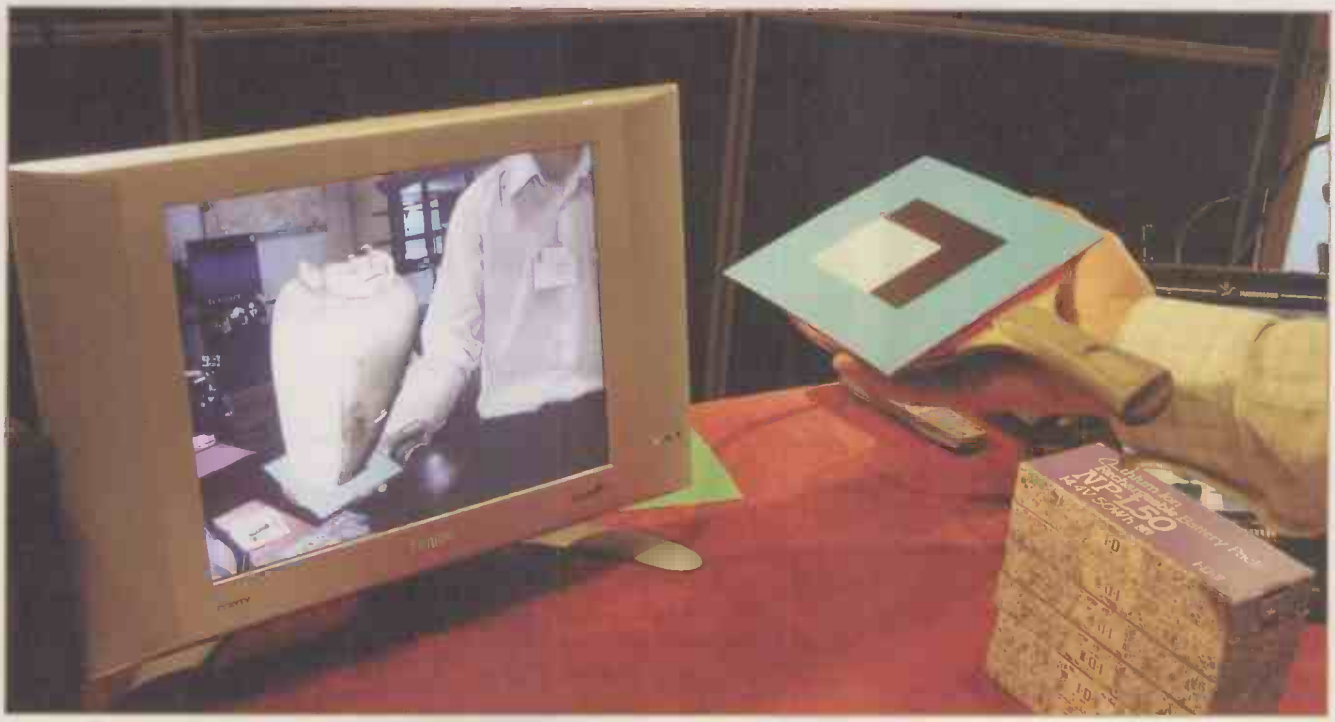
75Ω coax infrastructure

Mark Sauerwald of Gennum Corporation described how when television broadcast networks were first established 70 years ago, video signals - then analogue base band - were distributed on 75Ω coaxial cables, which were terminated with BNC connectors.

Twenty years ago, when the video signal transitioned to Serial Digital Interfaces (SMPTE 259M), the same 75Ω coax infrastructure was retained. As new facilities were built, higher grades of cable were introduced.

Ten years ago, when HD-SDI (SMPTE 292M) was introduced, the

Mark Sauerwald of Gennum Corporation



How to balance a doner kebab on a ping-pong bat. The BBC's stand demonstrated state-of-the-art innnovations.

existing cable infrastructure was once again retained.

Today, there is a need for even higher speed interfaces, but the transition to a higher speed interface can be achieved while retaining the existing cable infrastructure.

Two of the applications that are driving the need for a higher speed interface are the desire to produce and distribute digital cinema and video material in the 1080p50 or 1080p60 format.

Transporting these formats currently requires a plurality of HD-SDI interfaces operating at 1.485Gb/s each. The proposed 2.97Gb/s SDI interface provides a convenient and cost-effective transport mechanism.

Currently there are proposals before both SMPTE and the ITU for a 2.97Gb/s SDI interface using 75Ω coax cable and BNC connectors.

The interest at ITU is driven by a desire to be able to transport 1080p50 video over a single link, rather than the dual link interfaces currently used.

In support of these standard proposals, work has begun on the feasibility of a 2.97Gb/s SDI interface over copper media.

Skin effect

One of the major limiting factors for sending high-speed data over copper cables is the skin effect. This results in an increase in the attenuation factor as the frequency increases. Initial proof of concept silicon for a 2.97Gb/s SDI interface shows promising initial results.

The implementation of this interface with existing infrastructure components such as patch panels, connectors, coax cable types, etc. have been studied.

Blu-ray

Wiebe de Haan of Philips gave an overview of the Blu-ray (BD-ROM) AV Format.

The BD-ROM AV Format is being designed with a two mode framework:

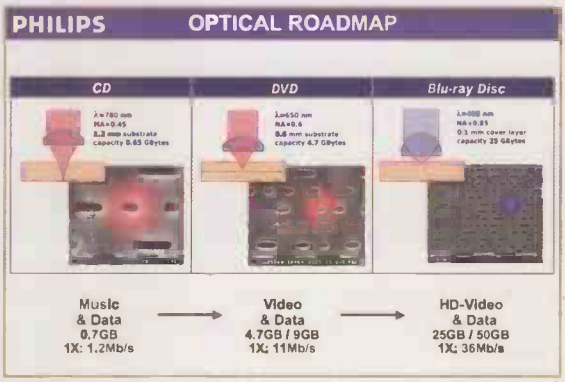
- HDMV mode emphasizes continuity from existing media(=DVD) formats
- BD-J mode (Java application) provides a fully programmable application environment with network connectivity thereby enabling Content Providers to create new types of content and interactivity for consumers.

HDMV mode supports all of the well known DVD-Video features such as seamless multi-angle and multi story.

Key features offered by HDMV mode include independent high definition graphic planes, and improved menu and subtitle quality with full color (8-bit index) and transparency.

Improved menu features include pop-up menus, full colour animated menu transitions and buttons, and button-sounds which are presented when a menu button is selected or activated.

Additional features include browsable slide-shows without interruption to audio playback and text subtitles in addition to bitmap subtitles.



BD-J (Java) format applications include downloading trailers from the studio's website and playback under application control, pre-packaged or downloaded games from a studio's website, and downloading subtitles or audio streams.

Wiebe de Haan of Philips

Letters

Send letters to "Television", Nexus Media Communications, Media House, Azalea Drive, Swanley, Kent, BR8 8HU

Email – TVeditor@nexusmedia.com

using subject heading 'Television Letters'

Re: Days of 405

Can I add a footnote to the Days of 405 TV article (Oct 2005)? While the BBC's NTSC transmissions of 7 October 1954 may have been the first broadcast demonstration of NTSC TV, the first public demonstration of 405 line NTSC actually took place some 5 months earlier.

In May 1954 Marconi's Wireless Telegraph Co. Ltd gave a 2 day demonstration of two possible adaptations of NTSC to the UK 405 line system at their London offices in the Strand.

Visitors were given a booklet containing technical details of the systems being demonstrated, the equipment used, and 35mm transparencies of monitor displays.

A description of the demonstration appeared in the next edition of the Marconi Magazine, Marconi's house journal.

Programme material was provided by a Marconi-designed 16mm flying spot telecine, a 35mm transparency scanner, and a two-tube colour TV camera of Marconi's own design having one high resolution monochrome imager and one low resolution colour stripe imager, the arrangement being not much larger than a contemporary monochrome camera.

This was probably the 'single camera of Marconi design' later used in Studio A.

One system was a straight adaptation of NTSC to the UK's 405 line system. The other was a higher bandwidth modification which allowed luminance and chrominance to occupy completely separate frequency bands.

Four colour monitors were used, two 10" x 8" RCA tricolour tubes, and two 12" x 9" projection displays using modified Philips-Schmidt projection tubes (no other details given).

One of the RCA monitors was fitted with a colour receiver, and this may well have been the 'Only one colour TV set' mentioned in the article which was later used to receive the BBC's first experimental transmission.

Monochrome compatibility was demonstrated by two 15" studio monitors and a number of standard domestic TVs supplied with the NTSC signal at RF.

The live TV demonstrations were introduced by Leslie Mitchell, a well-known contemporary BBC TV announcer.

Next came a colour film, followed by live studio shots of two young ladies showing off a collection of brightly coloured hats.

The camera (mounted on a substantial crane dolly) was then aimed through the window to give the lucky viewers their first outside broadcast of The Strand in colour, including a florist's delivery van with its wares, and some buses and GPO vans (which did appear as red!)

While the Marconi Magazine says that the demonstration was reported in the press the following day, its existence has largely been forgotten.

I came across the Marconi Magazine article by chance some years ago, and subsequently rescued the booklet of the Marconi demonstration from oblivion when clearing out a cupboard during an office move: it nearly ended up in the skip!

Ronald Camp, Brentwood, Essex.

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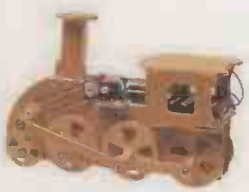

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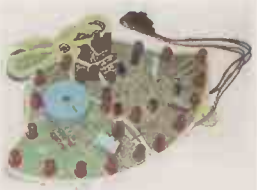

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Letters

Who invented the AVO?

I read Stan H's letter in Television October 2005 with considerable interest.

I am, presumably, one of those "ancient telephone engineers" you mentioned having trained with the GPO Telephones in the mid 40's when phones, mainly the candlestick type, had the respect due to them as modern telephones.

Switch rooms, even manual ones, were sheer magic and witchcraft. Automatic exchanges were the height of advanced engineering and with their flashing lights and noise were exciting and frightening places. Those were the days!

Early automatic exchanges used 60v batteries so that what was more natural than to use two of these in series as the main repeater station battery. (B Battery). This may explain to some extent the "odd 0-120 scaling" of AV0 7.

My memories of the early "Detector No 2" (their official GP0 title) are a bit hazy by now but we used to look for short circuits along overhead routes from those vans with the funny upper rear sloping wind-screens that let us look upward as we drove along looking for foreign objects hanging over the open wires, so much for HSE at work! And to hell with that little other traffic.

But to business – when we got to a cable head or a switch room it was a different matter, physical looking didn't help much so we relied on the MURRAY loop test, a variation on the Wheatstone Bridge.

That is where the meter with the variable resister came in. by using the faulty line as one arm and the voltage multiplier and variable resistor as the other arm a suitable circuit could easily be set up. The variable adjusted for zero and with a bit of luck and a following wind there was your fault.

It took a lot of luck or practice and skill to get it right and interpret the results. I also recall what we referred to as the "German Piano" in the repeater station – much the same thing but much more sensitive and set on a concrete block for use with trunk cables.

The indicator was alight beam cine 2 yards long. Very unstable and with a mind of its own.

Recently I've come across the same idea used on the railway for fault location where induction effects make more modern methods impractical.

I hope this fills in some details for you but please let me know how you get on and anything else you find. Have you a particular interest in this field etc?

R Potter
Eastleigh, Hants

Australian gold mine

I've read almost every copy of Television since the mid-60s, but never got round to writing to the letters page.

When I read recently that some TV engineers are having to resort to renting out the spare room for extra income, I realized how lucky I am.

My years at Granada TV Rental in Crewe and Northwich were some of the happiest of my life, but by the mid 80s the rental industry started to crumble.

It was then that I took a holiday in Australia and arrived at a small town halfway between Sydney and Brisbane. With the ocean on one side, and the mountains on the other, it seemed like paradise. I stopped outside the local RETRA shop to buy a plug, and, half an hour later I was offered a job repairing a huge backlog of TVs and videos.

Once settled, I concentrated on the aerial business that turned out to be a gold mine. A local call can be 30 miles away, and the temperature up to 40°C, but all houses are single storey with low angled roofs, which makes access very easy.

As I look out across the magnificent valley, the sun shining, the kookaboros singing and the kangaroos nibbling, I thought, "Yes, we made the right decision."

Arthur Hadfield,
Kempsey, NSW, Australia

BS symbols

Congratulations on the new format and style.

I was particularly pleased to see that at long last the magazine has adopted BS symbols in the circuit diagram on page 99 of the December issue.

BS symbols have been taught in colleges of FE since their introduction in the mid sixties and they were used in both C & G and the later B Tech courses.

These symbols were also used by companies such as BT,the BBC and IBA and manufacturers such as Thorn EMI,Philips industries and STC/KB to name but a few.

With the exception of magazines like Maplin,Elector and RadCom the technical press have been slow to conform and I trust that you will now take Television magazine into the 21st century.

Ron Bravery (by email).

Test Case 517

The last call of the day! Todd pulled up outside Mrs Wilkins' bungalow and rang the bell. Hopefully this would be an easy one – few of the others that day had been. He was led indoors and to an Hitachi model C2586TN TV set. Its symptom was simply no sound or vision via the tuner section. Results from a VCR, whose signals entered via the Scart socket, were fine. Todd checked the TV's programming via the user-menu and confirmed the presence of an RF signal via the VCR, and left it at that. The lady could watch her programmes via the video recorder's tuner, and both the workshop and the retail shop would be closed by the time he got back...

The next morning he called on Mrs Wilkins again, along with a loan set, and our Cathode Ray – to give a lift into the van if necessary. Before they took it away they removed the back cover and banged the PC board and wiggled the tuner: these had no effect. Into the van it went, then, and finally onto the repair bench. Ray's first action was to confirm that the set's tuner was getting all the services it needed. He checked out the presence of 8V, 5V and 33V supplies there, also that the I?C connections to pins 4 and 5 were present and pulsing. It's not possible, of course, to analyse the data on these control lines, merely to confirm its presence. On, then, to the IF/jungle chip IC501, which in this particular model was type TDA 8375. It had the correct supply voltage, it had active SDA and SCL feeds, it was generating time-base pulses and – as we saw earlier – was handling perfectly well signals entering via the Scart socket. It seemed, then, that either this or the tuner was faulty.

The correct type of IF/jungle IC was found in the component stores by Ray, and quickly fitted, all 56 pins of it. The fault remained just as before, even to the correct processing of AV signals via Scart. Cathode Ray found another Hitachi A7 chassis, removed from a 28" set which had been scrapped due to a failed tube. Its tuner was transplanted into Mrs Wilkins' TV forthwith. You guessed it: the fault remained even then! Next Ray tried injecting a 39·5MHz vision IF signal into the chip at pins 48/49, but got no response from that. Now he was starting to run out of ideas! He checked the conditions on every pin of the IF chip which he thought might be significant. Nothing was written in the service manual relevant to this one, neither was there anything relating to the symptom in the fault-list at the Hitachi dealer website. Already Ray had spent too much time on this one, with nothing to show for it.

An appeal was made to Television Ted, then, as soon as he came back from holiday a couple of days later. That worthy, with much experience of TV sets, Hitachis included, took the service manual back to his own bench and pored over its circuit diagram for a while. Then he went to the set and repeated some of the tests which had been made by Cathode Ray. Finally he made some suggestions to Ray, which led to a successful repair. What do you think was wrong?

The answer is on page XXX.

50 years ago

By Keith Wilson

Recent articles and correspondence have shown our readers to have a lively interest in television's history. And, there are few better records of that history than the past issues of this magazine, which first appeared in April 1950.

In January 1956, the big news was the coming of ITV which, for the first time, broke the BBC's television monopoly. The Croydon transmitter serving London on channel 9 had opened on 22nd September 1955, and the Lichfield transmitter covering Birmingham and the Midlands on channel 8 was already radiating test transmissions.

Most viewers, however, could receive neither of these Band III channels, as they had single-channel receivers permanently tuned to their local Band I BBC transmitter.

Small wonder then, that there was enormous interest in converters – the first set-top boxes – which shifted the frequency of the ITV signal to the BBC channel so that it could be received by those single-channel sets.

This was a far from ideal solution, of course, not least because re-radiation of the converted signals could cause severe interference with other nearby receivers.

Despite their shortcomings, converters were the cheapest way for most people to get ITV, and they were very popular.

It comes as no surprise, therefore, to see that the headline on the cover of the January 1956 of Practical Television – as this magazine was then known – is 'The VM Band III Converter'.

The VM reference may need a little explanation, however, especially for younger readers!

Viewmaster

It is an abbreviation for Viewmaster, a do-it-yourself television set which could be built at home from a set of plans produced by TCC – the Tubular Condenser Company.

Unbelievably, it was claimed at the time that more than 30,000 of these receivers were in use, all built, one assumes, on the kitchen table!

Practical Television's lead article was ostensibly, therefore, a description of a 'converter' for the Viewmaster, except that it was not.

The Viewmaster was a TRF design. With all RF amplification taking place at signal frequency, instability problems would have been almost guaranteed with an ordinary set-top-box converter.

Even worse, the London version of the Viewmaster had the vision stages aligned for the wrong sideband. (In 1956, Alexandra Palace was still radiating a double-sideband vision signal.) The designers had, therefore, bitten the bullet, and had, in earlier issues, described how to convert the Viewmaster's RF section so that it worked as an IF strip.

The Viewmaster converter was, therefore, actually a fully-fledged Band I and Band III tuner with outputs at the then-standard IF frequencies of 34.65 MHz for vision and 38.15 MHz for sound.

As can be seen from the pictures, the design is interesting because it used a printed circuit board – available from TCC, of course – which was something quite novel at the time.

Indeed, it was so novel that the magazine devotes considerable space to describing how to fit components to the board, and how best to solder them.

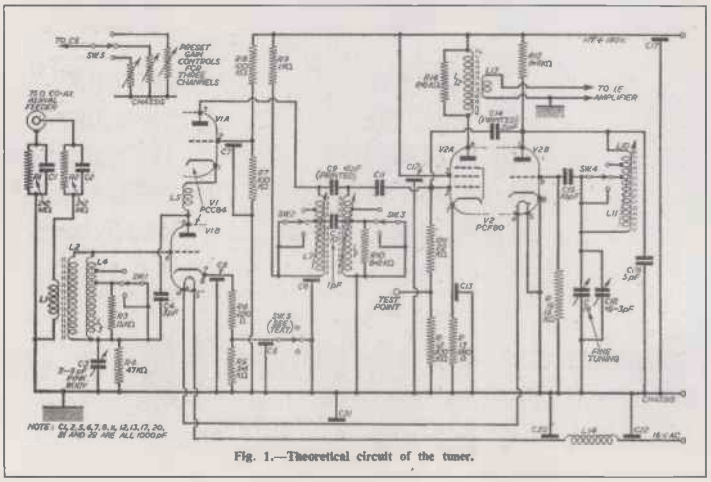
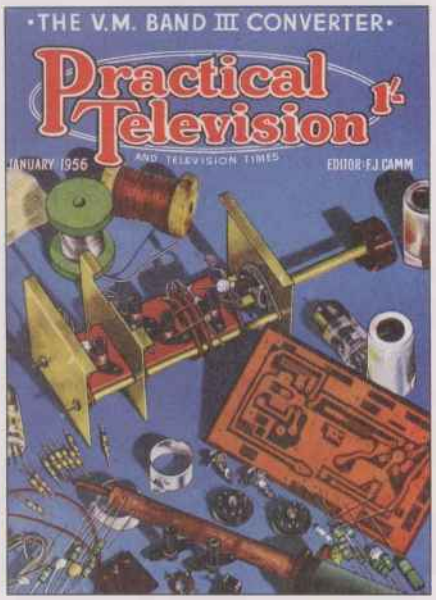


Fig. 1.—Theoretical circuit of the tuner.



For constructors of the era, this was the equivalent of moving into the realm of surface-mount devices and lead-free solder!

One other interesting point. The tuner uses a standard switch, rather than the turret arrangement popular in commercial equipment and, in the interests of simplifying construction, no attempt is made to cover the full twelve Band I and Band III channels. Instead the unit covers a single channel in Band I, plus two in Band III.

But why two Band III channels? The text explains that the BBC is expected to start broadcasting an alternative programme in Band III, presumably in the not-to-distant future.

In the event, of course, those who built the tuner would have to wait more than eight years for the launch of BBC2, only to find that they still could not receive it as the transmissions were in the UHF bands, and used 625 lines rather than 405.

The tuner's circuit diagram shows a typical double-triode cascode RF stage, followed by a triode-pentode mixer oscillator. The valves will be familiar to anyone involved with television in the 60s and 70s – the PCC84 and the PCF80.

The text explains that, even though the Viewmaster has parallel-fed heaters, these valves with series-connected heaters were chosen as it simplified the design of the PCB and, for the additional heater transformer needed, "it was not considered at all a disadvantage to specify a 16V winding rather than a 6.3V winding."

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Meteor III bakelite kit radio

By Ray Porter MSc CEng MIEE

The primary reason for the work that is done on equipment that subsequently becomes described in Television is usually to restore full operation for the user.

The reason for doing the work in this case was to satisfy both the curiosity of a friend and my interest in valve radios. The Meteor III bakelite kit radio that I examined was found in a cupboard when my friend had to clear the contents of his father's house.

In the 50's and early 60's, before Japanese transistor radio production swamped the world, home constructors with mechanical and soldering ability were keen to buy valve radio kits from radio and electrical parts suppliers and then assemble them for domestic use.

This was attractive as at that time the shop price of a brand name radio was high enough for it to be considered a luxury item. Big cities usually had several of these radio parts shops located in a specific area; some sold ex-government electronics surplus as well as new parts.

Tottenham Court Road in London and Hurst Street in Birmingham are two examples of radio and electronics goodies 'ghettos' of that era.

My friend could just remember, as a child, that his father had built the kit, but wanted to know when that would have been. I enthusiastically suggested that it also might be interesting to find out if the set worked, realising that I had now committed myself to help out.

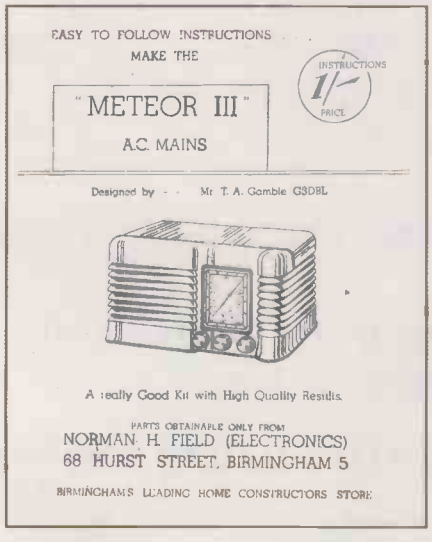

Figure 1. Front page of the instructions.

The kit and its designer

The kit assembly instructions, circuit diagram and parts list were also found in the house, but were not dated.

Figure 1 shows the front page of the instructions. This gave me a lead to start the research.

An internet search using the designer's name returned a reference to Tom Gamble at: www.virtualbrum.co.uk/oldads1968.htm. However I was sure that the radio dated from much earlier than 1968.

A picture of Tom is shown in Figure 2 as he was then as the service manager at Curry's Superstore in Birmingham's Martineau Way.

The website also reported that Tom was the first manager at the kit's suppliers, Norman H Field, who still have a shop in Hurst Street in central Birmingham, although now at a different street number.

Figure 3 shows the circuit diagram (as hand written in the instructions because there were no schematic capture software drawing packages in those days) and after looking at the two valve set up, I was impressed by the claims in the instruction book of 'strong reception of local and foreign stations on a few feet of aerial' and eagerly wanted to see if that could be verified in practice.

The parts list made interesting reading: Cabinets were available in cream or brown, the speaker cost 16s 6d (83p), resistors were 4d (2p) and SP41 valves were 7/- (35p).

Each part in the kit could be bought separately for a total of £5 13s 5d (£5.68) or all together for £4s 17s 6d (£4.87) plus 2s 6d (13p) postage.

Technical advice included "reverse the mains plug if there is excessive hum". This referred to the common usage of non-polarised two pin non-fused 5A (or 15A) plugs or lampholder plugs that replaced bulbs in domestic installations.

Figure 2. Tom Gamble.

