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JULY 2005

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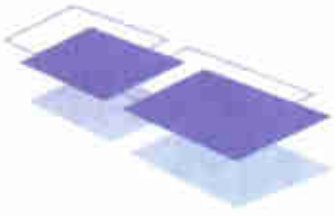

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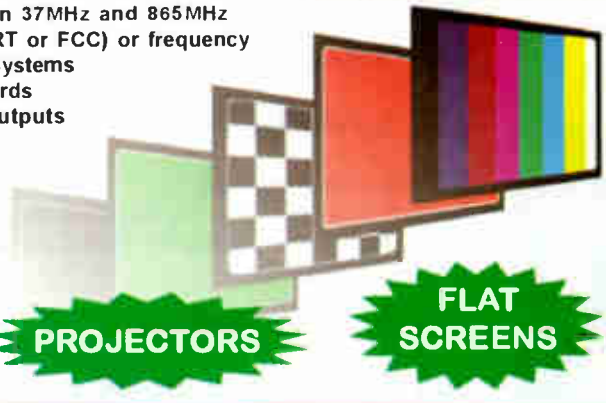

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INDEXES AND BINDERS
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Binders that hold twelve issues of *Television* are available for £6.50 each from Modern Bookbinders, Pringle Street, Blackburn, BB1 1SA. Telephone: 01254 59 371.
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NEXUS
MEDIA COMMUNICATIONS

The games scene

This year's E3 video games trade show at Los Angeles in early May was pivotal in introducing the next generation of games consoles from the leading contenders in this field – Sony's PlayStation 3, Microsoft's Xbox 360 and Nintendo's Revolution. With increasing time being spent on playing video games, the prospects for whoever achieves the number one spot are immense.
To be able to provide increasingly realistic games playing the new machines contain awesome computing power. With so much power, the question arises as to what else they could be used for. Video games companies might like us to see their machines, rather than that relatively low-performance entity the PC, as the domestic gateway to the internet. It's an interesting prospect, but the PC can probably take care of itself in this respect.

Observers seemed to agree that the PlayStation 3 provides the most impressive performance, as a result of its use of the Cell microprocessor which Sony has developed in conjunction with IBM and Toshiba (see Comment, August 2004). But it all depends on the display device in use. An expensive (at present) high-definition display is required to take full advantage of PlayStation 3's capabilities. Otherwise the Xbox 360 does more or less as well. It will also have the advantage of being available this autumn, while PlayStation 3's launch is scheduled for next spring. A lot remains to be revealed about pricing and features however. The Nintendo Revolution is still in prototype form, with no launch date suggested.

Falling standards

The media and telecommunications regulator Ofcom is to relax the rules on commercial sponsorship of television and radio, which could provide broadcasters with appreciable extra revenue. The ban on product placement in UK-produced programmes is to be reviewed – it's prohibited under national and European rules – and, in a new broadcasting code published towards the end of May, Ofcom said it was reducing the red tape surrounding sponsorship. Over thirty pages of rules have been cut back to just three. New proposals will for the first time allow sectors such as betting and gaming to sponsor TV and radio programmes. Under the new rules sponsorship will be allowed provided it is clearly labelled, remains separate from the programme, and doesn't affect editorial independence. It will not be allowed for news and current affairs.

The relaxation seems to be based on broadcast industry concern about falling revenues from traditional advertising. The industry would naturally be concerned about that, but there is no reason for Ofcom to capitulate. Chris Banatvala, Ofcom's head of standards, said: "Given the multi-channel environment we live in, it's time to look at the rules that govern unsuitable sponsorship. There was an awful lot of unnecessary regulation." It seems that, confronted with a rapidly changing digital, multimedia world, Ofcom is simply abrogating its responsibilities. Some regulator!

The broadcasting industry might consider that present regulation is too heavy-handed. But regulation was imposed for the very good reason of ensuring high standards in broadcasting and that the public receives the best possible services. Ofcom will no doubt get away with it – there has been no sign of a public outcry over the changes – but the result will be loss of ability to exercise control in the public's interest. Not a good day in the annals of broadcasting standards.

And the same to you!

The European Commission has called on countries to speed up their move from analogue to digital broadcasting. Member states have been urged to meet a deadline of early 2012 to complete the change, but only thirteen of the EU's 25 members have confirmed that they will be able to make the change by then.

It seems to me that the French have the right attitude to this sort of bureaucratic meddling!

CORRECTION

We apologise for some symbol errors that occurred in Figs. 1 and 2 on pages 467/8 last month. The strange capital U with umlaut should have been a dagger symbol, which was used simply to avoid repeating the BC558B transistor type in various places. In Fig 2 the –8V and –20V lines are shown with a strange n instead of the minus sign. These are computer compatibility errors that creep in after we have passed for press.

