TELEVISION
& consumer electronics

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Please note that we are unable to answer technical queries over the telephone and cannot provide information on spares other than that given in our spares guide.

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I hope you all had a good Christmas and make I take this opportunity to wish you a very happy and prosperous New Year. Thank you to everyone that subscribed to the NEW Television magazine. We were inundated with subscriptions and kind words since the day we launched the initiative.

I really hope you enjoyed the first issue; certainly the feedback I received was extremely positive and encouraging.

The message I got from readers was that nearly everyone involved in this wonderful trade wants a "community magazine" to serve it. As you know my plan is to provide that magazine every month full of the information you need and want to read about. Please tell your friends and colleagues in the industry that Television magazine is back and they need to subscribe to ensure they get a copy every month. Unfortunately Television magazine will not be available in Newsagents. I have, however made arrangements with PJ hill, Grandata and CHS to stock copies for customers.

I was talking to number of readers and contributors the other day and I have come to the conclusion that "our industry" is on the verge of a renaissance.

A revolution is just around the corner. If you are of the chosen few that is talented enough to repair electronic or electrical equipment, one of the see-saws of life is turning back in your favour.

The equation is simple. In the old days, electronic and electrical equipment – especially tellies – used to be very expensive to buy. In most cases, if a broken item was within its reasonable life span, the most viable option was to have it repaired.

Then came the throw-away era, helped on in the latter part by retailers selling extended warranties. The happy consumer was reassured that if he or she paid that bit extra – more often a lot extra – the equipment would be replaced or repaired free of charge within the period of the warranty.

So when the warranty period ended, and the product developed a fault, there were two options. The easiest was throw the kit away and buy a replacement. The more responsible option would have been to have it repaired.

But during this period, the dejected repair expert had very little business – so little that many turned to other ways of earning a living. Overheads became so high that the price of even a simple repair to a TV started to look silly in many cases.

Having a TV repaired was just not justifiable for the average customer in the throw-away era. Consumer pressure didn't help by encouraging people to chuck out the old and buy in the new.

Now to the good news – not just for repair experts, but also for the planet – the throw-away culture is dying.

When the business starts to come in, charge a fair price, do a good job, and Television Magazine will back you to the hilt.

Tony Greville

Publisher.

SANYO UNVEILS "SMALLEST & LIGHTEST" HD CAMCORDER

Sanyo claims its new HD1000 camcorder is the world's smallest and lightest model that can record in 1920 by 1080 high-definition resolution.

Weighing just 268g, it has been designed for easy one-thumb operation. It incorporates Mpeg-4 AVC/H.264 video compression. This enables up to 85 minutes of video recording at a resolution of 1920 by 1080 or more than five hours of footage in 640 by 480 resolution, onto an 8Gb SDHC memory card.

It also features a 10x optical HD lens and 2.7in wide-screen LCD. The display flips out from the camera and rotates up to 285 degrees on its axis, allowing its operator to take videos or still photos from difficult-to-view positions.

Users can take four megapixel still images while filming a video simply by pressing the shutter button.

In addition, the HD1000 makes it very easy to view and share footage on an HDTV. Using the HDMI terminal built into the base station, one cable connects the camcorder to the TV for a totally digital output.

According to the company, high definition will emphasise any camera movement or shake. So the camcorder comes with a sophisticated image stabiliser for both video and stills.

Further highlights include the 'Face Chaser' function, which automatically detects and isolates faces to assist exposure and auto-focus. Start-up is fast too. The camcorder ready to use just two seconds after turn on.

Small and light, this HD camera is ready to use just two seconds after it's turned on

Toshiba plans to increase its market share with a new factory in Poland

Toshiba opens Polish LCD TV plant

The official opening of Toshiba Television Central Europe, a production and sales company for LCD TVs, took place last month in Kobierzyce in south-west Poland.

Japan's ambassador to Poland and Poland's vice minister of the economy attended the ceremony.

The company was originally set up in September last year, but production at the site did not start until July this year and is now at full capacity.

Toshiba said it would use output from the plant to win an increased share of the European LCD TV market. This market is expected to grow from nearly 16 million units in 2006 to 33 million units in 2009.

Scotland next for analogue turn off

The switch to digital-only TV begins in Scotland on 6 November next year, when analogue TV signals from the Selkirk group of transmitters will be turned off.

This will make the Scottish Borders the second area in the UK, after Whitehaven in Cumbria, to complete the total switchover to digital TV.

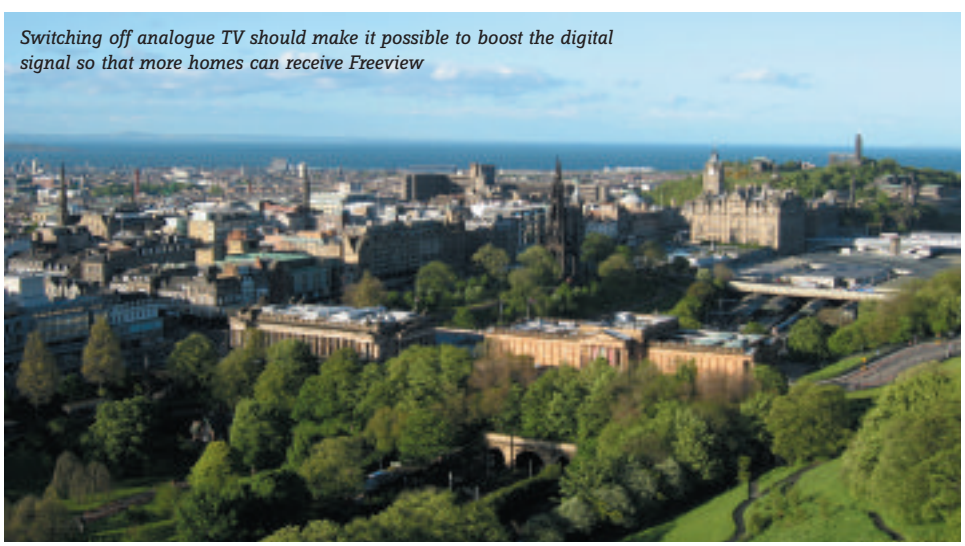
By turning off the analogue TV signal it should be possible to boost the digital signal. This should benefit one-in-five Scottish homes that currently cannot receive Freeview.

The campaign to inform Scottish viewers is already under way with a major advertising and marketing campaign in the Scottish press.

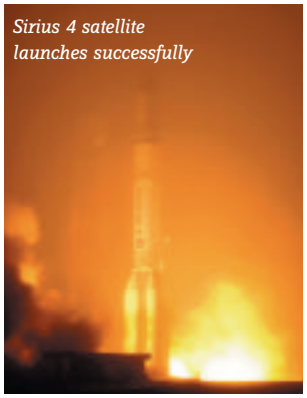
Paul Hughes, national manager for Scotland at Digital UK, said, "Around 80 per cent of Scots already have some form of digital television, but only around half of all TVs in the home are converted.

"So it's a huge challenge to complete switchover in Scotland between 2008 and 2011."

Switching off analogue TV should make it possible to boost the digital signal so that more homes can receive Freeview



SES Sirius blasts off



Sirius 4 satellite launches successfully

SES Sirius' new Sirius 4 satellite has been successfully launched into orbit.

The satellite will now be brought into its final orbital position of 5° East within the next few weeks and will be made commercially available in early January 2008 after extensive in-orbit testing.

"We are very proud and satisfied that the SIRIUS 4 mission has been a success", said Håkan Sjödin, managing director of SES Sirius.

"Sirius 4 will benefit our customers and extend our coverage and service."

SES Sirius is 75% owned by SES ASTRA and 25% by the state-owned company the Swedish Space Corporation.

SHARP LAUNCHES BIG 100HZ FRAME-RATE TVs

The Aquos XL2E-series LCD TVs from Sharp – in sizes 42in, 46in and 52in – is equipped with integrated 100Hz processing and short panel response times. There's also a wide choice of connections, as well as a very narrow bezel.

"The new Sharp Slimline TV generation is proof that the constant development in technology is not just happening inside LCD TVs, making for better and better picture quality, but that genuine design innovations are also made possible by this development," according to Frank Bolten, president of Sharp Electronics, Germany/Austria.

"As with a painting, the narrow frame, in a piano-black finish, makes sure that even greater attention is paid to the sharp, detailed display screen."

The doubled frame rate of 100/120Hz, together with Sharp's Quick Shoot technology, ensures the maximum detail, even with fast movement, says Sharp.

Compatibility of the Aquos XL2E TVs with 24p signals, without any loss in frame conversion quality, reproduces exactly what the Hollywood cameras recorded, according to Sharp. This makes the set ideal for use with Blu-ray and HD-DVD players with 24p output.

Ready to accept 24p input, Aquos TVs feature 100Hz frame rate and a narrow unobtrusive bezel

Whitehaven switches over

Whitehaven has become the first area in the UK to complete digital switchover.

At 2am on Wednesday 13 November last year, analogue versions of BBC One, ITV1 and Channel 4 were switched off and replaced with a series of digital channels. Ford Ennals, Digital UK's chief executive, said: "We've been very impressed by the response of people in Whitehaven to becoming the first all-digital community.

"I'm particularly grateful for the hard work of the many organisations and volunteers here who have been instrumental in helping their friends and neighbours prepare for switchover."

Following switchover in Whitehaven, viewers are able to receive BBC One, BBC Two, BBC Three, BBC Four, CBeebies, CBBC, BBC News 24, BBC Parliament, BBCi, ITV1, ITV2, ITV3, ITV4, CITV, Channel 4, Channel 4+1, E4, More 4, Five, Community Channel, BBC Radios 1-7, BBC Radio Five Live Sports Extra, BBC Asian Network, and BBC 1Xtra.

Whitehaven - the first area in the UK to lose its analogue terrestrial TV service

TiVo launches Power Watch

American digital video recorder (DVR) platform TiVo has launched a new service that will offer advertisers detailed profiles of its users.

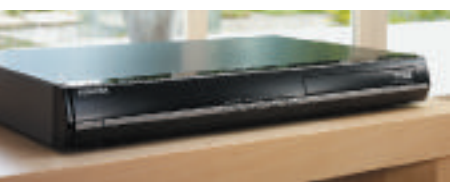
Named Power Watch, the new service will initially provide demographic and viewing behaviour data from 20 000 households that have volunteered to take part.

The company said Power Watch will provide advertisers with demographic data such as age, income, marital status and ethnicity on TiVo subscribers. This combines with data on which programmes they are viewing and recording.

"With 20 000 households, the Power Watch Consumer Panel will provide a new level of detail on DVR viewing behaviour among any given brand's target segments that will significantly enhance the approach advertisers take in creating and buying advertising on television," said Todd Juenger, vice president and general Manager, audience research and measurement at TiVo.

The shape of things to come? Power Watch is a new venture from TiVo that will provide advertisers with information about not only what viewers are watching, but also their profiles

Toshiba third-generation HD-DVD players



The latest HD DVD players from Toshiba offer 1080p image support and 24 frames-per-second playback

Toshiba has launched two third-generation HD DVD players, the HD-EP30 and HD-EP35.

According to Toshiba, the new players not only raise the bar in terms of audio-visual performance. They also continue to lead the next-generation home cinema market in terms of value.

The HD-EP30 is set to retail at between €349 and €399, while the HD-EP35 will retail at between €449 and €499.

These new players offer 1080p image support. In addition, both the HD-EP30 and the HD-EP35 introduce new features to the HD DVD range, such as Regza Link connectivity and 24fps playback.

The HD-EP35 also supports 'High Bit Rate' audio – up to 7.1 channels – via HDMI.

Olivier Van Wynendaele, deputy general manager, HD DVD, at Toshiba Information Systems, said, "The addition of 24 frames per second (24Hz) support will be welcomed by home cinema enthusiasts – films are traditionally captured at a rate of 24 frames per second."

"Both the HD-EP30 and HD-EP35 have been designed to run films in their native, which means that consumers can enjoy their favourite high-definition movies at the exact frame rate in which they were originally recorded, avoiding motion judder."

"Toshiba continues to lead the next generation field in terms of both technical specifications and – crucially – price."

"It was just over a year ago that we launched the first-ever HD DVD player in Europe at what was considered to be a very competitive price point. That has led to HD DVD capturing a majority share of the high-definition, stand-alone player market."

"We are now delivering products with premium specifications that offer even greater value to the consumer and will continue to drive the adoption of the HD DVD format."

Cyril Wood to step down from Panasonic

Panasonic has announced that its managing director, Cyril Wood, will stand down on March 31.

Wood's career with Panasonic spans more than 30 years culminating in his becoming managing director in June 2003.

He said: "During more than 30 years with the company, I have seen Panasonic grow from new entrant to market leader in many product sectors with our brand becoming very well respected within the industry and with end-users.

"Both the industry and Panasonic have seen many changes during this period, but I am confident that the company is well placed to further strengthen its market position at what is a tremendously exciting time for our industry."

From 1 April, Wood will take up the position of senior advisor to Panasonic Europe.

UK Radio chiefs issue warning on digital radio

UK radio bodies have issued a warning that the Government's failure to settle on a date to switch off analogue radio is, "crippling the industry".

They claim that car makers will not take digital radio seriously and that investment in digital by radio groups will come to a halt unless a clear plan is drawn up.

Andrew Harrison, chief executive of the RadioCentre, the commercial radio body, has recommended that a working party representing the Department for Culture, Media and Sport, Ofcom, the BBC and commercial radio groups be set up by mid-2008 to discuss the issue.

Could investment in digital radio come to a halt?

Virgin Media grows in third quarter

Virgin Media has returned to customer growth in the third quarter, reporting 13 000 customer net additions in the period.

The news follows a net loss of 70 300 customers in the second quarter, 40 000 of which were attributed to Virgin's dispute with Sky over carriage of the broadcaster's basic channels.

According to Virgin, the 13 000 net additions is Virgin's best quarterly performance since March 2006.

Neil Berkett, Virgin Media's acting chief executive, said, "Our third quarter results show a significant turnaround, with our best customer, broadband and telephony growth since the cable merger in March 2006.

Neil Berkett, Virgin Media's acting chief executive, said, "Our third quarter results show a significant turnaround..."

"With the cable merger integration expected to be complete by year end, we can focus on continuing to improve the fundamentals, enhancing our products, reducing our churn, and delivering on our competitive strengths."

Television net additions were 20 400 for the period, again significantly up from 2200 in the second quarter.

Virgin pointed out that 190 200 subscribers now take Virgin's V+ high-definition DVR service, which represents around six per cent of the company's total digital TV subscriber base.

Philips green TV wins CES Best in Show

Philips' Eco FlatTV won the overall "Best in Show" award in CNET's "Best of CES" awards at the 2008 International Consumer Electronics Show in Las Vegas.

The innovative Eco TV, the 42PFL5603D, is a high-definition LCD television that delivers high picture quality while minimising power consumption.

The Eco TV is designed with several power saving features such as a proprietary dimming technology. This technology is designed to lower the LCD panel backlight to reduce power consumption without compromising picture quality.

A built-in light sensor automatically measures the viewing room's ambient lighting and adjusts the television's backlight for power efficiency.

Paul Zeven, chief executive of Philips Electronics, North America, said, "Philips has long been an industry leader in sustainability and it is an honour to be recognised for that commitment by an organisation such as CNET.

Philips' 'green' TV automatically adjusts its backlight to suit ambient lighting conditions, reducing average energy consumption

"The Eco TV sets the standard in design and efficiency, giving consumers unmatched picture quality without the hefty power bills."

Gunners to launch TV channel – but not on Virgin

Arsenal Football Club's upcoming television channel will not be available on Virgin at launch due to capacity constraints, it has been confirmed.

Instead, Arsenal TV, which will broadcast on satellite channel 423, will show six hours of club-related programming every week between 5pm and 11pm. This will include regular bulletins from Emirates Stadium; full match action from every first team match, on a delayed basis; every reserve match live; exclusive interviews with Arsene Wenger; as well as countless classic moments from Arsenal's history.

Arsenal TV will be operated by Setanta Sports.

Michael O'Rourke, a co-founder and joint chief executive of Setanta Sports, said, "This is another fantastic step for Setanta Sports and once again confirms our on going passion to deliver the best in sporting entertainment to those who want it most – the fans."

Panasonic unveils world's largest plasma display

Panasonic has developed three prototype plasma display panels (PDPs) using ground-breaking technologies.

These include a 42in panel, which is said to halve the normal energy consumption while maintaining the same brightness. There's also a less than one-inch thick super-thin 50in PDP and the world's largest 150in advanced high definition (HD) PDP.

The three prototypes were on display at the 2008 International Consumer Electronics Show (CES), which took place last month in Las Vegas.

Measuring 150in, this is the world's largest monolithic plasma display yet

The Sky HD test card

It's seldom that a new broadcast test card comes along. Eugene Trundle reports

UK colour television started over forty years ago with test transmissions in the summer of 1967. An important part of them for service technicians was Test Card F, based on its black and white predecessors, but incorporating a colour photograph in the centre circle, and finer gratings in the definition/focus check. Its features and attributes were many. A flesh-tone (one of the most subtle tints to capture and reproduce) was incorporated, along with a chalked cross at screen centre to facilitate check and adjustment of static convergence on early types of picture tube. Other aspects of this brilliantly-designed pattern tested colour decoding; scan amplitudes and linearity; image centring; greyscale tracking; dynamic convergence (colour registration); beam focus; low-frequency video response; 'ringing'; ghosting; the setting of brightness, contrast and colour; and many others. It was regularly shown until 1983, and continued until the 1990s when it gave way to round-the-clock programme scheduling. The advent of widescreen TV fostered a 16:9 version, Test Card W, with extra squares on each side and many detail enhancements and improvements, but it saw little use outside studios and production suites. Equipment manufacturers like Philips and Snell & Wilcox also produced widescreen testcards, some animated (see later) but they were likewise restricted in their use and distribution – test cards don't generate revenue for broadcasters!

Enter Myleene

Sky television recently designed a new test card for use with digital high-definition widescreen equipment. Transmitted in 1080i mode, it carries some of the features of the old Test Card F for tradition's sake, primarily the picture of a girl and a toy clown

Test card F with Carole Hersee and the clown toy, looking a bit less eerie than the one on the new card

in the centre circle: its main function now is to provide a test of skin-tone. The girl in the new picture is Myleene Klass, musician, singer and TV presenter. Indeed she does some skilful presenting here, stepping out of the picture to explain, in a ten-minute instructional session, its features and how to set up the screen in simple terms for viewers.

Many of the other features of the old test card are now redundant: LCD,

plasma and similar screen technologies have no issues with colour registration, focus or geometry, while the digital transmission system has done away with colour decoding errors and the effects of poor frequency response, non-linearity and others. So the new card is simplified in many respects.

The aspect ratio (width: height) of the new card is 16:9 to match the shape of hi-def screens, and the white arrowheads should just touch the screen edges at the top, bottom and sides. The mid-grey of the background squares correspond to an average picture illumination, while the top right-hand circle checks video 'crushing' and brightness/contrast settings: the brightness should be set so that the sky logo in the black bottom half is visible. Any residual illumination of the black, here or elsewhere, implicates the display panel itself: LCD and plasma types may not fully extinguish light emission. The sky logo in the white upper half of the circle should be visible at all brightness and contrast settings. The left-top and bottom-right circles have 0/100% luminance segments and fine needle lines. At top right and bottom left are grey scale step wedges, whose eight levels, with white, present equal (12½%) increments of brightness. They indicate the luminance linearity of the display system and the setting and effect of any 'black-stretch' control, generally best left in the off position!

There should be no colouration of any of the steps when the user tint control is set to neutral. At this point the actual 'colour' of the whites and greys should be Illuminant D6500, which corresponds to 'standard daylight', a slightly blueish white like that of scattered daylight in an overcast northern sky. I have a D6500 calibration standard in the form of a rugged rubber-handled fluorescent tube with three neutral-density filters to render TV white at four brightness levels. It dates from the early 'seventies, and I can find no source of supply of one of these today.

Control settings

Once the correct black level has been established with the brightness control, the brightness of the rest of the picture is set with the contrast control. Its optimum level is determined by the ambient light in the viewing area: TV is best watched in subdued light with moderate contrast settings, but bright surroundings demand higher levels. Coming now to colour aspects, the bottom left circle contains primary and complementary colours: clockwise from the top cyan, green, blue, red, magenta and yellow blobs surrounding a black one. At top left and bottom right are the standard colour bars. As the colour saturation control is advanced, the setting is correct when, for instance, blue just disappears from the red bar, and red from the blue. At this point the flesh-tone should look exactly right, a healthy, slightly orange pink. The default 'factory', 'showroom' or 'demo' settings are generally too high and harsh for home use, and the picture benefits from resetting of brightness, contrast and colour levels, also perhaps tint.

Some aspects of the card are not as important as in days of yore: with thin screens the various circles cannot help but be perfectly round so long as picture width and height are correctly set; and the streaking, ghost and ringing effects addressed by the black letterbox in the top centre and the scattered black and white vertical needles are not really possible in an all-digital system!

The gratings across the centre of the new card illustrate the high definition capability of the new TV standard, increasingly tight-packed towards screen edges. In practice their main function is to help achieve an optimum setting of the user sharpness control: adjust it for best definition of as many vertical lines as possible. Its effect can be surprising, knocking out chunks of detail at some settings.

The circles containing speaker symbols provide a check on the connections and settings of loudspeakers in a Dolby surround sound system, while another animated feature facilitates the adjustment of the audio delay incorporated in a Sky box (and other equipment) to achieve good lip synchronisation; the need arises from the different processing delays in digital sound and vision data sections of the receiver and the screen. Details of these checks and settings are given with the test card when you call it up.

Moving targets

In a digital TV system using a flat screen a stationary test pattern does not go as far as it might in terms of system testing. Momentary interruptions in the datastream – which cause image freezing – can go unnoticed, while the quality and performance of the image scaler/convertor (adapts the incoming image to the screen structure) is largely manifest in its ability to handle motion. With some types of screen, too, there can be issues over pixel lag, whose effect is smearing or comet-tailing of fast-moving picture components. To address these issues some form of motion in the test image is required: perhaps a couple of clock hands rotating at different speeds and a little cannonball fired rapidly around the screen. Maybe something like this could be incorporated in any future version of a widescreen hi-def test card.

I don't mean to carp! This test card is excellent for viewers and technicians, and its nostalgic and iconic image gladdens the hearts of many amongst them – certainly me. Copied to a DVD in standard definition it could form a useful resource for those technicians who don't have a test card generator, and used for setting up (dare I say it?) TV sets incorporating cathode ray tubes and analogue/PAL processing. Sacrilege indeed!

The test card can be found on Sky channel 268, and – via the TV guide – on Anytime TV; it will generally be the last item in the content list.

Test case 531

TV model: Sharp 28LF92H

Last month we had an unusual visitor to the service workshop in the form of a Sanyo TV set. It may be that our unfamiliarity with this led to some of the problems described back then. It was soon after this that we had another stranger in the camp! Once again it was a big widescreen TV

This time the TV in question was a Sharp model 28LF92H. No problem with the service manual for it, though, because we found a Vestel 11AK45 chassis lurking inside, and didn't TV Ted have a complete manual for that in his 'miscellaneous' data files?

Progress with this one was good at first. It was quickly discovered that the power section was working OK, but the fusible resistors R_{603} and R_{614} in the feeds out of flyback transformer TR_{600} were open-circuit. They looked very tired and weary, especially R_{614} in the +11V line. Both were replaced by fusible resistors of the same type from our component stores, and we were in business again: the set sprang into life, with sound and picture. But all was not well with the horizontal scanning! Tuned to our test card, the set showed just the centre section of a grossly over-scanned image.

Accordingly, attention was directed to the EW modulator section, starting with diode 611 in the bottom half of the correction network. That proved to be OK, and the two flyback tuning capacitors C_{621} and C_{622} were likewise when checked on a digital capacitance meter.