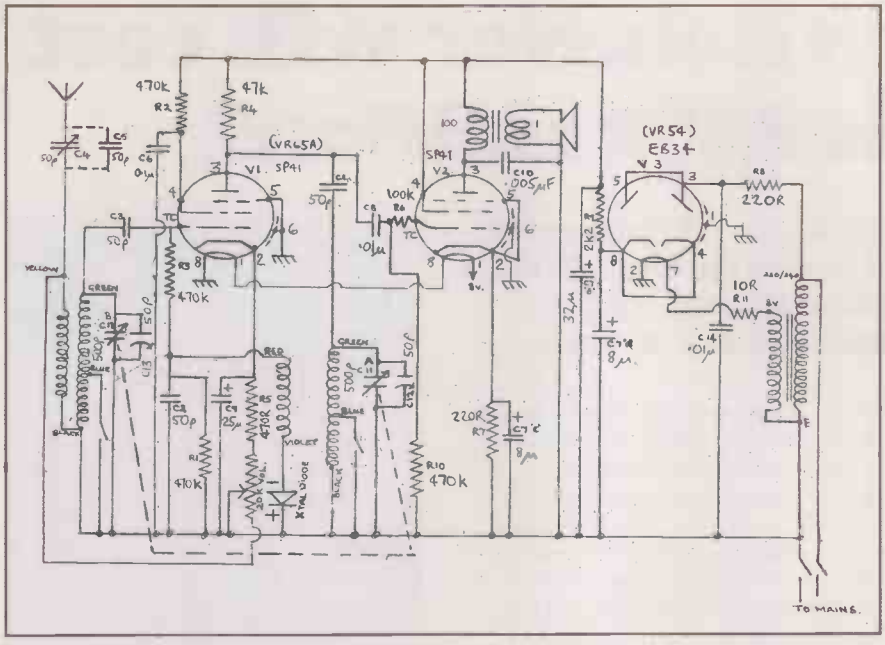

Figure 3. Circuit diagram.

The kit did not contain a mains plug, as mains equipment was not supplied with plugs until that was relatively recently legislated.

A caution notice advised that the chassis was connected to the mains, and that the exposed chassis fixing screws could become live, and that the grub screw holes on the knobs must be filled with wax to avoid shocks.

We have come a long way in electrical safety since then, designing in double insulation seems such an obvious safety precaution.

The kit was guaranteed: 100% refund if unused within 7 days, if the constructor couldn't get it to work then a repair would cost 10/- (50p) plus parts, if still not satisfied then 80% refund would be given.

Those were outstanding customer protection terms in those times, several decades before superstores introduced no quibble guarantees.

Taking a closer look

The style and appearance of the bakelite cabinet made the finished kit look acceptable in the living rooms of the time.

My next step was to look at the internals, shown in figure 4. There was very little dust, but there was some rust on the steel parts; the drive cord was intact and the tuning mechanism worked.

The fixing lugs of the polystyrene coil formers had cracked, so that the coils were not firmly fixed to the chassis.

All valves were fitted and their part numbers agreed with the assembly instructions. A 13A plug (I had to replace the 13A fuse with a 3A one!) was fitted to the mains lead, and thankfully the neutral was connected to the chassis.

The next task was to look for date markings. Pencilled onto the external metallising screen of V1 was '1955', which was also hand written onto the chassis.

There is a good chance that this was the year of construction as 'Apr 55' and 'Aug 54' were marked on two of the electrolytics by the capacitors' manufacturer.

About ten years later on a ready built pocket transistor radio with ferrite rod aerial could be bought for the price of this kit.

Figure 4. The internals.

Reception possible

Now I had to be able to show my friend if it worked. My first task was to reform the electrolytics, as that is what restoration experts say you must do.

Is it a myth that electrolytics lose their aluminium oxide layer with time?

I isolated the HT circuits and applied a variable DC voltage through a current limiting resistor to C7a and C7b only and never saw a value of leakage current that made me think that these capacitors were anything but immediately serviceable, even with full HT applied.

I did leave them with full voltage applied via the resistor for an hour in case flash over was going to occur, and all was well.

A quick check on their values gave some low readings, but there was no need to replace them unless there was hum that masked reception completely.

Three capacitors that I didn't trust were C6, C8 and C14. These were all subject to high voltage stress, and I knew from past experience that their waxed paper construction deteriorates and loses insulation resistance.

I replaced these with new modern types as visible in figure 5, before I applied mains to the transformer via a variac and saw the welcoming glow of all the valve heaters when the variac was at 100%.

After reconnecting the HT circuit, I wound the variac up to 100% again, and was pleased to get good MW reception (at 10 miles from Droitwich) on a metre of wire hanging from the aerial socket.

LW reception was also good, but slightly intermittent and tapping the aerial coil would make it cut out completely.

Well done Tom Gamble

My friend was pleased to see that his heirloom was still capable of working after 40 years, and said that he would treasure it rather than attempt to use it.

I have to agree with him that there is something comfortable about the appearance of bakelite radios. Perhaps it is the associated childhood memories that are so cosy.

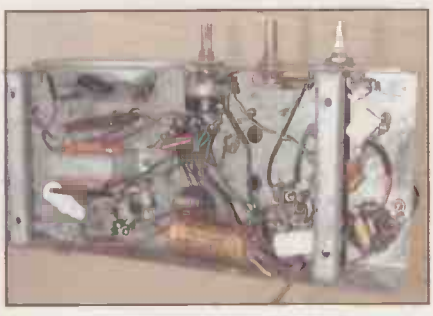

Figure 5. Capacitors.

Ofcom: "Switchover will cost households £572 million"

Ofcom predicts that around 10% of primary sets, 16% of subsequent sets and 10% of VCRs will need to be converted non-voluntarily due to the policy of switching over from analogue television to digital television according to the government's announced timetable.

The total cost to UK households over the period of switchover of non-voluntary conversions driven by switchover policy is estimated to be £572 million.

This represents around 2% of all UK consumer spend on brown goods over the same period, which is forecast to be approximately £30bn.

Actual cost to individual households of switchover driven non-voluntary conversion of sets and VCRs is estimated to range from £26 - £153 depending on the equipment in the home and the status of voluntary conversion at the time of switchover.

Where necessary, replacement of aerials is predicted to cost an additional £20 to £165 depending on whether there is a need to replace the roof aerial and on the number of new set top aerials required.

However, as only around 2% of households are expected to require new roof aerials, the range of aerial costs for most households is likely to be from £20 to £40.

Typical household power consumption is expected to increase by 0.1 to 0.4kWh per day - an estimated cost of £2 to £8 per year at current tariffs. This is approximately equivalent to running a 60W light bulb for 1.5 to 6.5 hours per day.

The total anticipated peak additional power consumption in the UK as a direct result of switchover is expected to be around 31MWh per day (approximately equivalent to each UK household running a child's night light for around ten minutes per day).

Over time, as older equipment is naturally replaced and technology becomes more power efficient, Ofcom predicts that this will trend towards zero.

The switchover to digital television (DTV) has so far been primarily a voluntary transition. Penetration of television in the UK is very high, with TV playing an important role in most households.

The switchover from analogue to digital transmission will therefore affect almost every household. As a result, it is considered necessary for government and broadcasters to regulate and manage the switchover process.

In order to maximise the likelihood of a smooth transition, government, in consultation with industry and other key stakeholders, has announced a timetable for switchover over the period 2008 to 2012.

Britain leads the world

Progress towards full digital conversion has so far been rapid - Britain leads the world with 63% of households already having DTV on at least one set.

However, the switchover to digital will involve consumers converting not just one set but every reception device in their home (if they want to continue receiving TV in the way they do today). There are still an estimated 26m sets remaining to convert.

While consumers will continue voluntarily to adopt DTV on some sets, government and broadcasters recognise that this alone will not lead to conversion of all the equipment necessary for switchover.

Consumers will be required to convert some equipment that would not otherwise be converted in preparation for switchover.

The total consumer equipment cost that can be attributed to the UK's switchover policy (i.e. due to non voluntary conversion of equipment and aerials) at a national scale is expected be approximately £449m with an additional £123m on aerials and related installations.

Power consumption

Conversion to digital at the time of switchover will require (in most cases) new equipment to be added to the home (STBs).

Inevitably, this will increase the amount of power consumed by a household. At a household level, the implications of this will be small, but are still noteworthy.

Overall household power consumption will increase due to non-voluntary conversion of equipment. Over the whole of the switchover period, typical household power consumption is expected to increase by around 0.1 - 0.4kWh per day.

With typical household power consumption in the UK running at approximately 4700kWh, this is an increase of 0.006%. This represents an additional household electricity cost of approximately 0.5p - 2.2p per day (approximately £2 - £8 per year).

Ofcom concludes that the cost of a set-top box is expected to see the most significant price reduction between now and the end of switchover from around £50 now to around £25 by 2012.

There are 24.8 million primary sets in the UK. Currently some 60% of these sets receive DTV (14.9m households). This is increasing by approximately 6% (1.5m households) per year. By the time they find switchover upon them, Ofcom expects that around 90% (22.4m households) will have decided to convert their primary sets voluntarily or naturally.

Ofcom adds that 52% of existing set top aerials will need to be replaced by digital set top aerials (£20 each) or a connection to a rooftop aerial (£50 to connect to an existing aerial).

However, because transmission power levels will increase after switchover, only an estimated 2% of households will face non-voluntary replacement of their rooftop aerial at £125 per installation. The total cost will be £123m.

Ofcom's Riverside House HQ

BBC's virtual production technology

Graham Thomas (right), head of BBC R&D's Production Magic work, investigates the application of image analysis, computer vision and tracking technologies to broadcasting.

Virtual Production techniques are probably best known for their use in virtual studios, generating virtual backgrounds that can be redrawn in real-time to match the camera movement.

We have previously developed various items of technology for this application area, including the free-d camera tracking system, a DVE system to provide 2D virtual backgrounds, and a keying system that does not need a coloured cyclorama.

Applications range from the inclusion of synthetic 3D elements in TV production, to techniques for extracting 3D information from images to assist the production process or create new forms of content.

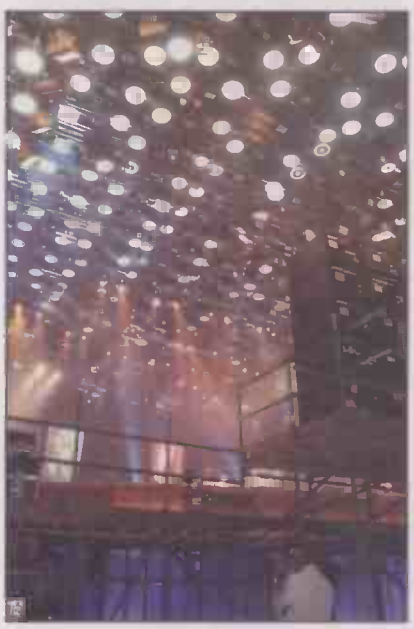

Figure 1. Markers are placed out-of-shot, for example on the ceiling

This technology offers the programme-maker exciting possibilities for creating a new look, as well as the prospect of cost savings, for example by creating a virtual environment that would be too expensive to use in reality.

Augmented reality

Technology can be used to insert a virtual object into an otherwise real scene - often known as augmented rather than virtual reality.

By tracking a real object in the scene and attaching a virtual object to it, it is possible for a presenter to manipulate a virtual object, and to trigger events such as animations by bringing two virtual objects together.

This area of application is being investigated in a BBC-internal project called MixTV. We are also developing tools aimed specifically at sports applications, for augmenting a real image with 'on-pitch' graphics.

To allow the use of virtual production techniques beyond the confines of a studio fitted with a camera tracking system, we are working in the MATRIS collaborative project to develop a marker-free system for measuring the position and orientation of a camera in real-time.

This project is a part of the EC's 6th Framework programme, and includes partners from Germany, Sweden and the Netherlands.

Some of our longer-term work is based on techniques for 3D scene understanding and automatic modelling, leading towards the concept of full 3D production. This work includes our contributions to the Origami and MetaVision EU IST projects, and the DTI-funded Prometheus project that finished in 2002.

A key component of any virtual production system is a means of measuring the precise position and orientation of each studio camera, so that the virtual scene can be rendered from the appropriate viewpoint.

Ideally, a camera position measurement system should:

- Allow unconstrained movement of many cameras over an area up to about 800 square metres, and allow panning through 360°.
- Work with a wide variety of camera mountings (including manual pedestals, cranes and hand-held).
- Measure the position and orientation to a sufficient accuracy to introduce negligible drift or noise in the relative positions of real and virtual elements of the scene. For example, to maintain the relative positions to an accuracy of ±0.5 pixel for a field of view of 10° and an object 4m away, the angular accuracy needs to be about ±0.01° and the positional accuracy needs to be about ±0.5mm.
- Measure the camera parameters with minimal delay. Long delays cause numerous operational problems, such as making navigation through the virtual world very difficult for the cameraman;
- place no significant constraints on either the scene content or the studio environment.

Free-d

BBC R&D has developed a system that uses a number of markers placed out-of-shot, for example on the ceiling (Figure 1). The optimum marker diameter depends on the height of the studio, but is typically about 20 cm.

Figure 2. The markers are viewed by a small auxiliary camera mounted on the side of each normal studio camera.

The markers are viewed by a small auxiliary camera mounted on the side of each normal studio camera (Figure 2). The markers are composed of a number of concentric white and black rings forming a type of barcode; each marker has a unique code number.

To make the markers easily visible despite the presence of the studio lights, they are illuminated by a cluster of bright LEDs around the auxiliary camera, and the white rings are made out of a retro-reflective material.

The serial digital video signal from the auxiliary camera is analysed by a purpose-built hardware unit (Figure 3) to calculate the precise position and orientation of the camera in real-time.

Sub-pixel accuracy

The unit identifies the markers, measures their positions in the image to sub-pixel accuracy, and reads their barcodes. Knowing the position of each marker in the studio, the position and orientation of the camera can be computed.

The settings of the studio camera's zoom and focus are measured using conventional mechanical sensors, and are passed to the hardware unit by multiplexing them with the signal from the auxiliary camera. The unit generates an RS422 signal which conveys the position, orientation, zoom and focus data to the virtual set system.

When the markers are installed in a studio, the position of each marker needs to be measured to an accuracy of about ±1mm. However, the system can perform these measurements itself.

First, approximate marker positions (to an accuracy of about 10cm) are entered into the system. Then the camera is moved around the studio, and the system analyses the images it sees in order to refine the marker position measurements to the required accuracy. As long as the markers are mounted rigidly, this process need only be done once.

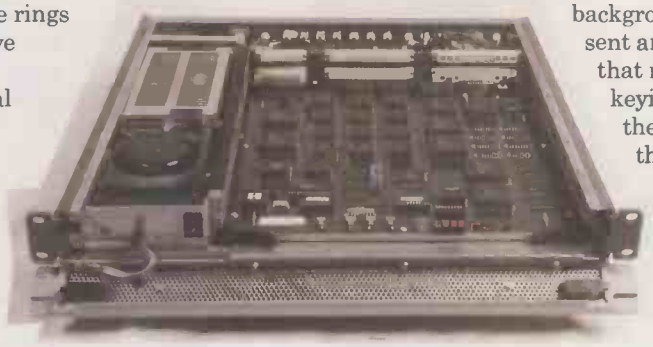

Figure 3. The serial digital video signal from the auxiliary camera is analysed by a purpose-built hardware unit.

Markers should be mounted at a minimum of two different heights (differing by about 0.5-1m) for optimum performance. At least 4-5 markers must be visible at any time.

For example, this might require markers to be mounted at intervals of about 1m in each direction on the ceiling of a studio 10m high, for a maximum working height of the camera of 3m. These figures allow for up to about half the markers being obscured by lights, microphone booms, and so on.

The camera tracking system was first demonstrated in public at IBC'97, and was subsequently licensed to Radamec Broadcast Systems who sell it under the name free-d.

The system is now in daily use by many broadcasters worldwide. UK programmes using free-d include ITN News, BBC News, and BBC programmes such as BAMZOOKi, Fightbox, and the 2001 and 2005 Election Night shows.

Truematte

Chroma-key is a well-established technique in TV production. It allows actors and props to be extracted from a camera image and superimposed onto another image to form a composite image showing the actors against a virtual background.

The actors stand in front of a background of a uniform colour. The background colour must not be present anywhere in the foreground; for that reason, blue is often chosen. A keying unit detects those parts of the camera image that contain this key colour, and replaces them with the background image.

In order to generate a good key signal with low noise, it is necessary to have the coloured background illuminated brightly and evenly. This gives rise to several problems, particularly when used in large studios:

- It is often time-consuming and difficult to provide bright and even illumination over a large area.
- It is sometimes difficult to light the actors to give the desired artistic effect, since the lighting is primarily determined by the technical requirements of the key generation. Scenes with low lighting levels pose particular problems.
- Areas where dark shadows cannot be avoided, such as under tables, do not produce clean key signals.
- Coloured light scattered from the brightly-lit background and floor lands on actors and props, changing their hue and giving an unnatural appearance. This is known as 'spill'.

Figure 4. Retro-reflective materials reflect nearly all incident light back in the direction from which it comes.

BBC R&D has developed a keying method that overcomes all of these problems. The system:

- Places no constraints on studio lighting (and will even work in complete darkness!)
- Eliminates spill.
- Allows clean keying even in difficult areas such as dark shadows.
- Works with conventional chroma-keyers and allows shadows to be extracted.

Figure 4 shows the method in use in a virtual studio production. It uses a background made of a special retro-reflective material, illuminated by a light of the chosen key colour mounted on the camera.

Tiny glass beads

Retro-reflective materials reflect nearly all incident light back in the direction from which it comes. They are usually made out of tiny glass beads with a reflective coating on half their surface.

Such materials are commonly used in road signs, to make them appear bright to a driver viewing them by his headlights. In this application, the material reflects the coloured light straight back into the camera, ensuring that the background appears brightly lit regardless of the setting of the studio lights. The material appears to have a dark grey colour under normal illumination, so coloured spill onto actors is eliminated.

Ideally, the source of coloured light should be placed coincident with the camera lens. This may be done using a semi-silvered mirror in front of the camera, which reflects a blue light to make it appear to come from the centre of the lens (as in a front-axial projection system).

A more compact alternative which gives results almost as good is to use a ring of bright LEDs around the camera lens (Figure 5). To change the key colour, it is only necessary to change the lights on the cameras; there is no need to change the whole cyclorama.

Since the reflectance of the screen is so high (many hundreds of times greater than white paper), relatively low levels of illumination from the camera are sufficient to make the screen appear very bright.

A large retro-reflective cyclorama can be illuminated sufficiently to produce a good key with as little as 5W of power. Despite the low light level needed, it is still important that actors are at least 1-2 m away from the camera, to avoid any significant amount of coloured light landing on them.

The use of retro-reflective screens with light projected from the camera is not new. So-called front-axial projection was used before chroma-keying was invented to project the actual background image.

Background illumination

It has also occasionally been used to project blue light for chroma-keying, to provide the background illumination for scenes that are particularly difficult to light in a conventional manner.

However, the technique has not been widely used. This is mainly because conventional retro-reflective material only works well when the direction of the incident light is nearly at right angles to the material.

In a virtual studio, the incident light from the camera will hit the material at a wide range of angles. In particular, if the material is placed on the floor, the light may hit it at 80° or more from the perpendicular.

BBC R&D, in collaboration with Reflecmedia, has developed a material which overcomes this problem. The new material maintains a high degree of retro-reflectivity over a very wide range of angles.

The material allows virtual production to be applied to programme genres not previously suited to the use of chroma-key techniques, by removing many of the lighting constraints associated with traditional keying methods.

Furthermore, by removing the need to illuminate the cyclorama with conventional lights, the method also helps to reduce electricity bills. The material was first demonstrated publicly in 1997, and is now sold by Reflecmedia under the name Chromatte.

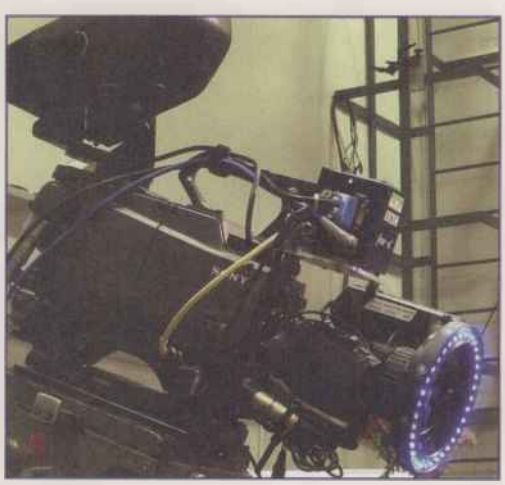

Figure 5. To change the key colour, it is only necessary to change the lights on the cameras; there is no need to change the whole cyclorama.

MixTV

MixTV is a system for tracking special patterns in a camera image, so that virtual objects can be overlaid on these patterns. This allows a presenter to pick up a virtual object.

1. The software analyses the camera image to determine the position of coloured marker objects. This is done in several steps:
2. Chroma-key is used to separate the marker from the background.
3. Edge and corner detection precisely locate the position of the markers in the image.
4. The binary grid code is read to uniquely identify the markers.
5. Mathematical calculations convert the image position to a 3D world position.

The system was first used live on-air during the BBC's 2005 Election Programme, and has been licensed to RT Software.

MATRIS

Augmented reality (AR) is a growing field, with many diverse applications ranging from TV and film production, to industrial maintenance, medicine, education, entertainment and games.

The central idea is to add virtual objects into a real scene, either by displaying them in a see-through head-mounted display, or by superimposing them on an image of the scene captured by a camera.

Depending on the application, the added objects might be virtual characters in a TV or film production, instructions for repairing a car engine, or a reconstruction of an archaeological site (see Figure 6).

Figure 6. Objects might be virtual characters in a TV or film production.

For the effect to be believable, the virtual objects must appear rigidly fixed to the real world, which requires the accurate measurement in real-time of the position of the camera or head.

Present technology cannot achieve this without resorting to systems that require a significant infrastructure in the operating environment, severely restricting the range of possible applications.

The objective of the MATRIS project is to develop and implement a system for determining the position, orientation, and focal length of a camera in real time, by analysis of the camera images and exploitation of unobtrusive inertial motion sensors.

MATRIS stands for Markerless real-time Tracking for Augmented Reality Image Synthesis, and is a collaborative project funded by the EU's Sixth Framework Programme.

BBC R&D is working with partners in Germany, Sweden and the Netherlands to develop the system, and hopes to have a first demonstration at IBC2006.

As the system will not require markers or other special infrastructure in the environment, it will be suitable for applications where existing tracking systems cannot easily be used, including:

- Insertion of virtual objects in live broadcast images outside of a dedicated 'virtual studio' environment, such as graphics for sport, or virtual objects in a conventional TV studio.
- Augmented reality applications in the area of development, production, service and maintenance.
- Augmented reality for architecture, design and product presentation.
- Augmented reality for cultural heritage sites and tourism.

The BBC is already using some early results from the project to track the position of cameras covering football and rugby matches. This allows the overlay of virtual graphics on the pitch in programmes such as Match of the Day.

There is more information on the project's website www.ist-matris.org.

Origami

The use of computer graphics allows the creation of special effects in feature movies, visualisation of facts in scientific programmes and many other applications.

The production costs of programmes that involve computer graphics are still relatively high. In particular, they quite often bear high risks in the case of something going wrong in the production chain.

A typical example would be a computer generated character that can not be integrated into real film footage, because the camera angle or the positions of (real) actors were wrong in the real camera images.

The Fifth Framework Origami project has developed new 3D modelling and production techniques for TV and film production. BBC R&D has developed a studio system with the following features:

- 3D multi-camera capture of action in the studio.
- A director's tool for real-time visualisation of real and virtual scene.
- An actor feedback module.
- Collision detection between actor and virtual world.

Current work includes adapting the capture system for use at outdoor sporting events.

BBC R&D has a staff of around 160 engineers, mathematicians and scientists. Of its £13 million annual spend, around £10 million is governance funding, with the residue coming from a mixture of licensing and funded work.

The BBC encourages its engineers to participate in conferences, seminars, lectures and demonstrations to help spread the message about its work.

Graham.thomas@rd.bbc.co.uk
www.bbc.co.uk/rd/projects/virtual

IEE members pack the room where Dr Graham Thomas presented a lecture on the BBC's Virtual Production Technology last November.

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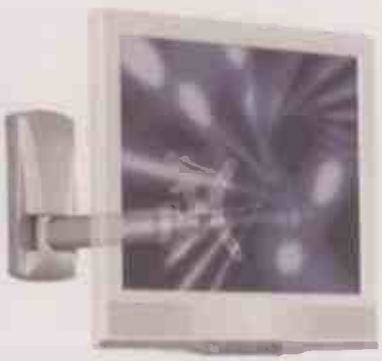

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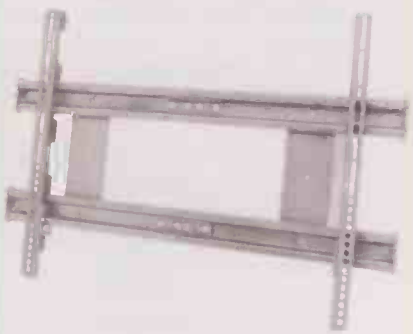
15m	HDMI7	£ 50.00 + vat
20m	HDMI8	£ 65.00 +vat

Wall Mount Universal Plasma Bracket



This plasmabracket can be used with all plasma and LCD televisions, due to its universal mounting possibilities.