Mobile TV

Orange has launched a mobile TV service called Orange TV via its 3G network. It is available initially using the Nokia 6680 3G handset from Orange – further handsets are to follow. Customers can download the TV application free from Orange World, then pay a subscription of £10 a month to watch the channels. The initial line-up of nine channels includes ITN News, CNN, Cartoon Network and extreme sports: special *Big Brother* and *Celebrity Love Island* channels have also been developed. All channels are streamed via the Orange 3G network and are available through the new Orange TV section of Orange World.

NTL Broadcast and O_2 have announced the first batch of channels to be part of their line-up for the forthcoming six-month Oxford mobile TV trial, which is to begin performance testing in July prior to a roll-out to 350 O_2 customers in early September. The channels include Cartoon Network, CNN, Discovery Channel, Sky Sports News and Sky Travel. BSkyB, Chart Show TV, Discovery Networks Europe, Shorts International and Turner Broadcasting are among the organisations that will provide sixteen TV channels, receivable using the new Nokia 7710 3G handset.

The trial is designed to test the televisual capabilities of 3G phones and will look at how people choose to watch TV programmes when on the move. It will use the DVB-H broadcast transmission standard, which has been designed for handheld reception. With its low battery-power consumption and robust reception capability, DVB-H provides an efficient 'one-to-many' method of delivering TV content in a way that complements the one-to-one video streaming which is possible via GPRS and 3G networks. Ofcom will need to license spectrum to enable a commercial service to be launched in the UK. The results of the trial will assess consumer interest.

In South Korea TU Media has brought its satellite-based TV-on-your-palm cell-phone service into commercial operation following a four-month trial run. TU Media is affiliated to South Korea's largest mobile phone network, SK Telecom. Seven video and twenty audio channels are available initially – TU Media plans to expand the service to some forty channels. In January South Korea became the second country to launch satellite-based DMB (digital multimedia broadcasting), on a test basis. Japan has been offering such services since last year, using its own satellite-based DMB technology. DMB enables users to receive regular TV programming or watch content on demand via portable equipment including mobile phones and mini-TVs.

In March the South Korean government issued licences to six operators to launch a new terrestrial DMB service, which is considered to be cheaper than satellite DMB. The South Korean Electronics and Telecommunications Research Institute expects terrestrial DMB to have more than ten million customers by the year 2010, with satellite-based services having about 4·5 million customers.

WEEE postponed

Implementation of the EU Waste Electrical and Electronic Equipment (WEEE) Directive has been postponed until January next year. A letter from the DTI states that there have been major practical difficulties in meeting the Directive's deadline of August 13, 2005. Several other major European countries have either announced a similar delay or are planning to take this course. The Directive imposes obligations on retailers, distributors and producers to take back and dispose of equipment at the end of its life, and will impose costs on all concerned, including consumers.

Akai has released a 30in. LCD, Model LM-H30CJSA, that functions as a TV set or a PC monitor, with WXGA (1,280 x 768) resolution. Its picture-in-picture facility enables the user to monitor TV while working on a PC. There's Nicam sound with 10W stereo outputs, also a headphone socket. Price is about £800. Features include simple use with intuitive on-screen displays, remote control and an automatic programming system.

FCC move ruled unlawful

A US Federal Communications Commission (FCC) plan to force manufacturers of consumer electronics equipment to include broadcast-flag technology in new digital TV sets and digital video recorders from July 1 has been halted by the US appeals court. The court ruled that in attempting to control how electronic devices work the FCC had overstepped its authority. The broadcast-flag system includes copy-control bits in the data stream to enable broadcasters and content owners to decide whether material can be recorded freely, a limited number of times or not at all.

News from Pace

Pace has announced the development of the first hardware H.264 decoder set-top box, Model IP215. It's designed to provide telecommunications companies and operators with an entry-level device for the emerging IPTV (Internet Protocol TV) market, which enables TV programmes to be broadcast over broadband internet connections. The IP215 uses a hardware decoder for MPEG-2 and MPEG-4 AVC/H.264 compression decoding. Full launch of the IP215, with conditional access and middleware integration, is expected in September.

Pace Micro Technology's prospects have been greatly enhanced by an agreement to supply between $375m and $550m worth of set-top boxes to Comcast, the world's largest cable TV operator, over the next three years.

The boxes will mainly be of the personal video recorder type. It's the first time that Pace has had a significant success in the US market, which is dominated by Motorola and Scientific Atlanta. Pace and Comcast have also agreed to joint development of products.

DVD technology

According to reports emanating from Japan the talks between Sony and Toshiba on a joint standard for next-generation, blue-laser DVDs (see page 452 last month) have failed to make progress. Neither side seems willing to make concessions which, because of the technology, would have to be major ones. Toshiba's president Tadashi Okamura has said that: "We may actually have a situation where merchandise from both sides is put on store shelves. But the market would not allow that situation to last for very long."