Moving back down the control line feed, resistor R_{613} and line-suppression choke L_{601} proved to be OK on test, along with, insofar as it could be tested, EW driver FET Q_{600}. Cathode Ray, whose job this was, then found what seemed to be a fault: the DC feedback resistor R_{605} connected to Q_{600} appeared to have gone high in value, measuring much more than the 47kΩ given in the manual.

Working from the print side of the PC board, Ray isolated one end of R_{605} and temporarily lashed a new 47kΩ type in its place. That did little for the picture! It became even wider, so that the screen was now filled by little more than the test card's central circle, representing, perhaps, a third of the picture.

Although progress started off well we soon discovered this was no easy repair

Then an oscilloscope was brought into play to check the EW correction waveform applied to the gate of Q_{600} – it didn't amount to much, and the same was true of the waveform coming from pin 32 of jungle chip IC_{200}. Maybe this IC was the cause of the trouble? Certainly the stores did not boast a VDP313XY chip on the day! Cathode Ray decided to check the effect of adjustment, and so he keyed into the customer's remote control the sequence MENU–4–7–2–5 to get into the service menu, from which he selected ADJUST and then scrolled down to the EW geometry controls.

Those for the 'panoramic' modes, nos. 40–49, had the correct effect but very little range, while nos. 34–39, governing the 'regular' (4:3 aspect ratio) horizontal scan, when selected, resulted in the screen going completely blank. What diabolical goings-on had we here?

Cathode Ray waited on Television Ted with the service manual. That worthy came to Ray's bench and watched as the junior technician demonstrated the problem. Ted examined the service manual and the chassis itself, and then made a suggestion. It turned out to be the right one!

What was it? Think about it before turning to page 35 for the solution.

Fault finding reports

Save time and money by benefiting from the experience of some of the repair business's most respected voices

For convenience, each report is categorised by its relevance to a particular appliance, e.g. TV, satellite, etc. In each appliance section, reports are grouped according to their author, whose name and details appear at the end of their respective report group. First off, Philip Salkeld...

TV FAULT FINDING

Toshiba 30WL46 LCD

We have had a number of customers with this set complaining of loss of teletext. There is a bulletin on this. The cure is to do a factory reset.

To enter the service menu press the menu button, followed by 9,3,0,1. Information will appear on the screen. Select calibrate with left/right cursor keys and then the down cursor key. To implement the factory reset, now press OK button.

After a few seconds TV will revert to standby. Power it off and on again using mains switch. Wait 12 seconds in standby before switching on again using the standby button.

Now the set will display a language and country selection page and then auto set up. Run auto set up. When it's completed teletext will be restored.

Bush 2877NTXSIL 11AK37 chassis

When I called on this customer, whose set was dead, stuck in standby, I knew straight away it was a 'bring in' job.

With this particular fault on this chassis, repairs have never been simple – or maybe I have just been unlucky. However, during the conversation the customer mentioned that the set went off while he was watching it.

Once on the bench this, gave me a starting point. The HT line was as usual low. On removal of the line output transformer, the 150 volts returned. The number on the transformer was 13420049B so the compatible HR8790 could be used.

Panasonic 42in plasma

In this caese, the model number is unimportant. A customer had bought a Technika DVD recorder from one of the superstores and wanted me to install it. No problem; I called and did the job and gave him a brief description of how to operate it.

I also promptly told him he could only record the programme he was watching. A few days later he phoned to say he had a query. I listened intently. He went on, "...if you make a recording when the television is on, everything works. If you switch the TV off though, the recorder goes into standby. Could you help?" he asked.

After some thinking I decided the cause of this was the SCART lead. I have the AV connector reference guide leaflet and noticed that pin 8 – the source switching pin – was snipped off. May this pin fool the recorder into thinking that the TV was on? This turned out to be a good idea.

Bush 2868NTX AK19 chassis

This set was brought to me by one of my television acquaintances with a right tale of woe.

The original fault was that the set was dead due to a short-circuited line-output transistor. A replacement transistor and a general dry joint re-soldering brought the set back to life.

It wasn't perfect though. It now exhibited an east/west fault. My acquaintance then admitted to removing a few components to try to locate the fault. The culprit was east/west loading coil L_{604}, which had shorted turns. When switched on again, the set had a straight black 2cm line down the side of the screen.

Going in to the service menu and selecting horizontal shift made no difference. I have never had this fault on this chassis before.

I had the advantage of having a scrap chassis. I eventually noticed that L_{603}, a black two-pin coil with a white polarity line down its side, was the wrong way round.

Reversing it put matters right. Inductor L_{603} has something to do with the line phase.

Hitachi LD7200 32in LCD TV

This was a strange situation. The customer had an upgraded Telewest cable box that uses a 'High Definition Multimedia Interface', of HDMI.

Input is via AV6, which uses a small 'D' plug inserted at the back of the television. The fault, appearing only

on this input, was distorted sound for the first 20 minutes. All the other AV inputs were perfect so that ruled out the sound-output stage.

After removing the stand and a large number of screws that holds the back, the sound processor board is under the AV6 input socket, part number 39012588011. This corrected this obscure sound fault.

Unfortunately these LCD sets are not easy to work on.

Sony KV14T1U BE4 chassis

With these sets, if the LED flickers six times then pauses and flickers six times again, the first the thing to do is disconnect the +B line on pin 4 of the line output transformer.

The LED should now flash four times indicating the power supply is working. Look no further than a faulty line output transformer. If it is a black one the part number is 145318611 and if it is grey, part number 145326611. This is one of only a few straight forward repairs on Sony sets.

Philip Salkeld

Samsung WS322306V CRT S62B chassis

The set was dead, but by removing the line stage the HT line from the power supply it came back to life. This suggested a short in the line stage.

A quick check soon revealed that the T6920A line-output transistor Q_{403} was short-circuited. A replacement restored operation but the picture was too wide. This fault we traced to a 150nF, 400V capacitor, C_{425} in the line stage which had gone open circuit.

Panasonic TH50PX50 plasma

If you have a set that shows no picture or no colour, the fault may be that the eeprom needs resetting. This must be set to the factory setting, the procedure for which can be found in the service manual.

Philips 42FD9945 plasma FM242 chassis

If you have this set and find there is no operation or the loss of picture and only the relay clicks, check whether 6.8Ω 5W resistors R_{8001} and/or R_{8002} are open circuit.

Sony KD-32X40U CRT TV FE2 chassis

If the set is dead, this may be caused by the line-output transformer and/or the BU2515DX line-output transistor

In this case however, we traced the fault to 1000µF 6.3V capacitor C_{005}. It had become a short circuit.

If you are still in trouble, check whether P6KE200A diode D_{628} is short circuit. Also check the TOP209P chopper, IC_{609}, by replacing it.

Sony KD-28DX40 CRT TV FE2 chassis

In this case, the red and green LEDs only were flashing.

If the set intermittently tries to start-up but there is no EHT rustling, check for faulty BU2515DX line-output transistor Q_{533}. Also, check the line-output transformer T_{511} for shorted turns on the primary section.

Alba ALCD15TV LCD L5A/Beko chassis

This fault occurred after a power cut when we lost the 15 volt line from the power supply. This was due to faulty KA3883C, IC_1. A replacement restored all functions.

If the set suddenly goes to standby after start-up, suspect 470µF 16V capacitor C_{620} for a high ESR reading. It may need replacing.

Toshiba model 28N33B CRT 11AK37/Vestel chassis

If the set is completely dead apart from a ticking noise, check 1nF 2kV capacitor C_{805}, If it's burnt also replace IC_{801}, the MC44608 chopper control IC, and 4.7kΩ resistor R_{801} along with 47µF 250V capacitor C850. This should then restore normal operation.

Wharfdale LCD3210HD 17MB11/Vestel chassis

When the set was first switched on, the picture just froze. Also, there was an intermittent sound that cleared when the set was warm. If you experience this, check 100µF 16V capacitor C_{108} for a high ESR reading.

If, just after switch on, the picture appears for short time then the set then reverts back to standby, try replacing capacitors C_{877} and/or C_{878}. These are two 15nF, 630V devices.

In some cases the capacitor can cause the set to fail to start up but the blue LED stays on in standby mode.

Toshiba 30WL46 LCD TV

If the set is dead with no standby light on, this may be due to the loss of the 24V line from the power supply. In this case try replacing capacitors C_{488} and/or C_{1011}. These are two 1000µF 35V components.

Toshiba 28W8DIB CRT TV C7SR chassis

If the set is dead, with no LED lit, then check whether the 470pI 2kV capacitor C_{817} is short circuited. Also be sure to check and replace the STY-S6700 transistor Q_{801}. Finally, make sure that 3Ω, 15W resistor R_{810} isn't open circuit.

Hitachi 42PD5300 plasma TV

If there is no AC power check the power supply for a faulty TS04961 photo coupler, PC_{001}. It may be exhibiting a short circuit.

If the set appears dead but the relay is switching on and off, check whether the ERA91-02 diode D_{114} is a short circuit.

Matsui 28WN05 CRT

If the east/west geometry is only operating correctly in 16.9 mode, check the 10µF, 100V capacitor C_{409} for high ESR.

Sharp 28LF92H CRT TV

On this set, loss of picture can be due to the STV9379FA frame-output device, IC_{600}, having gone short circuit. This can quickly be checked by examining resistors $R_{611/614}$. These 0.47Ω, 5W devices may have burnt out. A replacement of all related components will restore normal operation.

Sony KP41S3 projection TV RE1 chassis

If there is no picture then check all the 1µF capacitors on the tuner/IF PCB. These include $C_{115, 249, 316, 259, 129, 620 \& 623}$ replace them all to be sure of no come back.

Goodmans GTV34TS CRT TV, BECO 127 chassis

If the set is dead then it maybe due to excessive HT. This can be traced to 4.7Ω resistor R_{414} having changed in value. Also check 12V zener diode ZD_{401}. If you are still in trouble then check 47µF capacitor C909 for high ESR reading and replace.

John Coombes

Daewoo DUB2850 digital/analogue CRT TV

A replacement 'Digital Analogue' section had been fitted to this TV. When it was switched on, the words, 'HEAT RUN' showed on screen.

I contacted Daewoo's Technical department and it turned out that this problem occurred because the PCB had been taken off the production line in Poland. It hadn't had its final checks before it was issued to Daewoo's UK spares department.

The only way to remove this 'HEAT RUN' is to use a Daewoo Service Remote Control type R30-SV7and press the 'Normal' button.

Daewoo DP42SP plasma monitor

Here, the customer complained of elongated small dots all evenly spaced over the screen.

The picture was OK in the background. It looked like the TV was picking up some sort of interference. This interference came either from an outside source or internally from perhaps the Power module.

I switched off all appliances in the workshop – even the fluorescent lights – but the dots were still present. The power module was then replaced, but to no avail. The video PCB was then replaced and this resulted in a cure.

I didn't deem it cost effective to try to locate the faulty component as the cost of the complete video PCB was quite reasonable.

Daewoo DP42SP plasma monitor

This plasma screen is actually a monitor as it doesn't have a TV tuner built in. It's sold with an external tuner box which has two SCART inputs and two Composite phono inputs and an 'S'-Video input.

The tuner box connects to the plasma monitor via a VGA cable from its VGA monitor output socket into the VGA socket on the plasma monitor. There is also a stereo sound output from the tuner box. This connects to the monitor for the audio.

The plasma monitor has other inputs which are not normally compatible with products in the UK. These are five bayonet component inputs for horizontal sync, vertical sync, B-Y(Blue),R-Y(Red) and luminance (Green).

There are no other inputs unless you have been lucky enough to be provided with an external video jack adaptor that converts the 25-pin socket into a composite-video input with associated sound sockets plus a 'S'-video input. This jack is also on the back of the monitor

A replacement jack-input PCB is available from Daewoo spares. This is more 'UK friendly' because it has the VGA input for connection to the tuner box plus the associated stereo sound input. Instead of five bayonet connectors for the component video and sync input it has two rows of the normal three phono sockets. These are for component and composite video inputs. They also take stereo sound and 'S' video input.

There is no 25 pin socket, as the adaptor isn't necessary. However, when this modified jack input PCB is fitted, you will find that when you toggle through the inputs the displays on the screen no longer match the increased number of sockets on the replacement PCB.

The cure is to select 'Service Mode' on the monitor by using the customer remote control and pressing the following buttons:

- Up arrow
- Mute
- Display
- Mute.

This will bring up a list on the left hand side of the screen. Toggle down to 'MISC'. Next go across to the next column then down to video monitor and change this video mode. Press the menu button to exit service mode.

Charles Arundel

DVD/VCR FAULT FINDING

Matsui VXA1100

I have two Matsui VCRs; one in common use and an older VXA 1100 model used very occasionally for copying tapes.

A friend recently came from Kenya with a video diary of a house he built. He asked if I could make him a copy for his children.

Hooking the two VCRs together revealed a problem with the VXA 1100. The tape would load OK and

carry out the required function, but it would then unload after ten seconds or so and shut down.

My friend was going back to Kenya the next week so a quick repair was required. I managed to get a drawing and service tips from http://www.eserviceinfo.com, very useful. I removed the cassette tray to start checking the main PCB. This required overriding of the BOT/EOT sensors by shorting TP_{1010} and TP_{1011}.

To my surprise, the tape now loaded and operated almost perfectly on all functions. This led me to check the BOT/EOT sensors. Sure enough, BOT had failed. Replacing it restored the machine to full working order and my friend's video diary was preserved!

Bernie Storey

Pioneer DV717K

This one was completely dead. I've mentioned in the past that there are two different power-supply models used in Pioneer players from this era. Pioneer has no component values listed for one of them.

The start-up resistor, which appears to be 3.3MΩ, goes open circuit. This player was fitted with the other power supply type. It looks pretty similar, and many of the component reference numbers are the same. However, in the case of the start-up resistor, this time, its reference is R_{72}, and its value is 560kΩ.

A suitably rated replacement, restored the player to full operation.

Panasonic SA-PM08 home cinema

This kit would not read discs of any description, coming up immediately with the message 'NO DISC'. An examination of the deck activity revealed that other than the tray opening and closing, there was none. No laser homing either, and no spindle motor rotation.

I was quickly able to determine that this was due to a lack of the 'motor 9V' signal at pin 11 of connector CN_{105} on the power supply PCB.

This supply is regulated down from 12.6V, by Q_{805}. There was only about 1V input on the emitter of this PNP device. It arrives via R_{866}, which is a 1.5Ω resistor, which appeared fine.

Raw supply is derived from diodes D_{832-5}. These are, in turn, fed by R_{811}, a safety resistor, so this was my next suspect. It too proved blameless. In fact, there was actually a good DC supply at the output of the bridge.

A closer look at the circuit diagram revealed another diode, D_{808}, in series with the input to Q_{805}. There was a good level at the anode of this 1N4003 device, but only the 1V previously seen at the emitter of Q_{805} at its cathode.

A replacement diode restored the supply, and fullworking order.

Geoff Derby

Daewoo DR2100P DVD recorder

This customer reported the fault as no playback of picture or sound.

The machine was returned to the workshop and connected to a monitor via a SCART lead and. When it was powered up, there was a slight flicker on the screen and an OSD saying AV1.

I put in a DVD and suddenly there were flashes of picture. These gradually became whole and produced good video playback of the DVD but with no sound.

This made me suspect a faulty component that started working more efficiently when it warmed up.

A previous fault I experienced in a Daewoo VCR/DVD Recorder had been that the set produced no playback – just coloured lines. The cause was found to be a faulty capacitor in the power module. For this reason, I was decided to look in that area on this particular DVD recorder.

A 470µF, 16V, capacitor in the power module was discovered to be down to 15µF and had a high ESR reading. This component, circuit reference C_{823}, was replaced and the machine sprung into life with a solid picture and sound.

Charles Arundel

JVC DRMH30 DVDR player

Here I had no operation; just the word 'LOADING' displayed. If loading only comes up on the display this is usually due to a faulty STY-G6353 power regulator, IC_{5302}. A replacement will cure the fault.

In this case though, IC_{5302} proved to be fine. We traced the fault to 22µF 50V capacitor C_{5340}. It had a high ESR reading.

John Coombes

AUDIO FAULT FINDING

Teac A-H500i

This high-end amplifier came to me with the complaint that the left channel was intermittent – very!

The lad from the shop whose customer it was said that it had been in for repair three times with another engineer. Each time he took it back to the owner's house, it either let him down on the spot, or within minutes of him leaving. When retested back at the shop, it was of course working.

I put it on and left it running using a CD player that I had just finished repairing as input. Within moments, the left-hand channel went off. However, as soon as the unit was picked up to start having its case screws removed, it came back on.

I was confident that once the case was off, it would be a very easy problem to find. Not so. No amount of provocation would make it go off again. I tried flexing the PCBs, heating them until they almost caught fire an freezing the unit until it looked like it had been snowing in there. I even clobbered everything in sight with the butt end of the largest screwdriver that I could find.

Eventually, I replaced the cover and put the unit back on soak. Over the next week, the problem put in a brief appearance on occasions, but every time the unit was then disturbed, it came back on and stayed on.

By this time the owner, and the shop, were getting anxious, and apologetically asking after it every time they rang.

Friday afternoon came and I'd had a good week, with a number of 'nasties' having been fixed. I'd been out in the sunshine to collect some money. I then found that the cake shop had declared autumn, and put soup back on!

I was feeling good, so I decided to get to the bottom of this Teac's problem, once and for all. Five minutes later, it was fixed.

I put it on, and the fault was present. The right channel was working fine but there was nothing from the left channel

As usual, as soon as the case was removed, the dead channel returned. As usual, no amount of provocation would make it go back off.

At this point, it was unclear as to whether the problem was in the front end or the output. There is a L-R common preamplifier board, a common volume control board, and completely separate left and right power amp boards. Coupling all this lot together is a variety of connectors, and circuitry such as the electronic source switching.

A multiway plug connects onto each power amplifier board. It has a screened cable amongst its wires. An oscilloscope check here revealed normal looking audio.

I figured that the best thing to do would be to hook the 'scope probe to this point, put the case back on, and see if the audio waveform stayed or went when the fault next occurred. This would give a good indication of whether the problem was preamp or power-amp related.

Close to the connector is a bipolar electrolytic capacitor, C_{503}, with long leads crying out to have a 'scope probe attached. I guessed that this may well be the audio decoupling capacitor.

As soon as I clipped the probe onto one end, the audio went off. I went to unhook the probe again, and it came back. I then touched the cap with a finger, and the audio came and went.

In fact, it could be made to fault at will, simply by resting the weight of a ball-point pen on it, but no amount of banging or bending, would produce the same result.

When I examined the capacitor's joints under a strong magnifying glass, the leg in one of them could just be seen to move when the cap was disturbed. A quick dab with the soldering iron, with some fresh solder applied, effected a complete cure.

What beggars belief is that such a critically 'touchable' bad joint could be so stable under all other types of provocation.

NAD C340 amplifier

The reported problem with this one was that it, "plays for five minutes, then crackles and hisses". In fact, it produced no audio at all right from the off, although the output relay closed normally. This was a promising sign for an all discrete component output stage.

My first move was to check that the power amplifiers were indeed working. I did this by removing the rear panel link plugs between the 'Pre Out' and 'Main In' sockets and then injecting a signal directly into the 'Main In' pair. This produced normal-sounding audio.

I next went looking for supply volts around the transistor-based preamplifiers and found none. This led me back to Q_{92}, a heatsink-mounted 18V monolithic regulator.

There was voltage going in, but none coming out. As the device was cold, it was clearly not in thermal shutdown due to output overload, so I fitted a replacement LM7818. This restored the missing rail and – once the removed rear panel link plugs had been refitted – normal audio.

Denon AVR 1801

This one started its power-up sequence normally enough, with the various start-up messages appearing in the display. However, after about the third of these messages had appeared, the unit shut back down, with the stand-by LED flashing.

The cause of this was a missing rail, due to resistors R_{141} and R_{142}, both 1 ohm, being open circuit. They feed the rectifier diodes. I was not able to measure any shorts in the area, so I went ahead and replaced them.

This replacement produced a fully working unit. A long soak test showed there to be no further problems.

Technics RS-EH750 cassette deck

This cassette deck is part of a four-piece stacking system. It produced no output. All functions worked correctly mechanically, and all other items in the stack produced normal audio.

With a known good tape playing, I first went to pins 38 and 47 of IC_{101}. This IC is the record/playback equalization amplifier. The two pins mentioned are its left and right playback outputs. A healthy looking signal was present at both.

The two signals next arrive, via playback level-set presets, at pins 4 and 11 of IC_{102}. This is a switch IC labelled 'signal control' on the circuit diagram.

Signal was again present at these two pins, albeit at a reduced level, due to having passed through the presets. The signals were also correctly switched through, appearing at pins 2/3 and 9/10.

The next place that the signals arrive at, via C_{205} and C_{206}, is pins 3 and 14 of the Dolby processor chip, IC_{201}. They were present here, but did not emerge at pins 6 and 11.

Voltage checks at the various pins of this IC showed values seriously at odds with the ones quoted on the circuit diagram. This quickly led me to pin 4, which should have been at 4.7V but was actually at zero.

I measured a dead short to ground at this pin. It turned out to be due to C220, which should be 470µF at 10V working.

Replacing this item restored all voltages to normal and allowed the unit to produce audio output.

Hitachi HTDK-180

This one arrived on the bench with a note attached that read, "surround system faulty".

When it was tried, although its front-panel display correctly showed that it was decoding six-channel sound, there was only actual output from the front left and right, and subwoofer channels.

Even when test-tone mode was tried, only the main front channels produced output. Just the words 'Left' and 'Right' appeared in the display, in sympathy with the test sound.

My next move was to go in search of surround-sound settings in the menus. I found two. One was actually called 'Surround Settings' , and the other, 'Speaker Settings'. Both of these, curiously, were 'greyed out'. All attempts to access them, failed.

Eventually, under the 'Setup' menu, I found an option called 'RESET', so I selected it. The two greyed out options then became accessible and full surround operation was restored.

I wonder what 'hack' the owners had been trying, that had resulted in this 'illegal' condition? They were lucky that there was an easily accessible system reset available, and that it performed a deep-enough reset to get the unit out of trouble.

Fender PR246 Hot Rod Deluxe

The complaint with this one was that the sound became 'mushy' after it had been playing for some time.

I put my dummy load test set on it, with an oscilloscope attached, and set it running. The output waveform didn't look too hot, but the amplifier sounded fine. It sounded slightly better on its own speaker than through the tester's heavily attenuated internal 'squeaker'.

After running it for about an hour at its full rated power of 40W, it still didn't sound any worse. I decided to have a quick look at the operating conditions around the 6L6 output valves, to see if there were any slight imbalances. This may have indicated a failing valve.

On one valve, I was able to measure HT of around 440V on both its anode and screen grid pins. On the other valve, only the anode pin had supply. I was astonished to discover that the 470Ω, 1W screen-feed resistor for this valve was completely open circuit.