Safe & heavy duty construction & easy installation.

Max. display welght: 80kg
Display size: max. 61" (155cm)

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SLx2B 2 way Amp - With Bypass	6dB	SLX2B	£ 8.00 + vat
SLx4 4 way Amp - No Bypass	12dB	SLX4	£ 10.50 + vat
SLx4B 4 way Amp - With Bypass	6dB	SLX4B	£ 11.50 + vat
SLx6 6 way Amp - No Bypass	12dB	SLX6	£ 15.00 + vat
SLx6B 6 way Amp - With Bypass	6dB	SLX6B	£ 16.00 + vat
SLx8 8 way Amp - No Bypass	12dB	SLX8	£ 16.00 + vat
SLx8B 8 way Amp - With Bypass	6dB	SLX8B	£ 17.00 + vat

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VALUE	CODE	PRICE	PER PACK
100uF	CAP118	£0.45	10
220uF	CAP165	£1.00	10
470uF	CAP29	£1.20	10
680uF	CAP166	£1.20	10
1000uF	CAP119	£1.50	10
2200uF	CAP120	£2.10	10
3300uF	CAP167	£1.60	5

16 Volts

VALUE	CODE	PRICE	PER PACK
22uF	CAP121	£0.35	10
33uF	CAP122	£0.35	10
47uF	CAP123	£0.35	10
100uF	CAP124	£0.60	10
150uF	CAP168	£0.65	5
220uF	CAP125	£0.80	10
330uF	CAP30	£1.75	10
470uF	CAP31	£1.75	10
680uF	CAP32	£2.10	5
1000uF	CAP33	£2.10	10
1200uF	CAP169	£1.50	5
1500uF	CAP170	£1.50	5
2200uF	CAP34	£5.25	10
3300uF	CAP35	£5.00	5
4700uF	CAP36	£6.10	10
6800uF	CAP171	£4.50	5

25 Volts

VALUE	CODE	PRICE	PER PACK
10uF	CAP37	£0.45	10
15uF	CAP172	£0.45	10
22uF	CAP38	£0.45	10
33uF	CAP126	£0.40	10
47uF	CAP39	£0.48	5
68uF	CAP127	£0.55	10
100uF	CAP40	£0.70	10
120uF	CAP128	£0.85	10
150uF	CAP41	£0.95	5
220uF	CAP42	£1.20	10
330uF	CAP43	£1.40	5
470uF	CAP44	£1.90	10
680uF	CAP45	£3.15	5

25 Volts...continued

VALUE	CODE	PRICE	PER PACK
1000uF	CAP46	£3.65	10
1500uF	CAP47	£3.90	5
2200uF	CAP48	£2.00	2
3300uF	CAP49	£2.20	2
4700uF	CAP50	£3.65	2
6800uF	CAP51	£3.90	2

35 Volts

VALUE	CODE	PRICE	PER PACK
1uF	CAP130	£0.40	10
3.3uF	CAP131	£0.40	10
4.7uF	CAP132	£0.45	10
10uF	CAP52	£0.50	10
22uF	CAP53	£0.45	10
33uF	CAP54	£0.50	5
47uF	CAP55	£0.85	10
68uF	CAP133	£0.55	10
100uF	CAP56	£0.85	10
150uF	CAP57	£0.95	5
220uF	CAP58	£1.45	5
330uF	CAP134	£1.60	10
470uF	CAP135	£1.75	10
680uF	CAP59	£6.50	10
1000uF	CAP60	£4.35	10
1500uF	CAP173	£4.00	5
2200uF	CAP61	£2.45	2
3300uF	CAP62	£10.00	5
4700uF	CAP136	£3.50	2

40 Volts

VALUE	CODE	PRICE	PER PACK
2200uF	CAP174	£1.80	2
2200uF	CAP175	£2.00	1

50 Volts

VALUE	CODE	PRICE	PER PACK
0.47uF	CAP176	£0.35	10
1uF	CAP137	£0.35	10
2.2uF	CAP138	£0.35	10
3.3uF	CAP139	£0.35	10
4.7uF	CAP140	£0.35	10
6.8uF	CAP177	£0.45	10
10uF	CAP63	£0.50	10
22uF	CAP64	£0.70	10
33uF	CAP141	£0.85	10
47uF	CAP65	£0.85	10
68uF	CAP142	£0.90	10

50 Volts...continued

VALUE	CODE	PRICE	PER PACK
100uF	CAP66	£0.85	10
220uF	CAP67	£1.75	10
330uF	CAP68	£2.45	10
470uF	CAP69	£4.35	10
680uF	CAP70	£4.90	5
1000uF	CAP71	£5.25	10
1500uF	CAP143	£4.50	5
2200uF	CAP72	£3.25	2
3300uF	CAP144	£3.25	2

63 Volts

VALUE	CODE	PRICE	PER PACK
0.22uF	CAP145	£0.45	10
0.33uF	CAP178	£0.35	10
0.47uF	CAP73	£0.35	10
1uF	CAP74	£0.35	10
1.5uF	CAP179	£0.35	10
2.2uF	CAP75	£0.35	10
3.3uF	CAP76	£0.50	10
4.7uF	CAP77	£0.35	10
6.8uF	CAP180	£0.50	10
10uF	CAP78	£0.50	10
15uF	CAP79	£0.95	5
22uF	CAP80	£0.75	10
33uF	CAP81	£0.85	10
47uF	CAP82	£0.95	10
56uF	CAP181	£1.10	10
68uF	CAP83	£1.30	5
100uF	CAP84	£1.20	10
150uF	CAP85	£2.80	5
220uF	CAP86	£2.80	10
330uF	CAP87	£4.00	10
470uF	CAP88	£5.25	10
680uF	CAP89	£5.00	10
1000uF	CAP90	£5.40	5
2200uF	CAP182	£2.20	1
4700uF	CAP183	£4.00	1

100 Volts

VALUE	CODE	PRICE	PER PACK
0.1uF	CAP184	£0.80	10
0.22uF	CAP185	£0.80	10
0.33uF	CAP186	£0.80	10
0.47uF	CAP91	£0.50	5
1uF	CAP92	£0.85	10
1.5uF	CAP93	£0.70	5

100 Volts...continued

VALUE	CODE	PRICE	PER PACK
2.2uF	CAP94	£0.50	5
3.3uF	CAP95	£0.50	5
4.7uF	CAP96	£0.50	5
6.8uF	CAP187	£0.80	10
10uF	CAP97	£0.95	10
22uF	CAP98	£1.05	10
33uF	CAP99	£1.55	5
47uF	CAP100	£1.75	10
68uF	CAP188	£1.30	5
100uF	CAP101	£2.10	10
220uF	CAP102	£6.00	5
330uF	CAP189	£3.00	2
470uF	CAP103	£6.00	5
680uF	CAP190	£3.00	2
1000uF	CAP191	£3.00	1

160 Volts

VALUE	CODE	PRICE	PER PACK
0.47uF	CAP192	£0.45	10
1uF	CAP193	£0.45	10
2.2uF	CAP146	£0.45	10
3.3uF	CAP194	£1.00	10
4.7uF	CAP195	£1.00	10
10uF	CAP147	£1.40	10
22uF	CAP148	£1.80	10
33uF	CAP149	£2.30	10
47uF	CAP196	£2.20	5
100uF	CAP150	£3.25	5
220uF	CAP197	£3.00	2
470uF	CAP198	£3.25	1

200 Volts

VALUE	CODE	PRICE	PER PACK
22uF	CAP199	£1.60	5
100uF	CAP151	£3.25	5
220uF	CAP200	£2.50	1
330uF	CAP201	£2.50	1

250 Volts

VALUE	CODE	PRICE	PER PACK
0.47uF	CAP202	£0.60	10
1uF	CAP152	£0.60	10
2.2uF	CAP203	£1.30	10
3.3uF	CAP104	£1.75	10
4.7uF	CAP204	£2.00	10
10uF	CAP105	£2.60	10
22uF	CAP153	£2.30	10

250 Volts...continued

VALUE	CODE	PRICE	PER PACK
33uF	CAP206	£1.75	5
47uF	CAP106	£4.35	10
100uF	CAP154	£4.50	5
220uF	CAP155	£2.00	2
330uF	CAP206	£2.50	1

350 Volts

VALUE	CODE	PRICE	PER PACK
1uF	CAP156	£0.70	10
2.2uF	CAP207	£1.20	10
3.3uF	CAP157	£1.50	10
4.7uF	CAP208	£1.10	5
10uF	CAP158	£2.25	10
22uF	CAP159	£3.40	10
33uF	CAP209	£2.60	5
47uF	CAP210	£1.50	2
100uF	CAP211	£3.00	2
330uF	CAP212	£5.00	1

400 Volts

VALUE	CODE	PRICE	PER PACK
0.47uF	CAP213	£0.60	10
1uF	CAP107	£2.15	5
2.2uF	CAP108	£2.25	5
3.3uF	CAP214	£2.25	5
4.7uF	CAP109	£3.15	5
10uF	CAP110	£4.00	5
22uF	CAP111	£2.50	2
33uF	CAP215	£2.50	2
47uF	CAP112	£3.50	2
68uF	CAP216	£3.50	2
100uF	CAP160	£4.00	2
150uF	CAP217	£3.20	1
220uF	CAP161	£7.00	2
560uF	CAP162	£4.00	1

450 Volts

VALUE	CODE	PRICE	PER PACK
1uF	CAP113	£2.80	5
2.2uF	CAP114	£3.20	5
3.3uF	CAP218	£3.20	5
4.7uF	CAP115	£4.95	5

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Heater voltage : 24 Volt

Heater power : 48 Watt

Order Code: HQSOLDER30

Price : £ 35.00 + vat

Carriage charged at £ 6.00 + vat

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Description	Code	Price
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Spare tip Ø 3.0 mm	HQTIP2	£ 2.00 + vat
Spare tip Ø 3.0 mm 45°	HQTIP3	£ 2.00 + vat
Spare tip Ø 2.0 mm	HQTIP4	£ 2.00 + vat
Spare Sponge	HQSPONGE	£ 0.50 + vat

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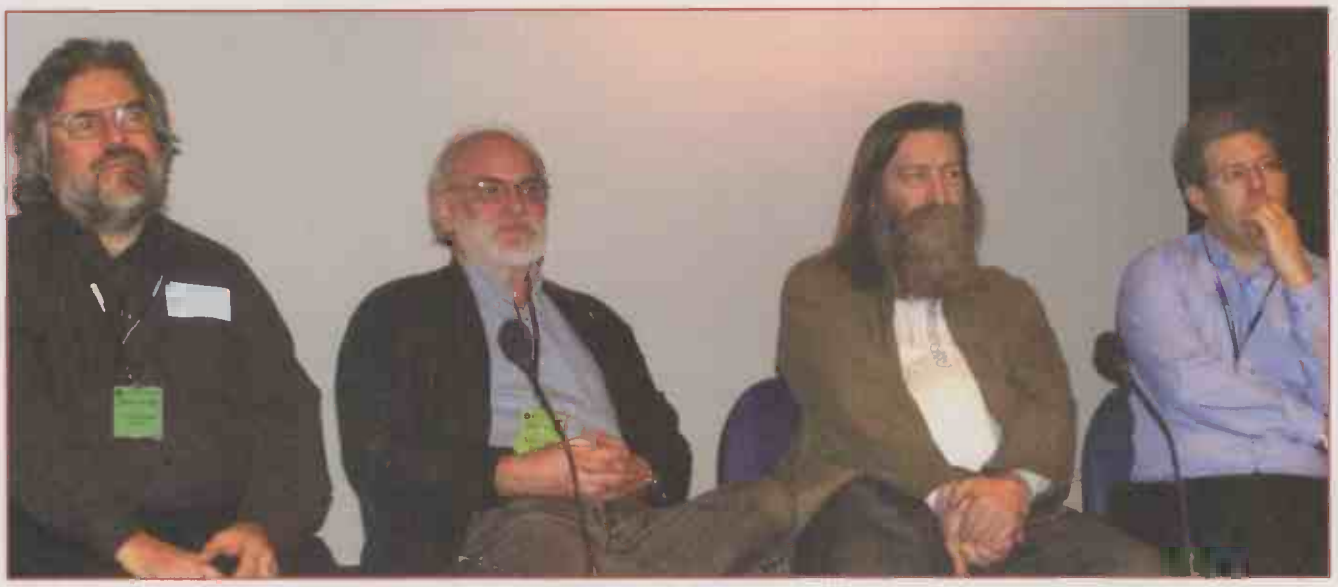
Migrating to HDTV

Boris Sedacca attended a two-day training course, Understanding HDTV Technology, at the NFT, London South Bank last November. This highly practical course has been developed for TV Industry Professionals facing the challenge of migration to HDTV.



The presenters (from left): Peter Wilson, Alan Roberts, John Watkinson and Stuart Sommerville.

HDTV has been a long time coming, from the psycho-visual experiments by NHK in the 1970s, through the format wars of the 1980's and the IT/TV battles of the late 1990s.

The first practical equipment appeared in 1985 and this was deployed in Japan with some pioneers in Europe and the USA. The equipment was mainly analogue but in fact already used quite a lot of digital processing in the cameras and recorders.

The politics also hotted up around this time and European manufacturers successfully parted the EU from many millions of ECU's (predecessor to the Euro) to develop an all-European system.

MUSE and HD MAC

So now we had both rival 50Hz and 60Hz HDTV production and transmission systems. The Japanese had MUSE (multiple subnyquist sampling encoding) and the Europeans had HD MAC (Multiplexed Analogue Components) for Transmission.

The European lobby made much of the fact that all the receivers would need to be changed if the Japanese system won. They omitted to say that this was also the case if the European system won.

For production equipment the pinnacle of performance was achieved in the late 80s with large format CCD cameras and uncompressed digital recorders.

The early 90s was a cooling off period though with some useful standardisation work including the much lauded common image format which used the same 1920 x 1080 Image format for both 50Hz and 60Hz.

Influential US senators

The end of the 90s was when influential US senators remembered that the Broadcasters had successfully quarantined spectrum for HDTV Broadcasting and put pressure on them to make it so.

The Broadcasters at this time were preoccupied with the threat of multichannel using compression over cable and satellite. They then coined the phrase DTV (Digital TV) and tried to deflect the politicians.

Enter also at this time software vendors who could just about process Standard definition in real time and did not understand the broadcast interlace system.

High School Allegiances

Using political influence and calling in High School Allegiances they managed to initially dilute the DTV offering to NTSC Progressive scan. The broadcasters now seeing a threat from another direction then switched back into an HDTV agenda.

The outcome of all this was the infamous ATSC (Advanced Television System Committee) table 3 with around 30 different broadcasting formats.

Stuart Sommerville

Head of Purbrook UK digital Product Design Consultant, Stuart worked for Plessey Radio Communications after university. He then moved on to Snell & Wilcox where he worked for 16 years before forming his own bespoke design company, Numedia Technology.

Stuart worked in many product areas in Snell including DEFT (Digital Electronic Film Transfer) which was created to sort out the infamous Dallas Problem when US networks went to electronic post. More recently Stuart's team engineered the first HD Compression Pre-processors and the Archangel Restoration engine. Stuart was a key member of the EU Presto Project.

The eventual result was a split between Broadcasters with some supporting the normally interlace Common Image Format of 1920 x 1080 for both production and transmission, and others supporting the 1280 x 720 progressive format much loved by the IT community. Progressive eats double the bandwidth but was easier to process by the novice software writers of the time.

Mainstream HDTV

With luck in Europe the target for mainstream HDTV will be both the common image format (1920 x 1080) and progressive scan. Luckily the NTSC Progressive Format also known as 480P has passed away.

Behind this story the professional equipment vendors were trying hard to make equipment better, lighter and cheaper. This resulted in a significant degradation of picture quality over the costly but superior equipment of the late 1980's.

In particular subsampling luminance and chrominance then compressing it to death confused the format debate by seriously degrading the capabilities of the 1080 I format. Another interesting point was the realisation that Film images in 50 Hz systems were carried as progressive images @ 25P.

This concept went back to the 1960's but was invented as new and promoted heavily as the HD 24P system when the term field dominance morphed into segment dominance. Woe betide anyone who got the dominance the wrong way and tried to display motion on a digital projector.

Healthier price tag

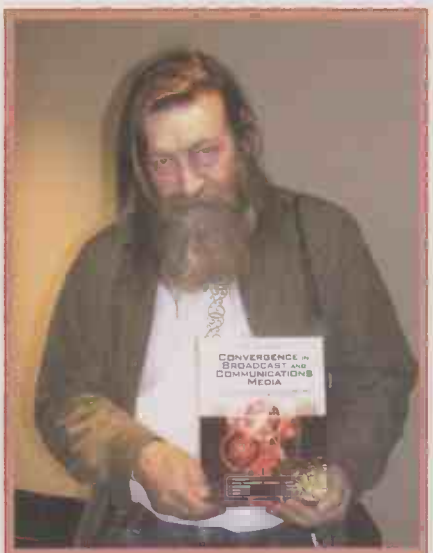
So moving on to the middle of the first decade of the 20th Century, several Broadcasters are on air, there is significant religion around the various formats and finally the technology is approaching the performance of the late 80's but with a healthier price tag.

With this background, High Definition and digital Cinema (HDDC) staged its two-day training course. The course was presented by John Watkinson, Peter Wilson, Alan Roberts, and Stuart Sommerville.

By the end of the course, delegates had a better understanding of the origins of HDTV and why certain decisions were made when defining the key parameters. They also better understood the difference between SDTV and HDTV and what issues are critical to reliable performance.

Delegates were given primers in the human visual system and moving image portrayal. They learned about colorimetry and its implications and given primers in HD VTR, switcher and camera systems. They gained practical information on how to build an HD system that works, with information on new diagnostic systems and metrics for reliable system operation.

Digital cinema is a relatively new phenomenon. It can be broken into two parts, production including post production and distribution/exhibition.



John Watkinson

John Watkinson is an international consultant in audio, video and data recording. He works in advanced applications of electronics to audiovisual and avionics systems. He is a Fellow of the AES, a member of the Society of Expert Witnesses, and the British Computer Society and is a chartered information systems practitioner.

He presents lectures, seminars and training courses worldwide. He is the author of many books, including Digital Interface Handbook, The MPEG Handbook, The Art of digital Video, An Introduction to digital Video, Convergence in Broadcast and Communications Media, Television Fundamentals and The Art of the Helicopter.

Peter Wilson

Until February 2005, Peter was Snell and Wilcox vice president for Display Processing. He was head-hunted as the manager of Strategic Planning from Sony Broadcast in 1991 where he was senior manager for New Business Development.

He is currently vice-chair of the European digital Cinema Forum and chairman of the technical module. Peter also sits on committees and working groups for the UK Department of Trade and Industry and digital Terrestrial Group.

Peter Wilson is an independent international consultant in the fields of HDTV application and digital Cinema technology. He presents lectures, seminars and training courses worldwide.

He is Co-author of several books, including The EDCF Guide to Digital Cinema Production, Understanding Digital Cinema and The EDCF Guide for Early Adopters. TV Appearances have included South Today current affairs programme, The Money Programme (BBC). He has also had technical articles published in several magazines, including Television's sister publication, Electronics and Wireless World.

He has presented tutorials for the International Broadcasting Convention (IBC), Society of Motion Picture and Television Engineers (SMPTE), British Academy of Film and Television Arts (BAFTA), the Royal Television Society (RTS), the International Association of Broadcasters (IAB), BKSTS (The Moving Image Society) and Fondazione Centro Sperimentale Di Cinematografia, Milan.

Production

Whilst there is a trend towards digital camera capture the mainstream movies are still shot on 35mm Film. Pioneers such as George Lucas have shot major features using digital cameras. Where digital technology is really causing a stir is in the effects and post production areas.

Television has had many advanced tools at its disposal for many years. These tools were until recently not good enough for use on major features. The advent of new digital Intermediate tools has changed the situation.

TV commercials used very sophisticated secondary colour correction

systems with the ability to isolate and change individual colours in a scene.

Film traditionally used a simple three light process where a skilled operator could match the overall image to the director wishes but could not manipulate colours within the scene.

Special effects have been achieved for some time by scanning the camera negatives at high resolution 2048 x 1556 pixels then storing the images as a file.

The computer graphics process then takes the file and integrates it into the CGI shot, or in fact the CGI may be completely synthetic.

The result was recorded back to Film and the negative produced cut into the movie as normal.

The advent of digital Intermediate brings the opportunity to edit and secondary colour grade the whole movie whilst it is in the digital Domain.

The finished file can then be either prepared for digital cinema distribution or written back to negative stock to facilitate film distribution.

A major benefit is the ability to write many negatives of equal quality so improving the quality of the film seen in the cinema.

Distribution

As mentioned above the digital files can be written back to film for traditional distribution. For digital distribution a digital source master is prepared.

This is then encrypted and packaged for delivery by satellite or data tape.

HDDC will run digital Cinema Technology training courses early in 2006 to explain the various technologies specified by the DCI and their practical implications.

Alan Roberts

Head of Mugswell UK, consultant in HD imaging specialising in cameras, Alan spent many years at the BBC Research Centre in Kingswood Warren specialising in imaging and colour science. He has authored several BBC white papers including:

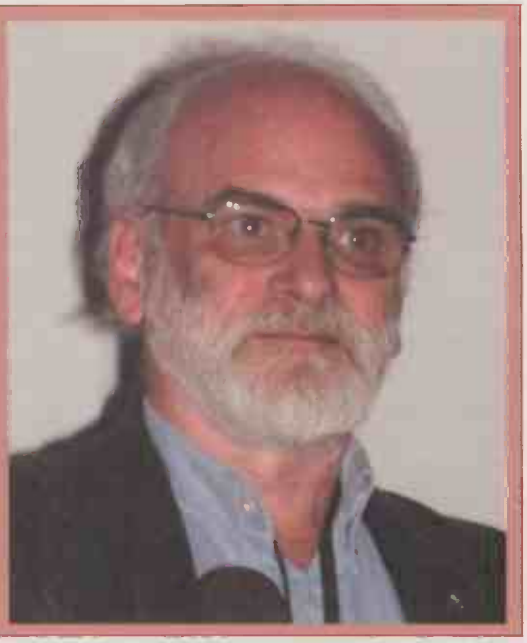
WHP034 Colorimetric and resolution requirements of cameras

WHP053 The Film Look: It's not just jerky motion.

WHP085 The "Rel": a perception-based measure of resolution

WHP008 How to recognise video image sources

While at the BBC Alan designed special camera setups for BBC HD co productions. Since retiring Alan has been very busy briefing Directors and Cameramen on HDTV characteristics in production and the best way to capture the images.



Course Contents

Day One

Introduction

What is your definition of High Definition? Is definition all there is to it? Of course not!

- The things that matter
- Realism v Escapism

The Human Visual System

- The structure of the eye.
- The retina.
- Rods and cones and how they differ.
- Why the eye is not a camera.
- Saccadic motion.
- The pretzel effect.
- Eye tracking and motion perception.
- Persistence of vision.
- Fusion.

Moving Image Portrayal

- Image sampling, spatial and temporal.
- Aperture effect.
- Oversampling and resizing.
- Scanning techniques.
- Motion portrayal and dynamic resolution.
- The optic flow axis.
- Comparison of film, interlaced scanning and progressive scanning.
- Choice of frame rate.
- Where present frame rates came from.
- What frame rates should we use?

Colorimetry

- How we see colour.
- Colour constancy.
- Metamerism and the use of primaries.
- CIE colour space.
- Colour temperature.
- Colour space for transmission and display.
- digital colour space.
- Valid and invalid colours.

Compression for HDTV

- MPEG-2 vs H-264(AVC).
- Spatial and temporal coding.
- Transforms, motion compensation, bi-directional coding, prediction.
- Blocking and concealment.
- Transporting compressed HDTV.
- Packets and PIDs. Timebase recovery & PCR.
- Multiplexing, statistical multiplexing.
- Stuffing.

Day Two

Cameras

- Types of HD camera: prism vs stripe and mask systems.
- Sensor size vs depth of focus.
- Enhanced processing; Gamma, white knee, etc.
- Set up files
- The importance of the correct shutter speed.
- Cameras connections: copper, fibre.
- HDV, "Will it make amateurs of us all?"