Meanwhile Toshiba has announced the development of a single-sided triple-layer HD-DVD-ROM (read only) disc with a data capacity of 45GB, fifty per cent more than the single-sided dual-layer disc already announced. Fig. 1 shows the basic construction. It provides sufficient capacity for up to twelve hours of high-definition movies.

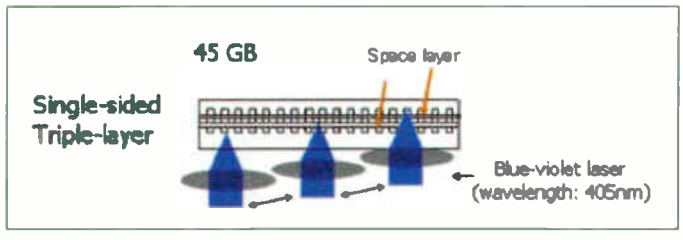

Fig. 1: Construction of Toshiba's single-sided, triple-layer HD-DVD-ROM disc that can store 45GB of data.

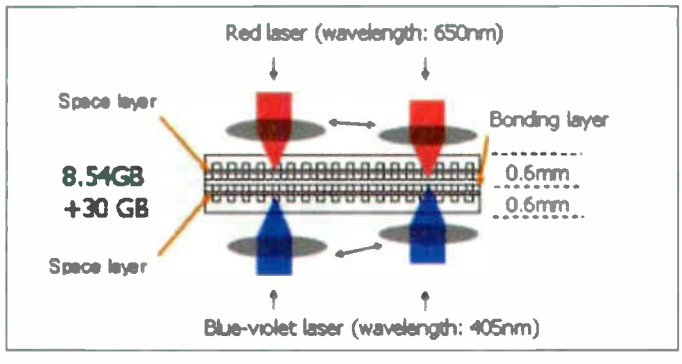

Fig. 2: Construction of Toshiba's double-sided, dual-layer hybrid disc, which has DVD-ROM and HD-DVD-ROM sides.

Toshiba has also announced a double-sided, dual-layer hybrid ROM disc that consists of a dual-layer HD-DVD-ROM side and a dual-layer DVD-ROM side, see Fig. 2. It can store 30GB of high-definition content on the HD-DVD-ROM side and 8·5GB of standard-definition content on the DVD-ROM side. Toshiba points out that the disc's standard-definition content could be played by the more than 84m DVD players and recorders produced worldwide in 2004 alone.

These new HD-DVD-ROM discs share the same structure as previously announced HD-DVD types, i.e. two 0·6mm thick discs bonded back-to-back.

The Taiwan Industrial Technology Research Institute has developed a red-laser DVD format, called Forward Versatile Disc (FVD), that can store 9·8-11GB of high-definition data on a dual-layer disc. FVD uses Microsoft's Windows Media Video 9 compression technology and AES (Advanced Encryption Standard) content protection. FVD players are due for release in Taiwan at about $175.

Philips-Microsoft agreement

Philips and Microsoft have announced a set of long-term, non-exclusive agreements to facilitate the flow of digital entertainment content between Windows-based PCs and products equipped with the Nexperia family of semiconductor devices developed by Philips. Philips will support Microsoft Windows Media Audio and Video and Windows Media Digital Rights Management 10 (DRM) technology in its Nexperia multimedia devices for use in digital media receivers, personal video recorders, portable audio players, IP set-top boxes and video phones. Support of Windows Media in Nexperia systems for in-car entertainment and for next-generation digital TV systems will follow later in the year.

Philips will add Windows Media to the formats currently used in its Mobile Infotainment and Streamium consumer products this month, and has announced plans to obtain PlayForSure verification for these products. Microsoft developed PlayForSure to make it easy for buyers of items such as digital music players to see that they are compatible with the variety of on-line content and services available – it uses a logo to show that equipment is compatible with Windows Media Player and Microsoft's Digital Rights Management technology.

Revised Sky+ pricing

New Sky customers who buy a standard Sky+ box now have to pay £99 for it, with free standard installation. The £99 Sky+ box is available only to new Sky Digital subscribers or existing subscribers who take up a multi-room subscription. A Sky+ subscription is required to use the personal video recorder features of Sky+, and is free to viewers who subscribe to two or more Sky Premium channels. Standard installation is free for new Sky Digital subscribers but costs £60 for previous or existing subscribers (existing subscribers who choose the multi-room deal do not need to pay for installation) or £120 for non-subscribers.

European DRM start

DRM (Digital Radio Mondiale), a digital radio broadcasting system for use in the LW, MW and SW bands, is to be launched commercially in Europe later this year. A description of the technology appeared in our May issue last year. Live broadcasts were a feature at the Paris Radio Show in early February. Demonstrators included the BBC, which provided SW transmissions from the UK to France, including audio-on-demand and data services. RadioScape and Texas Instruments are to collaborate on the development of receiver modules that operate with both DAB and DRM: TI is to supply a digital signal processor and RadioScape software radio technology.