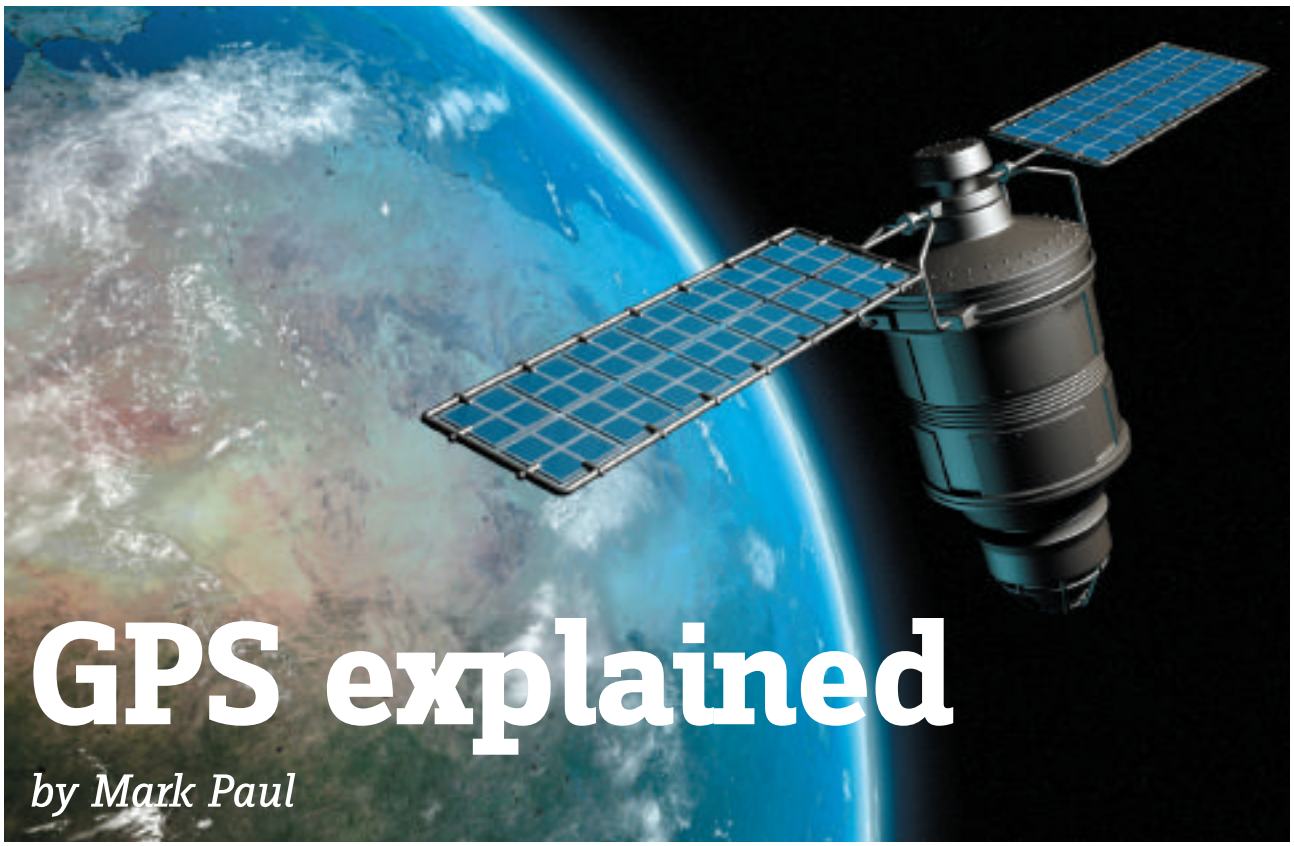
Once a new resistor had been fitted, the screen voltages were restored. Voltage drop across it was identical to that of the other valve, confirming that the valve itself was in good order.

When the amplifier was tried again into the load, the output waveform displayed on the oscilloscope was now perfect. Audio from the tester's squeaker was much improved.

When the amplifier had been refitted to its cabinet, and its own speaker reconnected, the audio was noticeably improved. But it was still amazing just how good it had been originally, with one half of the output stage barely working.

Geoff Derby

Fault index by model



GPS explained

by Mark Paul

We are all pretty familiar with the Global Positioning System (GPS), be it as mountaineers or drivers of motor vehicles. GPS is the only fully functional Global Navigation Satellite System and is designed to use a constellation of at least 24 Earth orbiting satellites that transmit precise microwave signals enabling a GPS receiver to determine its location, speed, direction and time.

GPS was initially developed by the United States Department of Defense and given the name NAVSTAR GPS. From the start it was a 'dual-use' technology having applications for both the military and civilian usage - which is free despite the current cost of maintaining the system being in the region of US$750 million per year.

Apart from having a prominent role in navigation worldwide GPS is a useful tool for map-making, land surveying, commerce, and many other scientific functions including a precise time reference used in many applications including the synchronisation of telecommunication networks globally.

GPS history and design evolution

GPS history is rooted in early similar ground-based radio navigation systems, such as LORAN and the Decca Navigator developed in the early 1940s and used during World War II. What inspired the present GPS system was the launching, by the Soviet Union, of Sputnik 1 in 1957. A development that was quite painful at that time for both the political and technocrat mindset in the U.S. as they jealously watched the orbital path of this silverised technical achievement reflecting back the stellar light.

As a team of U.S. scientists, led by Dr. Richard B. Kershner, were monitoring Sputnik's radio transmissions they discovered that, because of the Doppler effect, the frequency of the signal being transmitted by Sputnik was higher as the satellite approached, and lower as it continued away from them. They realized that since they knew exactly their own geographic position on the earth they could pinpoint where the satellite was along its orbit by measuring the Doppler distortion. This was the start.

The first satellite navigation system was successfully tested in 1960 and used by the United States Navy, it was called Transit. It was designed around a constellation of five satellites providing a navigational fix approximately once per hour – we've come a long way since then! In 1967 the U.S. Navy developed the Timation satellite which proved the ability to place accurate clocks in space, a technology the GPS system totally relies upon. It wasn't until Feb 1978 that the first experimental Block-I GPS satellite was launched.

Basic System

A GPS receiver calculates its position by measuring the distance between itself and three or more GPS satellites. Since the signal travels at a known speed measuring the time delay

Dateline

- *In 1972, The US Airforce Central Inertial Guidance Facility conducted developmental flight tests of two prototype GPS receivers over White Sands Missile Range, using ground-based pseudo-satellites.*
- *In 1978 the first experimental Block-I GPS satellite was launched.*
- *In 1983, after Soviet interceptor aircraft shot down the civilian airliner KAL 007 in restricted Soviet airspace, killing all 269 people on board, US President Ronald Reagan announced that the GPS system would be made available for civilian uses once it was completed.*
- *By 1985, ten more experimental Block-I satellites had been launched to validate the concept.*
- *On February 14, 1989, the first modern Block-II satellite was launched.*
- *By December 1993 the GPS system achieved initial operational capability.*
- *By January 17, 1994 a complete constellation of 24 satellites was in orbit.*
- *Full operational capability was declared by NAVSTAR in April 1995.*
- *In 1996, recognising the importance of GPS to civilian users as well as military users, US President Bill Clinton issued a policy directive declaring GPS to be a dual-use system and establishing an Interagency GPS Executive Board to manage it as a national asset.*
- *In 1998, US Vice President Al Gore announced plans to upgrade GPS with two new civilian signals for enhanced user accuracy and reliability, particularly with respect to aviation safety.*
- *On May 2, 2000 'Selective Availability' was discontinued as a result of the 1996 executive order, allowing all users to receive a non-degraded signal globally.*
- *In 2004, the United States Government signed a historic agreement with the European Community establishing cooperation related to GPS and Europe's planned Galileo system.*
- *In 2004, US President George W Bush updated the national policy, replacing the IGPS Executive Board with the National Space-Based Positioning, Navigation, and Timing Executive Committee.*
- *November 2004, QUALCOMM announced successful tests of the Assisted-GPS system for mobile phones.*
- *In 2005, the first modernised GPS satellite was launched and began transmitting a second civilian signal (L2C) for enhanced user performance.*
- *The most recent launch was on 17 October, 2007 while the oldest GPS satellite still in operation was launched on July 4, 1991, and became operational on August 30, 1991.*
- *On September 14, 2007, the aging mainframe-based Ground Segment Control System was updated.*

between transmission and reception of each GPS microwave signal gives the distance to each satellite. Embedded in the signal is information about the satellites' location and general system health – this is known as almanac and ephemeris data.

By determining the position of, and distance to, at least three satellites, the receiver can compute its position. Unfortunately receivers typically do not have perfectly accurate clocks so they track one or more additional satellites and correct any clock error by synchronising with the on-board atomic clocks.

In its original specification, 24 satellites were called for to be distributed equally among six circular orbital planes. Orbiting at an altitude of approximately 20,200 kilometers, each satellite makes two complete orbits each sidereal day. The orbits are arranged so that at least six satellites are always within line of sight from almost everywhere on Earth's surface.

As of September 2007, there are 31 actively broadcasting satellites in the GPS constellation. These additional satellites improve the accuracy of the calculations each GPS receiver makes.

The flight paths of the satellites are tracked by US Air Force monitoring stations in Hawaii, Kwajalein, Ascension Island, Diego Garcia, and Colorado Springs, along with monitor stations operated by the National Geospatial-Intellegence Agency (NGA). The tracking information is sent to the Air Force Space Command's master control station at Schriever Air Force Base in Colorado Springs which then speaks to each GPS satellite regularly with a navigational update via the monitoring stations. These updates synchronise the atomic clocks on board the satellites to within one microsecond and adjust the ephemeris of each satellite's internal orbital model.

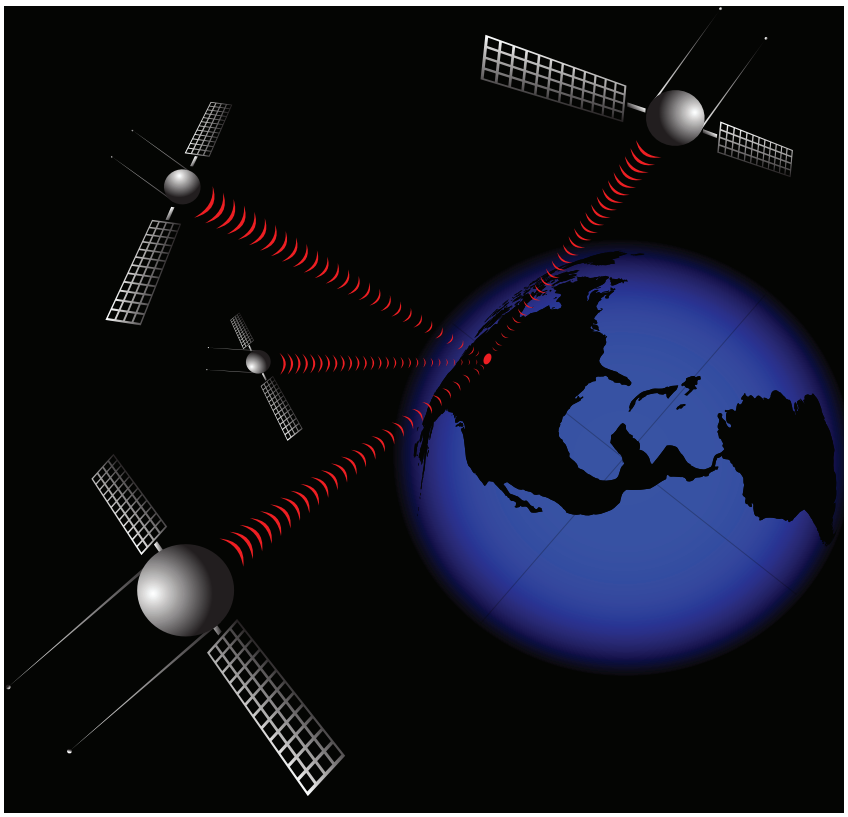
Basic Receiver

In general, GPS receivers give a moving display for providing location and speed information to the user, and are composed of an antenna (tuned to the frequencies transmitted by the satellites), digital receiver-processors, and a highly stable crystal clock. Its number of channels often describes the receiver – this signifies how many satellites it can monitor simultaneously. Originally limited to four or five, this has progressively increased over the years so that presently receivers typically have between twelve and twenty channels and more.

GPS Broadcast Signal

Each GPS satellite continuously broadcasts a Navigation Message at 50 bits/s giving the time-of-day, GPS week number and satellite health information along with an ephemeris and an almanac.

The ephemeris data gives the satellite's own precise orbit and is transmitted over 18 seconds, repeating every 30 seconds. The information is updated every 2 hours and is generally valid for 4 hours. Interestingly, the time needed to acquire the ephemeris is becoming a significant element of the delay to first position fix. This is because as the hardware becomes



more capable, the time to lock onto the satellite signals shrinks, but the ephemeris data requires 30 seconds (worst case) before it is received due to the low data transmission rate.

The almanac consists of coarse orbit and status information for each satellite in the constellation and takes 12 seconds for each satellite present, with information for a new satellite being transmitted every 30 seconds (15.5 minutes for 31 satellites). The purpose of the data is to assist in the acquisition of satellites by allowing the receiver to generate a list of visible satellites based on stored position and time, while an ephemeris from each satellite is needed to compute position fixes using that satellite.

Galileo Positioning System

The Galileo positioning system is a planned Global Navigation Satellite System, to be built by the European Union (EU) and the European Space Agency (ESA). Named after the medieval Italian astronomer Galileo Galilei, it is referred to as 'Galileo' instead of as the abbreviation 'GPS' to distinguish it from the U.S. system

The €3.4 billion ($5 billion) project is designed as an alternative, and complementary, to the U.S GPS and the Russian GLONASS systems. After a shaky start and a history of lengthy bureaucratic budget squabbles, the EU took direct control of the project in 2007. On November 30th, 2007 the 27 EU transportation ministers involved reached an agreement to complete Galileo with most of the €2.4 billion ($3.56 billion) needed to finish the system, it is claimed, coming from unused EU agricultural funds.

When in operation, Galileo will have three control ground stations, Munich, Rome and most recently agreed, Spain. The ground control centre in Spain will be responsible for the signal dedicated to civil protection – referred to as Safety of Life - which will be transmitted in instances of maritime, aerospace and rail security problems. 2013 is the proposed operational date.

Galileo cluster, intended primarily for civilian use, will use 30 satellites with an orbital altitude of 23.222km and is designed to be interoperable with U.S. 31 satellite GPS. It is intended to provide - more precise measurements to all users than presently available through GPS or GLONASS, better positioning services at high latitudes, and an independent positioning system upon which European nations can rely even in times of war or political disagreement.

It was on May 1, 2000, that the President of the United States signed an order disabling 'Selective Availability' and in late 2001 it was confirmed that the intent is to never re-enable it. This point is still touchy however as the US Department of Defense still maintains a 'Selective Deniability' ability within the network which could still be used to effectively jam civilian GPS units in a war zone or global alert while still allowing full functionality for military units. Galileo, once operational, will sweep away the fear that the U.S. military and/or the Pentagon would decide unilateraly to scramble the signals.

"Nobody can rely on somebody else's system," said Javier Benedicto, Galleo's project manager. "This is why the Russians, the Chinese, the Indians, the US and also the Europeans have to deploy their own system in order to match their own needs."

In addition to Galileo giving the EU more independence the system will also improve coverage in some areas, like large cities and remoter parts of the continent.

The first stage of the Galileo programme was agreed on May 2003 by the EU and the ESA and since then it has had a long struggle to arrive. Political pressure from the US; technical and launch delays; satellite failures; bureaucratic infighting and financial problems, not to mention critics has all meant a rocky road to this point. If all goes well in 2013 Galileo will come alive and we will have our own global positioning system – we wish it every success.

What a life

by Donald Bullock

I'm never very glad when Mrs Runner comes gliding into my vision. She's one of those bright, dapper little things who darts and pecks about like a self-centred blue-tit in a willow.

She's the bossy half of a double act. Her fourteen year old son is the unwilling remainder, and she dominates him into total submission.

"Come on into Mr Bullock's nice warm shop, Clarence," she grated as she pushed in. "Put your amplifier-thingy on the counter and tell Mr Bullock all about the trouble it's giving you."

Clarence swallowed hard, looked at his mother and opened his mouth to speak. But he wasn't quick enough.

"It's a Kenwood SW900, Mr Bullock," she cut in. "Say how long you've had it, Clarence!" The boy breathed in. "He's had it for seventeen months, Mr Bullock. Mind, my husband never could stand the noise it made. She lapsed into a reflective mood.

So we had him seen to...

"Hm…" she mused. "We had old Arthur seen to the very next day." I lost interest in the amplifier. This promised human misery unfolding before my eyes. I held her eyes in mine.

"Arthur?" I echoed. "You had your husband… er… Seen to? "

"Haw-haw!" Clarence laughed. Mrs Runner rammed him with the end of her handbag.

"No, Arthur was the cat," she said. "My husband was never that sort of trouble to me." Clarence looked up sharply, but I nodded understandingly.

"Are you going to tell Mr Bullock what the trouble is with your amplifier, Clarence, or has he got to turn psychic?" she blurted. Then she smiled at me.

"I always says that to him, Mr Bullock…" she said. "He simply will not speak!" Clarence started to screw his neck out of his collar.

"His amplifier-thingy has lost half its woof," she went on. "One channel-thing doesn't work, does it Clarence? Speak up, boy!" The lad raised his chin and made to part his lips.

"No, one channel's dead." she cut in. "My word, the boy just will not speak!"

I winked at Clarence, waved them out, then looked at the amplifier. One of the sub-woofer speakers had blown. We ordered another, under its part-number T10-0481-05, from Fullers Limited, of Suffolk.

Whilst we waited for it, I checked and compared the DC conditions of the output stages. Next I checked the symmetry and amplitude of their waveforms, as an insurance against sending the replacement into orbit.

But I needn't have worried. The fault was a one-off spontaneous speaker failure.

Roy Wallace

While on the subject of stereo reproduction, I wonder how many readers of *Television* noticed the death, the other day, of Roy Wallace? We all should have done, you know.

Known to his associates as 'Jolly Wally' he was the Decca recording technician who, in the 'fifties, invented and developed the stereo recording system.

A passionate music-lover, 'Wally' had already conceived and designed the 'Decca Tree'. This microphone array that swiftly achieved fame in the entire recording industry as a superior method of monaurally recording the many facets of orchestral music.

He was a pains-taking perfectionist with a mathematical brain. Born in London in 1927, he was passionately drawn to music in his early years.

He became increasingly enthusiastic as recording quality improved, but noticed that even the best completely lacked the vibrancy of a live performance.

After a great deal of thought he reasoned that because we had two separate ears, we heard live sound by way of two aural sources, yet the records of the day condensed them to one.

While nursing this limitation, the matter of his earning a living cropped up. Although he couldn't know it, his choice of career was an important milestone both in his life, and in the sound recording world.

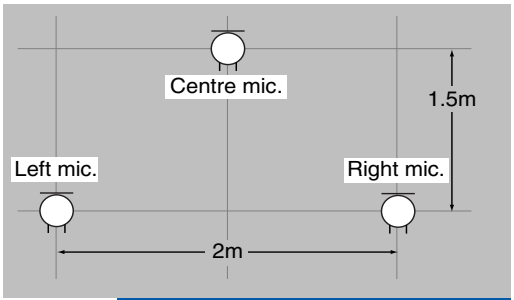
Chance meeting

In 1942 he took a job with a Clapham firm, Radio & Television Engineering. This company was then a wartime manufacturer of radar and early electrocardiogram machines that shared its premises with a local undertaker.

Its owner, Lawrence Savage, had worked at the BBC in the 'thirties. While there, he had conducted experiments with 'binaural' sound with C J Francis.

In 1947, Savage nourished the seed of the stereo idea in Wallace's mind. Working together, they pursued the concept of recording the studio sound on two separate channels fed by two spaced microphone systems for recording, and playing them back into two separate and spaced speakers.

With no tape recording available to them in those early days, they used sixteen-inch discs revolving at thirty-three-and-a-third revolutions per minute. Over these discs, they arranged a pair of stylus heads on a parallel tracking arm to inscribe two separate tracks.



Basic 'Decca Tree'. Sound arrives at the centre microphone slightly before the left and right mics, ensuring a clear, strong central sound image. Spacings vary to suit the recording environment

Demonstration impresses Decca

Wallace went on to devise and construct a gantry containing a three channel head, one vertically-positioned and central, and two others, one each side, each angled at seventy degrees. He then constructed a three-channel mixer to convert them to two channels, and sampled the results.

His work was well rewarded. On playing them back, he was delighted to hear that the missing realism, or naturalness, of a live performance had been captured and was now magically restored.

Towards the end of 1952 the pair demonstrated their experimental system to Decca Records. Decca's chairman, Edward Lewis, saw at once that Decca's future might well lie in their stereo sound brain child. He immediately invited Wallace to join Decca to refine and develop the stereo concept.

After a great deal of thought, Wallace decided to forsake the Francis/Savage workings and to begin again. This time he developed a frequency transposition system.

One channel handled signals from 50 to 9000 cycles per second (50Hz to 9kHz). The other handled 12 000 to 21 000 cycles per second (12kHz to 21kHz). There was a centrally-located carrier frequency of 9kHz to 10.5kHz.

Progress

Within a year this system became so technically refined that two entirely separate studio performances could be recorded in a single groove with perfect separation.

Immediately before Christmas, 1953, Wallace set up three spaced Telefunken M49 microphones in a studio and made an experimental recording, directly onto disc, of Mantovani and his orchestra.

When the Decca big-wigs had the wax acetates processed at their New Malden factory they were remarkably impressed with the results.

Meanwhile, Wallace felt the need for a stereo mixing desk. He promptly stripped down a standard Decca six-channel mono machine, re-designed it into a stereo mixer with two three-channel input banks. He then set about building a suitably matching pair of stereo power amplifiers.

His system was now complete. The next step was to launch it into general recognition. He decided he needed a music-world celebrity to endorse it, and settled on the celebrated seventy year old Swiss conductor Ernest Ansermet

Ansermet's opinions carried enormous weight. He agreed to record Rimsky-Korsakov's suite Antar with L'Orchestre de la Suisse Romande, and was enormously impressed when he heard the playback.

"It is as though I am still standing on the rostrum!" he said.

Roy Wallace's stereophonic recording system had come to stay.

Snoddies

"Is that Mr Bullbaiter?" trilled the voice on the 'phone. "My name is Moggie. That tall thin chap in Snoddies put me onto you. He said you were wonderful."

I closed one eye and shot the other wide open, like Stan and Ollie's landlord used to. Snoddies directing a repair to us? It had to mean that it was a nasty job. But nasty jobs, I reflected, mean money when they think you're smart. And money buys whiskey. I eyed the telephone earpiece and cooed into it with all the falseness I could muster.

"How utterly gracious of them," I remarked. "Do tell me more."

"It's our giant Sony telly. A model KV28LS60U," said the voice. Seems quite ill to me. I only live round the corner, in the pokey house with twenty plastic gnomes in the front garden!" A prat into the bargain, I mused.

"We'll be there in ten minutes, Mrs Moggie," I replied.

"Mr Moggie..." insisted the voice.

"Alright," I said. "Lock the dog and cat up. See you in a minute."

When we got there the patient was dead, but still warm. I hastily tried resuscitation, but its single eye blinked its sadness five times, indicating that it had fallen the victim of Error Five and had shrugged off its mortal coil.

Heart Trouble

With due reverence, we took the body to our surgery, where we found that its heart, the line transformer, had failed, causing the demise of R_{8895} and R_{8896}, its pair of 0.47ohm quarter-watt safety resistors.

We replaced these and the line transformer, part number HRR8638, and switched on. But it performed its five blinks again, and refused to rustle itself to life.

Assuming a further line-circuit fault, we spent some time looking for it, but to no avail. Then we noticed that the new line transformer's preset potentiometer had been set at zero at the factory. We upped it slightly and this instantly restored the set to life.

We regarded this as one of life's milder coincidences until we had an identical set with the same trouble. Again, after its repair, it wouldn't come to life until we'd slightly upped its pre-set potentiometer.

We aren't sure why these models should have behaved like this, but offer

these facts to perhaps save you a few headache-laced bouts of wasted time.

Tiresome Pair

As tiresome customers go, I can't think of one who's worse than Reg Reever. He' the little chap who keeps sniffing and reeving his nose up. Unless it's Kerry Quipper, who can't resist making wise cracks.

At weekends, there's a sort of mutual entertainment session at The Horsefly. Anybody who cares to sing a song or do a few tricks is welcomed. Reever and Quipper sometimes act as foils for each other's jokes. And they can be funny at times.

The other day they came in together, Quipper with his Sanyo CE28WP4 television set, and Reever sniffing and reeving his nose up as usual. Quipper looked at him then turned to me and winked.

"Not enough height," he announced. Reever stiffened and eyed him while I nonchalantly plugged Quipper's set in. He was right. The frame was practically collapsed.

"I can't deny it," I said. Reever shifted his gaze to me, sniffing and reeving his nose up like never before.

"Oh, its time for *the funnies*, is it?" he bellowed. "Right. I'll tell you, I ain't as short as old Rip Flanagan was. He wanted to be a policeman, but he was four inches too short, so he rigged up a stretching machine in his cellar!" Quipper came back on cue.