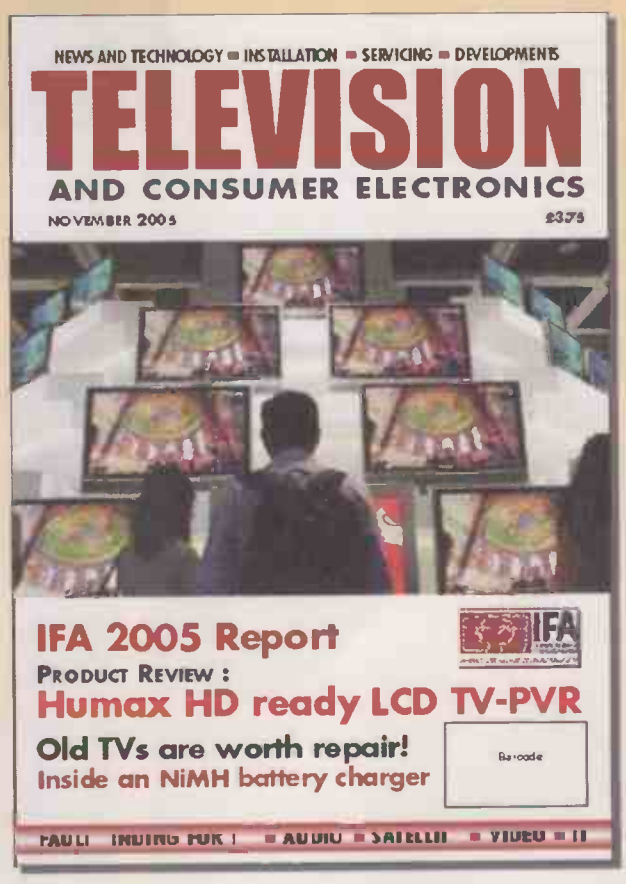
Equipment

- Interface standards
- P & PSF
- The 1.5 Gbps HD Serial interface
- Data integrity and CRCs
- Connectors & Cables
- Analogue design issues
- Switchers
- Graphics and CG
- Editing
- SD/HD compatibility and interoperability
- Displays, CRT, PLASMA, LCD

HD recorders

HD recorder block diagram.

- Compression, segmentation, multiplexing, error correction, channel coding, timebase correction.
- Practical HD formats: HD-Cam, HD-Cam SR, HD-D5, D6, HD-DV100, HDV.



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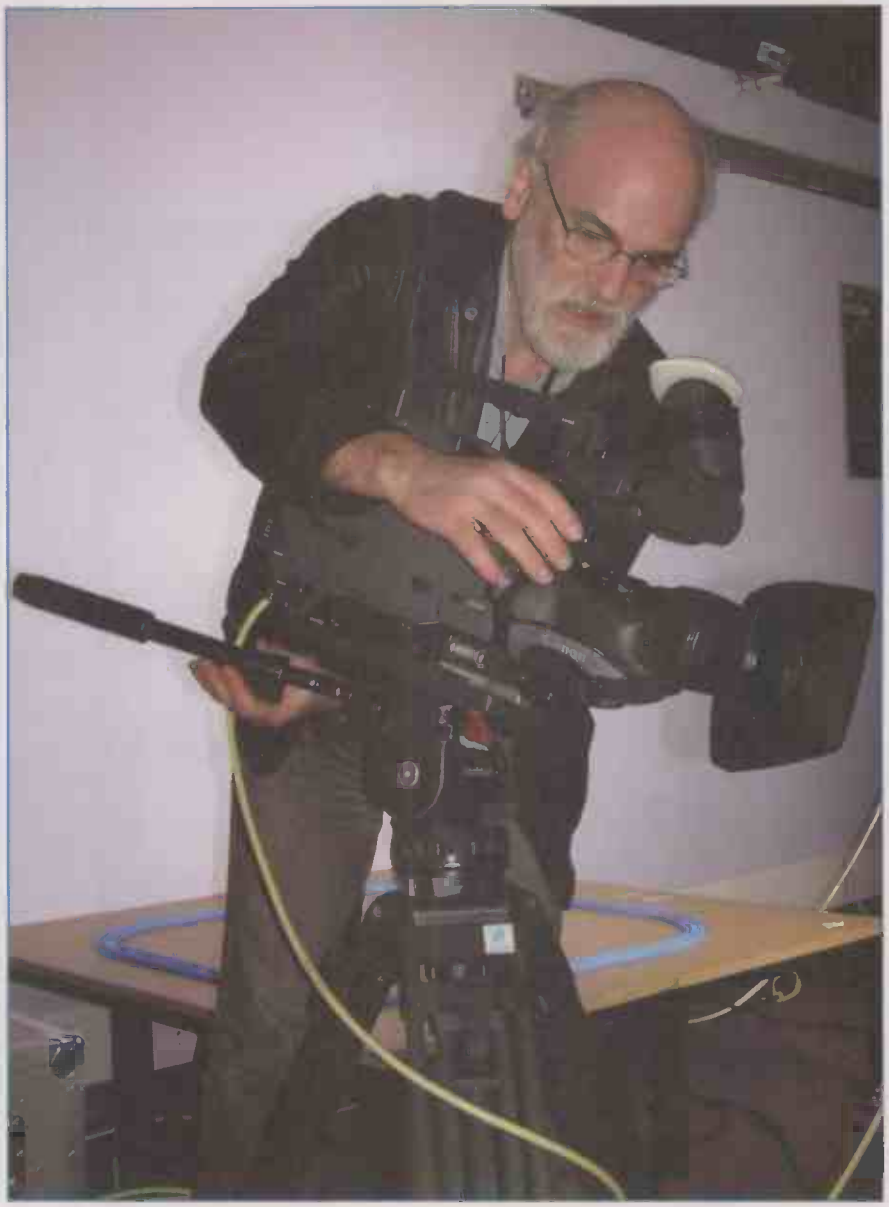
More than meets the eye

It is tempting to say that there is more to imaging systems than meets the eye, but it would not be true. It is only what meets the eye that matters, says Alan Roberts (pictured right).



To explain almost anything about television and film imaging systems we have to start with the eye. Depth of field is a classic example, we all know what we mean by it, we know what it looks like, and how to manipulate it for visual effect.

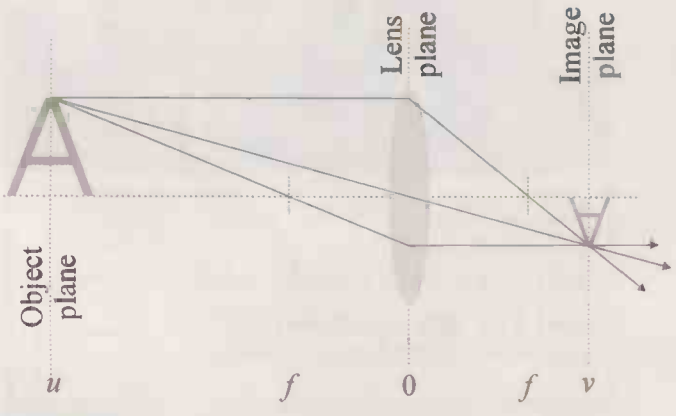
But how to predict it precisely is beyond most of us. Fear not though, because it is relatively easy to calculate for any given situation, provided we make a few assumptions and measurements.

So, first the definition: depth of field is the range of object distances, from the lens, within which everything appears to be in focus in the image.

On the other side of the lens is depth of focus, which is the tolerance range of distances for the image sensor, from the lens, within which the focused object appears to be sharp.

Clearly the depth of field is always much greater than the depth of focus, because the image is (nearly) always a great deal smaller than the object. But first some fundamentals.

The Ray Diagram



Ray diagram

In a ray diagram of a simple imaging lens, from my dim recollection of O-level physics, I know that $1/u+1/v=1/f$ for a lens of focal length f, and that the magnification is v/u. v and u are the distances from the lens plane to the image and object planes, respectively. The sagittal (like an arrow) ray travels straight through the centre of the lens without bending, all other rays are bent by the lens.

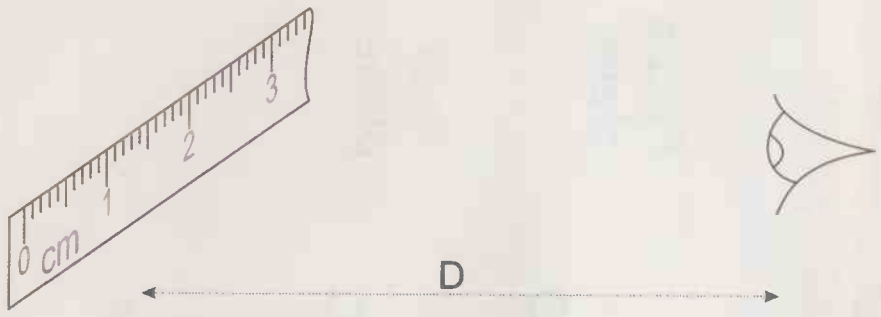
Rays that are parallel to the normal through the centre of the lens (horizontal in this example) are bent to travel through the focal point on the other side, and the focused image is formed where the rays from points on the object converge.

This principle is the basis of all the maths here. It is the divergence of rays from the object, and convergence at the image, that defines the depth of field, but first we need another concept.

Disc of Confusion (DoC, d)

This is generally used to quantify the size of the smallest object that an optical system can produce in the image.

Ideally, this would be a point of zero size, but lens manufacturing is difficult; for example, Zeiss prime lenses



Disc of Confusion

are designed to produce a DoC of about 4*μm* (microns).

However, the camera has a DoC as well, the sensor pixel spacing (or a little larger for safety, about 5*μm* for 2"/3 HDTV cameras, about 7*μm* for consumer 1"/3 SDTV cameras).

But in imaging systems, we should be more concerned with the DoC of the entire system, and that must include the viewer.

Assuming that our viewer has normal eyesight (that rules me out because I'm very long-sighted), a typical figure is about 1 minute of arc (1/60 of a degree).

So any object that subtends an angle of less than 1 minute of arc at the eye appears to be a point in the scene. There is no need for the imaging system to produce anything smaller than that - we can't see it.

We can use angles so that distances are not involved, and radians rather than degrees so that some nice approximations work. There are 2π radians in a full circle, so one radian is about 57 degrees, and 1 minute of arc is about 1/3420 radians.

You can measure your own eyesight very simply by holding up a ruler marked in millimeters and gradually moving away from it until the millimeter markings just merge.

A transparent plastic ruler is good for this, and it needs to be well lit so that your iris closes up sensibly. At the distance where the millimeter markings just merge, measure the distance from your eye (D) in millimeters, and the size of your disc of confusion is then ***d=TAN(1/2D)***.

This assumes that the millimeter marks are 0.5mm wide. Since the angle is small, we can use the approximation ***d=1/2D***. With my trusty varifocals on (I'm long-sighted, not blind), I get a distance of about 2.4m, so, for me, d is 1/4800 radian, about 0.7 minutes of arc.

And that is all the personal information we need to calculate depth of field for me, but we still need another concept.

Hyperfocal Distance (h)

This is the close-focus distance beyond which all points in the object field are 'in focus', up to but not beyond infinity, an interesting concept.

It means that I don't have to set the focus distance to infinity in order for distant objects to be sharp, I can maximize the range of sharpness by using a lens focus setting somewhat less than infinity, such that infinity is only just in focus.

What this means is that all points in this focus range are reproduced with the size of the DoC in the image plane. A ray diagram will help explain how this works.

Rays from the near point, at the hyperfocal distance, form an inverted image where the rays from the object, h, cross. Rays from another object *f*, placed at infinity, are all parallel as they meet the lens, so form an inverted image, *f*, at the focal point of the lens.

Both images cannot be on the sensor plane at the same time, so the sensor is placed between these images such that the converging (or diverging) rays form discs of equal diameter, the size of the DoC, the 'equal misery' point. And now we can derive Depth of Field.

Depth of Field

Let us assume that the camera is correctly focused on an object at distance u from the lens, and points at this distance subtend a field angle Ø at the lens.

I am not going to show the camera-side of the lens any more, only the object field. The lens aperture (diameter) is a (a physical dimension), and by trigonometry ***Ø/2=TAN(a/2u)***.

Since the angles are still small we can approximate and get ***Ø=a/u***.

At distances u_n and u_f (the near and far planes, extremes of the depth of field that we are calculating), points subtend field angles $Ø_n$ and $Ø_f$, (still in radians) at the lens, and produce discs of diameter d in the image, the size of the lens's disc of confusion, because the converging or diverging rays do not intersect the sensor plane at the respective points of focus.

By the same trigonometry, we can state that $Ø_n=a/u_n$, and $Ø_f=a/u_f$

Another advantage of calculating the angles in radians, and mighty small ones at that, is that we can add and subtract them without bothering with trigonometry, and make the bold statement that ***Øn=Ø+d***, and ***Øf=Ø-d***.

Now, we can rewrite that as $Ø_n$-***d=Ø=Ø$_f$+d***, and substitute the angle formulae to get ***a/u$_n$-d=a/u=a/u$_f$+d***.

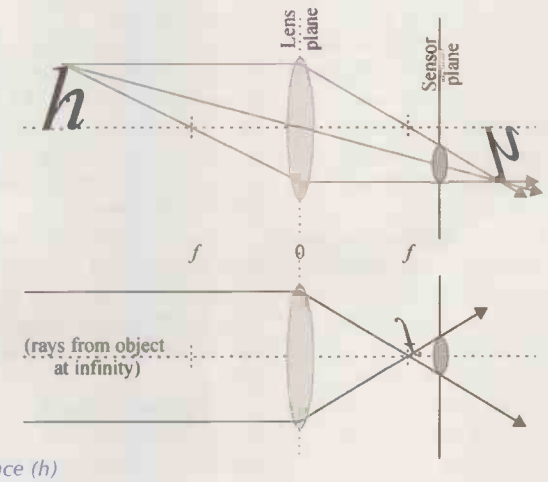
A little juggling gets u_n***=a/(a/u+d)*** and u_f***=a/(a/u-d)*** and after more substitution, ***u$_n$=a/(d*(n+1))*** and ***u$_f$=a/(d*(n-1))*** where ***n=a/(d*u)***, or ***u=a/(d*n)***.

This is a good time to use h, the hyperfocal distance, which is the value that u_n takes when u_f is infinite, and h=a/d.

Now, at last, we have a simple definition for the depth of field: if the lens is focused on a point at ***h/n*** (i.e. ***u=h/n***), then everything in the distance range from ***h/(n+1)*** to ***h/(n-1)*** will be in sharp in the image. So, the formula for depth of field is:

DoF = u$_f$ – u$_n$ = h/(n - 1) - h/(n + 1)

Take a good look at that definition. It depends only on *a* (the lens diame-

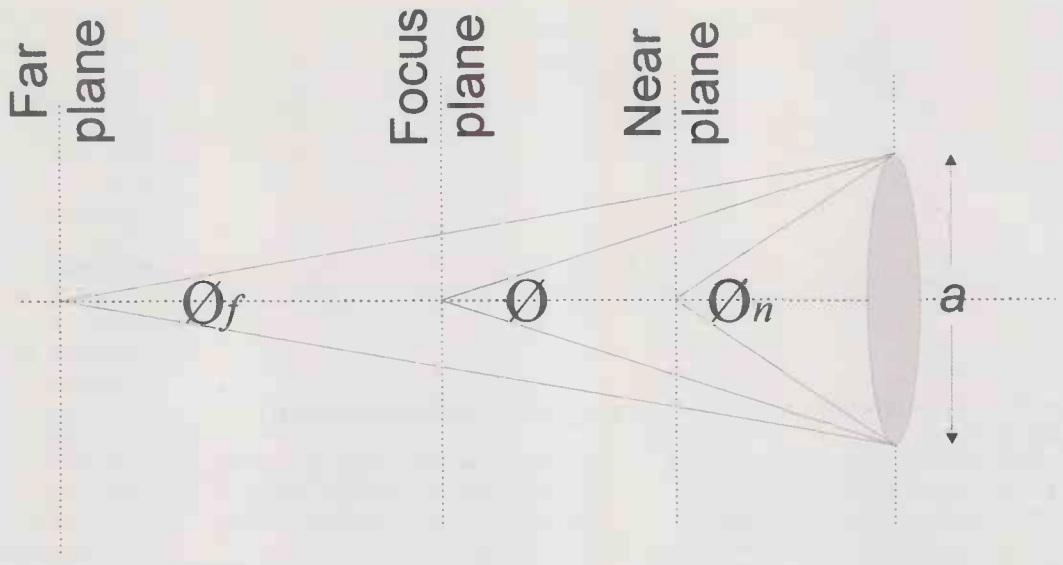


Hyperfocal Distance (h)

ter, a physical dimension), *d* (the size of the disc of confusion, another physical dimension), and *u* (the object distance, a third physical dimension).

It does not depend directly on *f*, the focal length of the lens except that *f* affects *h*, the hyperfocal distance.

One conclusion is clear: if we are using a zoom lens, then it does not matter whether we get close up with a wide angle, or a long way away with a telephoto; provided we keep the image size fixed, and the same *F* stop, the depth of field will be constant irrespective of focal length (since $F=a/f$).



Depth of field

Hands up all those who expected that! However, it does depend on image size.

Camera image size

We need to consider this because it indirectly affects the lens aperture. For a given field angle, subtended at the lens by an object in the scene, the required focal length of the lens is directly proportional to the image size. So the larger the image, the larger the physical aperture a must be for a give *F* stop since $F=a/f$.

Now we all know that, for example, a 35mm slide or negative is 36mm by 24mm, because we can see it.

But television sensors are hidden to us, so we have to read the makers' data sheets for values, and to use a bit of history to interpret them.

Camera image sizes are always quoted in inches. The value is the diagonal, just as for a display CRT.

However, just as in the CRT where the value can mean either the diagonal of the visible area, or the distance between the holes in the mounting lugs, or even something else, so the camera image size does not always mean what we expect.

In the early days, television images were formed on monstrous devices such as image orthicon tubes and the dimensions were of the actual image, 4.5" and 3" were common.

Then we had 1" and 2"/3 vidicon and plumbicon tubes, but by this time the dimension was not of the image but of the glass tube itself.

The actual image on a 1" tube was 16.5mm diagonal (13.2 by 9.9mm). Broadcasters have been using 2"/3 format for many years although some 1"/2 cameras are being used for economy.

The cameras used by amateurs are often 1"/3 or 1"/4 format so, using the same logic, the images are actually 5.5mm or 4.1mm diagonal (4.4 by 3.3mm or 3.3 by 2.5mm).

For the record, the used part of a 35mm movie film frame (4:3 aspect ratio) is 20.12 by 15.1mm, and super 16mm is 11.65 by 7 mm. To see how this affects things, let us take an example. A 35mm still camera with a 50mm lens gives a 'natural' looking image because perspective isn't distorted when viewed at the 'right' distance.

Conventional wisdom says that this is because the focal length is approximately equal to the image diagonal (43mm in this case).

But, being interested in the maths and not the suppositions, we can show (but I am not going to here) that the viewing distance for correct perspective is the focal length of the camera lens multiplied by the total image magnification.

Longer focal lengths flatten the image, shorter lenses exaggerate the foreground. Back to the 35mm image; to get the same natural image with a 1"/4 television sensor (4.1mm diagonal), the focal length must be 50*4.1/43=4.8mm.

Just to check, my Panasonic DX100 lens goes from 4.0 to 48mm, and that seems about right. So the lens is a lot smaller for small image formats, a lot lighter and a lot cheaper. That is why they do it.

This also means that, for a given *F* stop, the lens is a lot smaller, and the physical aperture a is directly proportional to image size. So the depth of field is inversely proportional to image size for the same *F* stop.

And that is why we cannot get short depth of field in amateur camcorders. QED.

Also, I have given you the means to calculate the Depth of Field for the entire system, since the size of the Disc of Confusion is the largest of that of the lens, camera, transmission system, display, and viewer's vision.

You cannot just talk of one part of the process, it makes sense only when the whole production and display process is taken into consideration.

Conclusion

Depth of field depends on object distance and lens aperture, visual acuity and magnification. It doesn't depend directly on the focal length of the lens.

It is pretty near impossible to get the same depth of field in a small television camera as we get in 35mm still photography. So, if we want to isolate foreground and background using depth of field, we'd better find another way.

The usual technique is to distort the perspective by getting in really close with the camera at a wide angle. That is fine for inanimate objects like flowers and insects, but humans tend to get a bit worried when a camera is thrust up to the nose, they feel a little threatened.

And they tend not to like having their noses looking very big either. By the way, there is a clue here about lensless imaging as in the pinhole camera and the camera obscura. Hands up who can tell me the depth of field for them?

roberts.mugswell@btinternet.com

Reader offer:

x1, x10 switchable oscilloscope probes, only £21.74 a pair, fully inclusive*

*Additional pairs as part of the same order, only £19.24 each pair.

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Cheques should be made payable to Telivision

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Please allow up to 28 days for delivery

Seen on sale for £20 *each*, these high-quality oscilloscope probe sets comprise:

- two x1, x10 switchable probe bodies
- two insulating tips
- two IC tips and two sprung hooks
- trimming tools

There's also two BNC adaptors for using the cables as 1.5m-long BNC-to-BNC links. Each probe has its own storage wallet.

To order your pair of probes, send the coupon together with £21.74 UK/Europe to ***Probe Offer, Television, Nexus Media Communications, Media House, Azalea Drive, Swanley, Kent BR8 8HU***

Readers outside Europe, please add £2.50 to your order.

Specifications

Switch position 1

Bandwidth	DC to 10MHz
Input resistance	1MΩ – i.e. oscilloscope i/p
Input capacitance	40pF+oscilloscope capacitance
Working voltage	600V DC or pk-pk AC

Switch position 2

Bandwidth	DC to 150MHz
Rise time	2.4ns
Input resistance	10MΩ ±1% if oscilloscope i/p is 1MΩ
Input capacitance	12pF if oscilloscope i/p is 20pF
Compensation range	10-60pF
Working voltage	600V DC or pk-pk AC

Switch position 'Ref'

Probe tip grounded via 9MΩ, scope i/p grounded

Camera motors and controls

Remember the days when cameras were pulled by men running backwards to capture sporting events like the long jump? Now it is all done with motors and servo controls.

Using mobile cameras to track athletes and events has made a huge difference to the quality of TV coverage. We have all grown used to seeing the determination and effort of athletes as they race for the line, but for the companies that design the camera tracking systems that give us these exciting images, the technical demands are escalating rapidly.

Media companies want better views, with centimetre-perfect tracking, and they want to see the technology applied to more sports disciplines. For the UK-based pioneer,

Camera Tracking Company (CTC), part of the Aerial Camera Systems group, has been at the forefront of this field since its inception in 1991 and needed a system re-design to cope with the escalating application program sizes forced by spiralling I/O levels.

Originally based on a Baldor UK SmartMove - a standalone servo motion controller with a 16-bit processor and 64kbytes of battery-backed RAM - the company upgraded its motion control systems to the NextMove BX.

The results could be viewed at the 1998 Commonwealth Games in Malaysia, which provided the venue for CTC to introduce new variations of its technology including a system which tracks gymnasts on the run up the vault, and a vertical system for tracking pole vaulters - a world first.

Gyro-stabilised camera

The motion part of CTC's system is based on a capstan-like drum driven by a brushless AC servo motor, to pull a gyro-stabilised camera payload along a carbon fibre track.

Over the past few years, more digital I/O has been integrated into this system to allow the operators to program in specific positions, accelerations, decelerations etc, in order to optimise the camera views and movement for specific events.

In total, around 100 digital channels are currently utilised, which are interfaced using options from Baldor's CAN-based I/O expansion range.

Controller area network (CAN) is a standard similar to Ethernet, but for process industry networking, and can itself be controlled at a higher level by an Ethernet network.

CTC's system also employs NextMove BX's built-in analogue I/O to give the operators fine control over acceleration and deceleration to make real-time adjustments to tracking specific athletes' performances.

Innovative motion control technology incorporated in Camera Tracking Company's mobile camera system is providing the first close-up filming of vertical sports action such as pole vaulting without track-side operators or cranes.

The MG2 rail system is a compact and lightweight tracking system which can currently run over lengths of up to 30m.

Housed inside a 14cm-high case with a vertical slide for the video camera, the system is controlled remotely over a network from a terminal which can be sited up to half a kilometre away.

Used for the first time at the Sydney Olympics in 2000 to cover pole vault, shotput and football goalmouth action, the system integrates the usually separate motion controller and electric motor drive into one compact box, and provides a fieldbus interface for communicating with it via a network.

These attributes allowed Camera Tracking Company (CTC) to construct the single-axis mobile camera controller in a little over half the space normally needed, and control it via a single cable - typically utilising standard microphone cabling which is often already in place at locations, or easily pre-rigged via contractors.