Plasma display technology

In the second instalment in his current series Fawzi Ibrahim describes various techniques that have been introduced to improve the performance of the basic plasma display panel

The basic plasma display panel arrangement described last month suffers from two major shortcomings, dynamic false contours and black-level reproduction, that had to be overcome for this type of display to compete in terms of performance with the well-established CRT technology. In addition the brightness and the contrast ratio had to be improved, and manufacturing costs had to be reduced.

False contours

False contours are the most serious impairment to picture quality. They occur with moving pictures. This artefact is basically a consequence of the sub-field coding technique used to control the brightness of the display. As I explained last month (see pages 456-7), for brightness control the TV pictures are broken up into a number of sub-fields: conventionally, eight binary-weighted sub-fields are used.

Consider an image in which the brightness of two adjacent pixels is 127 and 128 respectively. The first pixel will fire, producing a discharge, for the first seven of the eight sub-fields. The next pixel, to its right, fires during the eighth sub-field only. With a still image, there are no false-contour artefacts. If there is movement however what is known as false contours may be seen.

Fig. 1 shows a schematic time chart representing the two pixels. The left pixel has the 127 brightness level, moving towards a second pixel to its right with a brightness level of 128. Because the human eye follows the motion in an image, the pixel movement results in the visual sensation being integrated in the direction of the arrow in the diagram.

The eye thus adds up the seven sub-fields of the first pixel and the eighth sub-field of the second pixel, the result being a brightness intensity of 127 + 128 = 255, with a boundary of 127 on the left and 128 on the right. The effect, for the human eye, is a bright-line contour. The artefact is most pronounced when an image of middle and almost uniform intensity, such as a Caucasian skin colour, moves across the screen. The resultant smudging is illustrated in Fig. 2.

Several techniques have been used by PDP manufacturers to minimise the false-contour effect. The time-compression technique reduces the light-emission period for the sub-fields, as shown in Fig. 3. It leaves a break between one set of sub-fields and the next, thus reducing the possibility of adding sub-fields and the associated artefact. The area with false contours can be greatly reduced by the compression ratio.

The drawback with time-compressed sub-field drive, especially with darker images, is reduction in panel brightness because the total sustain period of each sub-field is reduced. To overcome this, adaptive time-compressed drive, in which the compression ratio changes with varying picture brightness, is used. A high compression ratio is applied for bright pictures and vice versa for darker pictures. In this way images with a low average picture level (APL) have a longer sustain period and an increased level of brightness.

In addition to time compression one or more sub-fields may be split into two lower-weighted sub-fields. With the conventional binary coding the maximum intensity weighting is provided by sub-field eight, at 128. If this sub-field is split into two

sub-fields each with a weighting of 64 then, when a false contour takes place as described earlier, its visual intensity will be greatly reduced to 127 + 64 = 191.

In practice this technique uses nine sub-fields, with the weighting distribution shown in Fig. 4. Sub-fields corresponding to 128 and 64 are divided into four sub-fields of 48 weighting each, positioned at either end of the sub-field set. As shown the sub-field with weighting 1 is neglected in order to reduce the number of sub-fields and maintain the total level of brightness. Compensation for the effect of removing the LSB (least-significant bit) sub-field is provided by the error diffusion circuitry (see Fig. 10 last month).

A further improvement is obtained by using adaptive sub-field control, in which the selection of sub-fields for each TV picture frame is determined dynamically depending on the average picture level. This is possible because level 48 may be represented by one sub-field of 48 or two of 32 and 16 (= 48). If, for example, the average image level is near 48, a sub-field of 32 and others below 32 are used. On the other hand if the average level is near 64, a sub-field of 48 and others below 32 are used.

Pioneer developed the CLEAR (Hi-Contrast and Low Energy Address and Reduction of False Contour Sequence) system that makes false contours "as invisible as possible". The CLEAR system uses 12 sub-fields instead of the conventional eight.

One of the most popular sub-field drive techniques is AI, Adaptive brightness Intensifier, which was developed by Panasonic. See Fig. 5. AI uses variable sub-field drive and non-binary weighting, which is usually referred to as linear coding. Non-binary coding changes the weighting of the sustain period to a linear value, with consequent reduction in the visibility of false contours. The variable sub-field coding is used to maintain the power consumption at a constant level as the brightness level varies. It's achieved by adjusting intelligently the number of sub-fields used to drive the PDP. In addition, variable sub-field coding improves the contrast with bright pictures and increases the brightness of dark pictures.

The average picture level (APL) is used to adjust the number of sub-fields. For normal brightness the standard number is 11: it's reduced to 10 for dark scenes (low APL) and increased to 12 for bright scenes (high APL). The use of a larger number of sub-fields provides finer weighting distribution and hence an increase in the grey-scale levels, which improves the picture's contrast range. With darker images the reduced number of sub-fields allows more time for the discharge period. This improves the peak brightness, making dark scenes more visible. The reduction in grey-scale levels in a low-luminance picture is not discernible by the human eye.