"Did it work?" he asked.

"Nah," replied Reever. "But if he'd lived, he'd have been the finest policeman in town." There was worse to come. Quipper looked out of the window.

"It's windy today, ain't it," he said.

"Nah," said Reever. "It's Thursday."

"So am I," said Quipper. "Let's get to the Horsefly." They were roaring with laughter now. I looked at my watch.

"My hearing aid cost me £4000," said Quipper. Reever raised his eyebrows.

"What type is it?" he asked.

"Half past twelve," replied Quipper.

"Now its got to be the pub!" said Reever.

As they trooped out I got the meter and homed in on pin 7 of ICC501, the Sony's LA7846 frame chip. Instead of fifteen volts positive there were nine volts negative – a polarity reversal with a potential difference of twenty four volts.

Pin seven of the IC is fed from the fifteen volt HT line through Diode D_{630}, and the diode was completely open circuit. A new one did the trick. When I'd fitted it and tried the set, its picture was impressive.

To contact Donald Bullock please email enquiries@wheatleypress.com

NOTICE BOARD

Please email your notices to: info@televisionmagazine.co.uk

WANTED!

Old half inch Ferrite rods. Must be half inch (12.7mm) diameter and six inches long or more. Will pay very good money for these.

Contact Peter Tankard
0114 2316321

WANTED!

Old copies of Television magazine. Do not throw them away, I will pay postage and pay cash for some editions.

Please contact me on **elettronerama@hotmail.co.uk** to tell me what you have.

DISPOSAL

Free to good home Brand new Thorn A51-161X new life CRT with scan coils, collect for free or pay for postage.

Michael Dranfield - Digifix Ltd
16 Terrace Road, Buxton,
Derbyshire SK17-6DU.
Tel: 01298-73989
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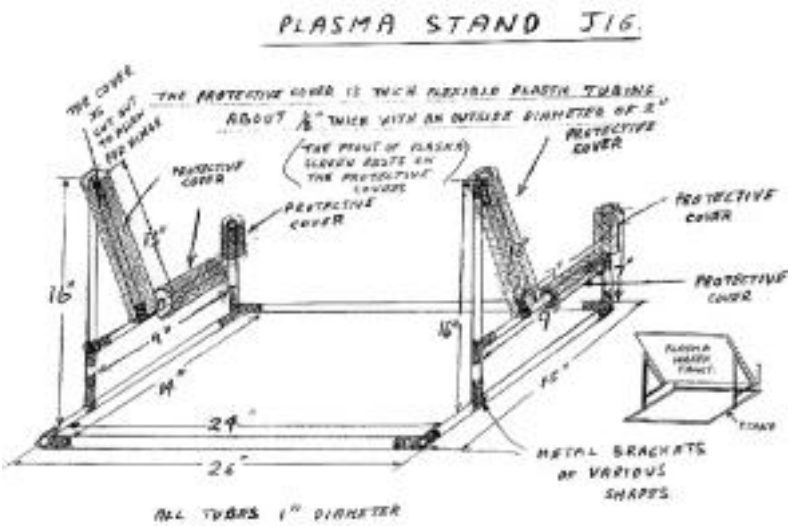
WANTED!

Can anyone supply me with a Panasonic Euro-8 Technical Guide? I've problems with a TX28DT30 IDTV. It forgets stations over 88. Teletext on 100 and analogue stations can be tuned in but are not stored. I suspect the X/V board as a software upgrade through the CI slot doesn't work. Any suggestions would also be welcomed.

Paul Hardy, Oxfordshire. T: 01844 354878

The perfect digital workshop

by Charles Arundel



Many TV service departments are not set up to repair Plasma screens or LCD TVs. This may be because they feel they haven't the necessary test equipment or de-soldering devices. Then there is the worry about lack of knowledge of these type of products plus the additional problem of where to obtain that expertise.

Unfortunately, there are very few, if any, Technical Colleges that offer these courses.Therefore, service engineers have to rely on one day manufacturers' courses or training courses issued by some manufacturers on the internet.

Another way is to study the relevant service manuals if available but this is never as good as attending a manufacturer's training course.

However, all is not lost because it is quite often unnecessary to diagnose faults down to component level. Nowadays, most manufacturers will supply complete Printed Circuit Boards at reasonable prices, now the overall cost of Plasmas and LCDs have reduced considerably.

It is therefore not such a problem to repair these beasts but you have to have some basic knowledge of how they reproduce pictures, as Plasmas and LCDs both use different principles.

You must also be up to speed with the latest external equipment that can be connected to these products especially as the UK is heavily into Digital TV and the forthcoming HDTV transmissions are gathering pace.

Both products are now manufactured with multiple inputs so you must know what to expect when these are used.

For instance; Component Inputs, Composite Inputs "S" Video inputs, SCART inputs, HDMI inputs DVI inputs, PC inputs, LAN inputs, SD card inputs, USB inputs, CI slots, and RS 232 inputs. That last one is usually for manufacturers to use for software updates of which there are becoming more and more as the digital transmissions are modified/increased.

Getting back to the heading 'The Perfect Digital Workshop' you can manage to repair these products in a less than perfect workshop which is probably going to be the case in most service departments.

Mainly, you require a fairly large bench space, large enough to accommodate the biggest screen TV which is now commonly up to 42".

This space needs to be covered by a cushion material to avoid scratching the screen and frame.

However, when the screen is facing down on the bench, although you can work on it after removing the back cover you can't operate it and watch the picture at the same time. To do this you need a 'Stand Jig'. This will allow you to place the Plasma or LCD in a near vertical position so that you can work on the circuitry while observing any adjustments to the picture in a large mirror placed in front of it, preferably a mirror attached to the bench wall. *(see attached diagram)*.

If you have to replace a complete PCB module you usually find that you need to adjust several voltages to obtain the optimum picture.

To do this, it is advisable to use an accurately calibrated digital multi meter, preferably a bench meter rather than the cheaper hand held types.

If you have received some technical training on a particular manufacturer's product you may be confident to diagnose some faults down to component level. A good quality oscilloscope may help but if you do locate the component causing the problem (usually an I/C) you will probably require specialised soldering equipment and the skill to use it.

Unfortunately, this equipment can be quite expensive and may only be worthwhile if you repair a large quantity of Plasmas and LCDs.

Another necessary item in this perfect digital workshop is substantial flight case to transport the repaired product safely back to the customer.

However, if this is not available then the original manufacturers carton will suffice. You should never transport plasma screens face down in the back of a van because any bumps could damage the integrity of the screen and cause cells to bleed into one another.

The Perfect Digital Workshop doesn't have to be costly and good results can be achieved once you have the above basic equipment and knowledge of how these products work.

In the post...

Coping with digital reception problems

In May 2005 a customer asked me to provide an aerial installation for freeview TV at Leysters Village near Leominster in Herefordshire. The elevation at the receiving site is about 670 feet above sea level. Contrary to what might be expected, it does not follow that a high location will bring in good digital reception. In fact, reliable terrestrial digital reception is hard to achieve in this village. Experience I have gained on this job may be helpful to other engineers who have to cope with similar reception problems.

The high location makes Leysters a dx'ers paradise but makes complications for receiving freeview. At the house next door, the Sony TV got jammed with analogue channels, so I had to apply reset in order to get the tuning to work again. From their aerial on the chimney Crystal Palace CH30 tuned in.

Probable Ch37 sources were Croydon and the Mendip Transmitter. This is an unusual arrangement using Anteference DX8 aerials, with group A on top and the group B aerial beneath. These are connected together with a triax diplexer combining channel 21-37 with 39-69.

The group B aerial has sufficient gain to receive CH63 digital although this is outside its group. Both aerials point to the Ridge Hill transmitter near Little Marcle. The group A aerial on top is entirely for analogue reception at present. The height of the group A aerial was chosen because the reception gets markedly worse a few feet lower. This drop off in signal is due to hill screening.

Group B comes in OK at a lower position. Signal strengths are low but the margin is acceptable with the use of a Triax low noise mast head amp with a gain of 25db providing sufficient signal level at each outlet on all four rooms. A margin of greater than 6db would have been ideal but could not be achieved. The signal strength drops greatly in dense fog particularly on CH28. Group B is not seriously affected. I figure that the reason for group A having greater hill screening is due to the signal coming over a succession of hills. On each hill top there is a degree of knife edge propagation. The signal gets split like light passing through a prism. The longer wave length red end of the spectrum gets bent more than the shorter waves on the blue end.

Likewise, group A gets bent more towards the ground over each successive hill. Hence it results in more hill screening than in group B. Raising the aerial at the reception site overcomes this type of screening effect. The other difficulty at this site was co-channel interference from Sutton Coldfield in group B. That is why I chose the Anteference aerial for its narrow acceptance angle.

Adjustment was critical on CH53 BBC multiplex due to adjacent channel interference coming in from the side on CH52 digital from Sutton Coldfield. The signal also had to be maximised on CH53 due to possible interference on Mendip CH52 digital,which comes down a baring close to which the aerial is set to.

The low position of the aerial also helped to minimise co-channel interference from Sutton Coldfield generally. Note that the effect of co-channel interference from an analogue transmitter is much worse when it is adjacent vision compared to the adjacent sound carrier which is transmitted at about 20db lower power.

Martin Abbott – Leominster – Herefordshire

Great first edition

Congratulations on your superb re-launch of Television Magazine. In a previous email to me you said "I might not get it totally correct from the first issue..."

Well you seem to have done the impossible, just the right mix of articles, containing both up-to date information & also for us 'oldies' some good technical nostalgia.

Well done, long may it continue.

Dave Stone – Shrewsbury

An old friend returns

Having waited with anticipation, since sending off my subscription

back in November' I was delighted to receive my first issue of the new, and greatly improved Television & Consumer Electronics Magazine.

It was like the return of an old and very valued friend, full of stories that I was wanting to hear.

Thank you for resurrecting this, the most unique magazine of its type, and long may it continue.

W. S. Molyneux - Wirral - GB

The best Christmas present

I received my copy on Christmas eve and although I am slowly still working my way through it I have to say I am delighted and very impressed with its appearance and excellent content. I have also been speaking to Uel and Vincent,(two other subscribers) and they both were singing its praises as much as me. I believe it was probably the best Christmas present any of us received, (sad lot aren't we?).

On a personal note I wish to thank you all for including so much of my scribblings and feel very privileged to have been part of this first re-launch issue.

Best of luck for the future,

Arthur Jackson – Kilrea – County Derry

Absolutely delighted

I have received earlier today my first edition of the 'New' Television magazine. I have read it from cover to cover and just had to email you to tell you how really pleased that I am with it. The production quality is excellent with glossy paper and many more pages than its predecessor.

The content too is wide ranging, interesting and informative. Keep up this standard and the magazine will flourish.

Many thanks and good luck for the future.

Malcolm George - Bishops Stortford - Herts

Welcome back 'Television' Magazine!

We have been a regular advertiser in past years and we hope that we will be once again. Television technology and publishing methods have certainly changed since the late 80s. Our company U-View originally sold re-conditioned television tubes around this time.

Owner Roger Yaxley after listening to various television repair men, hit on the idea of publishing servicing information in book form. Many television servicing manuals would be incorporated in one publication thus saving the TV engineers money. This was of course in the pre-digital days and involved much photographing, cutting and pasting, not to mention lots of hot wax in a damp basement!

Our first publication was a ring bound edition which although functional was a bit of an ugly duckling. Later editions were produced along the lines of Encyclopedia Brittanica and were several hundred pages thick. 'Satellite Servicing' and 'Video Servicing' also followed, the latter title would run to two or three volumes to include the mechanical adjustments, what a nightmare!

Digital scanning technology had now replaced the darkroom camera and chemicals, and we had moved out of our original basement offices. The Television, Video and Satellite Servicing publications were now proudly on display at trade shows at venues such as Earl's Court, Olympia. Television Magazine also had a stand I seem to remember.

Then Satellite receivers went from analogue to digital and the Video Recorders went to DVDs leaving us with quite a few unsold copies! In the late 90s economic factors in the TV repair trade could no longer sustain the large print runs, and binding costs were prohibitive.

Now was the time to change the format of the publications from books to CD-ROMs, the first of which was Television Servicing Five. This was sold alongside the book version, as was Television Servicing Six and Video Servicing Six. Widescreen TVs were coming onto the market to be followed by Plasma and LCDs. Television manufacturers were also starting to produce their service manuals in electronic format and bringing out their own CD-ROMs.

Television Servicing Seven became the first publication exclusively on cd-rom and continues to the present edition, TV Servicing Fourteen. The publications are more frequent now and less expensive than their encyclopedic counterparts.

Many TV manufacturers operate a 'closed shop' policy with regard to supplying servicing information, but there is still information out there. Television repairers can now find and exchange information via various web forums. There are also several websites out there from which service manuals can be downloaded, some free of charge.

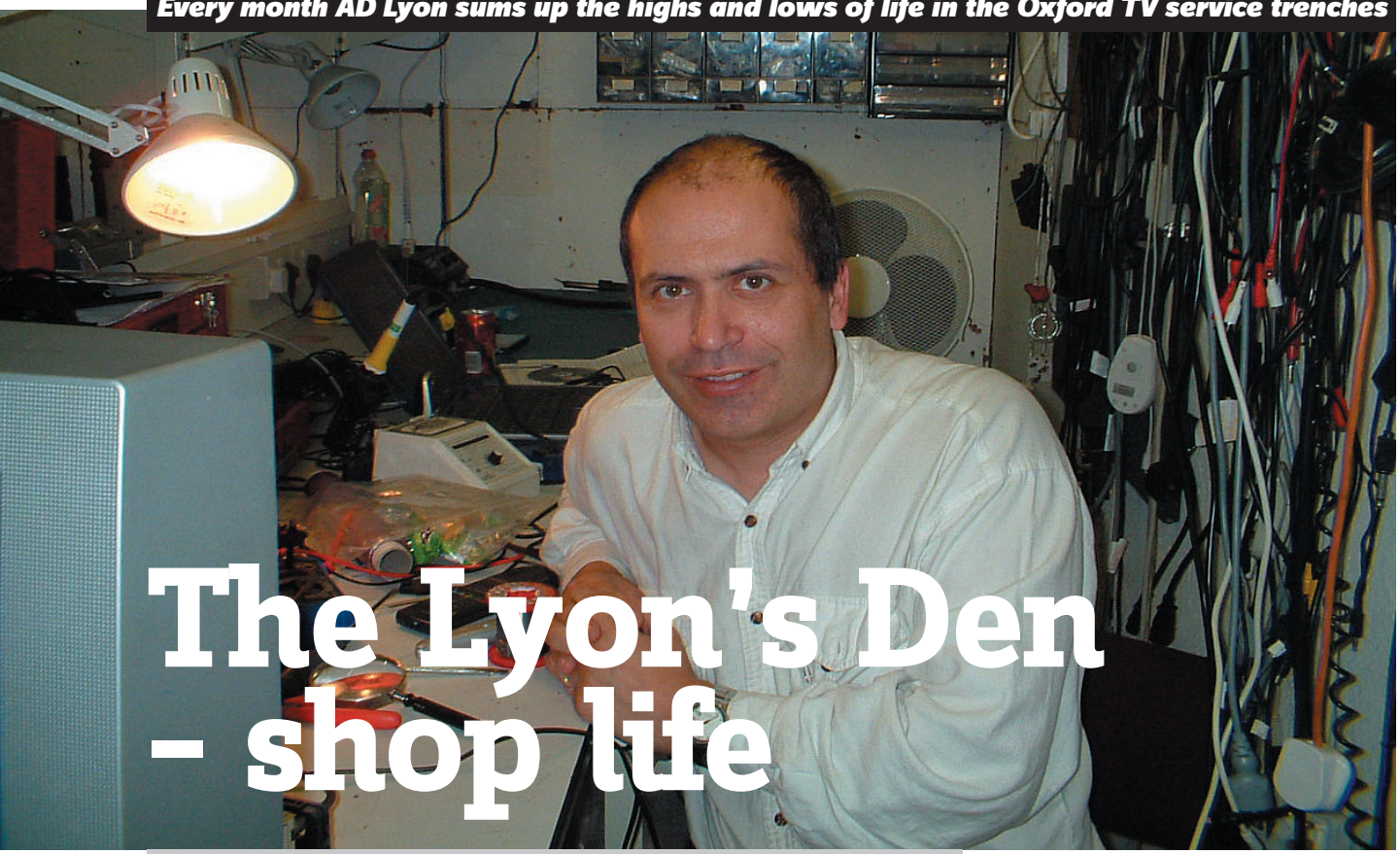
U-View has branched out into web design recently, in fact the now retired publisher Roger Yaxley has his own site. He has become a comedy magician in his spare time and goes under the name of Eric Fabulous! (www.eric-fabulous.co.uk)

Of course U-View has its own site too, books and CDs can be bought at www.u-view-circuits.co.uk

We hope though that U-View and indeed Television magazine still have a function to serve as a valuable information resource for today's television engineer.

Jonathon Winters – U-View

Every month AD Lyon sums up the highs and lows of life in the Oxford TV service trenches



The Lyon's Den – shop life

"I knew he was talking because I could see his lips moving so I just went into nod and smile mode"

The rain was coming down in sheet form as I swung the van into the yard, I sat in it for a while to see if it would let up at all, it didn't! So I got the keys for the shutter separated from the bunch and leapt out into the rain, times like this I wish I had the bolts put into the centre of the door rather than right at the bottom. As I struggled with the bolts, the rain running down my shirt collar, I could hear the telephone ringing. After wrestling with the stupid locks for about five minutes while getting absolutely sodden I got into a temper and kicked the shutter door, both locks popped straight out and the shutter rolled slowly upwards, brilliant security eh? Still the doors only cost me £1000 what can you expect really?

I opened the second door and rushed in to switch off the alarm, as I did so the phone started ringing again, turning away from the alarm panel I almost walked straight into a rather large, by which I mean overweight, bald and scruffy man who I know as Pete the Plumber. This man is a confounded nuisance, he had followed me into the shop I hadn't heard him because of the sound of the rain on the roof.

We had made the mistake of selling Pete a Philips Freeview box about a year and a half ago and have been paying for the mistake ever since in the form of regular visits made by him to our shop to complain about it, and then subsequent visits by us to his home to try and sort out the problems. These have ranged from Aerial problems, to box lock ups, scart leads that have fallen out, flat batteries in the remote you name it Pete's had a good moan about it. Pete is never happier than when he is complaining.

Anyway, as he began his latest tirade the phone stopped ringing. As Pete was going on about his latest problems I wondered to myself what business I had missed by not being able to answer the first two calls of the day. I wasn't really listening to him as he was going on and on; I knew he was talking because I could see his lips moving so I just went into nod and smile mode and shut my ears off to his ramblings because I knew that he would end up by asking me to do yet another call out, and

when I got to his house he'd only go through the whole story again anyway.

The phone went again, this time I couldn't resist it, I stopped Pete in mid moan "look Pete you want a home visit don't you?" "Well yes of course, but it will be free won't it?" I wouldn't think he ever does free call outs but I wanted to answer the telephone so I waved him out and told him I'd see him later in the afternoon.

"Hello Visiontech can I help?" "Uh your aerial is in my neighbour's greenhouse roof," said an angry female voice. Now this threw me for a bit, I imagined she must have been talking about the aerial on my roof at home, and was wondering how it had gone sailing through the ether into this caller's neighbour's greenhouse! Still thinking along these lines I asked her what number she lived at when she snapped back "number 8", I was even more bemused, "I live at number 176 I replied it's miles away from number 8 I don't think it can be my aerial in the greenhouse".

"You stupid man, I am Mrs Grouch I lives at 8 Shirkers Close and I rents a Telly off you people. Your aerial has blown off my roof in the wind overnight and smashed through my neighbour's greenhouse. E's threatening to put a brick through my window unless you lot comes round and sorts it all out this morning." "Ah I understand now what you are talking about Mrs Grouch, but I'm afraid the aerial that has embedded itself into your neighbours greenhouse belongs to you not me, as you said, you rent a TV from me, you do not rent the aerial I'm afraid." "So you ent gonna do nothing about it then," she barked back, "right come and pick your Telly up mate, it's no good for me is it, without the aerial the pictures rubbish and it hisses and pops. I'll tell my neighbour if anyone's window needs bricking it's yours."Ah well another rental customer lost but this one was no big loss, she never pays on time and has always been aggressive to us.

The journey to Pete the plumber's house was no more lucrative, in fact it was a disaster. I got there to find that his digital picture was non-existent and all his terrestrial stations were just snowstorms. The standby light on his freeview box was out, so I assumed that this was the reason for the lack of signal. On taking out the aerial socket from the back of the box which was stood on top of the TV a stream of water came from the coax lead and ran down the back of his TV there was a crackle followed by a puff of smoke and the TV died!! Pete looked at me and there wasn't the hint of a smile on his face. "Now I know electrics and water don't mix mate," he said with a smug look on his face. "You've busted my telly as well now and I need to see snooker tonight so you'll have to sort it out today." Sorting it out meant calling in a favour from our aerial man and running him back a loan Set and another Freeview box with a whole set of new problems involved, but more on that next time.

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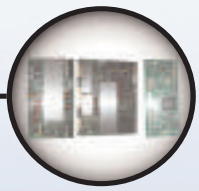

6871QDH066B PWB(PCB) Assembley

6871QDH066B PWB (PCB) Assembley

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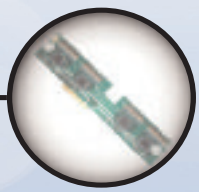

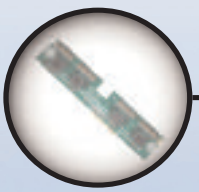

6871QDH067B PWB(PCB) Assembley

6871QDH067B PWB (PCB) Assembley

Order Code : LG6871QDH067B
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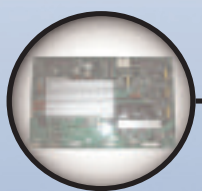

6871QYH029A PWB(PCB) Assembley

6871QYH029A PWB (PCB) Assembley

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6710V00151Y Remote Control

6710V00151Y Remote Control

Order Code : LG6710V00151Y
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AIVP-0001A	INV06.022R	£33.00
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AIVP-0017	INV06.028	£40.00
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Part Number	Code	Price
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DAC-12M019C0F	INV03.003R	£66.00
LI.2206	INV06.006R	£18.00
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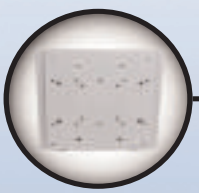
Plasma and LCD Wall Brackets



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Display Size : 30" - 60"

Max. display weight : 75kg

±15º Tilt

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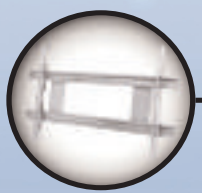

This plasma bracket can be used with most plasma and LCD televisions, due to its universal mounting possibilities Safe and heavy duty construction and easy installation

Tiltable : No

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Restoration corner

Steve Pendlebury explains the restoration of the BRC 2000

The BRC2000 was one of the first Colour televisions in the UK. Colour started in 1967, using the PAL system. There had been experiments in the 50s, but the first colour transmissions were in 1966, and the sets appeared to the public in 1967. There was the Philips G6, Baird 700, GEC 2028/2030, the very rare ITT/KB CVC1, The Bush CTV25, The Decca CTV25, The PYE dual standard colour set and of course the BRC2000.

The BRC2000 is a bit special, as it was the first all solid state colour TV. Despite this, they did tend to run hot, nothing to worry about though. The EHT was derived on separate transformers from the line, it was driven by the line oscillator, but then it was completely separate.

So, with the manual and the meter to hand, lets get going…

Getting started

One important issue when restoring any old set is to get a set which is a good restoration prospect. The BRC2000 had been used up until a few years ago. It came from a fellow collector who had found it inoperative and had need of space, so after I had recovered from an incident at work, the set went into the transit van, then back home into the Bush House kitchen to be worked on.

The kitchen workshop is derided in some quarters, but I have to say that it does me fine, all that space to use, quiet, warm, still in contact with the household and near to food and drink supplies!