Space saved

The complete system is packaged in a box which stands 14cm (6") high, with folding support legs. The space saved has allowed CTC to create an automated mobile camera that can be located right next to the action.

The technology gives broadcasting companies the means to provide unforgettable close-ups of a new class of sports events including pole vault, discus and shotput.

The motion control system consists of a MintDrive with a matched perfor-

Dual head (Slomo and HD) Railcam used for athletics events at Athens 2004.

mance brushless servo motor - which Baldor provides with a special shaft to fit an existing gearbox design - connected to a belt-driven linear slide to carry the camera.

The slide is mounted on an aluminium extrusion which CTC provides in lengths of four or seven metres according to the event being covered.

MintDrive's integral CAN fieldbus interfaces were key to CTC's selection of the product, allowing it to send camera movement commands using the standard CANopen protocol, and to exploit CAN's versatile network sizing mechanism which allows data communications speed to be traded off against distance.

In this instance, CAN is typically providing a 100 kbit/second datalink over distances up to 500m. At the remote terminal end of the system, the operator uses a joystick and switches to manipulate the camera.

Normally, the CAN network is used to link to I/O or other drives which might be up to a few metres distant around a machine.

Like any specialist market sector, the broadcast industry has its own collection of niche suppliers, offering highly tailored solutions.

Although they may well be fit for purpose, their bespoke nature ties customers in, leaving them little free reign to be flexible, creative and – a vital capability for the modern environment – agile.

"Bitten by bespoke, that is the best way to sum up how our market currently operates," says Martin Coleman of Dorset-based Colem Communications.

Countless suppliers

"There are countless suppliers all with equipment that won't talk to the others – each supplier has its own language, standards and communication protocols.

"As well as controlling the actual dataflow itself, we also offer monitoring functions for basic maintenance and fault finding.

"Indeed, in some applications we even control the air conditioning and generators.

"Where an industrial engineer would see drives, motors, conveyors and robots, we see modulators, transmitters and antenna systems.

"What to some is a PLC, is an antenna controller to us – it is the same hardware, but it has been preconfigured for a defined purpose.

"We can now write software for each of our modules that will enable them to interface with anything else within the systems."

Camera Tracking Company's G2W rail system, unveiled at the Athens Olympics 2004, is specifically designed for coverage of Swimming.

All aboard for a digital future

John McLoone (right) and Robert Sydee of Horizon demonstrate the company's HDSM satellite meter.

Boris Sedacca profiles Horizon Global Electronics, a manufacturer of hand held test equipment for use in the digital broadcast and VSAT market.

The TV aerial installation market was almost defunct before the days of satellite TV. Now if you fancy your chances going up a ladder and can master working safely with tools at height, you can install a satellite dish.

Unlike analogue TV aerials though, you need an instrument that will accurately lock onto a digital transmission. A satellite meter is an application-specific spectrum analyser in portable form, designed because you cannot expect an aerial installer to carry a bench spectrum analyser up a ladder.

Furthermore, at around £1,500 a piece, the cost of equipping every installer would be prohibitive, hence the need for dedicated hand-held meters.

The original concept for Horizon's satellite meter in 1999 came from the requirement for accurate aerial alignment for BSkyB. At a time when spectrum analysers were normally used by laboratory engineers and technicians, their application had to be 'dumbed down' for satellite installation.

At its simplest, the display will show a bar graph in the presence of a signal, and the say 'Found' when it locks. At the other extreme, it will show RF dBuV, carriage noise and pre-BER/post-BER. The tool can be customised for engineers to allow them to read data.

The Horizon HDSM Digital Satellite Meter allows the installer to select a particular satellite by means of the front panel cursor keys, and works by using unique DVB references.

The installer merely connects the meter to the LNB, selects the satellite, and and aligns the dish. The correct LNB polarisation is made using the BER reading. In Europe, most direct-to-home (DTH) satellite television is either vertically or horizontally polarised.

There are exceptions such as C-Band or left and right hand circular polarisation satellites settings for which are available on Horizons web site or directly from technical support via email.

C-Band satellites are generally used to cover much larger regions of the planet and have a typically hemispherical downlink footprint.

By contrast Ku-band provides direct-to-home downlink footprints over specific regions like Europe, or specific countries within. For example Astra 2D's spot beam carries the BBC services on the Sky Digital platform from 28.2 degrees East on the horizon.

Parameter download

As new satellites come on stream, the meter can be updated by downloading the new parameters from Horizon's website through an interface cable supplied with the meter. The meter

has a memory for 32 transponder settings. The default file setting gives 16 pairs of vertically or horizontally polarised satellites.

All the functions are contained in four cursor keys. Pressing and holding the OFF key gets the installer into setup mode.

There is an option to turn the back light on and off, as well as the beep, which in the default mode will increase the closer one gets to the target satellite, and will then change tone once locked.

Sleep time can be set from 1-95 minutes so that the unit automatically turns itself off if it has been left on. A default option will reset the factory default settings without affecting the satellite parameters stored in memory.

The language of the display can be changed from English to French, German and Spanish. Other versions are available for other regions, for languages like Polish. Other options include linear or logarithmic values and BER ratio.

A LNB is typically attached to a dish, which is a reflective parabolic surface that focuses the microwaves into the LNB. The satellite feed is taken from the LNB via an F to F fly lead to the meter.

Horizon also makes the Pyramid LNB, a multi-focus universal LNB, for reception of three satellites from one dish, for example, Astra1, Eutelsat W2 and Hotbird or services three degrees apart.

The company claims quick installation via standard 40mm collar fixing. Switching is made via DiSEqC commands, and has a low current consumption.

Astra default

When the satellite meter is first switched on, the first satellite it will look for is Astra 2A, which is where Sky services come from. Carriage noise is measured in dB by pressing the ON button. Both pre-BER and post-BER readings are given.

The installer will adjust the azimuth and elevation position of the dish until the highest value is displayed on the meter.

"We now export 85% of our products," says John McLoone, sales director of Horizon Global Electronics.

"For example, we OEM for Kathrein in Germany. If you think of Rohde & Schwarz as the Rolls Royce of meters, then Kathrein is the Mercedes Benz. We also OEM in the US for Perfect Ten.

"We started in the US market three and a half years ago and were initially doing about 200 satellite meters a month. Now we average around 1,500 meters a month."

Horizon set up operations in India about three years ago in anticipation of five new DTH services launching there next year. With a population of one billion, McLoone anticipates that the Indian market will over the short term have a 20% take up from early adopters.

At 200 million this equates to a market the same size as the US, which has an 80% percent take up. Over 50% of the Indian population speak English as their first language, which makes market entry easier.

DVB-T meter

Horizon has also developed a new version of its DVB-T meter for terrestrial services like FreeView.

Horizon's HDTM Digital Terrestrial Meter uses a similar platform as the HDSM and shows UHF signal strength (RF level), DVB-T Mux indication and signal to noise in dB.

It also has simple quality of service indicators. The meter comes pre programmed with channels 21-69 and can hold up to 32 transmitter Mux groups allowing for customising of the meter.

"In

Horizon has also developed a new version of its DVB-T meter.

Europe DVB-T is still running a long way behind, so the market for meters has not been very buoyant," adds McLoone.

"Apart from the UK, Australia, Holland and Sweden are the key markets for DVB-T at the moment. Italy should have been there two years ago, but it is still in a right mess because they have problems.

"Germany's roll-out program stops and starts. Spain should have also been well developed by now. France is only just starting but has some way to go. Only this year has it been a serious market in the UK."

Most people understand now that you cannot use the old analogue tools for digital transmissions. An analogue signal can fade and come back again, and you can get ghosting and snow, but you might just be able to hold onto the picture.

When you go to digital, the picture is there or it is not – there is nothing in between. If the aerial is not lined up correctly, you get picture freezing or pixellation.

"Digital transmissions can bounce off things," continues McLoone.

"If you stood on the roof and could see the transmitter, this is not necessarily the direction that the aerial will be pointing. When Kathrein was testing with digital meters for example, the signal was actually being bounced across the Alps and back again."

McLoone recalls Sony suffering a high returns rate on its DVB-T enabled TVs in Australia because an installer was not using test equipment. Now the installer has to record meter values like dB and signal-to-noise ratio on an installation certificate.

End user prices: HDSMV2.5 £250.00, HDTMV2 £299.00 (plus carriage, plus VAT.)

www.horizonhge.com

Horizon's HDSM digital satellite meter.

Competition

Win a Horizon HDSM satellite meter

Television is offering its readers the chance to win a new Horizon HDSM satellite meter.

Horizon Global Electronics Ltd was established in the UK in Late 1999. The company is a world leader in the design and manufacture of hand held test equipment for use in the digital broadcast and Vsat market.

The original HDSM meter was developed for use by BskyB installers in the UK and is now used by the BBC, BT, Hughes, Bentley Walker, SCC, Aramiska, Onstar Beam, SIS and many more.

The Horizon Digital Satellite Meter (HDSMV2.5) is for the easy alignment of satellite dishes. Battery driven, the meter finds a satellite chosen from the menu. 32 transponders or 16 satellites can be stored at any time.

From a set up menu the following features can be customised on the display: signal strength in numerical or dBuV, BER in % terms or numerical, carrier noise in dB, True BER after install, graph or Logarithmic.

The satellite data is upgradeable from downloaded HEX files via our web site taking around 30 seconds to update, this feature is very useful for specialist applications like broadband or Vsat installations.

Different languages are available for the display with up to four languages being stored at any one time. The meter comes as a kit with car charger, mains charger and computer interface lead along with a leather case.

Specifications

- Signal Strength and BER displayed together
- 32 Transponders or 16 satellites, horizontal & vertical
- Audible tune-in, with back light
- DVB, C&Ku band, Mpeg, V Sat compatible
- Input dynamic range -65dBm~-25dBm
- Input connector F-female. Input imp 75 ohms
- Symbol Frequency rate from 1 Msps~45Msps
- Universal charger 100 V ~ 240 V Ac/ 12 W. Intelligent Charger (CE approved) with delta V delta T detection Fast charge, then Trickle
- Run time with full charge (single LNB): Minimum 3 hours from 2.4Ah NiMH battery
- Figure of 8 mains input connector. 2.1 mm Female PSU plug for external charge via supplied car charger
- LNB short circuit protection 500 mA automatic limiter
- RF input range 950- 2150 MHz
- Computer interface: Serial Port (COM 1,2,3 or 4) for
- Upgradeable software on satellite settings
- RF level can be displayed in dBuV (accurate to +-1dB) or linear scale (256 steps). Feature available in set up mode
- C/N (carrier noise) is displayed in dB
- Quality (Pre B.E.R or bit error rate) is locking on faster making it easier to lock on to the satellite initially typical lock in less than 100 mS
- Instead of "found" to indicate lock of correct satellites actual BER can be displayed. Feature available in set up mode
- The quality (Pre BER) bar graph can be logarithmic rather than liner. Making it easier to peak the dish and helps with weak satellites. Feature available in set-up mode
- Diseqc switch commands available in submenu

To enter the competition, please fill in the form below and return it before 31st January to:

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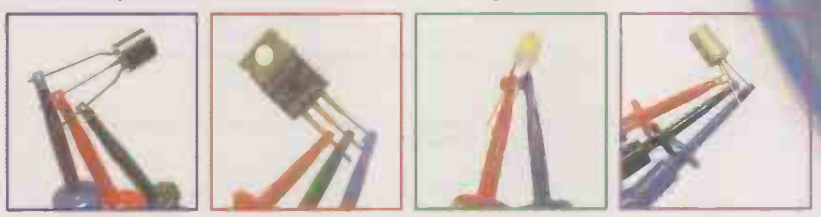

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LCD Technology

Part Two

By Fawzi Ibrahim

Figure 1 shows the component parts and the function each of the backlight assembly unit. The orientation of almost all parts is specific and must be adhered to.

The backlight itself is normally cold cathode fluorescent tube (CCFT) although other types are also in common use for larger screens such as tungsten-halogen and metal-halide.

CCF tubes are not unlike the fluorescent tubes used for office building lighting, just smaller in size. These narrow-diameter tubes are very bright and can be configured as single, double, or L-shaped edge lights.

They require an alternating sinusoidal voltage in the region of 500–1000V rms (700–1500V peak). To produce such a voltage, a DC-to-AC inverter is used.

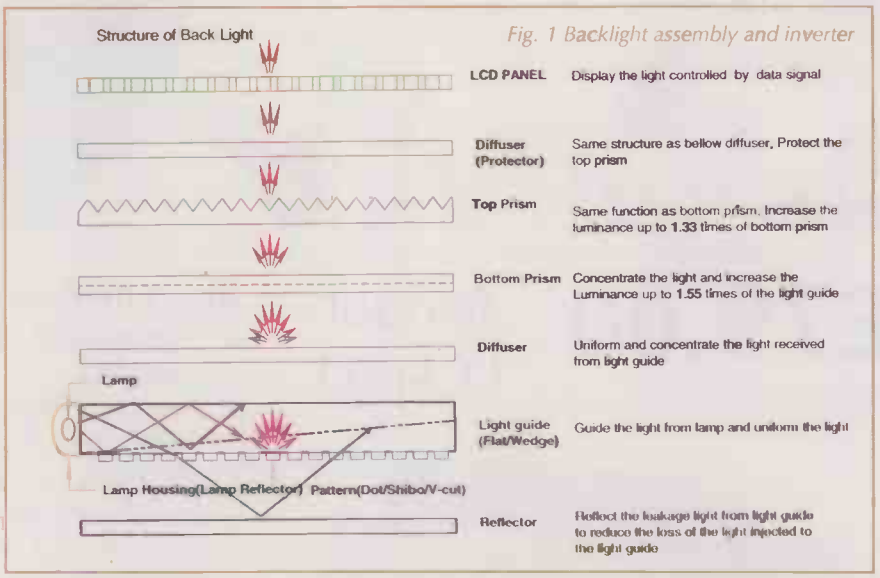


Fig. 1 Backlight assembly and inverter

CCFT parameters

The following are the main parameters of a cold cathode fluorescent tube that have to be considered when designing the driving dc-ac inverter or in replacing the tube:

Starting voltage (typical values 1000–2000V peak). Also known as the discharge voltage, the starting voltage is the minimum voltage required to ignite, i.e. start the tube. The starting voltage is usually 50% higher than its operating voltage. The starting voltage is the primary parameter which determines the 'end of life' for the tube. The older is the tube, the higher is its starting voltage.

Operating voltage (typical values 700–1500V peak). This is the voltage across the tube when it has been lit. It is a key parameter in the design of the dc-ac inverter.

Tube current (Typical value 5mA rms) The current through the tube determines, to a large extent, its brightness. It also indirectly determines the tube's useful life. In general, the tube's life is the square of its current. If the current increases by 20% above its normal value, its life span decreases by 40%. Higher than normal current also results in excessive heat.

Frequency (typical value: 40–60kHz). Frequency generally has no effect on the brightness of the tube, its efficiency or its useful life. However, it does have an impact on the compatibility between the tube the display itself and the graphic information displayed by the tube.

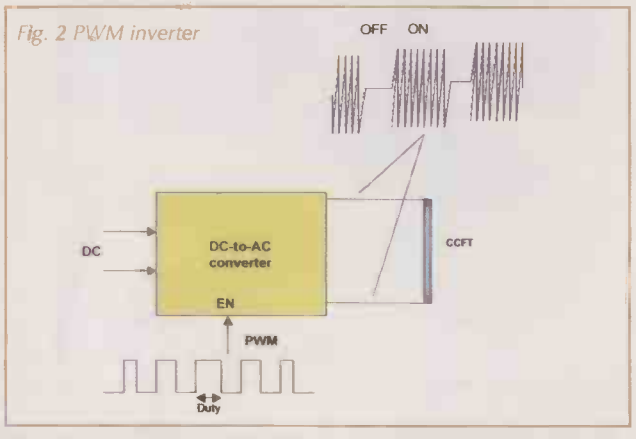


Fig. 2 PWM inverter

Waveform. An undistorted current and voltage sinusoidal waveforms are required to avoid radiated electric noise that may impact on the system and surrounding environment introduced by a distorted sine wave. Although dc-ac inverters produce pure sine waves, the dynamic nature of the tube distorts both the voltage and the current waveforms.

Impedance. A high impedance is presented by the CCF tube assembly which is in the region of 50–70kΩ.

Dimming Techniques

There are two basic methods for dimming the CCF tube used in backlight LCD panels: analogue and digital. The analogue approach simply reduces the tube current either directly or indirectly by reducing the voltage applied to the tube. The digital technique employs a pulse-width modulated (PWM) pulse to turn the inverter on and off (Figure 2). If the inverter is turned on for longer periods than it is off, a brighter light is produced and vice versa. The frequency of the PWM pulse has to be chosen carefully to

avoid interaction with the frame rate. A typical value is 270 Hz and in the case of PC monitors, it is varied with the frame rate itself to avoid interference with the graphics.

The DC-AC inverter

Essentially, the DC-to-AC inverter is a tuned collector oscillator (Figure 3).

When power is switched on, the transistor conducts feeding power into the inductor L. When the inductor saturates, current ceases and the back e.m.f. forces the current to reverse. Energy in L is now transferred to C.

When C is fully charged, its energy is now transferred back to L and so on. The output across the secondary of the transformer is a pure sine wave.

Figure 4 shows the basic elements of a practical DC-to-AC inverter. C_P is the primary tuned capacitor which resonates with the inductance of the primary winding of transformer T_1.

C_S is the series tube capacitor employed to present high impedance in the range of 50 – 70 kΩ to the inverter.

At the frequency of operation, the impedance is very high making the inverter act as a constant current source.

The output is a sine wave with a slight distortion caused by the reactance of the tube. Because of the very high impedance, measuring devices such as a DVM or a CRO would load the output enough to render the readings almost meaningless.

A current probe should be used to observe the shape of the waveform on an oscilloscope.

Figure 5 shows an integrated solution using a single chip (OZ962) for inverter control with push-pull drive.

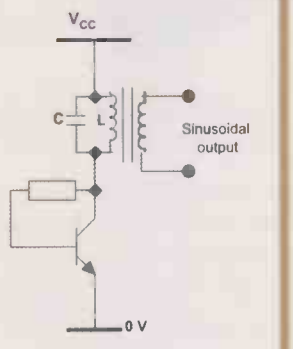


Fig. 3 Tuned collector oscillator

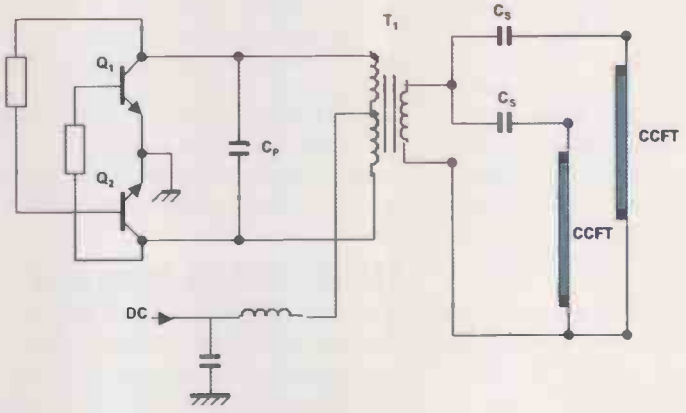
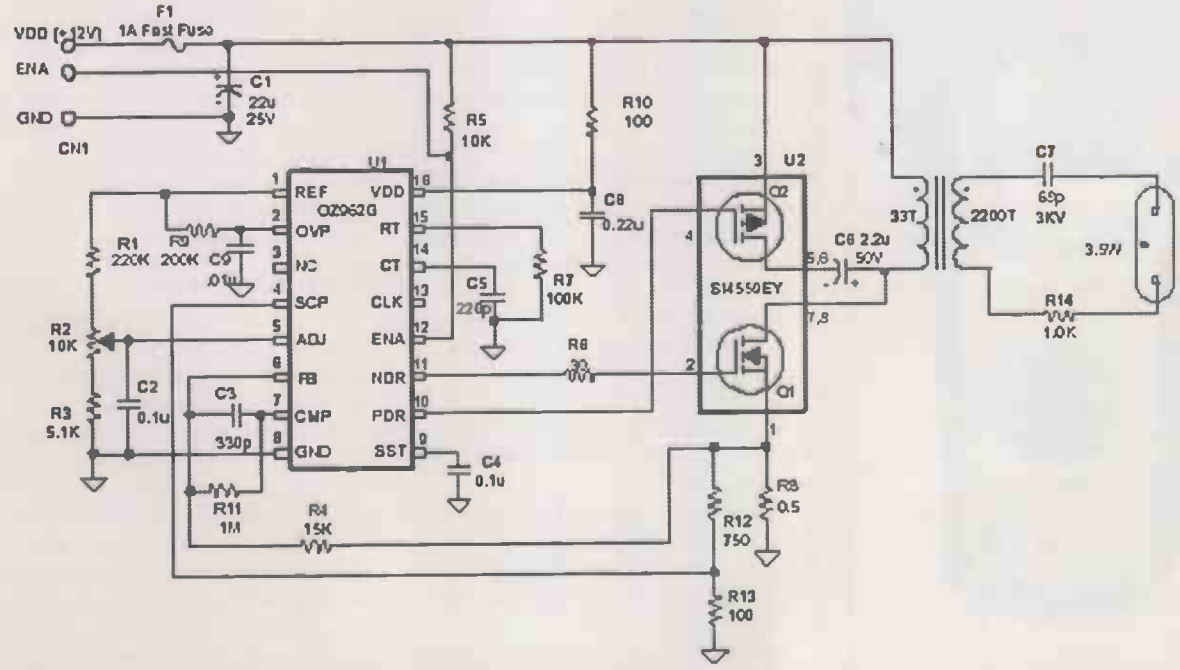


Fig. 4 practical DC-to-AC inverter

Fig. 5 An integrated solution using a single chip (OZ962) for inverter control with push-pull drive.



When an AVO is not an AVO

In response to the recent lively correspondence in this magazine about all things AVO, Mark Johnson of Megger, AVO's present-day successor, gives the inside story, covering not only the company's history, but also current products of interest to Television readers.

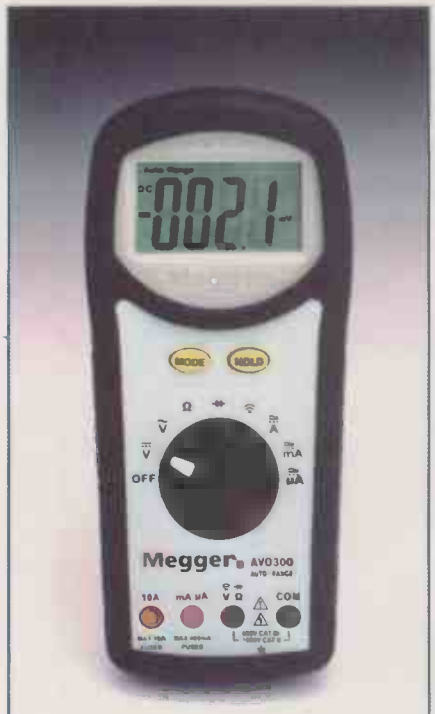
An original AVO 8 - impossible act to follow?

When is an AVO not an AVO? When it's a Megger instrument, of course! Before plunging into the history and present of these long established yet always dynamic brands, it is perhaps worth making it clear that there are no currently manufactured products that bear the AVO name.

That does not mean, of course, that you can no longer buy products that continue the AVO tradition of combining quality and innovation with safety and reliability, it just means that you have to ask for Megger.

This may seem perverse, particularly to those of us who were brought up to revere AVO instruments, but the change was made for excellent reasons, as will become clear.

Let's begin at the beginning, however, with the name Megger. This trademark recently celebrated its centenary, having been first registered on 25th May 1903.



Megger's AVO300

This, incidentally, makes it much older than the AVO name, which was first registered as recently as 1923.

The name Megger was initially applied to insulation testers devised by Sydney Evershed who was the first to realise that effective insulation testing could only be carried by using test voltages at least as high as the normal working voltage of the system under test.

Hand cranked generator

Evershed joined forces with Ernest Vignoles in 1895, to form Evershed and Vignoles. The company's insulation testers were incredibly successful, and will be remembered by many for the hand-cranked generator that they incorporated.

Some may also remember how useful they were for administering relatively safe electric shocks to unsuspecting apprentices and trainees!

The rise of the AVO has already been covered in this magazine, but it is worth briefly re-telling the story with some added detail.

Donald Macadie, a Post Office engineer, was the initial driving force. Having become tired of lugging around a bag full of test equipment every day, he came up with the idea of a multi-function instrument.