Reduced power-consumption variations improves efficiency and reduces the cooling requirements, making it possible to dispense with the use of cooling fans.

Black-level drive

Plasma panels have a weak point when displaying dark scenes. This is because of the high-amplitude set pulse required to prime or initialise the cells at the start of each address-discharge sub-field cycle, before the address stage. The effect of this pulse is a small but significant discharge that produces a fairly bright radiation, known as 'priming light', from the phosphor. As this is repeated with each sub-field, the cumulative effect is to lift the black level and decrease the contrast ratio.

The effect of the set pulse can be reduced by using a ramp-shaped instead of a high-amplitude sharp, square pulse, see Fig. 6. When a ramp-shaped set pulse is applied to the insulated sustain/scan electrode, a very weak discharge occurs for a longer period,

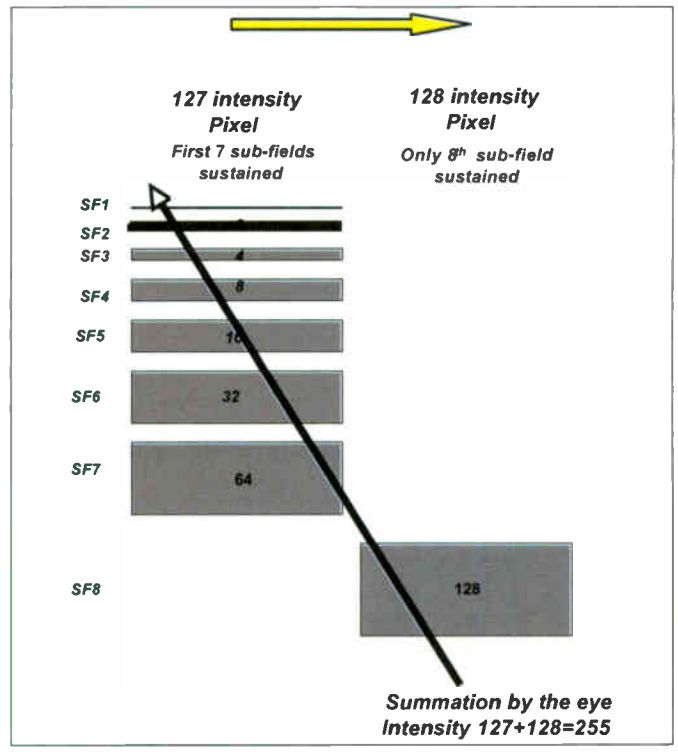

Fig. 1: False contours are seen by a human eye in the direction of the arrow.

Fig. 2: Effect of false contour with a moving subject.

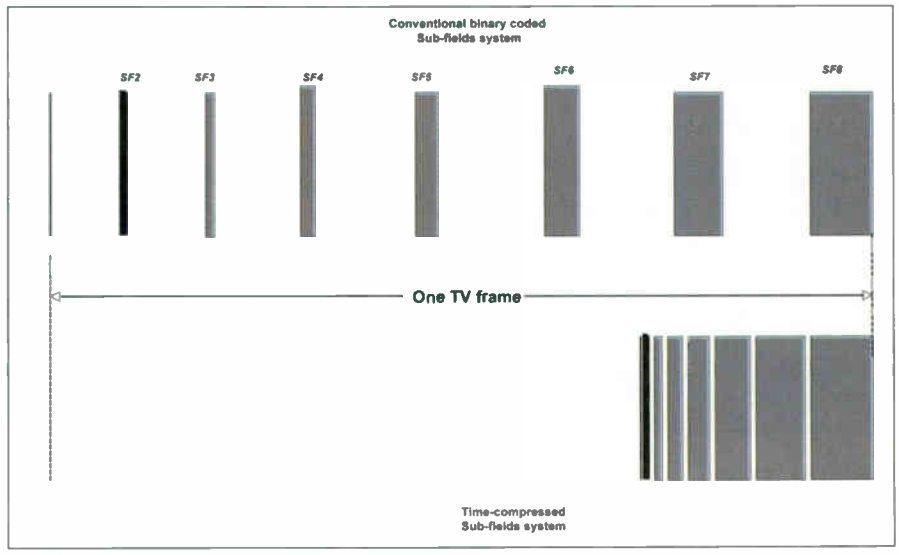

Fig. 3: Time-compressed sub-fields.