The BRC2000 is of modular design, this means that all the panels can be easily removed and replaced, or in my case, removed from the set to be worked on separately.

The official BRC photograph shown here is of the set and its ten boards placed in their respective positions around it. This is my set at the start of its restoration. All the panels have been removed and placed on top of the set for this photograph. This makes the task of restoration look massive, but it is surprising how quicky the finished project takes shape. My set took just over 2 weeks.

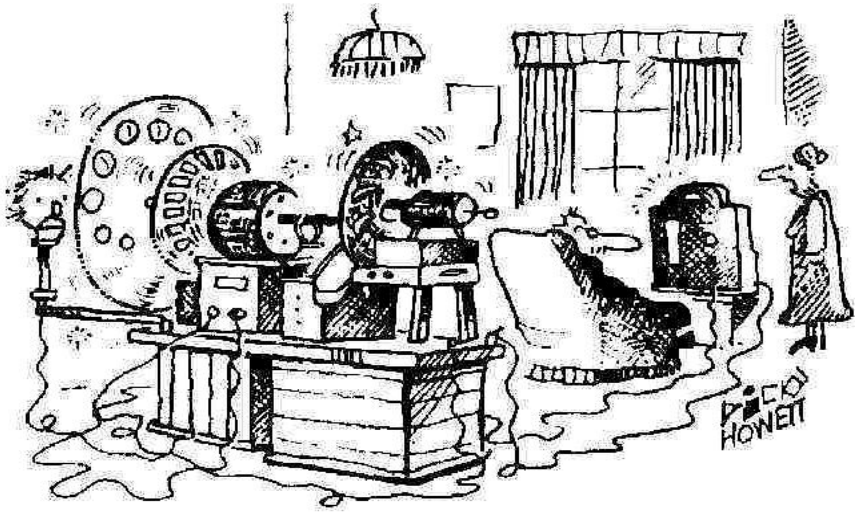
Initially, all the panels were removed and inspected. The 2000 used those horrible black cylindrical electrolytic capacitors that always dry out, so all these were replaced on sight. It is important to replace one in particular, on the video board, as it has about 200V across it and can go off like a little bomb!

All the boards were inspected for track damage and cracks. The convergence board had a beauty, right across, and so the tracks were bridged with copper wire and the board strengthened with a drop of araldite.

Another problem was with the tuner. The locking bar had come free at the back, and so this was attacked with the heavy duty soldering gun to restore tuning button operation.

Applying the mains

It is VERY important to resist the temptation to just plug something in, and so the power supply was fitted, the tube base put back onto the CRT and the mains applied gently with a variac. This was done over several hours, in order to spare the main electrolytics on the power supply the traumatic shock of full mains. After a day's in situ



"Isn't it about time we got a new telly, Gilbert..?"

reforming, they seemed to be performing OK and there was no excessive ripple on the various PSU rails.

The Regulator board was fitted then, and I set it up as per the manual. Unfortunately, the 55V rail stayed sadly at about 48V, this was due to a high resistance skeleton pot. This was replaced and we tried again. The 55V now came on nicely, and so all the boards except for the EHT generator were refitted. I have to confess to fitting a 625 line only line timebase board, as this was the one that was in the best condition and I was, of course, spared the additional complications of a system switch. Hopefully the purists among our readership will not hate me too much!

There were no crashes or bangs when the set was powered again. Upon connecting an antenna, I was rewarded, after a few minutes twiddling, with good strong BBC1 sound. This at least proved that there was life in the tuner and the IF board. There was, of course, no raster. There was, however, no line whistle either when either of the line hold controls were operated. Checks on the regulator board showed that the 55V rail to the line board was high, which suggested that it was not being loaded down, i.e. the Line Timebase Board was sitting there drawing no current. There was a good healthy voltage at one side of the decoupling choke L6, but not on the other side. Close inspection revealed a fine crack in the track, just on the edge of the soldered connections to this coil. The coil was refitted and the tracks reinforced with another length of copper wire. We now had volts on the two parallel line transformers but not on the horizontal hold controls, or on VT1/2 Line oscillator stage as R15 was open circuit.

Replacing this rewarded me with a nice healthy line whistle and, joy upon joy, the A1 voltage came up as well.

Getting a picture

I now refitted the EHT Generator and was rewarded with a healthy spark from its output, to which the tripler was connected. The tripler itself, when fitted, sparked nicely and a blue spark was visible on the back opposite the CRT anode connection. The CRT was discharged and the tripler removed for inspection. The casing was crumbling, and a replacement one from Swindon – thanks Dave! – was fitted. This gave me EHT and Focus Volts, but still no raster.

A look at the tube base revealed that the voltages on the Focus and A1 Anodes were present, as was the 30V supply to the grids. The heaters were all glowing away merrily. The cathode voltages seemed too high, however, and the 2.2K resistors checked OK, so I moved down to the video board. All three video amps were sitting there doing absolutely nothing as there was no luminance drive. This was put right fairly quickly, VT3 luminance emitter follower BF115 was replaced.

We now had light on the CRT. Well, three lines, one of each primary colour. Frame collapse was not down to the switching on the convergence board, I have made that mistake since, but the height control series resistor, 4.7k, was open circuit and the two frame output transistors, BD124s in push pull, were in need of replacement. I now had frame scan, albeit impure raster, misconvergence and the blue raster was so far out that the picture looked like abstract art. It was, however, a picture!

Right on black and white!

The old saying 'Get it right on black and white' holds very true. I set up the grey scale by collapsing the frame with the switches on the convergence board and following the workshop procedures.

The lack of degaussing was traced to a fault in the wiring loom. On the 2000 series, two sets of degauss thermistors are used, and so I wired this small board across the on/off switch with an extra switch to enable in use degaussing by swapping thermistors. and started the set up again. After a good degaussing session, I was rewarded

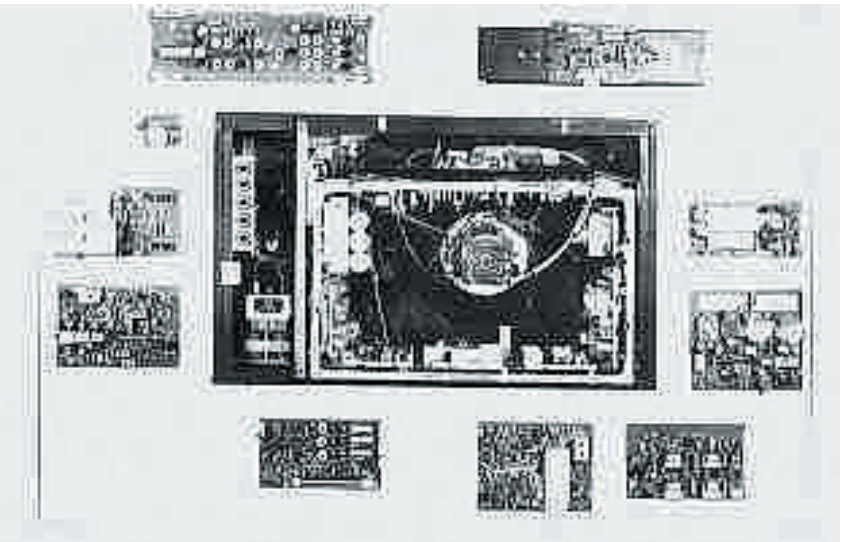
with a raster that needed minimal adjustment to create a pure raster on all three primary colours and of course white. Viewing a cross hatch, I set up the static convergence with the magnets on the tube neck. This gave reasonable results, and so I set about the exact setting up procedure as described in the manual. Red and green converged well, but blue vertical would not set up! The blue vertical control is flanked by two 50µF reversible electrolytic capacitors. As the other controls on this stage were OK, I replaced these two capacitors and the control itself. This made some improvement, but I found that this setting could be made to align very well when an extra reversible capacitor was added in parallel with one of the two!

I then went through the whole procedure again to optimise the convergence. This now looked good. I then went through the grey scaling procedure again and was rewarded with a good monochrome picture. With it 'right on black and white', I advanced the colour control. No colour at all.

Getting the colour

The decoder put up a fight! The first thing to do in this situation is to defeat the colour killer, this is done in the 2000 by applying a bias voltage to the base of the first chrominance amplifier stage. This rewarded me with floating pretty colours which tried to lock as the phase detector was rotated. The burst gate and its amplifier appeared to work, and the lack of bias was found to be down to the killer rectifier diode, an OA91 and the two capacitors across the tuning coil on the 7.9 kHz amp stage.

This now gave me colour without the killer overridden, but colour and picture bore little relation to each other! To cut a long story short: Two diodes and the electrolytic in the bistable, the two diodes feeding the



R-Y demodulator, track faults on the 4.43MHz oscillator's emitter follower, The crystal itself (varied when touched!); were all replaced to give me stable colour. I then followed the setting up procedure as per the manual again, but the set still had a tendency to misrepresent colour on some picture content. It especially didn't like blue, however there are a couple of BRC modifications for this, involving reducing the value of certain components in the burst gating circuit to eliminate colour information here affecting the phasing. When these were changed, we had a very good picture off the roof antenna.

Cosmetics

The set responded well to a good clean and polish, a little meths was used to bring up the wooden finish of the cabinet and all the knobs were removed and cleaned with soap, water and a toothbrush. The brass handles responded well to a quick bath in Coca Cola. This brings them up well, and to think how much of the stuff we drink!

In use

The set was then promoted to the lounge, where the only problem I still have is teletext lines, has anyone got any ideas about how to remove them? In fact they aren't THAT bad, but the more discerning members of my family, especially the less sympathetic to the cause, seemed to remark on them most.

There has been one breakdown, this was traced, eventually, to a high resistance track on the line timebase board. This was reworked and, touch wood, the set behaves well. It gives a very good and clear picture, easily comparable with the nasty modern sets in the local showrooms.

The wooden cabinet also makes the set a nice addition in the way of an item of furniture, and the stand, now strengthened by our local joiner, adds to the retro effect. People marvelled at colour in the 1960s and this set gives results that can give any set a run for its money! But, of course, some people say I'm a little biased!

And before you ask – the Bush House in question is not in The Strand. It's the name I give to my home in Bolton.

Test case 531 solution

This is the solution to Test Case 531 detailed on page 12

The combination of excessive horizontal scanning on widescreen modes and loss of the entire picture when the software settings for line scan on 4:3 operation were selected in service mode suggested to Ted that the EEPROM IC502 was the cause of the trouble. This is a 24C08-type chip, but not any old 24C08! It has to be specially ordered from the setmaker (or, in this case, the 'badged' company) and it has to be the real McCoy, pre-programmed for the specific make and model; indeed you even have to quote the type of CRT in use when ordering it. At least the fitting was easy because it goes into a socket on the main PCB – a case of plug and pray?

The new memory chip certainly cured the problem of picture-blanking on selection of some software parameters, and it also gave some degree of EW geometry and width control in 'regular' (4:3) mode. To sum up, then, everything now seemed to be working OK, except for the gross horizontal overscan.

Experiments showed that if the standing conduction in Q_{600} was reduced by increasing the value of feedback resistor R_{605}, a point could be reached where everything worked fine: 120kΩ was the optimum value. Then it was discovered that a 120kΩ resistor was actually fitted to this model – Ray had been misled by using a 'generic' manual, produced for a different badge merchant…!

TV model: Sharp 28LF92H

HDD & DVD recording technologies

Get up to speed with the latest video recording techniques and media

Extracted from Fawzi Ibrahim's new book, Newnes Guide to Television and Video Technology, 4th edition

Digital video can be recorded on a magnetic tape, an optical disk – CD or DVD – or a hard disk drive. In all cases, analogue video and audio are sampled and compressed to form digital data-bit streams ready for storing. This article looks at the process of recording using hard disk drives and recordable DVDs.

Data recording on a hard disk drive, or HDD, is carried out in the same way as recording on an electromagnetic tape.

A thin magnetic surface is magnetised by a flux produced by an electromagnetic head gap. The disk rotates at a constant speed and data in the form of one and zero bits are written along concentric tracks, **Fig. 1**. To retrieve the data from the disk, a read head is used and the process is reversed.

Early hard disks used a single read/write head. Today, thin film heads are common. Read and write heads are separate units, but are mounted on the same actuator arm.

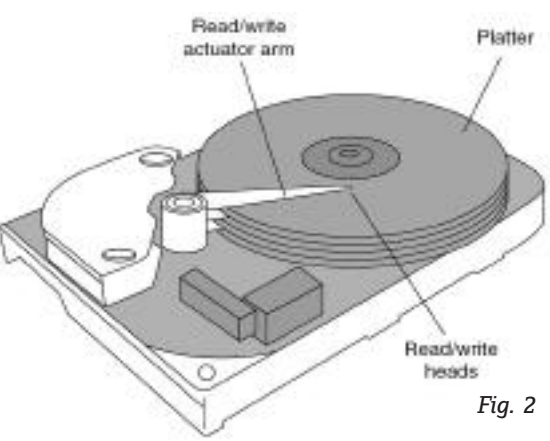


Fig. 2

The hard disk drive, or HDD. Modern drives may have many platters and read/write heads

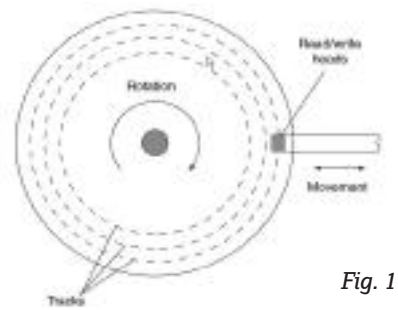


Fig. 1

In a hard disk drive, each platter surface is divided up into concentric data tracks known as cylinders

The hard disk consists of a number of rigid disks called platters. Separate read/write heads are provided for each active platter surface as shown in **Fig.2**.

Each active surface is formatted into a number of tracks, known as cylinders. Each cylinder is divided into a number of 512-byte sectors. Modern drives rotate at a very high speed – up to 10 800rev/min – and can have a capacity of over 300GByte.

In the hermetically-sealed drive enclosure, the read-write heads to float on a cushion of air very close to the disk surface. This helps to increase the potential capacity of the disks.

A hard-disk drive may be part of a personal computer for general use, or dedicated to a single task as in the case of Sky+, personal video recorders (PVRs) and twin-tuner terrestrial DTV receivers.

In all cases, the video and audio must be digitised and compressed before they are stored on the disk.

Fawzi Ibrahim is director of KFI Training and Consultancy e-mail: Fawzi@talktalk.net

Digital video recorder

Apart from improved picture quality, DVRs provide advanced features in terms of time shifting, pausing live TV, instant replay of interesting scenes and chasing playback. With chasing, a recording can be viewed before it has been completed.

Most DVRs use the MPEG-2 standard for encoding analogue video signals.

Video signals may be available in a digital format directly from a digital source via an HDMI or a DVI port. In such cases, the MPEG packets are recorded directly on the hard disk. Alternatively, where the video signal is analogue RGB or YCRCB signals, analogue-to-digital conversion and data compression must first be performed by the DVR before recording can take place.

Many satellite, cable and terrestrial DTV decoder manufacturers are now incorporating an in-built DVR in the form of a hard-disk drive into their set-top box. Examples are the Sky box and the twin-tuner terrestrial box. In these cases, encoding is not necessary as the signal is already digitally encoded.

The in-built DVR simply stores the digital stream directly to the disk.

With this arrangement, interactive functions can continue to be provided on recorded programs.

Today, satellite DTV set-top boxes feature two separate LNB inputs allowing two separate recordings to take place simultaneously while a recorded program is being played back. The same facility is also available in twin-tuner terrestrial set-top boxes, removing the need for a dual aerial sockets.

Audio and video capture

Audio and video capture involves storing AV on the hard drive of a personal computer using AV capture cards.

AV capture cards can allow a computer to capture composite, component video or directly from a UHF modulated signal from a terrestrial or a satellite antenna. Video capture cards should not be confused with video editing cards, which have dedicated video processing hardware.

Video capture starts with a fast A-to-D converter, providing YUV 4:2:2 data. Its sampling rate – and hence final picture quality – can usually be selected in software. This is primarily to allow tailoring ot the resolution.

Typical resolution settings are shown in **Table 1**. These correspond to standard television with zoom and other facilities. High-definition capture cards are also available with 1920 by 1080 picture resolution.

Following sampling and quantisation, data is compressed to reduce the bit-rate. This reduces the amount of hard-disk space needed.

Most analogue capture cards work to Motion-JPEG – or M-JPEG – standard. With this standard, the data rate can be reduced by a factor of up to 100, though there's a trade-off between compression rate and moving-image quality.

For compression ratios higher than 20:1, MPEG-2 algorithms are used. These are Main Profile@ Main Level MP@ML for SDTV and Main Profile @ High Level (MP@HL) for HDTV.

Compressed video data is now applied to the computer's data bus, along with audio data, ideally produced and processed on the same card to avoid lip-synchronisation problems.

Table 1. Typical resolutions used for video capture

Pixels	Corresponding standard
384 by 288	Low band/VHS/Video-8
640 by 480	NTSC
768 by 576	PAL

Editing

The editing is carried out by special software. The user's requirements are specified in terms of trimming and combining clips, adding transitions, effects, titles and so on.

Sophisticated editing programs offer many effects and facilities including batch capture, animation, 'morphing', 'paints', chroma-key, filters, and image re-sizing. The final picture/sound programme schedule is built up on a time-line – a series of horizontal on-screen rows, each representing a video, audio or effects track, and progressing in time from left to right.

This time-line can be scaled as required, ranging from the entire required 'movie' to just a few frames, seconds or minutes. The instructions are stored with frame/time-code markings, but not yet executed.

Rendering

Editing is followed by a process known as rendering.

The rendering process is a long one, during which all the instructions are carried out on a frame-by-frame basis. It involves pulling sound and vision data off the hard disk drive, processing it as required, and then progressively reassembling it back onto the HDD.

DV Editing

The A-to-D and data-processing involved in off-line computer editing of analogue video necessarily introduces degradation of picture and sound.

Where the footage is captured in a camcorder to DV tape, the data compression ratio is fixed by the system at 5:1, with an excellent, tailor-made data-reduction algorithm.

So long as this data is fully preserved during the editing and storage phases, it is possible to carry out 'transparent' editing. This is done entirely digitally, with no degradation of quality at all – no matter how many generations of dubbing take place.

Once editing is complete, the information is exported back to the DV tape in digital form.

Recordable DVD

Recording on a DVD requires a digital recording and blank camcorder disk capable of being written on.

Today, there are several competing recordable formats for DVD applications. They fall into two groups:

- Recordable, write once formats:
- Re-writable or re-recordable.

The various recording formats have different features: DVD-R is compatible with over 80% of all DVD players and DVD-ROM drives.

DVDRW was the first DVD recording format released that is compatible with almost 70% of all DVD players and DVD-ROM drives. It supports single side 4.7GByte and double-side 9.4GByte disk capacities.

DVDR is compatible with over 80% of all DVD players and DVD-ROM drives. DVD+RW has better features than DVD-R such as lossless linking and both constant angular velocity (CAV) and constant linear velocity (CLV) writing.

DVDR's greatest advantage is that it is compatible with almost all DVD players and DVD-ROM drives. It supports single-side 4.7GByte and

double-side 9.4GByte disk capacities.

DVD-RAM has the best recording features. Unfortunately though, it is incompatible with most DVD players and DVD-ROM drives. DVD-RAM disks are used more as a removable storage device than a recording medium for audio/video information.

Dual layer technology is also known as DVDR DL or DVD-R DL. It provides two individual recordable layers on a single-sided DVD disk. Dual-layer disks have a capacity of 8GByte and are normally referred to as DVD-R9.

Two versions of DVD-R format exist: DVD-R(G) for General and the DVD-R(A) for Authoring. It is also also possible to create a hybrid disk which is partially read only and partially recordable.

While a DVD-ROM disk, such as a DVD-video disk, has pits stamped permanently onto its surface, writable or recordable disks use other techniques to produce the same effect as a pit.

The disk is manufactured with a wobbled groove. This wobbled groove provides a self-regulating clock to guide the laser beam.

DVD-R is available in two versions. Version 1 has a capacity of 3.95 billion bytes, or 3.68GByte, and version 2 has a capacity of 4.7 billion bytes, or 4.37GByte.

Re-writable DVD disks including DVD-RAM employ a different technology, known as 'phase-change'.

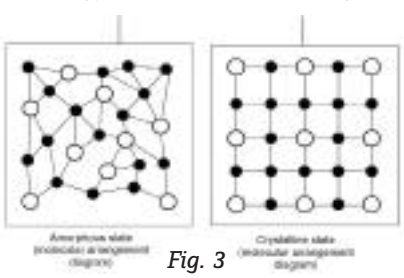


Fig. 3

Molecular arrangements. Phase-change technology uses a metal compound that changes its reflectivity as it moves between a amorphous (left) and crystallised (right) state

Phase-change technology uses a metal compound that changes its reflectivity as it moves between a crystallised and an amorphous state **Fig. 3**. These states are determined by the operation of the laser.

Phase-change uses the same wobbled groove as DVD-ROM, but it writes its data bits in both the groove and the land between the grooves. The wobbled grove is used to generate a spindle motor control signal and for a gate signal related to detecting the pits.

Recordable DVD layout

The DVD disk is divided into four areas or 'zones', **Fig. 4**.

The main zone is the data or information zone. Here, video and audio data are recorded. This is preceded by a burst cutting area which is between 44 and 47mm from the centre of the disk. The information zone itself commences with lead-in zone and followed by a lead-out area.

Before the video and audio data are recorded in the user area, the data bits are grouped into 2048-byte chunks or sectors. Each sector commences with a header.

Reading data off the disk involves directing the pickup head to the part of the disk surface where the required sector is recorded. Once the sector is identified, data is extracted for further processing.

There's more on the burst cutting area and write strategies in the book.

DVD recorder

A DVD recording system consists of two major sections. These are AV playback/record (PB/REC) and servo-control. The servo-control and AV playback are detailed in another part of the book.

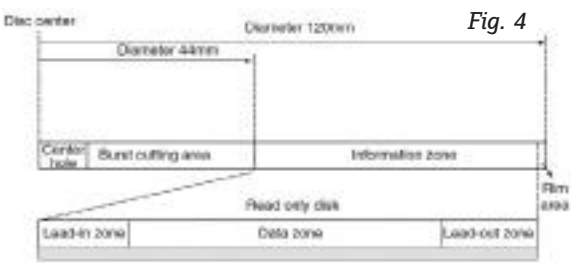


Fig. 4

Disk layout for DVD-ROM. DVD disks are divided into four areas or 'zones'

In video playback mode, RF signals from the optical pickup unit (OPU) are amplified and processed to produce MPEG-2 PESs, – or 'packetised elementary streams' – that are decoded by the MPEG-2 decoder to produce analogue

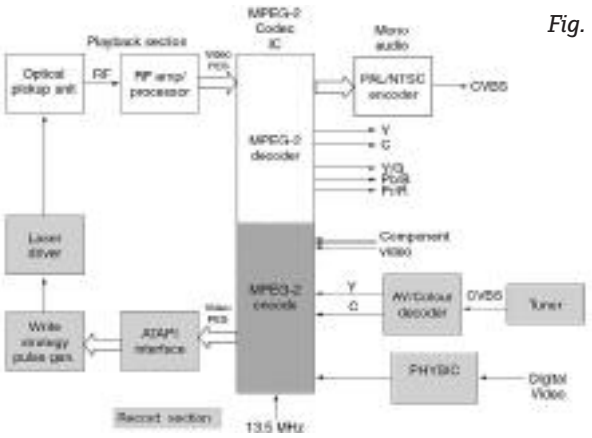


Fig. 5

Video processing in a DVD recorder, outline diagram

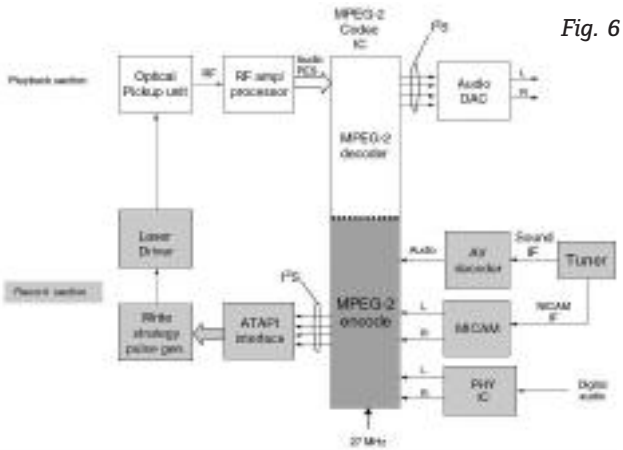


Fig. 6

Outline of the system that processes audio in a DVD recorder

video signal in the form of component video or Y/C a shown in **Fig. 5**.