This was to be for DC use only, and to have three voltage ranges, three current ranges and two resistance ranges. The basic sensitivity was 12mA (83 ohms per volt), and there would be no fuse or other protection for the movement.

Following an approach by Macadie, the Automatic Coil Winder and Electrical Equipment Company (ACWEECo) developed this concept into the first AVO meter.

This had a high quality moving coil movement, knife-edge pointer and a large five-inch scale with an anti-parallax mirror, all housed in a robust case. Two rotary switches selected the ranges.

If this sounds familiar, so it should; all of these features have survived into present-day production, an exceptional tribute to the foresight of the AVO pioneers. So successful was the instrument, that ACWEECo ultimately changed its name to AVO.

Key developments over the years include the introduction of the 'Universal' AVO meter in 1933, which was given its name because it could measure both AC and DC, and the Model 7 in 1936, which was the first to incorporate a mechanical trip (that little button that jumps out at you) to protect the movement.

That favourite of the radio and television servicing industry, the Model 8, was introduced in 1948. Offering the amazing sensitivity, for its time, of 20kohm per volt, it used special carbon resistors to achieve 2% accuracy, and each individual instrument was hand calibrated.

Braille version

1951 saw the launch of a Braille version of the Model 7, but one suspects that this had little appeal in the television servicing trade!

A more significant development, and a portent of things to come, was the introduction of the company's first digital meter, the DA114, in the late 1960s.

No LCDs in those days – this ground-breaking 25-range instrument used neon-filled Nixie numerical display tubes, one for each digit.

The early 1970s brought an internal redesign of the Model 8 to use printed circuit boards in its construction,

although the external appearance remained largely unaltered.

Also, at about this time, AVO and Megger came together under the auspices of Thorn Industries.This is really the end of the story for the development of the traditional AVO meter, as in most applications, it was quickly supplanted by electronic digital instruments.

the DA114 used neon-filled Nixie numerical display tubes

Even today, however, there is a small market for analogue instruments, and the Model 8 in its latest Mk7 incarnation is still manufactured, albeit to order only, to service this.

So, what has happened to the AVO name, and why? Megger is now an international company, with development and manufacturing facilities in both the US and the UK, and with sales representation in almost every country of the world.

To enhance its already substantial success in such a broad market, the company needs a strong, universally recognisable brand name.Market research, however, revealed something that those of us who live and work in the UK may find surprising.

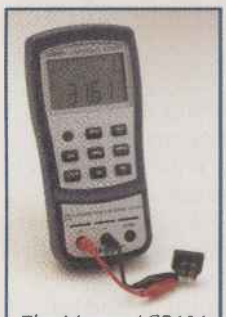
Outside of the UK, the AVO name was very little recognised, but the Megger name was well known. Within the UK, recognition for the AVO and Megger names was about equal.

With these facts to hand, it was not difficult to decide that the Megger name should be applied to all of the company's products.

AVO Institute

The AVO name has not quite disappeared. It has been retained for the company's training division, the AVO Institute, which offers courses largely related to testing in high voltage and high power systems.

Also, Megger multimeters bear a model numbers, which in tribute to their ancestry, start with the letters AVO. Indeed, if you were to spend the £750 or so needed to buy a new Model 8, you might well find the AVO logo moulded into its front plate, even though it is officially a Megger product.



The Megger LCR131 component tester

As the foregoing has shown, throughout its history, Megger has always been at the forefront of developments, and has always been highly regarded for the quality and durability of its products.

These things have not changed, and Megger today remains committed to innovation and to the supply of test equipment that maximises safety and convenience, while offering outstanding value for money.

Likely to be of particular interest to service engineers is Megger's AVO300 range of digital multimeters. These tough compact instruments are designed to withstand the rough and tumble of daily use in the field, while maintaining both their accuracy and appearance. They are fully auto-ranging, and cover voltage up to 1kV and current up to 10A, AC and DC.

The resistance range covers 0.1 ohm to 40 megohm. Timesaving diode test and fast-response continuity buzzer functions are also provided.

The AVO310 model adds a maximum/minimum function that is invaluable when chasing those elusive intermittent faults, and all models have large liquid crystal displays that are easy to read, even when crouched in the dim recesses behind some huge immovable widescreen TV.

The design of these multimeters also reflects Megger's ongoing concern for user safety, and they are fully compliant with the requirements of EN61010-2-32 for Cat III 600V and Cat II 1000V use.

This guarantees safety in any normally servicing application, something that certainly cannot be claimed for some of the very cheap – and very dubious – instruments that are offered to the servicing trade.

Compact and rugged

Also of interest is the Megger LCR131 component tester. Compact and ruggedly constructed like its multimeter counterparts, this handy instrument analyses a broad range of discrete electronic components.

It accurately measures inductance, capacitance and resistance and is ideal for checking electrolytic and ceramic capacitors, transformers, speaker voice coils and transformers as well as standard LCR components.

Measurements can be made at 120Hz or 1kHz and the average accuracy achieved is ± 0.5%.

A particularly useful feature of the LCR131 is a dual display, which means that the instrument can simultaneously display the value of the component, along with D/Q (dissipation/quality) factors, as appropriate.

Parallel or series mode

A choice of parallel or series mode is also offered, which allows all of the measured values in series or parallel equivalent circuits to be displayed.

Finally, for those whose work involves domestic appliances as well as audio-visual equipment, Megger's new MMC850 clamp tester is worthy of consideration.

Simply by inserting a two- or three-core cable into the clamp, the tester displays the current flowing in it.

There is no need to disconnect the cable, or to separate the cores. This provides a very fast and accurate way of, for example, confirming that the current drawn by an appliance is within expected and acceptable limits.

The instrument has a resolution of 0.1A, and measures currents up to 100A, so it is certainly capable of handling every situation that is likely to be encountered in the domestic field.

It is, perhaps, worth mentioning that Megger's current product range now extends far beyond the products already discussed.

In the domestic and industrial area, the range includes PAT testers, an extensive new family of products for testing electrical installations, and testers for both optical and fibre-optics networks.

The company also offers many specialised products, including insulation testers which working voltages up to 10kV, testers for power distribution transformers, and some of world's most sophisticated automated equipment for testing the protection relays used in high-voltage power distribution systems like the national grid.

While some of this may seem a long way from servicing domestic equipment, it does give an indication of Megger's capabilities, and of the level of expertise behind every single one of the company's products.

Megger's new MMC850 clamp tester

Given the company's name change, it is perhaps acceptable to think of AVO as a respected name from the past. Megger, however, is without doubt the name for the best of testing today, and on into the future.

www.megger.com

What a life!

Donald Bullock's servicing commentary

Old Don's nice plush chair ✎ Where the gum chewin' chappies come from ✎ A less than perfect electrolytic ✎ A burly and big-booted chap

I say, you chaps, it's jolly dee to be sitting in Old Don's nice plush chair. My name's Flighty, by the way. Flying officer Flightly, actually, though I'm dashed sure that you'll tell me I look far too young!

Old Don's slipped out to have his wig tidied up and his knees planed down, or his deaf aid turned on, or something, and when I popped in earlier young Greeneyes asked me to guard the fort whilst she went to do some invoices or other...

I said 'yes' right away, o'course, 'cos I like Greeneyes! I daresay she'll clop in anytime now with a nice cuppa tea for me. Lovely little thing, she is. Dunno what she sees in Old Don.

She ought to swap the silly old bounder for somebody like me, and come for a spin or two over the clouds in my zippy kite... Now, that'd be a jolly good wheeze! I rather care for that...

Fact is, you fellahs, a couple of Old Don's sons have warmed me old heart this week by making a pair o' technical moves that made me proud of 'em. Must have got their brains from young Greeneyes, I reckon...

Let's start with Steven, eh? Felt a bit down-in-the-mouth the other week when some bounder brought him a Toshiba laptop computer-thing with a damaged DC power-socket.

Don mentioned it at the time in the old column from this chair... Daresay some of you remember it....

Steven ordered a new socket from his Toshiba Spares fellahs, Hugh Symons from Dorset, and they had to tell him no-can-do! Said they couldn't get 'em from Toshiba! Not supplied on their own, and all that! That he'd have to pay four hundred quid and more for a complete new main board!

Well, that got young Steven's rats up, I can tell y'u! Dash it all, he knew that the blasted socket is only worth peanuts, as they say, and would have been simplicity itself to fit!

But what could he do? He couldn't charm a new 'un out of the air, could he? So he couldn't repair the old boy's machine. He had to bally-well put the dashed computer-thing back together again and send the poor client away with his costly computer useless and his tail between his legs! Poor bounder!

And it gave Steven a lot of work for no return, don'tcha know, what with stripping the thing down and writing and telephoning for the spare, then having to put it all together again and ending up with a miserable would-be customer to boot! Well! I mean t'say...

Schools and things

Well, soon after, they got a run of laptops in from the Education chappies – schools and things – all with the same trouble, don'tcha know – all with their pappily-made DC power sockets falling apart, what?

There were about eight of 'em - another Toshiba, a couple of IBMs, and four or five Acers amongst 'em... Saw 'em m'self....

Well, this is where the worm turned, so t' speak! Where Steven made his move. He came and sat at this computer-thing and looked up the old Google, typed in 'Lap Top Jacks' and got hold of a company called www.laptopjacks.com in the jolly old United States – you know, where the gum-chewin' chappies come from!

Dashed detailed website-thing, they had, and they seemed to specialise in DC laptop-jack-sockets for pretty-well every make there is!

Well, he winged off an eMail and immediately got a reply from their fellah there – a chappie called Mark Godovich who took an order right away for ten jack-sockets at $5.99 each, plus $10 postage to the UK! Cost Steven $69.90 altogether – about £44.00 – and they arrived in about five days.

He had the laptops repaired in no-time, the money in the till, and eight or nine well contented customers who thought the firm was wonderful and went around singing its praises! Gotta hand it to these Yank-fellas, y'know. Unashamedly commercial, what? No hanging about at all, old boy!

So if any of you fellahs need power sockets for laptops – and I'll bet no end of y'u do – you know where to go!

Then there's James Quentin, y'know, their son who looks like a professor! Seems to thrive on a bit o' hammer, Don reckons. Says he repairs Philips video recorders for one thing! More than Don'll do, as he'll tell y'u, with their chewing-gum pinch rollers and pappy mechanics...

Anyway, James had this Philips recorder on the bench – a model 23DV1, it was, and it was dead, with the power supply gently pulsing away. He got into the old power circuits, changed the SMPS IC and replaced one or two faulty semi-conductors, and this 'n' that, but the darned thing just wouldn't come to life!

He couldn't understand it! But o'course, he's a scientific blighter, James is. Ran his logic all around that power board and decided to carefully re-check the value of everything he could reasonably suspect. But everything passed muster!

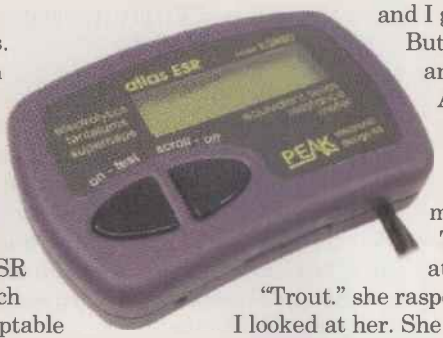
Even when he got the old Wheatstone Bridge to the 47 mfd 25 volt electrolytic capacitor that sits with the SMPS chip! It was 47 mfd. alright, said the bridge. Absolutely bang-on! And that was that!

Brainy fellah

Or was it? After thinking a bit, he looked out a Television article by a brainy fellah – Alan Wilcox, I think it was, expounding the advantages of testing the capacitance of an electrolytic capacitor whilst applying a high frequency RF voltage to it.

Just then a rep called in, and he happened to have, on his wagon, a new meter designed to do just that! An

The Atlas ESR 60. James bought one on the spot.



Atlas ESR 60, it was. James bought one on the spot, and checked the so-say perfect 47 micro-farad electrolytic with it, and found it wasn't so perfect after all. It had an ESR reading of eight, which made it quite unacceptable in that appplication.

Well, I don't have to tell y'u that when he fitted another capacitor, the dashed recorder burst into life!

So there it is, chaps. Two bits of jolly-good original thought that paid dividends. It's using the the old grey-matter for original thinking that counts, I reckon.

Ah, I can hear some clopping! It'll be young Greeneyes with that mug of tea. My word, you do look lovely, m'dear! Just having a chat to old Don's usual company, don'cha know, what with him gone for his face-lift-thing.

Hm!! Lovely tea! Gosh, you do look charming, m'dear! Anyway, that's Old Don's car drawing onto the front, I reckon. Hi, Don! Just keeping your chair warm, old mate, and chatting to your lovely wife. She'll have to make do with you now!

❄❄❄

"Would you like a nice cup of tea, dear?" asked Greeneyes as I settled in my warm chair. "Good idea!" I said.

"And the sooner the better, otherwise I might get bored enough to scan back and read some of Flighty's silly ramblings!"

But I needn't have worried, for at that moment James Quentin telephoned.

"I can't tell you how useful that Atlas ESR60 is!" he enthused. "I've just repaired a Sony television set – a KVX2942U model that uses the AE1C chassis. Its trouble was intermittent starting up.

"When it wouldn't start, its front-panel LED flashed in sympathy with its pulsing sound. I checked the power supply electrolytic capacitors with the bridge and found that whilst C605 and C611 were low, the others tested alright.

"But when I checked them with the ESR meter I found that C608 and C617 had very high ESR readings. And replacing them completed the repair and cured the set!"

"Hm!" I said to Greeneyes afterwards. "To think that for the bulk of my servicing life I had no more than an Avo Seven! Didn't even have a 'scope for the first fifteen years! Shows how clever I was, I s'pose!" and I gave her a sly wink.

But she simply snorted and clopped away...

At that an old couple waddled in with a Sony camcorder, a model CCDTR760.

The woman looked at me.

"Trout." she rasped.

I looked at her. She gave me a curt nod. I sat thinking a bit, then blinked up at her.

"Trout?" I enquired...

"Yes." she grated. "I'm Mr. Trout, and Horace here is Mrs. Trout." I looked at her.

"Surely, you mean that you're Mrs. Trout, and Hor..." Horace touched my elbow and slowly flagged me down...

"Tell Mr. Bullock the trouble, Horace." she said. I looked at him. He breathed in.

"It doesn't always work." she said. "Tell him, Horace." He breathed in again.

"It stops in Play." she said. "What else was it, Horace?" He breathed in again.

"The buttons don't always work" she said. "You tell him, Horace." He sighed.

"It sometimes won't accept a cassette." she said. Horace started to fill his pipe.

"Never mind your bloody pipe!" she screamed at him. "Talk to Mr. Bullock!" I gave him a weak smile and waved them out, and Paul started to dismantle their machine.

"I know exactly what I'm going to find wrong in here." he said.

"How come?" I asked. "You psychic?" By now he'd opened it, and he pointed to a fine strip of ribbon cable that connects the function buttons, the eject switch and the record switch to the main board. It was cracked.

"As the carriage slides in and out, the ribbon cable repeatedly flexes along one side of the carriage, causing it to eventually split and sever some of the conductors." he said.

"The good news is that I've encountered so many that I have the part number in my head. Its 1-661-052-11, and it can be got from Charles Hyde." I looked at him.

"You're gonna tell me the bad news now, aren't you?" I asked. He nodded.

"Sure am. The ribbon cable is absurdly over-priced at £55.00 plus VAT."

"You'd better telephone Mr. Trout first, I reckon." I said. "There's no point in wasting your time telling poor old Horace."

I looked through the glass door to see a burly and big-booted chap striding towards the shop. He kicked the door open without slowing, and stood astride in the middle of the shop.

Bristol prison

"My name's Buck." he boomed. "I'm a Bristol warder just transferred to here. I want my set mended fast and you can send the bill to Bristol prison!"

I shook my head. "It doesn't look as though we can do business, Mr, Buck." I said. "Not knowing the cause of the set's trouble, we can't say how long its repair might take. And if we did repair it, you would have to pay us and use your receipted bill for your own purposes."

"Then you can go to blazes." he boomed, and strode out.

"Sure hope I never get put into the local pokey!" I breathed...

Trapped duster

I had another eMail from Chris Drew the other day, referring to my story about the fellah who tried to clean the plastic cabinet of an Ultra Twin radio with a tin of switch-cleaner and a duster. You'll recall that the cabinet dissolved and trapped the duster for keeps.

Chris recalls that around 1970 he cleaned the office telephone and, for good measure, his plastic bicycle light, with a newly available brand of contact cleaner, and it did a good job – until, a few weeks later, when both items split in half!

He doesn't name the contact cleaner, but I bet it was called Electrolube! Is that right, Chris? This came in a tiny plastic bottle with a flexible spout, and cost £1 trade price when an engineer earned about £9 a week.

It certainly was a very good and effective contact cleaner, but as Chris says, it wasn't very kind to ABS plastics.

Damien Thomas, an engineer who both sells and repairs television sets in his small shop, tells me that while he has been in the trade since 1975, what happened to him lately took the biscuit!

"I have sold sets over the years to an old couple, Mr. and Mrs. Cheak, and, of course, repaired them when necessary.

"The other night, as I was locking the shop, my mobile telephone rang. It was her, saying that the 28" set I'd repaired two years ago had failed again.

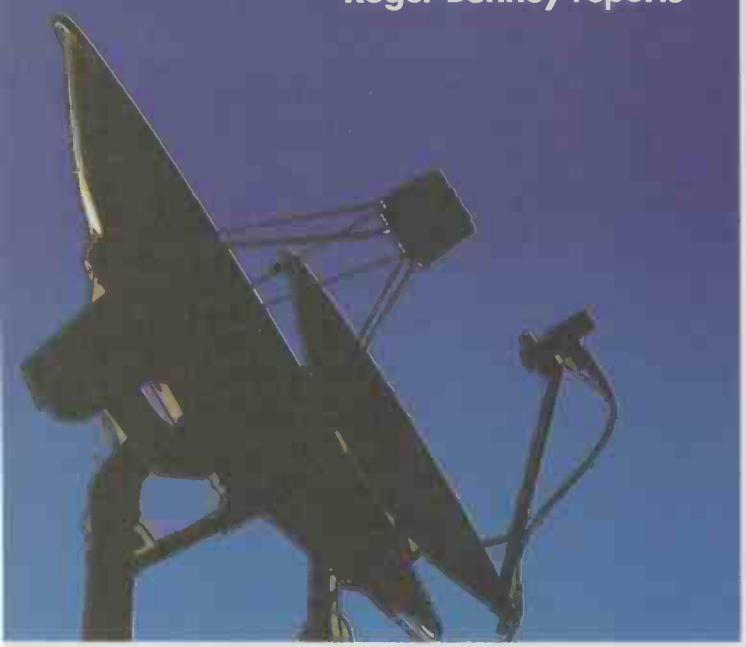
"As they lived close, I said I'd call on the way home to my evening meal. Mrs. Cheak greeted me with a broad smile, told me that they didn't want it repaired, and would I take it away for spares."

donald@wheatleypress.com

DX and Satellite Reception

- Terrestrial DX and satellite TV reception reports.
- Broadcast and satellite TV news.

Roger Bunney reports



In the depths of winter and November has reflected the usual situation for distant TV reception, nothing! Cyril Willis (Kings Lynn) noted a mid afternoon minor Sporadic E opening on the 15th from Italy with RAI chs. IA, IB and an Italian private station - TV Luna on ch.E2. The Leonids meteor shower didn't give the anticipated boost of short 'ping' signals though ch. E2 on the 19th was rather active with scatter signals.

Good news however from Gareth Foster who reports successful digital TVDX (DTVDX) from St. Boniface Down, Ventnor in the South Wight. Late October armed with a battery TV, 12 element wideband UHF aerial and a Commag digital box (Lidl special offer) and in flat conditions he found 3 French digital TV muxes on chs. 32, 34, 63 via auto scan, a manual scan brought in ch. 53. The Cherbourg muxes on chs. 49, 57 were present but with no programme content. Being 100m from the Ventnor TV relay mast however restricted much of his Group B operation. The French muxes received contained between 4 - 6 TV channels. Conditions were poor which suggests that given a Tropospheric lift DX should be excellent. For the record, the upcoming Lidl weekly offers can be checked out on their web-site so a close check will confirm when any imported VHF/UHF digital boxes are available – but they sell out quickly.

Broadcast News

Scotland. OFCOM confirm that Grampian and Scottish TV are to jointly support a digital Gaelic language TV channel opening in 2007 along with the BBC, eventually the commercial TV companies reducing involvement and allowing the BBC to continue operation of the channel. Once the Gaelic language TV channel is established Scottish and Grampian can then reduce Gaelic content on their main TV channels.

London. Perhaps too late for readers of this column but 'National Grid Wireless' have run a DRM (Digital Radio Mondiale) test period from Crystal Place starting October 31st 2005, lasting approx. 6 weeks @ 26.080MHz with 400watts erp.

Belgium. The Council of State have declared the 300 metre high transmitter mast at Sint-Pieters-Leeuw is illegal, the area being re-designated as agricultural land. The mast has been in use for several years and carries 6 radio and 2 national TV channels.

RSL-TV, UK. The Isle of Wight 'Solent.TV' local station is to air on Astra/Sky and you can view preparations on www.solent.tv/sky2.aspx. Our aerial expect Bill Wright took several impressive pictures of the transmitting aerial system for the RSL 'York TV'. Full details of 'York TV' and their aerial system atop a water tower can be found at http://mb21.co.uk/gallary/askham-bryan.asp

Spain. Commercial TV stations Antena 3 and Tele-5 have dropped legal proceedings against the government after what they considered was biased treatment with a rival broadcaster. The government will now grant DTT channel allocations to all commercial broadcasters rather than go out to tender. With consumer awareness growing for DTT and the prospect of more FTA DTT transmissions so the sale of set-top boxes has grown rapidly with nearly half a million sold this past year.

European News Exchange from Luxembourg (W2)

Digital News

Prague in the Czech Republic has opened a Band 3 DAB transmitter in Euro block 10A (209.936MHz) with 5 radio channels. Prague's DVB-T transmitters are now operational on ch.R25 - Praha-Mesto (5kw erp) and Praha-Cukrak (2½kw erp) transmitting CT-1, CT-2, CT24, Nova-TV. Meanwhile in the Slovak Republic DAB may open during 2006 with the national radio services in Block 12C (227.360MHz) and the regionals in Block 12A (223.936MHz) and 12B (225.648MHz). There will be a closedown of Band 3 TV transmitters operating in ch.R12.

France. DAB-Block 11B (218.640MHz) is currently transmitting audio from TF-1, LC-1, Europe1, Europe 2 in the Paris region. Canal Plus opened their PAY-TV DTT service end November 2005 offering either a 'Premiere' or a 'Minipack' package. Some 200,000 MPEG-4 decoders have been ordered which rent at €8 monthly.

Holland. The Dutch government have announced that ALL radio transmissions will be digital by 2015, following the move of the UK and Germany to also close analogue and be 100% digital in that year. The first digital radio licences will be distributed in 2006 with more in 07 and 08.

Finland. Further expansion of digitalisation of the broadcast system will allow 99.9% of the population to receive DTT. More relays will extend coverage over the next 2 years leading to analogue closedown on August 31, 2007. All DTT will be UHF.

Switzerland. DTT (UHF) is already operation around Lake Geneva (SRG) and in part of the French speaking region, leading to full digital coverage by 2009 and analogue switch-off in 2015.

China. State TV is opening it's first digital HDTV transmissions Spring 2006 though operating as a PAY-TV service only. On-air for 18 hours daily it will carry major entertainment and sports events. The move to DTT will start in 2008 and the analogue switch-off in 2015. Shanghai has enjoyed HDTV test transmissions since August 2004 courtesy of the China Central Television Service (CCT).

And finally **Vietnam** where the Ministry of Culture and Information have licensed the 'Vietnam Television Technology and Development Company' [VTC] to establish a nation-wide digital TV network to broadcast both home grown and suitably edited foreign TV programming. The service will be carried both on fibre and over the air, VTC holding the TV licence until end 2010.

Satellite News

Test card from the White House, Washington (AB-1)

To accelerate the move into digital TV and expansion of DTT, the government are suggesting that satellite should provide coverage in those areas that will be DTT problematic. A footprint that will contain France only is essential for copyright reasons and Atlantic bird-3 (5o West) is best suited, already used for analogue TV reception in difficult areas - only a digital STB with perhaps a viewing card would be needed for digital reception in non-DTT covered regions. The government are seeking an 85% population coverage of digital TV by end 2007.