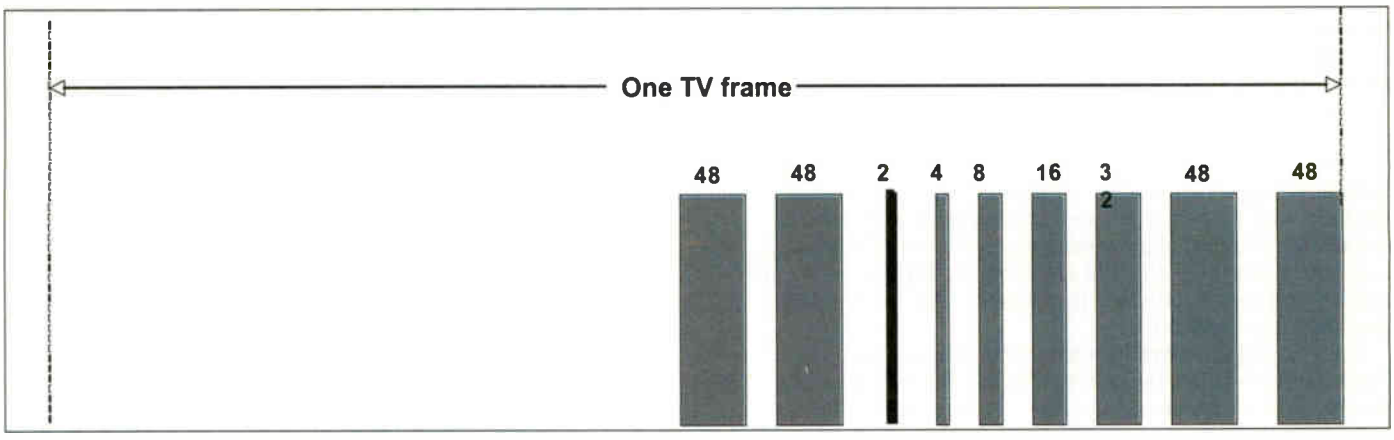

Fig. 4: Time-compression and division of the upper levels of sub-fields.

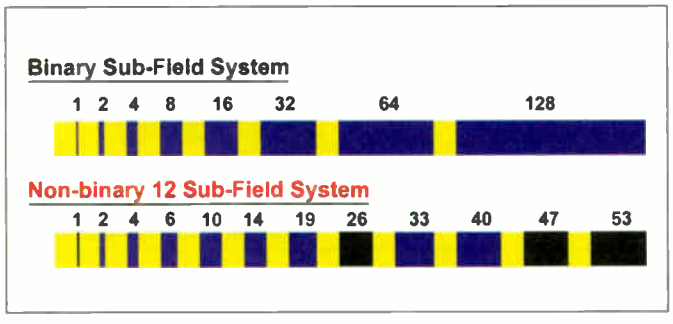

Fig. 5: Variable and non-binary sub-field drive.

generating fewer UV rays and hence less radiation from the phosphor.

Another technique, introduced by Panasonic, is called 'Real Black Drive'. It dispenses with the use of a large set pulse at the start of all sub-fields except the first one. The first sub-field starts with the normal high-amplitude set pulse while the remaining sub-fields start with smaller set pulses, see Fig. 7.

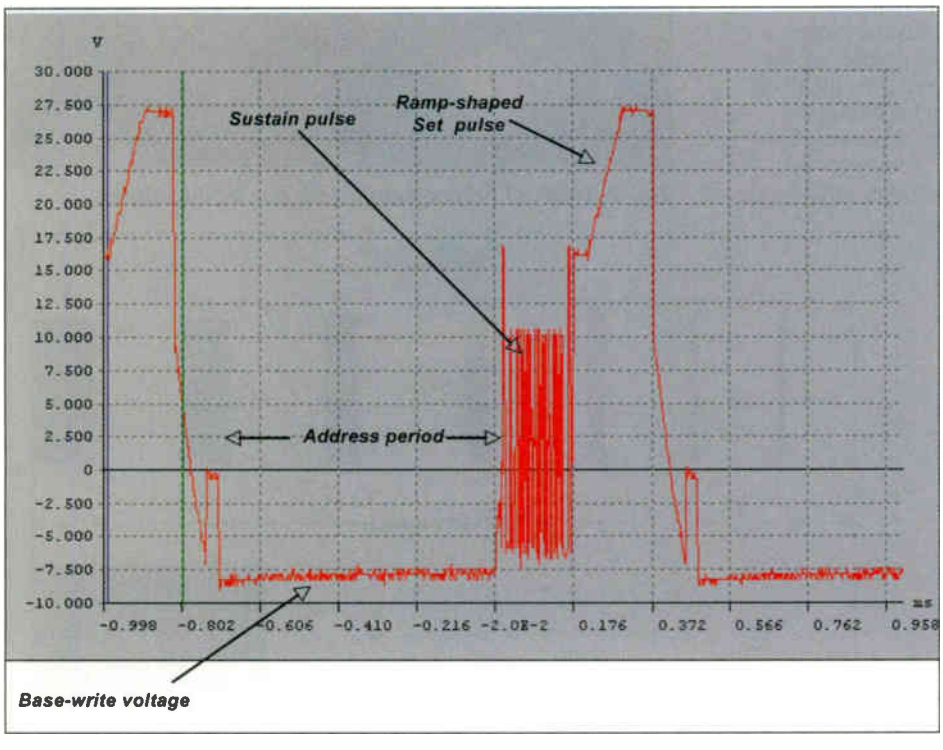

Fig. 6: A ramp-shaped set pulse reduces 'priming light' from the screen.