Composite video (CVBS) is also available from the PAL/NTSC encoder. In record mode, analogue video from a tuner via a colour decoder, or direct component video, is first MPEG-2 encoded to produce video 'packetised elementary streams'.

These streams are fed into the write-strategy pulse generator via an ATAPI interface. From there they are passed to the blue laser driver.

ATAPI stands for AT (Advanced Technology) Attachment Packet Interface. It's a standard interface between a PC or other computer-controlled device on the one hand and CD/DVD or tape back-up drives on the other.

This interface standard is based on the Integrated Drive Electronics, or IDE, interface specifications used for HDDs. It has some additional commands needed for controlling a CD/DVD or tape drive.

Where the video input is digital, a PHY (pronounced 'fi' and explained further in a separate part of the book) IC is used. The PHY chip is a fast 400Mbit/s transceiver that acts as an interface between digital and analogue domains.

A similar process is applied to the audio signals in the playback and record modes as shown in **Fig. 6**.

In record mode, mono or stereo audio is MPEG-2 encoded by the MPEG-2 codec chip. PCM sound from the MPEG-2 encoder goes to the ATAPI interface via sound serial bus I2S on its way to the write-strategy pulse generator, where it is multiplexed with the video signal. Next it is fed to the laser driver.

HDD recorder

Video-processing activities similar to those used in DVD recording are required for recording A/V signals on a HDD, where audio and video PESs are stored as files on the disk. A block diagram of a DVD/HDD recorder using system processor made by LSI Logic is shown in **Fig. 7**.

DMN 8603 is a system-on-a-chip IC that carries out a wide range of DVD recording functions. These include DSP servo control and video and audio encoding/decoding using an in-built microprocessor.

Two ATAPI interfaces are available. One is for the DVD drive and the other for the hard disk drive. The hard drive is a normal IDE-type hard disk with a capacity ranging from 80GByte upwards.

In DVD HD recording, two modes may be used. The first is real time, in which the DVD is written to directly. Secondly, there's non-real time. Here, the data bit-stream is first recorded into an HDD first and transferred to the DVD at a later stage.

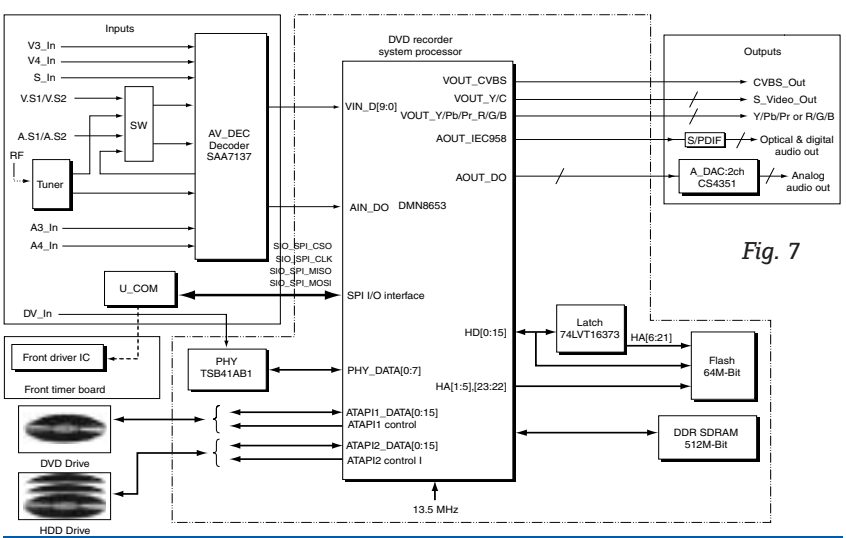


Fig. 7

Outline diagram of a DVD/HDD recorder

How to Satellite

by Roger Bunney

In my first column within the re-incarnated Television magazine, I commented at length on the pedigree of this worthy publication, rambled over the basics of satellite 'DX' and hopefully on the way inspiring our readers to consider taking up the call of the tracking dish! Armed hopefully with the satellite geostationary slots across the European skies from www.lyngsat.com we can prepare to seek out some of the elusive programmes, sports and news feeds that appear on a random basis throughout 24 hours.

I have previously mentioned Blind Search receivers, for sensible satellite signal 'DX' hunting, use of this type of receiver is essential. I will list just a few prime frequency bandwidths to check out that should provide signal reception on a 90-100cm dish. Most satellites carry random feeds and experience over time will provide a clear picture of the most productive spots to blind scan.

Unfortunately there is a slow migration from MPEG-2 to MPEG 4:2:2 which the former receiver cannot resolve, coupled with the need to encrypt and prevent unauthorised viewing of signals – perhaps 50% of signals received will now be non-viewable due to these reasons. In the longer term carriage will increasingly favour internet that offers security, instant connectivity and economy. Cisco, for example, are bringing to the worldwide market a broad range of innovative networking hardware linking both industrial, commercial and domestic environments – its 'TelePresence' system for very large video screening with high quality imagery is allowing major multinational companies conferencing without travel.

Where to look for satellite feed circuits

A few favoured spots are listed that should offer reception, if you don't at first see something, blind scan again an hour later!

PAS-12 @ 45° East, try the 11.400-11.750GHz and 12.500-12.750GHz bands using Vertical polarisation. African sports are often carried on weekend afternoons in the 11.4-11.7 band, signals are very strong in the UK.

Eutelsat W2 @ 16° East, try 10.950-11.160GHz and 12.500-12.600GHz, both Horizontal. Many European links are carried, look for NTV Russia, various Polish, Sky and NBC that are regularly carried;

Eutelsat W1 @ 10° East - a European hot spot. Favoured sections are 10.950-11.200GHz; 11.620-11.750GHz; 12.500-12.750GHz – all Vertical. European, UK feeds, much APTN and corporate activity;

Intelsat 10-02 @ 1° West. The 11.450-11.750GHz-V band is very productive, favoured by the Scandinavians, ABC News and Irish Greyhound race meetings [evenings]. Occasional BBC feeds;

Atlantic Bird-1 @ 12½° West. The 10.950-11.750GHz-V band carries a variety of occasional traffic, the 11.060-11.190GHz is used by the BBC for regional feeds though most have now opted into 4:2:2.l. Active but requires patience.

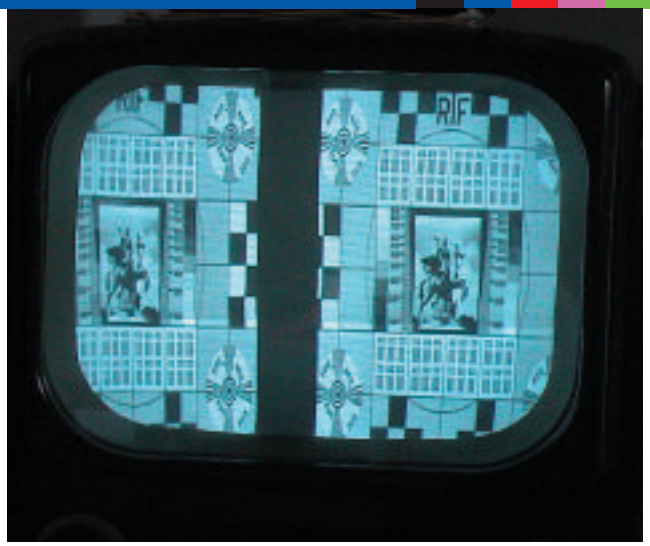
NSS-7 @ 21½° West has provided much activity in the past over the 10.950-11.750GHz-H band but both Reuters and CNNewsource have encrypted, another satellite that requires regular 'searching'.

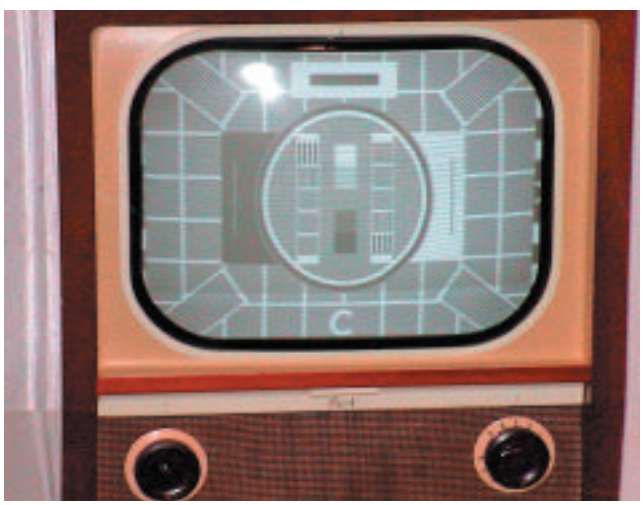
Intelsat 905 @ 24½° West and Intelsat 907 @ 27½° West. Search the 10.950-11.750GHz-V + H for occasional feeds ex USA.

[The Lyngsat listings will provide more accurate data but remember activity is totally random]

MPEG 4:2:2 update

My previous column noted that MPEG 4:2:2 is possible but equipment is very limited. It's thanks to Kevin Hewitt in North Kent who has kindly updated the present situation. The only commercial satellite receiver capable of 4:2:2 reception is the QUALI-TV model 1080IRCI, it has sold from a few UK dealers for around £450. My own experience is that it worked initially, but over a period of months I found that the remote control commands were 'delayed' with the receiver failing to respond immediately, best described as 'storing up several button pushes and then downloading them in a single sequence'. I eventually became totally frustrated with the receiver feeling that either a QUALI-TV version 2 might improve or another manufacturer's receiver might appear on the market, sadly neither has happened. Kevin however purchased his QUALI-TV on e-bay for £138 in 'as new' condition with software version v 2.76, he has v 3.16 upgrade but as yet it isn't installed. He too notes that remote control commands appear not to react, saving them and then executing them all in one go. The receiver signal installation menu requires a single frequency as entry and once entered the receiver exits the menu, receives [hopefully] the signal; inputting





another frequency requires a repeat installation menu operation. But, states Kevin, it displays MPEG-2 and 4:2:2 faultlessly. The only alternative to the QUALI-TV approach for MPEG 4:2:2 is with a computer fitted with the 'SKYSTAR 2' card, which shortly will be released as USB 2.0 in addition to the PCI. Kevin's 'Skystar 2' kit included the PCI card, remote control and 'serial dongle', the latter is also available as a USB alternative.

Orbital sightings

Motor racing enthusiasts would have delighted at the 'Le Mans Series' as the cars roared round the track on the afternoon of November 10th. But as the evening darkened here in Europe, the Le Mans racing continued in daylight. Not from France, however, but the Le Mans series was being uplinked out of Brazil for several hours. The service identification 'BT5' confirmed the facility, providing signal carriage which landed here in Europe via Atlantic Bird-1, 12½° West @ 11.147GHz-Vertical [Symbol Rate 5632 + Forward Error Correction ¾]. The 'service identification' usually indicates the satellite facility link company or broadcaster client [for example 'SKY NEWS DSNG'] and appears within the menu during tuning. There is sometimes embedded within the signal parameters a 2nd identification that normally cannot be accessed, the early RSD-302 series was the only receiver able to reveal this hidden information.

The National Basketball Association [NBA] hit the encryption button on its European bound feeds from the USA ages ago, perhaps due to its carriage over PAY-TV sports channels in Europe. Interesting to note, though, that the 'NBA TV EUROPE' feed appeared non-encrypted and clear on the evening of November 15th. The New York Knicks v. Miami Heat match was transmitted over Intelsat 907, 27½° West, 11.521GHz-V [5632+¾], previously NBA encrypted feeds have been carried over Intelsat 905.

Oil prices are hot news as the price per barrel increases, the petrol pump price and UK tax also rises, the Arab states meanwhile tell you that there's plenty of oil available. The oil producing states held one of their regular meetings to discuss the situation and Eutelsat W1, 10° East carried live transmissions of their deliberations and reports back to their own national TV news networks. 'APTN OPEC 1', 12.723GHz-V and 'APTN OPEC 2', 12.738GHz-B [both 4167+⅚] carried these reports and provided satellite capacity for their clients seeking programme carriage. APTN are generally the most active news agency

on W1, the 4167+5/6 parameters instantly identifies an APTN signal. The Turkish news agency 'IHA' is another prolific customer on the W1 satellite.

The BBC 'Autumn Watch' programme hit the airwaves again during November. At least 2 live broadcast feeds were dedicated to the broadcasts, linking over Intelsat 10-02, 1° West. The 11.467GHz-V was the main programme output feed with 11.476GHz-V a secondary circuit contributing into the main 'Autumn Watch' programme makeup from a 2nd location. The common BBC parameters 6076+7/8 identifies the BBC generic service and both feeds used MPEG 4:2:2. Interesting however to note on November 15th when the BBC Weather Studio fed a live insert via Intelsat 10-02 into 'Autumn Watch' @ 2045 hours that straight MPEG-2 was used – 11.521GHz-V [6078+7/8]. Philip Avery presented both the 'Autumn Watch' weather forecast and several other weather offerings into the BBC main networks as the feed into the Weather Studio uplink wasn't cut after the 'Autumn Watch' insert, eventually the studio lights were dimmed, Philip put on his coat and wandered out. The service identification for the BBC Weather Studio sat feed 'SATOP TX2' suggested that a non-BBC uplink truck was used.

Roy Carman [Surrey] watched the 'Worlds Darts Grand Prix' from Dublin during October on an MPEG 4:2:2 transmission over the 'DIGITAL SPACE' satellite truck downlinking @ 11.023GHz-V [13333+7/8] over Atlantic Bird-3 @ 5° west. Interesting to see Roy using a QUALI-TV and a Skystar card to view the pictures. The Arab countries provide high quality TV programming at strong levels both from the ARABSAT 31 1/2° east slot and increasingly it appears from the BADR slot at 26° east slot. Recently Eritrea was displaying its test card over 26° East @ 12.558GHz-H [2599+3/4] suggesting that it too were moving its downlink from the 31 1/2° slot.

Littlehampton reader Edmund Spicer notes that coverage of the recent Sirius 4 satellite November 17th launch was carried live over Sirius 2, 4.2° east slot @ 12/265GHz-H [27500+3/4].

With the increased political tension across Pakistan, the American ABC network has established a news bureau locally. In recent weeks numerous live news reports into the NY studio and video packages have been transmitted. Check 10-02, 1° west for the downlink @ 11.674GHz-V [3207+7/8] with service identification 'ABC NEWS DSNG'. Transmissions may be in either 625 lines PAL or 525 lines NTSC. On the nearby 1o west frequency of 11.679GHz-V [3207+7/8] will be found the downlink from the ABC news bureau in Baghdad with service identification 'ABC SCOPUS'.

A final sighting from Kevin Hewitt [Chatham] notes that W1, 10o east on November 11th carried the 'Tennis Masters Cup Shanghai' @ 11.103GHz-V [1333°+7/8] with several successive feeds on the same frequency: – 'TMC NEWS SOLO' with on-screen ident 'MCR SHANGHAI' [MCR = master control room] ; then 'TMC WORLD FEED'; then 'ESPN service provider' and finally 'DOUBLES service provider solo'. At each change the video/audio/PCR PIDS changed values.

News round up

The analogue TV closures around Europe continue to multiply, at this time Finland, Sweden. Luxembourg and Holland have digital TV only. Norway plans analogue closure by November 2009. Both Germany and France will see analogue closure by the end of 2008.

The forces broadcasting service SSVC are changing their TV feed into the Falklands Mount Pleasant base to digital that in turn may have an impact on the TV service available for the local civilian population. The Falkland Islands Executive Council has accepted the delivery change though the increased equipment/operational costs may be recovered by the introduction of a broadcast receiving licence. There are concerns over the future operational integrity of the Mount Maria transmitter site; a failure would deprive a large area of the island and rural population of broadcast radio and TV programming.

'Medianetwork' reports that there are now 370 Arabic satellite broadcasting networks operating across the Middle East: the UAE has 22% of the satellite networks operating out of that state, a further 15% are in Saudi and 11% in Egypt.

The first fully digital terrestrial TV channel operating in Azerbaijan opened mid November transmitting using a 1.5MW transmitter to cover the north-east part of that country for some 16 hours daily, providing regional TV and news across four regions of the north-east.

Pakistan authorities have banned the import of satellite dishes and receivers to minimise local folk viewing news coverage of Pakistan's problems from outside that country. The authorities have also restricted overseas journalists activities and satellite broadcasting equipment [ie satellite uplinks from within].

Cuba continues to rattle a blunt sabre at the continued propaganda broadcasts by the American government/CIA. The USA is accused of broadcasting over 2000 hours weekly on MW, SW, FM and airborne TV into that country, from August 'the new G-1' aircraft increased TV transmissions together with direct broadcasts from Miami into Cuba, these figures having been presented to a recent UN General Assembly.

A day in the life

by Peter Dolman

In early January, one full day before we officially reopened for business following a much needed Christmas break, I made a rash decision to sneak into work for an hour or so. Not that I'd got my days muddled, I just hoped that having a bit of a tidy up and then quickly sorting out an especially urgent audio repair might help relieve my self-inflicted headache. Scribbling a quick note to Dear Heart, I made off toward the workshop.

Stepping inside I flicked down the latch. Then, on casting a weary eye around the cluttered surroundings, I decided to sweep out a square of space on the audio bench and pick up my good buddy Dave's NAD C350 amplifier, which had expired at the finale of a recent party. On power up, it clicked meekly then moments later shut down, the front led glowing red instead of a reassuring green. In view of the circumstances under which it had failed, I set about making resistance checks on the output transistors, but to my disappointment, readings here were normal. After a little think I then did what I should have done in the first place and checked out the relevant DC conditions, which turned out to be correct. Finally it dawned on my addled brain that, despite appearances, both output stages of the amp had actually survived their recent ordeal and were functioning properly; there was headphone drive but nothing more. Reaching for the service manual, I focused on the loudspeaker protection circuitry. Figure 1 shows the basics. Relay control is carried out by IC105, a uPC1237H, which provides 'power off muting', 'speaker on' delay following power up, plus protection against DC offset and overcurrent in the output stages. In this particular design, the relay switches the loudspeaker lines only, the headphone signals being delivered directly from the emitter circuit of each output pair. This avoids the need to route the outgoing speaker feeds via the fickle contacts of the headphone socket. The protection relay is switched to achieve muting by the socket's ancillary contacts as shown.

My instincts told me that the problem had little to do with the amplifier's recent exertions. Suddenly I started to hanker for home, my cosy chair and the pleasures afforded by home cooking. In my mind's eye I visualised the scene as Dear Heart floated in, doe-eyed, tray in hand, having created yet another culinary masterpiece for my delight. I saw her expression of fulfilment turn to one of sorrow and then finally to admiration as she read my note of dedication to duty…what a gal. Then my bench drifted back into focus, and my vision of utopia faded… I reflected on the unfortunate fact that the amplifier in front of me had been appropriated by my pal without the consent of its owner and how, influenced by a mix of loyalty and alcohol I had rashly assured him that I would try to sort it so that no one would be any the wiser. I just had to give it one more hour. With luck I'd soon be home…

Another culinary masterpiece...

Checks around IC_{105} revealed that pin 6 remained high at all times, pin 8 was normal and pin 7, which controls 'speaker on' delay time remained low instead of ramping up over a couple of seconds as C_{146} charges. Confusingly, it transpired that R_{229} was OK, the resistance between pin 7 and ground was as expected and, surprisingly, C_{146} was open circuit, which seemed not to be consistent with circuit behaviour. I replaced it, but to no avail of course. Finally it dawned on me that pin 7 was being held low internally. Resisting the temptation to change the IC just yet, I 'scoped every pin very carefully and identified a small but perfectly formed 50Hz ripple voltage at pin 4. Yes, C_{145} on the 'power off mute' pin was high ESR. Upon fitting a replacement, the amplifier powered up and music filled the workshop. Uttering a cry of triumph I

confidently wound up the volume, only for my elation to evaporate as the NAD shut down again. Then, breaking the silence came a fierce rattling at the door.

I cautiously inched it open and glimpsed one of Edgar Cudlip's bloodshot eyeballs peering in at me. Then a rancid wellington boot wedged itself into the gap. "Telly's pegged out" rasped my uninvited guest. "Seen you creeping about over here, so I said to the missus, Ethel, I said, forget all your washing and ironing and let's get some fresh air…'yer she is, comin' with 'im now look". Through the gap I observed the uneven approach of a small figure, flagging under the burden of an LCD set. "You done 'im a year ago last February - never been right since" continued Edgar grimly. My headache moved up a notch. "February" he repeated tragically. "Come on Ethel!" As I searched my fragile memory, light dawned and I decided to apply a little sideways force on the door. "Hmmm, wasn't that the day you hacked through the aerial cable as you were pruning the clematis Edgar?" I remarked, increasing the pressure. "Not actually anything to do with the set, was it?" The visible sector of my unshaven visitor's face became crimson as he turned to his wife. "'Twas your fault that– I were steadying the ladder…it's me back, see?" he added, presumably for my benefit. Then, heaving the set from his wife's grip he shoved it roughly through the narrowing gap in the door, into my arms. "Home, Ethel" boomed Edgar heaving out his disgusting boot. As the door crashed shut I returned to the audio bench and stared despondently into the NAD. When I powered it up it sprang back into life again.

How often have you walked away from a problem, only to find a simple solution on your return? Well, in this case I suppose I had the Cudlips to thank for giving me a fresh take on it, because as I gazed at the electrolytics I'd replaced, and then at the remaining two that I hadn't (C_{135} and C_{143}) I realised how cosily they're all clustered alongside the heatsink of Q_{139}, the 18V regulator. A quick check proved that C_{135} was high ESR explaining the tripping out at high volume. I also replaced C_{143} for good measure. At last the amplifier was declared bullet proof…perhaps the temperature it reached during use as a makeshift PA system served to finish it off, but I reckon this might well become a common problem on what is otherwise an excellent entry level audiophile amplifier.

I hooked up the NAD to a tuner and Tammy Wynette came on loud and clear. 'Stand by your man…' she was singing. The thought of Dear Heart standing by in a state of wanton readiness for my return warmed my heart. Then "poor old Ethel" whispered my inner voice. "She can't have much of a life with that oaf of a man of hers". Maybe I had time to do a good deed and have a look at their TV. Just a really quick look….

Edgar's set was a Maxim11-54 LCD TV. When it powered up, the LED on the top should flash like a beacon for a few seconds before becoming constant. Picture and sound should follow. As none of these events occurred, I began by doing some basic checks around the power supply board and soon found that the standby 5V supply was missing. (Measured at the cathode of rectifier D500, situated a couple of inches down from the top right hand corner of the PCB). In this model, a valiant single chip SMPS is employed, comprising IC_{21}, an FSD200 (containing pulse width modulator and power mosfet), and relatively little else apart from a transformer and the usual feedback components. Resistance checks across D500 proved normal, and I measured about 320V between pin 1 and 7. However, there were no switching waveforms, so having discharged the associated smoothing electrolytic, I set about replacing the IC. This restored normal operation. We've had this IC fail in various products ranging from chargers to plasma TV's. Designs that use it include the Bush PDP42TV003 (Plasma 42), sets employing the Beko R82.195-04 PSU panel and various models badged by Grundig and Goodmans. Nikko Electronics can supply this device really cheaply. In cases where the power supply fails more catastrophically, a repair kit is available from CHS, part number MODKIT60.