French president Chirac hopes to start his flag waving international 24 hour satellite news channel is in suspension over questions arising on the funding of the news operation. The EU from Brussels are stopping the French funding the channel (Chirac has committed €70million) unless its a public service channel. Both the state 'France Televisions' and private 'TF-1' were to operate the channel, it's reckoned the EU delay will push back the project into June/July 2006.

Good news for exiles from the Ossetian region (Russia's Georgian region) as the governing authorities in S. Ossetia have indicated that a 'joint North/south Ossetia' satellite TV channel will open during 2006. Initially programmes will run for 8 hours daily with news and views from the region though the intention is to extend output around the clock - there's no information on a specific date or satellite slot as yet. And another new channel due on-air November 14th 2005 from PAS-12 (45o East) is 'Aghapy TV', organised and funded by Egypt's Christian Coptic minority and friends in the USA. The target area is Egypt where there are about 8 million 'Copts' and nearby Middle Eastern countries. 'Aghapy TV' can be found on Telstar 12, 15o West at 11.494Ghz-V (17486+3/4). More info: www.aghapy.tv/aghapy/index.php

The 'SES Astra' group based in Luxembourg have signed an agreement with the Greek satellite operator 'Hellas Sat' to utilise additional capacity on their 'Hellas-Sat-2' craft @ 39o East to further expand 'SES Astra' operations into the Middle East and Eastern Europe. SES and Hellas Sat already enjoy operational co-operation through the 'Satlynx' (SES) service.

Satellite Sightings

Excitement over rural North America as a light passenger 'plane circled high in the sky around the Hillsboro airfield, burning up fuel as it prepared to land with faulty landing gear. The local TV station scrambled their 'eye in the sky' news chopper to bring live action pictures as the aircraft slowly approached the single runway. Prayers were answered as the 'plane made a text book landing and then taxied to it's company hanger where the passengers and pilot thankfully descended to the floor, hugs of joy from the women and firm handshakes with the pilot and male passengers. A news item that didn't become news! Carried live over the APTN 'UP4' European distributor - 10.972GHz-V (Symbol Rate 4167 + Forward Error Correction 5/6) over Eutelsat W1 @ 10o East, UK evening of November 21st.


Aircraft lands safely at Hillsboro Airport after an undercarriage fault (W1)

More Stateside forest and scrub fires were carried mid November with another live 'eye in the sky' news chopper – answering to 'Air 7' – a town under threat from several fires to the North West and the South East, fires could be seen jumping gaps and rekindling, an aircraft 'bombs' the fire front with fire retardant. The location was not apparent other than Highways 33 and 101 intersected in the township. UP4 once more carried live breaking news from hometown USA.

Early November and the funeral/celebration service for Black Rights campaigner Rosa Parkes in the 'States was transmitted over UP4 in its entirety, unusual for APTN to run such content over several hours on their prime W1 slot. Rosa Parks will be remembered for sitting in the front of a bus when 'whites sat in the front and blacks at the back'. Rosa was arrested and became a hero with her life long campaigning for equal rights. At the end of the service the coffin was carried to a horse drawn traditional hearse and the carriage moved out to the cemetery, pulled by 2 white plumed horses! Even in death Rosa still made the point! And just for the record the familiar APTN spinning globe logo was replaced on or about November 16th with a new rather gloomy dark identification montage.

Drama at local level appeared as a live news report carried by the 'GIGATEL UKI-760' satellite truck somewhere in Wales mid evening of November 9th. Fast flowing flood waters are seen in stark relief, lit by the TV crew's lights and on the far side of the river is the wreckage of a house, part of which has collapsed into the stream as the bank itself appears to have disappeared into the flood waters. A background JCB is seen shovelling bricks and debris as in the foreground the reporter prepares for his report, speaking alternately to the crew in Welsh and English. The eventual report when into BBC Wales in pure Welsh. The feed from Atlantic Bird-1 (AB-1) was carried at 11.045GHz-V (42265+7/8) in the 'usual' BBC OB/news feed leased bandwidth on this satellite 11.030-11.120GHz.

Philip Salkeld

Sharp 32LF92h (11ak45b Chassis)

This chassis is being used quite extensively it came in for geometry problems and blanking out when selecting screen sizes. The Eprom was the fault IC502 however you need to go on the technical website and find bulletin CTV20050402 which gives you the part numbers for different models. The P/P for P/No for this model was V20148983.

P, T1, 90 Chassis

In this report I have not mentioned the make or model number, the fault which I have reported before is frame Bounce. The modification that was used earlier has not been successful in some cases. You now need to order PT90 Modkit3 which involves fitting two electrolytics and a surface mount capacitors, full instructions are given, hopefully this should be the end to this ongoing problem.

Sony KV-28LD6ou

Two of these sets came in with the same fault that being no remote control functions, using the scope from the remote control sensor I eventually arrived at the 'm' board.

Unplugging this board brought me to IC0002SAA5667HL/M1/1036 which reminded me of the Philips Painter chip. Comparing the price of the I. E. and a new board there was not a great difference. The 'm' board was ordered P/No A1300287A £40.13 + VAT and when fitted brought back the remote control functions.

Sony KV-28LS6ou

This set came in dead with the red L.E.D. flashing. I did not pay attention to the number of times because in these sets I always check the line output transistor.

In every case it is always short circuit 25c5696 P/no. 872905617 caused by the line output transformer P/No 859885150. When both parts were replaced the set was still dead with the L.E.D flashing four times. R8895 and R8896 both 0.47Ω 0.5W were open circuit. They supply the –ive and +ive L.T. supplies to the field output I.C. these two components completed the repair.

Samsung WS-28M64N

This set came in with a very intermittent crackle on the sound. It was on soak test for over a week and I heard it twice. Off with the back and in goes the hairdryer which brought me to IC601 MSP3410D P/No I204-001661 where you could activate the fault. I noticed when the replacement arrived it had a slightly different number MSP3411G. It cured the fault which was proven after a long soak test. MSP stands for Multiple sound processor.

Philips 28PW6517/05 L1.1E Chassis

This set came in with a purity problem. The auto deguassing appeared to be working, so a replacement CRT was ordered. I was not confident that it would solve the problem because Philips tubes normally cause going into standby but having said that Philips CRTs are not the most reliable. When it arrived and was fitted the purity problem was still present. The next step was to check the degauss circuit again, applying cold checks I came across component reference 3509 470Ω resistor which was open circuit. A replacement corrected the purity and no doubt the CRT will be used eventually.

PHILIPS 25PT4458/05 LO4E CHASSIS

These sets are less than a year old and already I don't like them. The picture on this one was displaced to the right and had a tendency to jump back giving the impression it was a dry joint. I must thank Philips Technical for their assistance. Replace circuit reference 2486 27PFD 500 Volt capacitor in the line stage P/No 225250808255 would put matters right. Good information he was spot on.

TATUNG T28NG80S G SERIES

I like working on Tatung sets but unfortunately we do not see many in the workshop. This one was dead and tripping, straight to the line output transistor Q403 BU2508AX which was short circuit. The usual dry joints on the line driver transformer were innocent. The cause of its failure was due to a lovely dry joint on the scan coil socket. Always a good picture on these sets.

BUSH 2017 SIL VESTEL CHASSIS

This cheap set from one of the supermarkets came in dead with a slight tripping noise. A quick check on Q603 BU208 DF1 (Darlington Transistor) showed that it was short circuit. There was no sign of dry joints, so reluctantly I replaced it and switched on, and the set sprang to life. However, I am never happy just replacing the line output transistor. There is generally a cause for its failure. Freezing components individually on the line stage was a wise decision. When C613 was sprayed, the line started to tear. 100MFD 50 Volt its replacement and a long soak test proved the answer.

THOMSON T70171R TX807CS CHASSIS

This set came in dead with the L.E.D flashing continuously. On the earlier TX807 Chassis when this happened it was in child lock. To come out of this all you need to do is press any number button on the remote control. There was a look of disappointment on my face when this did not put it right this time. A few checks brought me to the line output transformer, which was promptly ordered and fitted. S.E.M.E Supply I.T Code No. LOPTX1344 £17.10+VAT.

PHILIPS 28PW6322/05 MD1.2E CHASSIS

Whenever these sets come in with a blue picture I immediately think CRT. However,the blue screen did not look like a tube fault. On the tube base I removed component reference 7302 BF869, the blue output transistor which restored red/green. Further checks on the base brought me to 3309 1 K ohm 1/2 watt, which had burnt out. Comparing cold checks with the red output stage with the blue revealed an 80 ohm reading across the base/emitter of 7303 BF422 transistor. Replacement of this component restored the blue level to its correct state.

SANYO CE28FWN3-B

The customer said there was a flash and the set went into standby. The line output transistor Q432 2SD2580 was short circuit. There was no obvious reason for this so in the interest of sanity I ordered 2 transistors and the line output transformer T451. When the parts arrived I fitted the transistor and switched on. I was rewarded with a loud crack

Philip Salkeld

across the transformer. Fortunately, the transistor survived and after replacement of the transformer,all was well. Q432 P/No. 4051442307 T451 P/No. 6450519659.

TOSHIBA 29N23B 11AK37 CHASSIS

This set was dead with the red standby light flickering continuously. I checked all the usual components in the power supply,which proved they were in working order. From this it was apparent that something was preventing the power supply starting up. Time for drastic action, I removed D889 MCR22,although its marked as a diode its actually a thyristor. The set sprang to life. The activity of D889 is controlled by the micro. The 5 Volt supply for the micro is from regulator IC802-its output was low at 2 Volts. There are two capacitors, C827 and C838, which are decoupling capacitors, C827 4700 MFD 16 volts was open circuit. Replacement of this component fully restored the set to working order.

GOODMANS GTV69W4SIL 11AK37 CHASSIS

This set was totally dead, no standby light,no HT voltage. The 330 volts across the smoothing block C809 was present. The voltage on PIN 6 of IC 800 was pulsing from 8-12 volts. The smoothing capacitor remained charged when the set was switched off. A clear indicator that the fault is in the power supply. After spending hours on the power supply doing cold checks, and finding nothing wrong the only other alternative was to start replacing parts. Out of desperation I replaced the 3 BA159 diodes-D804,D892 and D893 which miraculously brought the set back to life.

TOSHIBA 28W33B 11AK37 CHASSIS

The customer complained that the picture went greenish,and the usual bang on the back of the set restored the blue. A dry joint on the tube base perhaps??-No chance. With more time spent on the set it was apparent it was on the main board. After resoldering the jungle I.C and components around it I was getting nowhere. I eventually noticed the fault would come and go when flexing the leads which carries the RGB signal to the CRT. No more time wasting,I hard wired PL405 direct to the board,which restored the correct colour.

PHILIPS 32PW6006/25 L01.1E CHASSIS

This set came in dead and with most Philips sets I generally do a quick cold check on the line output transistor. In this model it is circuit ref. 7460 BU4508DX transistor and it was short circuit. I could find no other fault and replaced it and the set fired up. I put it on the soak test bench and it ran for a few days but I did notice on occasions the picture jumped in from the right hand of the screen. A phone call to Philips Technical seemed a good idea where he told me this was a common fault. Replace circuit ref. 2455 47MFD 35 Volt capacitor which would also cause the failure of the line output transistor.

John Coombes

Sharp model 56FW53H

No picture/ sound alright.
If this fault gives no picture then be sure to check capacitor C613 (0.68uf 400v) for open circuit or check for dry-joints on capacitor. If still in trouble then check also R613 (2.2 kilo ohm 2w) for open circuit. If the set still proves to be at fault then check the zener diode D516 (47v) for short circuit.

Matsui model 1420T

Dead
This fault can be traced to the power supply check Transistor Q501 (2SK2647) for short circuit. If Q501 does prove to be at fault also check diode DS22 for short circuit and resistor R503 (22ohms) for open circuit. If all these components are at fault and before switching on after fitting the new components also replace IC504 (L0414817B) opto coupler.

J.V.C. model LT-26C31BJE

No picture / sound alright.
Although there is no picture but sound is alright the LCD set will intermittently go off to standby mode. This fault can be traced to the large P.C.B. heavily screened under the AV P.C.B. check IC004 and/or IC4103 for dry-joints this operation of resoldering should not be undertaken without the correct soldering equipment and careful operation to restore normal function.

Bush model 7690D

Dead
If the set is dead initially check the line output transistor Q605 (BU2508AF) for short circuit. If Q605 is short circuit then also check capacitor C626 (01uf) for dry-joints. A new Q605 and C626 is the best course of action if the capacitor was dry-jointed because this my have arc internally giving an intermittent fault

Sony model KV28FX68U

Dead.
This fault can easily be traced to dry-joints on the transformer T6003.

Proline model 28N1

Dead
If this set is dead and there is a loud whistling or squeal check the line output transistor TR16 (S2055N) for short circuit. If after replacement transistor TR16 goes short circuit again be sure to check capacitor C69 (22nf 400v) for low capacity.

Hitachi model C2154S

Dead
This fault is located in the power supply check the resistor R836 (1.2 ohm) for open circuit and/or capacitor C812 (471nf 2Kv) for short circuit.

Toshiba model 40PW08

No picture/sound alright.
This fault can be traced in some cases to a faulty frame output IC 303 (LA7833S). But if this proves to be alright then check the C.R.T. tube base for transistor Q915 (A6317440) which goes leaky.

Toshiba model 24Z33B

No tuning.
This is a quick fault to trace which is a open circuit resistor R547 (220 kilo ohms).

David Packham

Sharp 51AT-15H

Intermittent picture, intermittent line sync and intermittent frame shifted down were the problems with this TV. I eventually traced the responsible item to R712 (560R) base resistor to the 8v regulator transistor Q803.

Sanyo 32WN5 (Chassis EB7)

I was called to this set with the reported fault of sound but no picture. EHT was present as was the 200 volt supply to the crt base and the heaters were lit. The three cathodes though had 180v on them. The frame circuit checked OK so that wasn't the problem. I eventually solved the problem with the tried and trusted tap with a screwdriver on the tube neck and the picture appeared. Oh dear, another one destined for the scrapheap.

Sharp 32LF92H (11AK45)

This TV was over-scanning and the E/W was bowing. I found that D611 (UF5407) was leaky, C622 (18n 1Kv but varies depending on set) was faulty and these had damaged Q201 and Q223 (Both BC848B sm transistors). Replacing these and a quick prayer resulted in a normal raster.

Sony KD28DX40U

This set was dead and the line output transistor was s/c. Now I am always suspicious when this transistor is faulty and look for reasons for its demise. I checked and resoldered around the line stage although the joints all looked OK. I replaced the transistor shut my eyes and switched on. I was right to have been suspicious as the line output transformer crackled and smoked and the new transistor said goodbye. A new transformer and a second transistor produced an excellent picture.

Panasonic NV-HD640 VCR.

For a while video recorders were not worth repairing but now as the supply of new ones dries up and people are left with racks of pre-recorded video tapes they are becoming more willing to have them repaired. This one was crinkling tapes and the customer was complaining of intermittent eject. A new pinch roller sorted out the first problem and the second one was traced to a cracked loading motor pulley (VDP1660).

Sony KV25K5U

Intermittent no sound or picture was the complaint with this TV. On inspection I found that the line driver transistor was dry jointed.

Proline 28N1

This set was dead and I diagnosed a short circuit line output transistor. On inspection I found that the buffer capacitor was dry jointed and the heat ad caused it to bulge. Replacing these two items and re-soldering various suspect joints completed the repair.

Toshiba 2812DB

Sound but no picture was the reported fault with this machine but on arrival at the house the TV was working. On interrogation the customer said that the picture faded slowly and then would reappear over a period of time. I headed straight for the CRT heater circuit which had a number of poor connections on it. Re-soldering provided a complete cure.

Mitsubishi CT 33B3STX

This set suffered from intermittent sound and picture although the tube heaters were lit and there was EHT. I traced the problem to the IF panel which was dry jointed. You have to remove the panel which is soldered in before you can get into it to attempt a repair. Usually you will find the IF coils are dry jointed (a la T201/2 in Sony sets). After repairing the joints and refitting the panel you switch on and hope you haven't missed any otherwise you will have to repeat the operation.

Watson FA7040

Varying height and frame linearity were the problems with this Makro special. A cure was effected by replacing the frame flyback capacitor and resoldering the frame output IC cured the faults.

Panasonic TX29AD2DP

The customer complained of a loud crack when the set was switched on which was caused by a dry joint on D544 in the line stage. The other fault (not reported) was East West distortion which was cured by going into the service mode and adjusting the width and E/W controls. To get into Service mode; Bass on max, Treble on min, press F on the set then vol – on the set while pressing reveal on the remote. Pressing N gets you back out.

Philips 32PW9556/05R (MG2.1A)

On switch on this set intermittently went to standby with the LED flashing red.I found that the relay 9584 contacts had burnt out so that no AC was getting to the main power supply. I replaced this and found that although the set would go to standby the LED stayed green. This was caused by the other relay 1010 being open circuit. Replacing both relays (5 volt coils single pole single throw) cured the problems.

Philips 28PW6506/05 (L1.01)

An alarming amount of smoke from back of this TV prompted the customer to call me. On inspection it was coming from the CRT base and involved VDR 3345 (P. No. 482211713016), which connects the aquadag to chassis, was caused by the Line Output Transformer. Replacing both items and carefully setting up the A1's restored normal service.

Panasonic TX25A3

This TV reverted to standby. The fault was caused by a faulty field output IC, which in turn had been seen to by the 220uf feedback capacitor. The TDA 8175 field chip is no longer available but has been replaced by a kit (TZS9EK026) from SEME. Fitting this and the 1R5 resistor R566 cured the fault after adjusting the height etc.

Phil Cooke

Toshiba 36ZP18Q

I arrived at the house and the customer said it had gone off so they had taken the back off found a fuse that had blown, changed it and it blew again so they called me. For some reason they had replaced the back and all the screws, so on removing it I was surprised to find the mains fuse intact, instead F889 aT5A was distressed. Not having a circuit with me I removed the panel to trace its reason to be. It appeared to be in the earth return on the secondary side, so I checked where the supplies went to, and wasn`t surprised to find a s/c reading which I traced over to the sound output

stage.The supply goes to Q640-Q670 and isolating them after removing the panel quickly found the culprit. This was replaced, the panel re fitted, switch on and the fuse blew again. Don`t panic the thought of my chiropractor`s fee should this have to be taken to the workshop made me persevere in the house. I checked the line again and it was dead short again so I removed the large right hand panel again but all cold checks seemed ok. Don`t panic again refit the panel and make more checks. This time doing it slowly I noticed that two four pin plugs were identical and very close, these being P606A and P607A guess what? I had reversed them, fitting them correctly and a new fuse and all was now well. The moral of the story Don`t be in a hurry and Don`t panic.

Schneider SRF2108T

The customer phoned and said all was well for about twenty minutes then the picture gradually got brighter with white lines until the screen went all white. I told him what time to switch it on the next day so that I could arrive and see the fault. Sure enough when I arrived there were the flyback lines. I put my meter on the A1 pin and of course it went dark, but on removing it a perfect picture returned. I resisted the temptation to wack the tube and switched off to make some cold checks on the tube base. A good idea, the first check was R709 a 220r which was o/c, a replacement curing the problem.

Sony KV29F1U BE3D chassis

Off air reception was ok except for the low emission tube, but when cable reception through the scart was on, the picture was flashing on and off every few seconds with changes of brightness, a slight adjustment of RV701 the screen voltage cured the problem.

Glyn Dickenson

Panasonic TX21-GV1

This televideo is a badged Daewoo. It had worked very hard and was now dead. There was a blown 5A plug fuse in the internal holder – not very encouraging! Luckily there was a dead short due to C835 (2n2, 630v) having blown its side off. Replacing this brought back life of sorts, but the LEDs flashed and the relay clicked in sympathy. Eventually a picture appeared. There's a standby power supply as well, and C840 (47uF, 25v) in the primary was found to be low in value.

Hitachi C1420VT (Philips televideo)

This set was dead. As I was removing the back cover I powered it up to see how dead it was – and was rewarded by a degaussing thermistor that literally exploded. I wondered why the fuse hadn't blown – well, it won't if it's been wrapped in silver foil! In these days of people being told they can sue for almost anything, I wondered whether I would have had any redress had I been injured. At least the customer is now in no doubt as to the differing purposes of fuses and foil...

Panasonic TC21S1 (Z5)

This set was dead, although voltage was present at the 'top' of IC801. The chip was leaky, but a replacement (STR51424-M) caused the set to make a metallic thumping noise, although standby worked. There's a thorough explanation of the workings of this power supply (it uses the then fashionable 'hot' line output stage) in the August 1996 issue of Television, which led me to the HT rectifier thyristor D820. It wasn't turning on sufficiently because transistor Q803 (2SD1272) was leaky.

Toshiba 24W33K (11AK37)

Time was you could rely on those nice shiny reddish-brown high voltage capacitors. Not any more! If you get a line output stage fault go straight to the capacitors – usually at least one will have changed value. C618 (3n9, 1.6kV) will blow the BU2508 instantly and C625 (typically 0.12uF) can short causing severe E/W distortion.

Philips GR2.2 chassis

This oldish set had a picture which was shifted to the right with severe foldover. The TDA2579B causes many faults on this set, but the cost of a replacement led me to carry out further checks before ordering one. There was a very low waveform at pin 12 which is the feedback from the collector of the line output transistor. Checking back to see why I stopped at a nasty brown patch on the print side – C2559 (100uF, 25v) had leaked through the print. This is the decoupling capacitor for the line driver stage. Replacement and a clean-up resulted in a good picture.

Philips 28PW6517 (L01.1E)

Clicking on and off was the complaint here. There was a vague burning smell coming from the CRT base where a small disc component was getting hot. This isn't a capacitor – it's a thermistor between aquadag and true earths to provide a reference potential. It's also a red herring as the fault is due to the line output transformer. The HR replacement is HR7057. Amazingly for a Philips, the set worked fine after replacement with no other damage.

Panasonic Euro-2L

If one of these arrives with a short-circuit line output transistor, remove the metal screening plate under the digital section and resolder the lugs from the top can. This will prevent the fault recurring. Incidentally, the digital processing IC which causes all sorts of faults and used to come as a kit is now obsolete.

Samsung SP42W5HSX

This projection set has one main problem – one of the two convergence amplifier ICs fails with drastic misconvergence and jumping colours. They are each on a large heatsink on the left of the main PCB – some dismantling is needed to remove them. For this reason I replace them as a pair despite their price. There are eight pairs of parallel-connected 150R resistors feeding them – check for overheating here, also two SOC-type fuses. The ICs are usually type STK392-040, although -010 might be fitted – I use the type originally used. A word of warning – only use genuine Samsung parts as pattern components drift wildly as they heat heat up and correct convergence cannot be achieved. To adjust the convergence, enter mute, 1, 8, 3 in quick succession. This displays a crosshatch and cursor which can be navigated and adjusted by the joystick buttons. Colours are switched on and off by the two buttons adjacent to the zero button, and active colour select is by keys 7 and 8. Store is via S-MODE I-II. After completion, carry out the 'perfect focus' adjustment (top left under flap). The service manual is available via the Samsung service portal. The 47" version has the ICs and associated components on a separate PCB which is more economic to replace as a complete unit.

Ivan Levy

Philips 24PW6006 LO1.1AA(chassis)

This set came in completely dead with no standby light. I discovered the start up voltage at pin 1 of the switching control i.c in the primary side was at half its correct voltage(5v approx). After various substituting of parts(including i.c,fet)i found the capacitor C2526 470NF surface mount capacitor was leaky.i found this by isolating pin 1 of the ic which then produced oscillation at pin 1, so obviously pin 1 was been loaded.

Matsui 20T10A TV

This set came in dead,voltage checks showed all secondary voltages were present and correct,i discovered there was no line drive because IC101 STV2246 was faulty.

Sony KV32C570U

This set would start up the standby light would go green but there was no line drive,the m board contains a painter chip, it was this that was faulty.

Matsui 24WN20

This tv came in dead,the standby light would go green then back to red,discovered there was no line drive to lien output transistor TL2 due to no supply voltage to the line driver transistor TL1.Resistor RL1(15 ohms) was open circuit due to DL15 being short circuit.

Panasonic TX28G1

This set came in dead the STR54041 was faulty

Toshiba VTV1534 TV/VCR combi

This set had a screaming noise when switch on,the lopt had a short circuit primary

Samsung WS32A116T

This tv came in with what looked like red flaring,scoping the red drive to the red cathode showed the waveform to be completely wrong. I discovered the feedback resistor R506(82K) tob be open circuit,this is becoming very common I have since have this several times no only in the red but green and blue channels.

Philips 32PW9308-EM5

This TV would intermittently trip, tapping the main board showed a filed callapse, I found the field waveform to be present at IC7440 pin 1 but was missing at the frame i.c input, after tracing the field waveform i came to the field coupling transformer 5621 the field waveform was present at its primart but disappeared at its secondary removing the transformer I discovered one of the pins had a poor connection to its winding, remaking the connection cured fault.