Alternate Lighting of Surfaces (ALiS)

With conventional PDP construction each pixel cell has two driver electrodes, scan and sustain. Discharge between these electrodes takes place when a sustain pulse is applied between them. It follows that each line of pixels requires two strips of electrodes, scan and sustain.

When the resolution of a panel is increased, there are more pixels per line and more lines. So the pixel cells have to be much more finely pitched. In addition more electrode drivers are required, which increases the manufacturing cost.

A further drawback with the conventional structure is that the gap between the electrode pairs cannot be used for luminance radiation. While the conventional structure is adequate for VGA-resolution PDPs, it is impractical and costly for high-definition panels.

This is the reason why the ALiS structure was developed. ALiS uses a single electrode for the visible picture line above and below, as illustrated in Fig. 8. The sustain and scan electrodes are now referred to as display electrodes X (sustain) and Y (scan). The X electrodes are arranged at equal intervals and the space between them is used as the display lines, thus doubling the resolution for the same number of electrodes and increasing the panel's luminance area.

As each Y electrode is shared between two X electrodes, interlaced addressing has to be used to ensure that each pixel line is independently addressed and discharged. The 'odd' field is addressed first, line by line, by energising pairs of electrodes in the order X1-Y1, X2-Y2, X3-Y3 and so on (see Fig. 9). This is followed by the sustain stage, when all the pixel cells that have been selected during the address period are discharged. The same process is then repeated for the 'even' field, by energising pairs of electrodes in the order X2-Y1, X3-Y2, X4-Y3 etc., followed by the discharge stage. The whole process is then repeated for each individual sub-field.

With interlaced PDP drive the need for an interlace/progressive (I/P) converter is removed. The number of electrodes required for a given number of lines is half the conventional number of lines plus one. In comparison with a conventional PDP, the ALiS technique provides higher resolution, a brighter picture, reduced manufacturing cost, and longer life because the lighting duty of each cell is reduced by half.

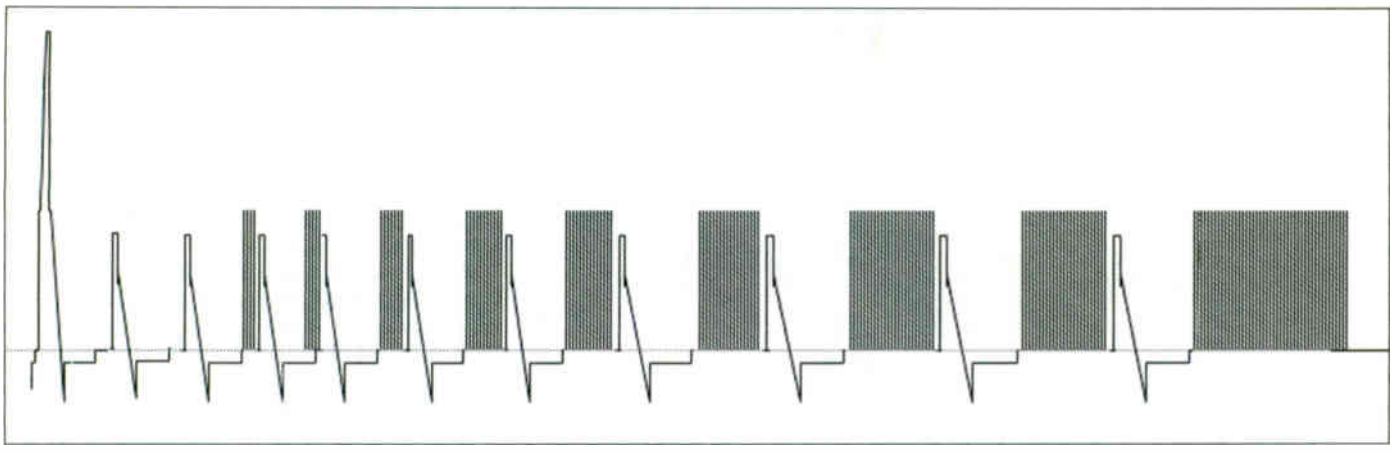

Fig. 7: Pulse waveform for the Panasonic 'Real Black Drive' system.