"Well, this could be the last time…" sang The Stones as I boxed up Edgar's Maxim. Then in my peripheral vision I spied a shapely silhouette beckoning earnestly at the window. Speeding out, I ushered her inside. "It's this silly plug gizmo" she announced apologetically. "I'm sure you don't need this, some damsel in distress, today of all days, but you see, I found this lovely little second hand Apple for Candice Marie's big Christmas present and now it just won't charge". She swallowed hard. "The man at Planet PC says that I've to spend eighty or ninety pounds to get a new one…I just don't know what I'm going to do". She held out a delicate hand in which was clutched an Apple G4 iBook laptop mains adaptor. I could see that the lead was fractured where it entered the DC plug. My throat seemed suddenly very dry. "Let's take a look" I croaked, extracting it from her grip. Fortunately, we'd sorted several of these units before. Spending an hour on one is a viable proposition in view of the difficulty and cost of replacement. The DC plug has a unique construction, but with care it can be opened and re-used. Details of the repair are shown overleaf.


Step 1


Step 2


Step 3


Step 4


Step 5

Run some PVC tape around the barrel of the plug, taking the edge to a point 8mm from the front of the plug body.

Using a fine hacksaw, gently cut a shallow circular track around the body of the plug where it meets the tape. The depth of the cut needs to be minimal; with care you will feel when it has just penetrated the outer layer

Carefully 'snap off' the rear of the barrel shell and slide it along the cable ready for re-use. Observe the small circular PCB located in the main part of the plug and note the position and orientation of the connecting leads.

Cut the cable about an inch or so back from the plug. Unsolder from the PCB and discard along with the rubber stopper

Strip the fresh end of the existing cable and resolder the inner and outer connections to the PCB.

Apply a blob of silicone (such as Dow Corning, Farnell part number 108-899) on to the PCB area so that when the rear shell is slid back into position, it becomes filled with the silicone.

Press the two halves of the plug together.

Cut a short length of adhesive - lined heatshrink sleeving (about 35mm) and feed this over the plug, taking the front edge slightly proud of the front of the plug body. Suitable sleeving can be obtained from CPC, stock code CB10005.

Using a heat gun, warm the sleeving so that it shrinks evenly around the plug and moulds to its tapered contour.

As I bade my fragrant visitor goodbye, my attention was diverted by the tones of Carole King. 'It's too late baby…' she sang. , Checking my watch, I suddenly realised that the time was getting on. I'd best defer delivering the LCD until tomorrow I decided, time to hurry home now. As I was making an exit, the 'phone rang. Lifting the receiver, I listened, praying that it wasn't Edgar. "Might have known you'd still be there" said a voice. To my relief I recognised the dulcet tones of Dear Heart. But she sounded annoyed about something.


Dog and phone

When I enquired what, her response was immediate. "What the hell are you up to? Let me guess, I suppose you'd rather be cosying up to something technical than to a real person, ie moi? No, don't answer that, you'll get your wish, the TV's packed up so you can spend some time at home sweet talking to that. Me and our credit card are off for some retail therapy, so don't wait up. Oh yes, and by the way your dinner's in the dog".

'Alone again, naturally…' sang Gilbert O'Sullivan as the phone slammed down.

To my relief I recognised the dulcit tones of Dear Heart...

Replacing surface mounted components on a low budget

Working with surface mounted components on a low budget is a very real prospect suggests Michael Dranfield

Surface mounted devices are now commonly used in all types of consumer electronic equipment but it's surprising how many people still struggle to replace them or say they do not have the money to invest in the specialist equipment. I regularly get requests for help from dealers needing a chip replacing on a PCB, I have a very well tooled up workshop and am well known in the trade for my surface mount capabilities having been involved in sky digibox repairs for the last 6 years. Tooling up for surface mount was very expensive in the early days, I paid over £4000 for an infrared rework station but now thanks to the Chinese who can copy anything for next to nothing replacing SMD components with less than £100 worth of kit is a real prospect and well within the budget of most service departments. In fact the cost could be recouped in just doing one simple job as I will explain later.

When replacing surface mounted components there are two important things you need to be aware of before setting out; PCB pre-heating and the use of flux. Let's take the issue of pre-heating first, imagine trying to replace a surface mounted component on a multilayer PCB with heavy ground planes and a soldering iron with a needle point tip,as soon as you touch the component heat will be drawn away from the irons tip causing it to drop below the melting point of the solder which is approximately 183°C for conventional leaded solder. If you have a temperature controlled iron increasing the tip temperature will not cure the problem either, all this does is cause the irons tip to oxidise more quickly and then solder will not stick to it, so what's the answer ?

Simple , pre-heating the pcb to between 100 –120°C first,this does

two things , it allows you to solder at very low temperatures and it also cushions the thermal shock of both the component and the PCB itself,a pcb sitting at 100°C only takes a few seconds to raise the temperature to solder melting point with a hot air blower. Surface mounted ceramic capacitors can crack if soldered from cold, now this may not be apparent at first and very powerfull magnification would be required to detect a hairline crack but in the passing of time atmospheric moisture would enter via the crack eventually causing the capacitor to exhibit a resistance a bit like a wax paper capacitor in a vintage radio.A professional board pre-heater could set you back £700 but I have come across a Chinese company who produce a capable model for less than £80 including UK delivery. Aoyue Tongyi Electronic Equipment Factory based in Zhongshan city. However, there is a UK importer of which I will provide details later where I bought the one for this test.

Measuring 220 x 247 x 73 mm the Aoyue 853A Pre-heater is a bench top infrared heating station with a board heating area of 130 x 130 mm and a built-in PCB holder for clamping smaller PCBs , no problem if the board is larger, you can just sit it on top so that the quartz heating elements are underneath the components to be removed/replaced. On the front there is an rotary potentiometer that is used to set the temperature to between 98-380°C, and a red LED display that can be set to display the target temperature and the reached temperature.

However a word of warning here, with infrared soldering systems the temperature of the heat source is always higher than the soldering temperature reached by the solder joints. For example in order to pre-heat a FR4 (epoxy/fibreglass) composition PCB to 100°C you will need to set the pre heater temperature to approximately 260°C which can be a little confusing at first.

My Ersa IR500A rework station has a thermo couple which can be placed directly on the the board to display the actual surface temperature, the Aoyue 853A does not have this luxury but then what can you expect for such a low price. Most surface mount work will require the board to sit at between 100 - 120°C but I would recommend 100°C as a good starting point, when the target temperature is reached place the PCB you are working on onto the pre-heater for a couple of minutes, if you have a digital thermometer, I have a laser sighted one, keep a check on the actual temperature of the component you are replacing, as soon as it reaches 100°C you are ready to rework.

Now before explaining the rework/replacement procedure a word about flux and what it does. A thin skin of oxide forms on molten solder when it is exposed to atmospheric oxygen making a very poor and dry solder joint if no flux is used. Applying flux removes the oxide skin allowing the solder to flow and make the perfect joint, it also prevents solder bridging two adjacent pins when soldering very fine pitch ICs. A question I have been asked many times is “how on earth do you stop solder bridging all the pins together?”; well this is all down to the use of flux, over the years I have tried many different types of flux and to a certain degree most types have been successful but one particular brand has provided outstanding results,the Interflux IF8300 marketed by Blundell production equipment in Coventry. Use of the correct flux is very important especially where cleaning cannot take place such as on

BGA chips where there are no visible pins, a flux must exhibit no long term corrosive properties and introduce no surface conductivity, the IF8300 is a no clean, thick gel flux specially developed for BGA work but I have found it excellent also for general rework,as it is thick and sticky when cold placement and alignment of smd components is less critical for those without a steady hand!

Let's take a look at some example component replacements and reflowing,starting with replacing a 16 pin smd integrated circiut. First give the pins of the chip you are going to replace a very light brush with a fibre glass pencil to remove any dust and light oxidisation, not too hard as a fibre glass pencil is very abrasive, now run down both sides of the pins with flux, place the pcb on the pre-heater and heat it up to 100°C. With a hot air blower, I use a weller pyropen set to number 3, heat the top of the chip directly while holding it with a fine pair of tweezers, after only a few seconds the chip will lift off the board. Don't worry about damaging the chip contrary to popular belief you will not damage the chip by heating the package directly as long as you don't heat it for an extended time, BGA chips ,the ones with all the pins underneath are fitted this way in manufacture by heating the top of the package until the solder balls underneath collapse.

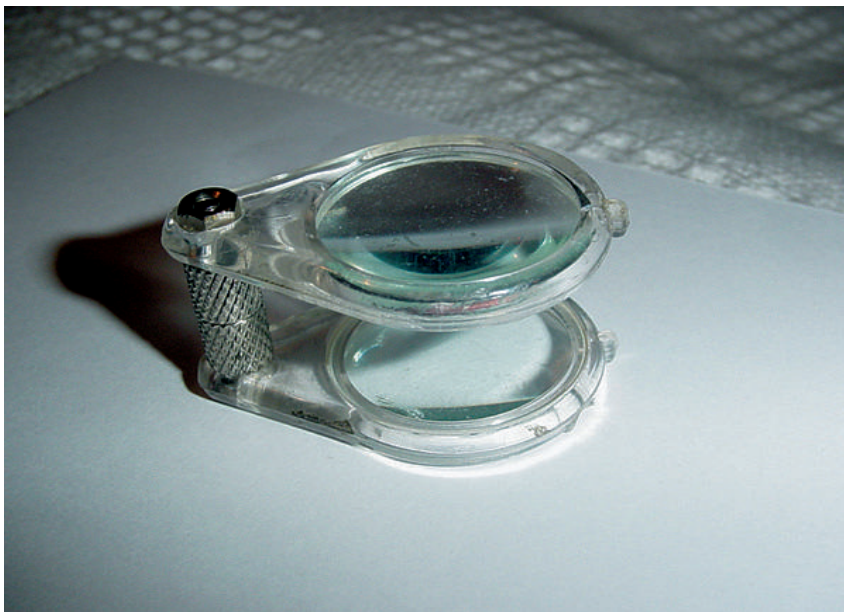
As soon as the chip has been lifted from the board remove it from the pre-heater and allow it to cool. Applying flux to the chip before removal will allow the chip to be lifted off and the solder will stay on the board, you will now have 16 perfectly formed pre soldered pads on which to mount your new chip ,give the pads a good clean with flux remover and allow to dry. Next take your new chip and give the pins a good clean with the fibreglass pencil, apply some flux to the pins and also to the PCB solder pads, line up the chip onto the solder pads accurately and place your board on the pre-heater, when the board reaches 100°C run down each side of the pins in turn with hot air for a few seconds, as soon as the solder reaches the melting point you will see the chip sit down onto the board, when this happens carefully remove the board from the pre-heater and allow to cool.

Now although the IF8300 is a no clean flux I still like to give it a brush with flux remover afterwards, the result is so good you cannot tell the component has been replaced and the new chip has never seen a soldering iron. A word of warning, never try to replace a component in this way without first pre-heating the board first, chances are if you do the PCB will de-laminate and you will be left with a large blister on which it will be impossible to mount any component flat down.

The second method of replacing a surface mounted chip with a soldering iron is as follows. Remove the old device as above, remove the solder from the PCB pads with desoldering braid and clean the PCB with flux remover. Now flux up both the new chip and the PCB and mount the new chip on the board, lining up the legs onto the solder pads, pre-heat the PCB to 100°C and using a suitable instrument such as a sharp pointed tip push the chip down onto the board and tack down some of the pins with solder. Don't worry at this point in time if you solder loads of the legs together, the idea is just to get the chip stuck to the board in the right place for starters, apply more flux to the pins and remove from the heat. If you heated up the whole board you may have to handle it with a glove to avoid getting burnt. Hold the board at an angle and run down each side in turn with a soldering iron and fresh solder, the flux will cause solder to migrate from between adjacent pins, while it is possible to use an ordinary soldering iron to do this it is far better to use a tip specially designed for this type of wave soldering. I use a Pace iron fitted with a mini wave tip, this is designed with a hollow concave surface to hold a reservoir of solder so when you run down the pins of a chip only the molten solder is in contact with them and not the face of the bit,as you run along solder is deposited from pin to pin.Give the PCB a quick wash with flux cleaner and then examine all the solder joints, any bridged pins at this point can simply be re- worked by applying a little more flux and while holding the PCB on a downwards angle touching the bridged pins with a soldering iron until the solder runs away from the shorted pins.

OK so that's two examples of SMD replacement, now let's cover re-flowing, this is where a chip has a dry joint, for example, the digital scan module used in Toshiba CTVs. Most people in the trade will have come across these before, there's a problem with the picture, tap the digital scan module on the side and the fault is cleared. From experience the dry joint is nearly always on the 200-odd pin chip in the centre of the board, the fine pitch of this component frighten's people into attempting a repair with a soldering iron, a new module costs over £120 plus VAT making this a £200 retail job,however these sets cost £1300 when they were new so most people have them done anyway, but the module can be repaired in a couple of minutes, charge your customer £80 and that's the board pre-heater paid for in one job!

First give the pins of the chip a very light brush with a fibre glass pencil, run round all the pins with flux, pre-heat the board to approx 100-120°C. Then working one way round with a hot air gun heat up the



pins until the solder melts, this will be seen as a colour change in the solder and that's it, module repaired and you have not even touched it with a soldering iron.Although the IF8300 is a no clean, minimum residue flux I always wash it off so a close inspection of the joints can be made.

So there you go, working with surface mounted components on a low budget is a very real prospect, obviously there are components you will not be able to replace without specialised equipment, such as BGAs. But sods law dictates that the more expensive a part is the less likely it is to cure the fault anyway! Don't rush in and practice your new techniques on someone's £1000 plasma. Working old model sky digiboxes, such as the pace 2200 which now run very slow, can be picked up for a couple of pounds and are packed with surface mounted devices of all shapes and sizes. Try removing one and seeing what effect it has, usually you will end up with a box that is stuck in stand by, then replace it again and see if the box comes back on, this way if anything goes wrong it won't matter.

As you can see pre-heating is an essential and little known part of successfully working with surface mounted components, but it is also very useful for removing leaded components which are soldered on both sides of the board such as electrolytic capacitors on computer main boards. Even with a top of the range desoldering tool you will struggle to remove these from a cold PCB. Another example is the Amstrad DRX100 tuner, it is soldered on both sides of the board and if you don't manage to melt the solder on the top side you will invariably destroy the through board links rendering it useless. Pre-heating cures all of these common problems on double sided PCBs .

Finally a close inspection will have to be made of any soldering work, this can also be done on a very low budget, don't rush out and buy a microscope, they are not all there cracked up to be. I have got one and while it's good, it only allows a solder joint to be viewed from above, which is not what you want, ideally you need to be looking in at an angle to make sure the solder has flowed between the PCB and the component leg. SEME in Melton Mowbray do a single eyeglass, Part number AID3004, which is supposed to be attached onto a head band magnifier, buy two of these and fasten them together with the screws provided, the magnification provided is more than adequate to see the finest pitch chip. Alternatively the lenses out of an old cine projector will give near microscope magnification, I managed to pick one of these up at the local tip for nothing!

Contact numbers

The Aoyue 853A currently costs £69.95 (£59.53 ex VAT) next day delivery £8.95 and is available from:

Allendale Electronics Ltd
PCB soldering dept, 43 Hoddesdon Industrial Centre, Pindar Road, Hoddesdon, Hertfordshire. EN11-OFF.
Tel. 01992 450789.
Web. www.pcb-soldering.co.uk
E-Mail. sales@pcb-soldering.co.uk

Interflux IF 8300 flux 5 cc syringe. Costs £11.08 Plus VAT and is available from:

Blundell Production Equipment
203 Torrington Avenue, Coventry. CV4 9UT.
Tel . 024 7647 3003.
Web www.blundell.co.uk
Note: This does not come with any needle tips for application but these can be obtained from general component suppliers such as CPC plc in Preston.

Long-distance television

by Keith Hamer & Garry Smith

Currently there are four European countries which have totally abandoned analogue: Luxembourg, the Netherlands, Finland and Sweden.

The German transformation from analogue to digital should be completed very soon. Our old friend Grünten E2 switched off during the night of November 26th. There was a special showing of the FuBK test card with rolling script, a waving hand bidding farewell to analogue followed by shots of the transmitter itself being turned off.

The Swiss Bantiger E2 outlet also suffered the same fate recently, but the programme being screened was simply switched off without any ceremony! Switzerland is well ahead with its analogue closure with only outlets in the Valais remaining on-air.

Throughout both countries, few viewers relied on the analogue terrestrial service as dependency on cable distribution is high. This means that the viewer is exempt from the financial burden of having to change their equipment. The cable company changes the head-end to receive the new digital broadcasts and after processing, or conversion, sends the new signal down the cable as if nothing had happened. Where analogue distribution is used, there is no set-top box terminal and the added benefit is that the subscriber can split the signal to other rooms without extra payment. This is in complete contrast to the United Kingdom with its knack of squeezing the last ounce of money out of the subscriber with its charge for additional boxes.

Reception Round-Up

November reception was fairly active with displays of Sporadic-E activity on a couple of days, namely the 9th and 14th. On the 9th, signals arrived from Hungary on Channel R2 during the late morning with RTL KLUB programmes dominant for a while. R1 signals were present but unidentified. Later, Italian signals materialised followed by Canal Plus from Corsica, characterised by its inverted video which shows as a negative image. On the 14th, channels R1 and R2 were a complete jumble of signals for several minutes before retreating. Tony Jones (Basildon) reports regular instances of Band I reception up to the end of the month, mainly at around midday.

Twenty years ago, DX-ers witnessed one of the biggest tropo openings of all time. For several days in early November 1987, Eastern European stations invaded Bands III and UHF with sustained signals during the day. Test cards were the norm in those far-off days and it was an experience watching the stations opening uninterrupted with perfect colour and sound. Polish and Czechoslovakian stations provided the best viewing. Band I was also affected with reports of the low-power Antwerp E2 relay in Belgium and also a Russian station displaying its test card on R1.

DX Newsdesk

Belgium: On November 28th, the RTBF digital terrestrial network officially opened. Two channels are used, shared between several transmitters. The 'E' channel has been given a 'D' prefix to indicate it carries a digital multiplex. Transmitter ERP details are not known. Transmitter polarisation is shown in parenthesis.

Channel D56: Tournai-Froidmont (V), Anderlues (H), Brussels RAC (H), Wavre (H) and Profondeville (H).

Channel D66: Liège- Bol D´air (H), Léglise (H) and Marché (?).

TV programmes within the multiplex are:

La Une, La Deux, La Trois (ex-RTBF Sat), Euronews (in French) and ARTE Belgique (planned).

Radio programmes are:

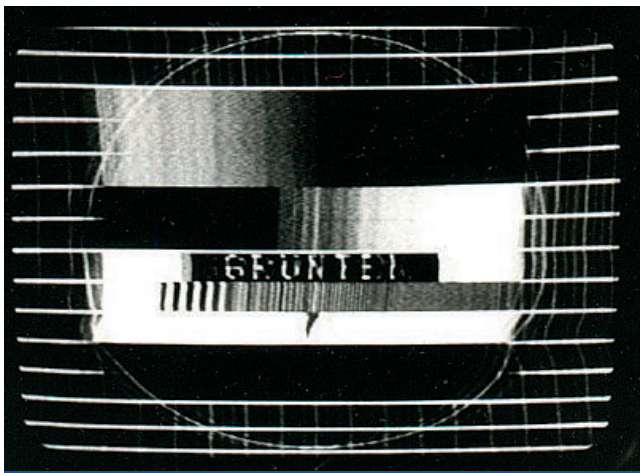
La Premiere, Vivacité (Brussels), Musique3, Classic21, Pure FM and BRF 1.

Both channels have been frequently received in the south-east of the United Kingdom whilst undergoing tests.

Switzerland: It has been reported from Bern that 20% of Swiss homes now subscribe to digital Pay-TV channels and 36% of viewers have flat-screen receivers.

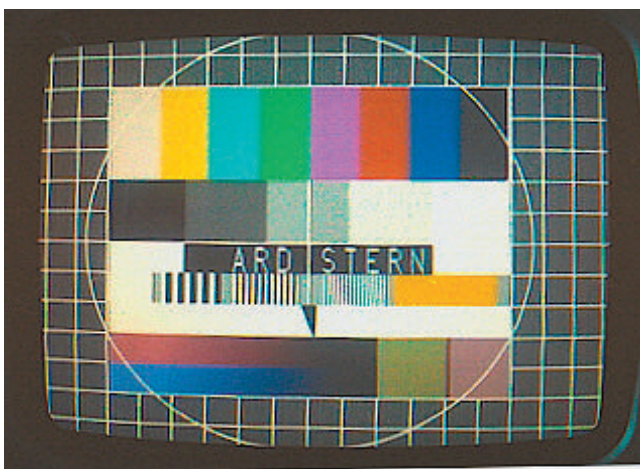
Austria: The private TV channel, ATV, has been sold-off following urgent negotiations. The Vienna-based broadcaster has been operating at a loss for some time.

New channels have been announced for the country's second terrestrial digital multiplex. These include 3sat, Pro Sieben, Sat. 1, Euronews and Sport Plus. The private TV channel, ATV, is also due to be included in the multiplex depending on the company's financial situation. It is also proposed that the German-language channel, Puls TV, will be broadcast together with the private TV outlet called Okto. Puls TV was recently bought



Typical Sporadic-E reception from the BR-1 Grünten transmitter

East German TV opening in early November 1987



An FuBK test card from West Germany

A festive caption from the Italian private station, Telelombardia

by the large German ProSiebenSat.1 TV organisation.
Denmark: Mobile telephone TV test transmissions have been conducted in the Copenhagen area and, apparently, viewers have reported that sound and picture quality was "extraordinarily good". The DVB-H trials were organised by Viasat and TDC which involved only twenty participants but they all thought that the system was a good way to keep in touch with news and sports reports while on the move.

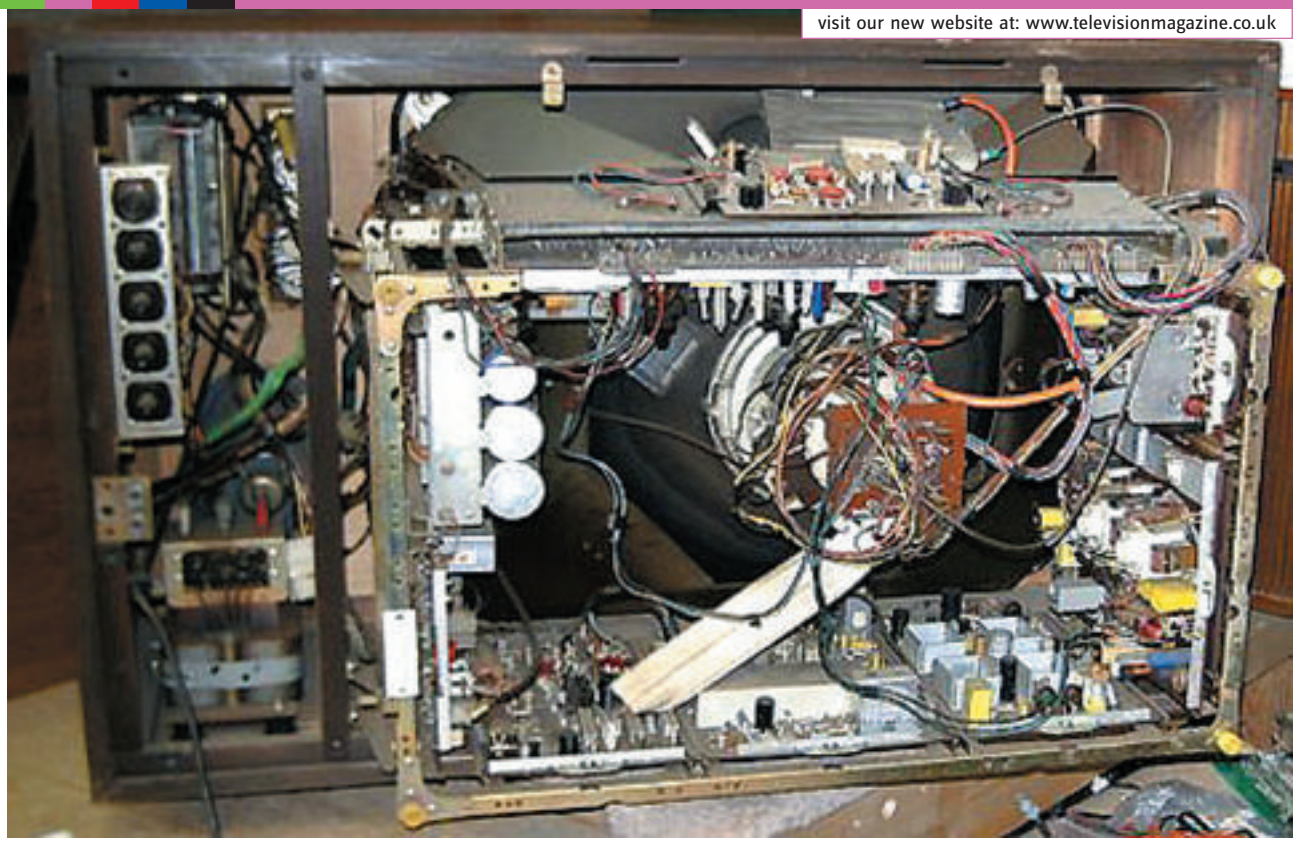
This month's DX Newsdesk was kindly supplied by Gösta van der Linden (Rotterdam) and the Benelux DX Club.