Samsung CW21A113V TV

This tv had no sound,resetting eeprom brought up distorted sound, replaceing the MSP34000G sound processor cured fault.

Samsung SP43H3HTX rear projector(with built in dvd)

This projection set would not play DVD on its built in DVD player due the 8volt supply (from the power supply mounted vertically on the left hand side when viewed from the rear)missing. I discovered the zener diode DZ814(30Vzener) connected to IC812S A KM1M05565R chopper i.c to be leaky, I also discovered that the chopper ic IC812S was dry jointed, resoldering the i.c and replacing the diode cured the fault.

Roy Blaber

BUSH 2877ntx AK19 chassis

Yet another AK19 chassis with an east/west fault,not the usual suspects C630,R629 or L602 but L604 with shorted turns, its in the drain of Q603 the east/west FET.

GRUNDIG MW70-502 cuc2059 chassis

This set came on with a very bright screen and then it tripped off.There was no 200 volts to the video output chips because R24081&R5400 were open circuit, the cause one of the TDA6106q chips was short circuit.

GOODMANS TVC202

The cause of dead set was IC1901an TDA6107JF video output chip, it being short circuit.Only the JF version will work and is available from Charles Hyde.

GOODMANS 286NS Philips L6.2 chassis

This set was dead with only 20 volts on the 150 volt rail.Various checks were made until I found D6502 an 15 volt zenor was short circuit.

PHILIPS 21PT1557 LO12eaa chassis

This set was tripping but EHT was heard at switch on. Suspecting high HT I disconnected the line output stage and quickly monitored the 95 volt rail,which was high at 128 volts. Replacing D6541 an 10 volt zenor was the cure its connected to the anode of the opto coupler.

PHILIPS 25 PV720

This combi would intermittently go to standby,reducing the contrast level kept the TV on.Suspecting a beam current limiter fault I replaced D6541 an 22 volt zenor which is connected to

SANYO CBP2180 A5 chassis

For reverting to standby after a few seconds, check R558 an330k resistor it goes high in value and monitors the 180 volt rail.

WHARFEDALE GTV850

After replacing the degause positor for mains fuse blowing.I switched on to be rewarded with a good picture but the sound had a whistle on it,flexing the sound module varied the volume of the whistle but soldering suspect dry joints had no effect.Then on closer inspection I realised the panel was plugged into the main PCB and not hard wired as I first thought. The cure was to simply apply some switch cleaner to the plug and socket connection.

Send your TV fault reports to:

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Having just wound up my service dep`t I have the following crt`s for disposal, no reasonable offer refused, could deliver if close to Wolverhampton otherwise buyer to arrange collection

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A68ESF002X111 JVC 29SX4 etc Phospher missing	**NEW**

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23797509 TYPE P16LNV10 Red CRT 43PJ93B	**USED**

USED CRT`S

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A66EHJ43X01 28" Akai
A59EHJ43X38 25"Sanyo noisy scan coils
W86LTQ350X97 TOSH 36ZP38 faulty scan coils
A34AGT13X38K1
A33LPE02X01

Replies to sdav78@aol.com

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I need to find the equivilant or replacement parts for a Dynatron Chassis part No. 1275 made in 1975. The parts required are two transistors type C1115 and C1131 not to be confused with 2SC types. These are pre-drivers to MA8003 and ME0412. The original part No's are 13047528 and 13047536.
As usual all reasonable costs will be met.
ian.electronics@blueyonder.co.uk
I will pay all reasonable costs and postage.

WANTED
Wanted, circuit diagram for the Bang and Olufsen Beolit 600 AM/FM portable radio made circa 1974. A photocopy will do. Any info please to
David Bolt: d.bolt@tiscali.co.uk or telephone 01473 780833

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copies of Television Magazine from 1980 to June 2005. Only a few earlier copies missing. Offers please to
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Dave Smith.01455 448821

WANTED
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Paul Fairfield: 01372 275351 or fairfiepa@aol.com

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Michael Dranfield

Pace ZIF tuner failure

Tuner failure in pace satellite receiver boxes is now one of the most common faults there is ,I am of course referring to models fitted with the ZIF type tuner module,the problem is caused by failure of the MAX2104CCM 48 pin down converter chip and typical faults range from stuck in st/by to no satellite signal received sometimes intermittent or affecting only some channels.Now the underneath of the chip has a metal pad which is not only the R.F ground plane connection but also the heatsink contact ,which of course has to be soldered to the ground plane on the pcb,investigation has shown that the soldering between these two areas is very poor and for a long time I assumed this to be the cause of the chip failure however this has turned out to be incorrect and the real cause of chip failure is more complex.

Some time after 1996 Maxim semiconductors introduced a change in the moulding compound that is used to produce the chips package ,phosphorus was added to the moulding compound as a flame retardent,replacing Bromine and Antimony which are not considered to be very environmentally friendly and it would seem that the addition of the Phosphorus sets up some chemical reaction within the chips package leading to the growth of Silver Dendrite between adjacent pins ,this growth then results in high resistance shorts between pins.

Any one who has restored vintage radios will be familiar with 1960 s transistor radios that use the AF XXX series of transistors in which over time a crystal substance grows within the transistor which eventually causes one of the lead outs to short to the screen connection , a simple way round this is to simply cut off the screen connection extending the transistors life.

Now in the case of the MAX2104CCM there is a way to destroy the Silver Dendrite growth and believe it or not it is possible to repair the chip without having to remove or replace it ,this is of course only a short term solution as the Silver Dendrite will start to grow again , remove the tuner and the small metal screening can covering the chip and heat up the chip to around 190-200 degrees ,don't go over 205 and then let it cool and hey presto the chip will now be found to work again,I have soak tested repaired tuners in this way and they still continue to work,but I stress this is only a short term solution as a repeat failure is inevitable.

Chips manufactured by Maxim after November 2001 were produced with non- Phosphorus based moulding compound ,but bare in mind millions had already been produced and many will still be sitting is stock at semiconductor surplus suppliers so beware ,the top of the chip carries the date code as follows, 0145= 2001 year , week 45(November).

John Coombes

Philips model 28PW6515/05 A10E Chassis

This A10E chassis covers many different models all of which have thewell known Painter module which contains the Painter I.C. 7064 which can be a different type of IC for many different models. The list that follows is the different models the type of IC and the part number.

28PW6305 28PW6315 28PW6515
29PT5515 32PW6305 32PW6515
part no; 935271077557 A10EP1-2.0
24PW6005 28PW5406 28PW6005
32PW5406 32PW6005
part no; 311125054511 A10ET1-1.8
28PW6315 28PW6526 32PW6315
32PW6526
part no; 996500010425 A10ED1-1.2
28PW6816
part no; 996500010426 A10EDN-1
28PW6826 32PW6826
part no; 996500012349 A10EDD1-1.3
32DW6557
part no; 996500014559
A10EGN1-1.4.

The replacement of SMD devices can be difficult and can lead to the ruin of the pcb in this case the Painter module. The easiest way to replace a SMD like the Painter IC. 7064 is to use the new SMD removal system CHIP QUIK it will enable normal solder to reflow at a safe low temperature below 150 deg C (300 deg F).So due to the low temperature reflow it prevents mechanical damage from I.C. extraction when the reflow is incomplete. It will also stop thermal blistering burns and delamination of pcbs. This in turn will also prevent heat damage to pads leads and all circuitry .

Also it finally eliminates heat damage to solder joints of adjacent components. Because of the easy replacement it will reduce labour cost and eliminate loss P.C.B. due to heat damage. So with just a little practise the replacement technic can be perfected very quickly with good results every time. The CHIP QUIK SMD1 kit can be obtained from C.P.C. this contains 2.5 feet of CHIP QUIK which is said can remove 8 to 10 S.M.D.s.

Also 1cc syringe of CHIP QUIK no clean rework paste flux. Alcohol pads for clean-up and complete instruction for SMD removal and clean-up. The removal is very easy just apply the flux to all leads with the syringe . Then melt CHIP QUIK over all pins, it is necessary to maintain CHIP QUIK in a molten state long enough to release the SMD device. Finally lift the chip (I.C.) off the P.C.B. with a dental pick or vacpick or even tweezers. While still in a molten state use a cotton swab flux to move excess to an unused section of P.C.B. Then with solder braid clean each pad until thoroughly clean and finally remove residue with a alcohol pad. Once removal is complete and clean it is necessary to be very precise about the position of a new SMD. Incorrect fitting gone lead to further faults or even damage or the ruin of a new SMD. There is quite along list of faults caused by the Painter SMD IC7064.

- Intermittent sound mute.
- No reaction to remote control but set controls work normally.
- Pincushion distortion or east/west fault.
- Chroma as shifting and shadowing effect.
- Standby LED flashes at half intensity only set does not function.
- Dead LED flashing or just goes out.
- Color lines down picture.
- Ghosting image.

- Sometimes does not start-up/channel or picture slow to reappear after channel changed.
- Switches off after 1 hour or longer.
- Muted sound while a DVD player is used on EXT1 or EXT2.
- T.V. is switching intermittently to EXT1.
- Sound distortion from DVD player connected to external scarts.
- Intermittent loss of sound.

It is worth mentioning at this point when removing a SMD to give added protection surround the SMD with Chemask a high viscosity peelable temporary solder masking agent. This protects P.C.Bs, contacts, pins posts terminals and gold fingers during wave soldering. After completed soldering it is removed easily by hand or tweezers. This is produced by CHEMTRONICS which is available from C.P.C.

When the Painter I.C. has been replaced then it is necessary to set-up the receiver again.If the Painter IC is fitted correctly when the set is switched on then the relay will click twice and the set will go into auto search. If this tunes all channels it then IC is operating correctly and it may only be necessary to set-up the geometry.But before checking all functions be sure to set-up the option-codes as external sockets may not be working if the codes are incorrect. Option codes can be found on the label on the C.R.T.

If the download has not been made correctly data corruption can occur with problems like geometry data lost or all programmes locked in some cases the menu password is protected. If this fault occurs it is necessary to change the eeprom (N.V.M. none volatile memory) IC7066 (M24C32-WMN6) to force the Painter IC to initialize a download of default values. If after changing the Painter IC with the updated software which is IC7064 from A10EP1.1x to A10EP1-2.0 and there is intermittent break –up of sound or even a stutter or drop effect while using the scart input. This could be a problem which requires the changing of addresses in the eeprom (N.V.M). for software version A10EP1-1.6 change the value of version main ID on address 12 (hex) from value 01 to 02. Also be sure to change value of version sub ID on address 13 (hex) from value 09 to 00. If the software versions are lower than A10EP1-1.6 wrie down IF PLL, AGC and GEOMETRY alignment values then replace with software version A10EP1-2.0 changing the alignment values in the service alignment mode. Iff however there is a problem with the eeprom (N.V.M.) device which is likely to be corruption then there is only one course of action and that is to replace IC7066 (M24C32-WMN6). If after replacing IC7066 eeprom turn on the set and wait 30 seconds, then enter the service mode (SAM) and go to options and set-up according to numbers on the CRT sticker. If however the television is still not back to normal operation then it is necessary to use the Philips Compare diagnostic system to upload a blank N.V.M. If this is available go to the Compare/data directory on your local hard disc and open a hex file. Be sure to change all values to (0) zero save and then close file. Now start up Compare and go to menu item Tool/Compare tools eeprom read/write. Click on load select the adjusted file and click on o.k. Then click on write click o.k. then wait until the file is upload to the (N.V.M.) and close Compare. At this point go back and turn of the television. Turn the set on again and wait 30 seconds, then enter the service alignment mode (SAM) and go to options code and set-up from numbers once again on the CRT sticker.

On this chassis there are a few faults caused by IC7066 (M24C32-WMN6) the eeprom (N.V.M.) the first is in the service alignment mode (SAM) were there is no remote control operation but the picture and sound prove to be alright. There can also be a fault with erratic picture size. If there is intermittent loss of color and no tuning both of which can be caused by a corrupt eeprom (N.V.M.) IC7066. on a few rare occasions we have found the eeprom causing excessive green.If however if the option codes prove to be incorrect due to data corruption of the eeprom be sure before replacing IC7066 eeprom that the capacitor C2962 (4700uf) is not at fault check by replacement.

Power Supply Faults – Dead

One of the most common problems on this chassis for no results is the failure of the on/off switch (0132) which goes open circuit or overheats very badly sometimes causing damage to the Mains input P.C.B. it is mounted on.

It can also go dry-jointed on any of the individual tags to the P.C.B. If it has gone dry-jointed on any of the pins it is advised to replace the on/off switch because this can be caused by overheating of the contacts which is caused by poor connections between the pins. If this all proves to be alright and there is no still no results check the D.C. voltage across capacitor 2915 (470uf) if this voltage is 285 volts or plus but there is still no results then suspect the Power regulator IC7921 (STR-Q6551) but also when replacing IC7921 also replace the opto coupler 7929 (TCET1103G). If however when checking the voltage across capacitor 2915 (470uf) there is no voltage then check the bridge rectifier D6915 (GBU4J) for short or open circuit. If Power regulator IC7921 and the opto coupler 7929 have failed then be sure to check for dry-joints on the switching transformer T5912. If this proves to be alright on the primary side of the power supply check for 140 volts from the secondary section of the power supply. If this is missing from the power supply check D6938 (BY229-800) for open or short circuit. If there is a secondary voltage from test point (4) but the voltage is low then suspect a short circuit in the line stage. Check under Line Output Faults if the secondary proves to be low. If the set proves to be dead then be sure to check the degauss circuitry for faulty P.T.C. (3912) for short circuit or if after replacing the mains input fuse the set works m,ake sure the P.T.C. as not blown itself apart.

Line stage faults

If the set is dead and the relay is clicking until the protection circuitry operates and shuts the set down. Then is due to a faulty line output transistor 7410 (BU4508AX) check for short circuit. If the line output transistor 7410 proves to be short circuit check for dry-joints on the line driver transformer 5408. If still in

John Coombes

trouble then check for a faulty line output transformer 5431 which may have gone shorted turns. If after removing the line output transistor the short circuit is still present across collector to chassis then suspect tuning capacitor C2411 (820nf 2kv) having gone short circuit.If however the set is dead but there is a very noticeable whistle check capacitor C2414 (12nf 1.6kv) for short circuit. If this all proves to be negative then check the east/west transistor Q7470 (STP16NE06) by replacement. In the line stage if transistor 7408 (BF423) is short circuit which will mean there is no tuner function or scart picture, this means there is a black picture with no on screen display. In a few rare cases the line is tearing when cold but can only be visable on the left hand side of picture when warm this is due to the thyristor 6485 (PQ10ZDA) check by replacement. If the picture gives excessive width or there is pincushion distortion, which may be intermittent check for dry-joints ontransformers 5474/75/76 resoldering will restore normal operation.

In a few cases we have found east/west correction varying and on the left hand side of the screen there is a bright line moving downwards this fault can be proved by heating diode D6474 (BYW95C/20) and/or D6475 (BYW95C/20) very slightly to ensure these components are at fault before replacement. If the diodes prove to be alright be sure to check the capacitors C2419 (470nf 250v) and/or C2418 (680nf 250v) also check by replacement. If there is a tripping sound from the relay and there is a burning smell check and replace faulty line output transformer T5431. If still in trouble then check the line driver transistor 7481 (BF819) for open circuit or may be short circuit. Over the last few months the common fault on the line driver transistor is dry-joints. If still in trouble then check for line pulse on the base of the line driver transistor T7481 (BF819) if this is missing then trace back to source.

Frame faults

In most cases the common fault in the frame stage is frame collapse. This fault is usually due to a faulty frame output IC 7501 (TDA8172) or check for dry-joints on the pins of the frame IC7501. The dry-joints can also give intermittent frame collapse or maybe lines on the picture or even intermittent frame foldover. If however frame output IC 7501 (TDA8172) is at fault the set may go into protection mode which renders the set dead and the LED flashes twice. If the picture is broken in two with foldover in the upper part of the picture be sure to check diode D6505 (BYD33D) check by replacement. If the set goes intermittently into safety mode (protection) this may be no picture or frame fault check capacitor C2425 (100uf) for open circuit which is in the frame amplifier circuitry which gives a incorrect frame drive pulse. If the frame stage however appears to be alright but there is a loss of LT lines to the frame stage, trace back to the deflection PCB and check resistors R3448 (1ohm) and/or R3449 (1ohm) for open circuit. If still in trouble then check the diode D6448 (BYW95C/20) for short or open circuit. If this all proves to be negative then check the scanning coil connections (0222) for dry-joints, or possible open circuit of the coils.

C.R.T.and/or C.R.T. tube base faults.

Before condemming the C.R.T. check the tube base for D.C conditions firstly check the cathode volts this can be a clue to indicate if C.R.T. is at fault or its associate circuitry. If there is excessive red, green or blue this could be caused by the C.R.T. but if the eeprom is at fault this can also cause similar symptoms. In some cases however the red, green and blue color guns are at fault this may cleared by a gentle tap on the C.R.T. or in very bad cases a short circuit can be read from heater to cathode.

A faulty C.R.T. can also show a bright raster but before replacing the C.R.T. check that the G2 screen grid control on the line output transformer (T5445) is set correctly or if the control is at fault then it is necessary to replace the line output transformer (T5445). The C.R.T. can go open circuit heaters this will give sound but no picture this fault is surprisingly rare so check the supply feed from the line transformer (T5445) check for windings open circuit or dry-joints on connections leading to the C.R.T. tube base. In some cases however no heater supply is due to open circuit feed resistor in the heater supply line. Poor focus can be caused by a faulty C.R.T. but inmost cases this is due to the lead into the C.R.T. tube base making poor connection or corroding or in a few cases breaking off. In some cases however there may be excessive bright screen with horizontal flyback lines across the screen with the set then tripping because there is no 200 volts on the C.R.T. base. This can be due to faulty D6445 short circuit or resistors R3445 (1ohm) and/or R3840 (100 ohm) check resistance or by replacement .If there is no raster the set will sometimes trip if the screen voltage is turned up but the eht is alright. Check the diode D6832 (1N4148) for open circuit on the C.R.T. tube base.

Various fault guide on A10E

If the sound keeps varying and the red LED blinks this is due to capacitor C2009 (100uf 25v) check by replacement.

If there is ghosting and the Painter IC is not at fault check filter (1451) on the SSB panel.

If the picture is alright when cold but after about 15 minutes the contrast slowly decreases. This then leaves a dark picture but the teletext and on screen graphics are alright then suspect C2246 (1uf) surface mount capacitor on the SSB panel.

On a few cases of this chassis the set starts up in factory mode this gives a letter "F" which appears on the screen. If the set does not respond to the remote control or manual keyboard then to clear the problem there is two solutions. Method1 use the update for A10 Compare to exit this "F" mode. Method2 For this method you need a universal remote control (RU880) firstly programme the RU880 with the factory mode off code (system 27; data 127) by means of instruction.
Press CD on the RC->CD is dis
Press SMART until the RC display timer. Press cursor up to close SETUP option on display.
Press O/K > the display becomes ENTER CODE.

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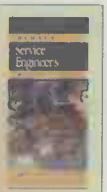

Lewis & Sinclair

This title aims to provide the service engineer with all the necessary information to carry out work on domestic electronics equipment. The coverage ranges from satellite reception to NICAM. Both analogue and digital equipment are covered, and there are chapters on common problems.

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TV FAULT-FINDING GUIDE

Edited by Peter Marlow

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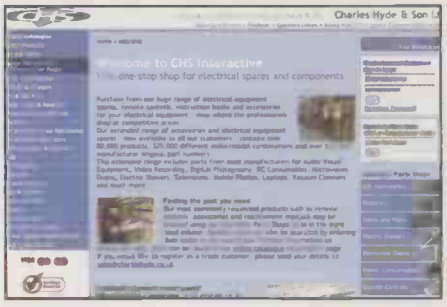

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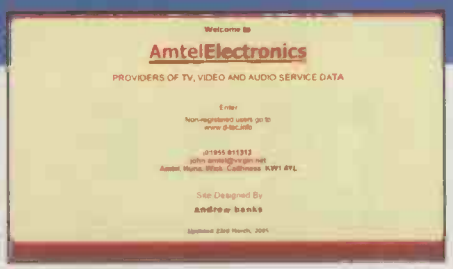

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Solution to Test Case 517

– see page 141 –

Even though the Hitachi A7 chassis, and hence the model C2586TN involved here, is now about seven years old, the service procedures applied by Cathode Ray were more appropriate to a set of seventeen years or more old, taking no account of the control system beyond checking for the presence of activity on the SCL and SDA lines of the IÇC control bus. Even though data may be present there's no guarantee that it's the correct data! The next action was to swap the EEPROM between the sick set and the scrap set. That restored tuner operation to Mrs Wilkins' set, but some aspects of operation were incorrect. Then it was found that the set's own EEPROM would function OK after entering the menu and restoring the settings to shipping mode. Wow: all that time spent on replacing silicon and hardware for the sake of pressing a few keys! Software is becoming more significant than hardware in consumer electronics (it's even controlling washing machines now...) as time goes on.

With this particular set they decided to play safe by ordering and fitting a new EEPROM chip and programming it as required within the service menu. They also – needless to say – attended to the usual dry-joint trouble-spots in this Hitachi A7 chassis. It's now been back with Mrs W for a couple of months with no further problems.

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2 Good Old Summertime, The American Quartet 1904
3 Marriage Bells, Bells & xylophone duet, Burckhardt & Daab with orchestra, 1913
4 The Volunteer Organist, Peter Dawson, 1913
5 Dialogue For Three, Flute, Oboe and Clarinet, 1913
6 The Toymaker's Dream, Foxtrot, vocal, B.A. Rolfe and his orchestra, 1929
7 As I Sat Upon My Dear Old Mother's Knee, Will Oakland, 1913
8 Light As A Feather, Bells solo, Charles Daab with orchestra, 1912
9 On Her Pic-Pic-Piccolo, Billy Williams, 1913
10 Polka Des English's, Artist unknown, 1900
11 Somebody's Coming To My House, Walter Van Brunt, 1913
12 Bonny Scotland Medley, Xylophone solo, Charles Daab with orchestra, 1914
13 Doin' the Raccoon, Billy Murray, 1929
14 Luce Mia! Francesco Daddi, 1913
15 The Olio Minstrel, 2nd part, 1913
16 Peg O' My Heart, Walter Van Brunt, 1913
17 Auf Dem Mississippi, Johann Strauss orchestra, 1913
18 I'm Looking For A Sweetheart And I Think You'll Do, Ada Jones & Billy Murray, 1913
19 Intermezzo, Violin solo, Stroud Haxton, 1910
20 A Juanita, Abrego and Picazo, 1913
21 All Alone, Ada Jones, 1911

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Black Diamond	BD65DSF	IRC83079	Matsui	TUTV1	IRC83114
Black Diamond	BD68STB	IRC83079	Nokia	121T	IRC83078
Bush	DFTA 1X1	IRC83079	Nokia	221T	IRC83078
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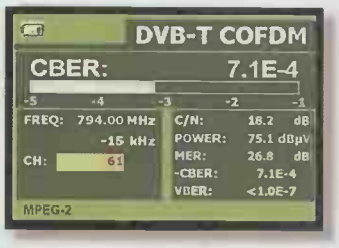

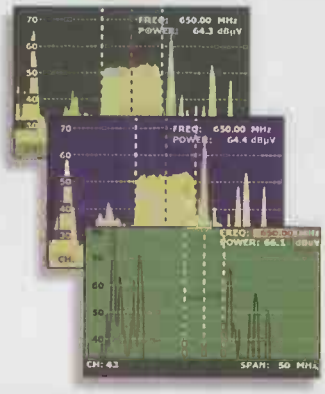

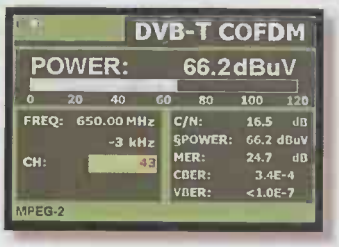

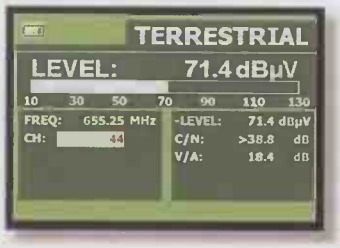

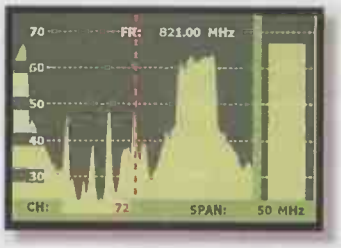

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