Feedback!

Please send news, comments and any off-screen DX-TV photographs, particularly any unusual test cards and captions, to: **Garry Smith, 17 Collingham Gardens, Derby DE22 4FS**. Our E-mail address is: **Television@dx-tv.fsnet.co.uk**

If you are interested in archive TV, test cards and identification captions, check out our website at **www.test-cards.fsnet.co.uk** via the Internet.

Skating penguins were the theme for the 2007 BBC-1 Christmas Identification Symbol. A repeat of the 2006. Christmas Symbol was also used, summing up the current repetitive and woeful state of British TV!



Reality TV

by Mike Leach

Many years ago, customers would call out their local TV Engineer in the event of a breakdown because they didn't want to miss The Forsyte Saga or Peyton Place or, if they were Scots, The White Heather Club. By the 1970's it was The Sweeney and Fawlty Towers, both of which are still running today. In the 21st Century they watch all the reality shows which are summarised with the now well known phrase 'Reality TV'.

But Reality TV has a different meaning to the average TV Engineer. To us it means things like: "Hell's Workshop" and "I'm an Engineer get me out of here." Television has always been a reality to us but in the 21st Century, many aspects of it have changed so much and so quickly that not even Big Brother himself knows where to look next for an insight into the future!

The purpose of this, and forthcoming articles, is to look at our trade and analyse with a hint of sarcasm and a touch of humour where we might have gone wrong; to give credit where it's due and maybe have a pop at some of the less helpful organisations that help to make our working lives such a pleasure!

I'm starting at around the time of the late sixties. The first big change!

The first big change

Forty years ago there was a scramble to get out of the trade: engineers coming up to retirement didn't want to bother with colour and muddled through just repairing black and white sets, irons and transistor radios.

The smart ones took the courses, became qualified and, during the 1970's made a lot of money selling and renting colour sets. Getting qualifications and experience became easier; there were home study courses and night school. Technical Colleges ran all of the City and Guilds courses and young people with an interest in the trade, like myself, got jobs as apprentices. Those who had shyed away from colour retired and made way for the "new" brand of engineer. We were young and qualified and oozed enthusiasm.

The TV trade had come through a significant change: a major leap forward with the advent of colour

and many more young people doing the job.

Part of that change was the world's first all transistor dual standard colour set. Made by the British Radio Corporation (BRC, later to be known as Thorn) it was way ahead of it's time in comparison to other sets (see pictures) and actually worked very well. It was some of the design developments in this set such as the use of a separate EHT generator circuit and the use of a tripler that started the ball rolling to where we are today. It all started to move so fast!

Who said I must repair THAT?

By the mid 1970's customers would ring up with stupid faults. A customer once asked me why her sonic remote TV would not change channels when her husband jangled his keys in front of the set. I explained that the keys were not being jangled at the correct frequency.

She called me back a couple of days later and said that her hubby had tried it five times the day before in quick succession but still it wouldn't change channels!

This all came about because someone had told the customer that if her remote control packed up they could waggle their house keys in front of the set to change the programme! It did work with ITT sets though.

We all knew when the likes of remote control came in that we were on a hiding to nothing. But it didn't end with remote control. Subsequent years saw the introduction of video recorders; microwave ovens; early video discs; V2000 system; compact disc; DVD and everything that has come along since! Were we trained for any of this? No, we had to cope.

Manufacturers' would run the odd course here and there on their products but we were essentially left on our own to handle the workload.

To be fair, the City and Guilds courses in the late 1970's were fairly thorough in their line of training, but as the trade took on less apprentices the courses slowly changed and dried up. So where are we with training? Let's see if we can rustle up a bit of debate here.

Training: Then and now

Sitting in an open area drinking coffee out of plastic cups and discussing a bloke with the surname of Kirchoff. That's what we did some thirty years' ago during our break time at technical college. Kirchoff was instrumental in our understanding of applied electronics and how things worked: "The algebraic sum of the currents which meet at a junction point in a circuit at any instant is zero." Or how about: "The algebraic sum of the products of current and resistance of each part of a closed circuit is equal to the e.m.f. acting in the circuit."

We actually learnt this stuff and it helped us to understand how electronics worked, and how to go about fault finding in a given appliance. Coupled with hands on experience in the workplace and practical tests at college, we became engineers in our own right.

And what of today? Easy. Training couldn't be simpler. All manufacturers' have to do these days is put their latest boring episode of their current soft focused LCD TV on a website and explain to half asleep engineers how a LVDS signal travels through one integrated circuit and into another. They end this so called "training session" by asking viewers' if they have any questions! How can you possibly ask a question when you are about to fall off your chair with boredom? This, of course, is assuming that your internet connection has not been broken and that your state of mind allows you to sit there and watch a static image for longer than you have to! Anyone out there disagree with me? OK so maybe I'm being a little harsh. The point is that training has gone much the same way as everything else to do with TV service. How much does a web cam cost these days? Answer: Not as much as a conference suite in a local hotel and thirty lunches for hungry engineers! A droning voice from a loudspeaker is no substitute for a human being demonstrating and explaining a difficult subject. But praise where its due and I say well done to Hitachi who still take their training out on the road to various locations and don't expect engineers to have to fly from one side of the country to the other.

The lack of apprentices for the past couple of decades is slowly but surely leaving our trade vulnerable to a complete lack of trained and experienced staff for years to come. Some would argue that engineers will soon only need a laptop to repair customers' TVs in their houses and that may be the case. But what happens when the fault isn't just a software issue? When a power supply even more complicated than the ones we see today fails? Well I suppose it will simply become a throw away item just like everything else. Sad really, when it could have been repaired. If only someone was trained to repair it!

Hopefully now that our beloved magazine is up and running again, we will be able to read some articles that will enlighten and train us on some of today's technical advancements and once again help us to achieve our goal of repairing customers' appliances. If ever we needed a technical magazine it's now. Oh yes and forty years' ago when we needed to learn about the BRC 2000!

See you next time for another subject.

Wireless: Going "On the Air"

by J. LeJeune

Wireless Networking refers to a technology that enables two or more data handling devices to communicate without a cable connection. Originally the devices would be personal computers, but the technology can now be applied to a much wider range of equipment such as cable modems, set-top boxes, printers, routers and file servers. Wireless networks can connect to wired networks such as LANs and CATV systems also. Hardware for this type of networking should conform to the cross-vendor industry standard IEEE 802.11. The technology is employed in situations where hard-wired connections are difficult or impossible, especially where a hand-held terminal device is in use. On investigation, the subject is a vast one. Three systems dominate the wireless networking scene, Bluetooth, Wi-fi and WiMax.

Bluetooth

Of the three systems, Bluetooth (IEEE 802.15.1) is the lowest-powered with, on average, a radiated power of about 2.5 milliwatts. This limits the coverage to approximately 10 metres or 32 feet. The frequencies used are in the ISM (industrial, scientific and medical) band of 2.402 to 2.480 GHz – a band also used, incidentally, by microwave ovens. Baby-monitors, garage-door openers, DECT cordless phones and intruder alarm wireless remote controls are other devices using the same band. Despite the very low powers used for Bluetooth, its signals will penetrate walls of a house and makes the system ideal for communicating with items in other rooms. It can communicate with up to eight devices simultaneously using a technique developed for military communications known as "spread-spectrum frequency hopping" that makes transmissions secure from scanners but also makes the possibility of two or more devices transmitting on the same frequency simultaneously a rarity. To achieve this the transmitter uses 79 different frequencies selected at random and changing 1600 times a second. The technology also minimises the risk of interference from other Bluetooth devices and fixed-frequency signals.

When two Bluetooth devices come within range of each other communication between them commences and together they establish a network, synchronously hopping frequencies to remain in touch and to avoid interference to and from other communications that may be operating in the same area. When communication of this type is established the two devices form what is called a 'piconet' . Devices are pre-programmed with unique addresses that come within a range of addresses dedicated to that particular type of device, be it telephone, audio or computer, etc. Similarly, when a base station is first turned on it transmits a signal and then looks for responses from any units within range with a similar address. Where there are a number of different devices operating in an area they will each set up their own 'piconets', the frequency-hopping technique allowing them to operate independently as well as simultaneously. When simultaneous frequency clashes occur their duration will be for just over 600 microseconds and error-correction techniques will deal with the problem. Up to seven 'slave' devices may communicate with the base station in the piconet. The master station polls the slave units in a sequential fashion and master/slave roles can be reversed at any time.

For much of the time transmission takes place in one direction only so that two communicating devices transmit alternately, a condition known as half-duplex. For telephony, however, it is normal to have communication in both directions simultaneously, a condition known as full duplex. Bluetooth can operate in both modes, in full duplex it can send data at speeds in excess of 64 kilobits per second, a rate sufficient to carry several voice communications. At the other extreme, a high-speed full duplex link, Bluetooth can operate at 433 kilobits per second. The 10-metre range uses a power of 2.5mW (+4dBm), but there are lower and higher powers available, the lower one being 1mW (0dBm) with a very short range of about 1 metre, and the higher 100mW power (+20dBm) with a 100 metre range. There are also three current versions of

Bluetooth, the original v1.1, an improved v1.2 with higher data exchange rates and an algorithm that allows re-sending of corrupt data. Version 2.0 allows data exchange rates of up to 3 MBps, lower power consumption, more available bandwidth and a better bit error rate performance. New versions of Bluetooth, codenamed 'Lisbon' and 'Seattle' are under development, the improvements being mainly in speed and bandwidth.

Wi-fi

Originally intended for use by mobile computing devices such as laptops, it has found increasing application in consumer electronics, Internet, VoIP phones and traffic management systems. Someone operating a Wi-fi enabled device can gain access to a network via an appropriately-named 'access-point' and the geographical area covered by one or more access-points is known as a 'hotspot'. In fact, hotspots can range in size from that of a single access-point to one covering several square kilometres of overlapping ones. It is the popular name for wireless technology conforming to the IEEE 802.11a,b, and g standards and to some future developments of 802.11.

A typical Wi-fi setup contains one or more access points and one or more clients (users). An access point broadcasts its Service Set Identifier plus network name in packets that are termed 'beacons' that are repeated every 100mS. The data rate is 1MBps so that the interruption due to beacons is minimal and provides a useful indication of whether the client can communicate at least at that speed. The Wi-fi standard leaves connection decisions and roaming entirely to the client, one of Wi-fi's strengths, and since it operates in free space it has the attributes of a non-switched Ethernet network. Unhappily it means also that collisions, a feature of Ethernet, can occur just as in non-switched Ethernet LANs.

Wi-fi uses the 2.4GHz band with standardised channel numbers that apply world-wide. Only 802.11a uses the 5GHz band. Transmitter power (EIRP) is limited to +20dBm (100mW) in the EU so that range is limited. The 2.4GHz band delivers better range than the 5GHz or the old 900MHz ranges. In high population density areas where extensive use of the network is likely there is a problem with channel congestion causing interference from encrypted access-points to open ones. In addition, access-points can be monitored and used to read data unless encrypted with VPN or similar security methods.

WiMAX

The **W**orldwide **I**nteroperability for **M**icrowave **A**ccess, defined by the WiMAX Forum, is designed to promote conformance to the IEEE 802.16 standard. The Forum describes WiMAX as technology for delivering an alternative to cable or DSL for "the last mile" of broadband networks. With interoperability uppermost in the title it follows that equipment supplied for this application should carry the "WiMAX Forum Certified" accolade. WiMAX is quite different from Wi-fi in the way it works. With Wi-fi, users wishing to pass data via an access-point are in competition with one-another for its attention in a purely random fashion and this can cause more distant stations to suffer repeated interruption from users at close range. This can be a problem with VoIP and IPTV services that require a guaranteed high level of Quality of Service. The 802.16 standard for WiMAX allows scheduling by Media Access Controllers so that all users wishing to pass data are required to compete only once for a time slot. The slot is unique to the user and other stations cannot hi-jack it, but the slot itself is elastic and makes for greater bandwidth efficiency.

Originally the frequencies designated by 802.16 for WiMAX ranged from 10 to 66GHz. However, variant 802.16d added the 2 to 11GHz range, but this was updated subsequently to 16e and specifies scalable OFDM as the modulation, whereas 16d was non-scalable OFDM. So 16e brings further advantages of improved coverage, self-installation, lower power demand and more efficient use of bandwidth. Some extravagant claims have been made for WiMAX, typically that it will deliver 70MBps at 70 mile range and at 70 M.P.H. Taken singly, each of these claims could be true. However, to achieve all three simultaneously is not possible, for one can have high bandwidth OR long reach, a bit like DSL, but not at the same time!

802.16 specifies a wide sweep of spectrum for WiMAX, but this is not the same as permission to use it all! The USA uses the band around 2.5GHz but in other parts of the world the likelihood is that 2.3 to 2.5, 3.5 and 5GHZ are more likely, and in Asia the 2.3 to 2.5GHz sector will dominate. The possibility of gaining a slot around 700MHz is also mooted, however this depends on what governmental agencies decide to do with it should it become available after analogue TV is switched off.

In Conclusion

We have barely scratched the surface of the subject of wireless networking, for so vast is the range of options offered by the three systems. We cannot expect the situation to remain static, for as with other branches of electronics the quest for development, improvement and refinement goes forward at a breathtaking rate. To take a break from it is to fall behind. TELEVISION will keep you up-dated.

Measurements... did you get what you paid for?

There is a well used and accepted saying, "You only get what you pay for!" This is the excuse trotted out when of the quality and performance of a service provided fails to meet customer's expectations. Why doesn't the customer approach the service provider on the basis? "I want a quality service and I am prepared to pay the correct going rate". Sounds sensible enough, but 99% of customers would baulk at this fearing they are giving an open chequebook. If you are looking for a television signal distribution system, then we think we have an answer.

Being the supplier of Promax test equipment our business world revolves around our spectrum analysers and signal level meters. Our customers install all sorts of telecommunication systems, television aerials, satellite dishes and complete communal television signal distribution systems. The "TV Explorer" has the ability to 'automatically' scan all signals and measure their quality from the data collected and from which spreadsheets can be produced for all to examine.

So many of our customer's clients will be totally unaware of our products even though Promax test equipment features very much in the attainment of the quality and performance of the system. In most trades extensive checks are performed by the technician to prove the quality, this data will be filed in with Job Sheets. When a client approaches an installer for communal TV system quotation it is now possible to add the condition that prior to final payment he receives a complete report on the signal quality at every point within the system, yes even a 200 bedroom hotel! The spreadsheet can be made available in the form of a *"Promax Report"*.

We suggest that for a relatively small charge the installer can issue a complete and accurate report on six different technical signal parameters, each technically recognised as a true representation of the television signal quality. In reality, if the installer has done his job correctly and in accordance to the terms of the contract, then he should have recorded all the results anyway. Clients must be prepared to ask for the *"Promax Report"* and be prepared to pay something extra for the added level of confidence.

It must be suggested that many clients would not understand the significance of the data provided, but it is worth them asking for some explanation and after a while some things become appreciated. If the explanation starts along the lines, "No need for such data guv", then I suggest it is those installers have something to hide.

What does the *"Promax Report"* contain? The print out is in the form of an Excel spreadsheet and lists all the outlet points within the building and all the signal measurements at those points. The 'points' includes those signals received *"Off Air"* in other words at the aerial or dish. Next, the signals being launched by the *"Head-End"*, a name given to the main signal assembly point generally this position has filtering and amplification.

It will be the highest signal level in the system and it is critical to ensure that after the processing, especially amplification, the signal is launched into the RF cable network with a high level of signal quality. From that point onwards signal quality cannot be improved upon and in principle quality can only deteriorate. Which is why the installer, with the "TV Explorer" analyser record all the signal parameters at each and every signal outlet. Each outlet point can be logged by name or location, i.e. *"Floor 3, Flat 19", or "Caretakers Room"*.

Testing & recording the quality of signal at each outlet plate

All signal parameters can be measured

If the television signal parameters are so important to determine signal quality, then what are they?

The most obvious one is the signal level, which for digital signals is called *Channel Power (CHP)* expressed in "dBμV". It is by no means the be all and end all because within any level of signal there can be noise and corruption that will cause picture break up or "pixelling".

The next parameter we call, *"Carrierto- Noise Ratio", (C/N),* expressed in "dB", and it is what it says. It's the relative level of background noise within the digital signal. Whilst with analogue TV high noise appears like a snowy picture. With digital signals it can lead to loss of picture. In any system where amplifiers are introduced they can produce a disproportionate amount of noise to the amplification it provides.

Terrestrial digital signals take the form of 1705 carriers and are transmitted within an eight megahertz bandwidth of the UHF spectrum referred to as a channel. To enable the digital signals to be transmitted the data must be converted from the digital data into RF energy. This precise transformation is called COFDM (Coded Orthogonal Frequency Division Multiplex) modulation. The COFDM signal can arrive distorted at the point of reception or become distorted within a system. Rarely would the distortion originate from the transmitter. We measure the modulation distortion in terms of the *Modulation Error Ratio, (MER)*, expressed in "dB". The technicalities are quite mind blowing but the effect of a poor MER quality can give rise to several forms of corruption making the signal unusable by the digital Freeview box or the iDTV (integrated digital television) set. The measurement offered by the Promax is both simple and remarkably accurate and is achieved without any effort on the part of the installer. Broadcasters are passionate about achieving high MER performance.

The journey taken by a transmitted digital signal to the final point of decoding, i.e. at the Freeview box or iDTV, can be exposed to interference and data corruption. Such interference can come from many potential sources, directly or indirectly. From air borne microwave links systems and other terrestrial broadcasters as well as noise and interference from within the confines of the host building. This can be elevators, lighting systems and general electrical appliances. The amount of data corruption we define as the *Bit Error Ratio, (BER)* expressed as a numerical ratio, e.g. 2.0E-6. That ratio means that in every one million bits of data there are two errors. There are two points of measurement for BER, one before the Forward Error Correction (FEC) circuit referred to a *"CBER"* and the second point at the point after FEC referred to a *"VBER"*. This first stage of FEC is called Viterbi. The 'after Viterbi' level of corruption must have less than 2.0E-4 errors, that is, less than two errors for every ten thousands bits of data. These again are industry standards and are accurately measured by the "TV Explorer".

The final measurement has evolved and is a mathematical calculation that takes into account the above parameters of noise, channel power and modulation ratio and presents the convenient statement we call, *"Noise Margin", (NM)* expressed in "dB" This measurement is always shown in the MER screen to mark their close relationship.

Having mentioned all the parameters we must stress that it would be unwise for any installer to suggest or believe there is one or maybe two parameters are the most important and by getting them right the signal quality is assured. The installer must make and record all the measurements in order to achieve guaranteed signal quality.

How does the installer make these potentially complex measurements? With the Promax "TV Explorer" all that is required is to save a channel plan of the installation, that includes terrestrial TV and satellite signals, and open up the "Datalogger" function. Enter the location, i.e. floor level, apartment and maybe location within that apartment and "press" RUN. The analyser makes all the above measurements for each channel, stores them and repeats the automatic process for every other signal in the system. The user can view the results before moving back to base to download into a spreadsheet format and then print.

Downloading data from the TV Explorer into the computer making ready for printing "Promax Report"

Every one can be confident the measurements cannot be massaged and are completely and utterly true.

With the *"Promax Report"* system installers demonstrate their work is of a high standard and the client can have a record that makes him feel confident that he has, "Paid for what he expects and rightly deserves".

Promax offers regular training for installation engineers

PROMAX

The TV Man

by Arthur Jackson

The excellent ITT hybrid sets fitted with the CVC5/8 and 9 chassis were undoubtedly the backbone of our colour rental business and as our knowledge of them increased a substantial amount of preventive maintenance could be carried out during routine repairs.

As time progressed we started to rent out ITT CVC20/25/30/32 and 45 models and Pye/Philips G11 chassis sets, this proved to be an education! As valve sets were on the way out there was little option but to meet the rental demand with the above mentioned makes and models, all of which quickly developed a catalogue of stock faults and caused us to clock up thousands of miles on the hard worked estate cars (these cars saw very little by way of regular servicing in comparison to the TVs we were attending to.)

When I think back now to the days of 'in house' repairs and the numerous characters/customers encountered I can't help but laugh. The following are a few of the more memorable events and I'm sure that many others in the service trades have experienced very similar or maybe even worse situations;

I was on calls one day in a beautiful part of the country we call The Glens (in the north Antrim coast) but I didn't manage to get to this particular customer until about seven-thirty in the evening.

It was a small and very rundown old farmhouse down a bumpy lane about a half-mile long, and when I commented on the length of the lane to the elderly lady who lived there she looked at me quite seriously and told me she was going to make it shorter at one time but found that she couldn't, I of course innocently asked, why not? To which she replied "BECAUSE THEN IT WOULDN'T REACH THE HOUSE" – she then gave me a slap on the back that shook the fillings in my teeth and fell about the place laughing.

I wondered to myself how many others were caught with that one before me!

The faulty set was an early ITT type fitted with the CVC5 chassis and when I entered the room the sound was on but the screen displayed just a bright white horizontal line. I quickly switched it off and asked how long it had been faulty, "Oh, about ten days" she replied "but at least I could listen to the sound!" The tube of course had a permanent line burnt into it but people didn't seem to care in those days. A new PCL805 valve put matters right and when I asked why she hadn't reported the fault sooner she replied "oh the weathers been a bit rough down here lately and I couldn't chance the tractor up the lane in the snow to get to the phone box."

She then went on to tell me how her hens and cows had provided all the food and milk she had required when she was snowed in and then insisted that I sit down while she made me something to eat. I thanked her but said a cup of tea was fine and asked her to go to no trouble, "ah sure its no trouble" she said and then she poked me in the ribs with her big farmers fingers, "you could do with a bit more meat on your bones if you ask me she said!"

About ten minutes later she set me down what was beyond a doubt the blackest fry I had ever seen and it was swimming about on a plate of fat like an oil slick, the trouble was she was so genuinely nice and obviously glad of the company that I had to attempt to eat some of it with a forced smile and a false impression of enjoyment as she was talking right into my face while I ate.

When she finally left the table to get more tea I threw the dog a couple of slices of the carbonised bread but to my horror it simply looked at the bread and then at me as if to say "and I thought we were friends" it then quickly raced out of the room leaving the bread on the floor, fortunately my toolbox was still nearby so I hastily stuffed half the fry into it before the tea arrived.

When she returned and saw how quickly I had 'supposedly eaten' a good half of it she presumed that I must be really hungry and darted off to the kitchen to cremate a pile more! I may have been young and game for most things at that time in my life but I can honestly say that night required the heart of a lion.

...story continues in the next issue!

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