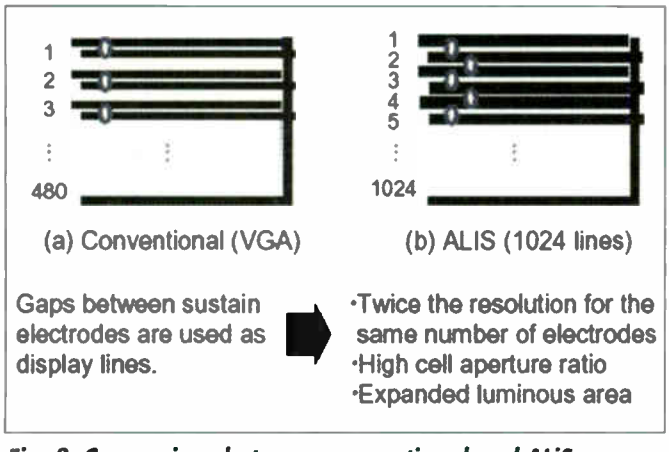

Fig. 8: Comparison between conventional and ALiS discharge methods.

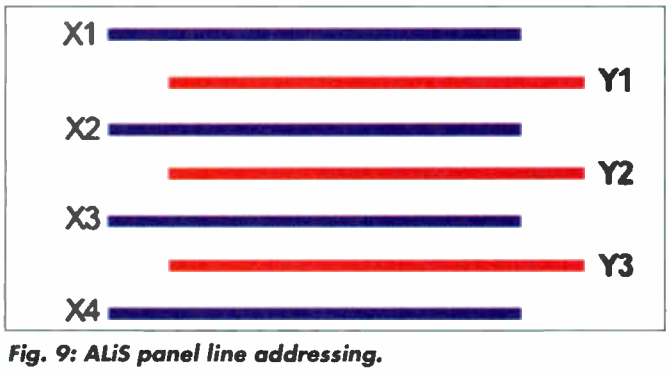

Fig. 9: ALiS panel line addressing.

Enhanced ALiS

As with all interlaced pictures there's line flicker. It is far less than that experienced with a CRT, but an element of it remains. This can be removed by using Fujitsu's enhanced-ALiS (e-ALiS) technology. Instead of the column-orientated structure of cells, e-ALiS uses box-shaped cells with an additional horizontal running rib, see Fig. 10. In addition to providing a larger effective phosphor surface and thus improved brightness, this structure provides the option to include opaque electrodes on the horizontal-running barrier rib.

The outstanding feature of e-ALiS however is that it once more offers progressive drive. But to move from the interlaced technology of ALiS to progressive drive calls for a more complex addressing procedure. With e-ALiS the display is broken up into pairs of visible lines arranged in two groups, 1-2, 5-6, 9-10 etc. in one group and 3-4, 7-8, 11-12 etc. in the other.

A four-phase drive cycle is used: set, pre-condition, address, discharge. In the first phase line pairs 1-2, 5-6, 9-10 etc. are initialised and addressed (see Fig. 11). The sequence begins with a general set pulse to erase and neutralise any internal charge. The new second, pre-conditioning phase initialises the lines for addressing. Thus with the following address phase all pixels are addressed line-by-line to be in either the 'on' state, by formation of a wall charge, or otherwise 'off'. The second group of line pairs, 3-4, 7-8, 11-12 etc., is then pre-conditioned and addressed. Once both groups of line pairs have been addressed and cells selected for discharge, a sustain pulse is applied to discharge all the selected cells simultaneously. The process is then repeated for the next sub-field and so on.

By reintroducing progressive drive, e-ALiS eliminates flicker completely.

Basic PDP drive arrangement

Fig. 12 shows the basic PDP drive arrangement. The scan waveform is constructed section by section. All the voltages are generated using those provided by the power distribution unit, and are synchronised by clock pulses and generators.

During the set-pulse part, all pixel lines are selected by a negative-going pulse. During the address period, lines are selected in sequence by a negative-going pulse from the shift register. This activates a switch to connect the sustain/write pulse to the selected line.

A set of one-bit data is then clocked on to the data bus electrodes. When the data bit is one, a wall charge is formed and the cell is turned on. A zero bit leaves the cell uncharged. During this period lines that are not being addressed are kept at a negative potential by the base-write voltage. When all the lines have been addressed, a sustain pulse is applied to all the pixel cells to discharge those that are on.

The process is then repeated for the next sub-field and so on.

Erase wall charge drive

With Address Display Separated (ADS), the driving scheme described so far, addressing a cell involves the creation of a wall charge to turn the cell on, ready to be fired during the sustain period. With a VGA-resolution panel the address period is in the region of 3·5μsec per line. For higher resolution (1,000 of more lines) the address cycle time is reduced to between 1·5 and 1·0μsec per line, requiring address frequencies approaching 1MHz.

The higher the frequency, the larger the power requirement and the higher the cost of the address drivers. Furthermore the address pulse itself, regardless of the speed of the line addressing cycle, cannot be that narrow because time is needed to create the wall charge for a cell to be selected. One way of reducing the pulse width is to raise the address voltage, but this often results in higher power consumption.

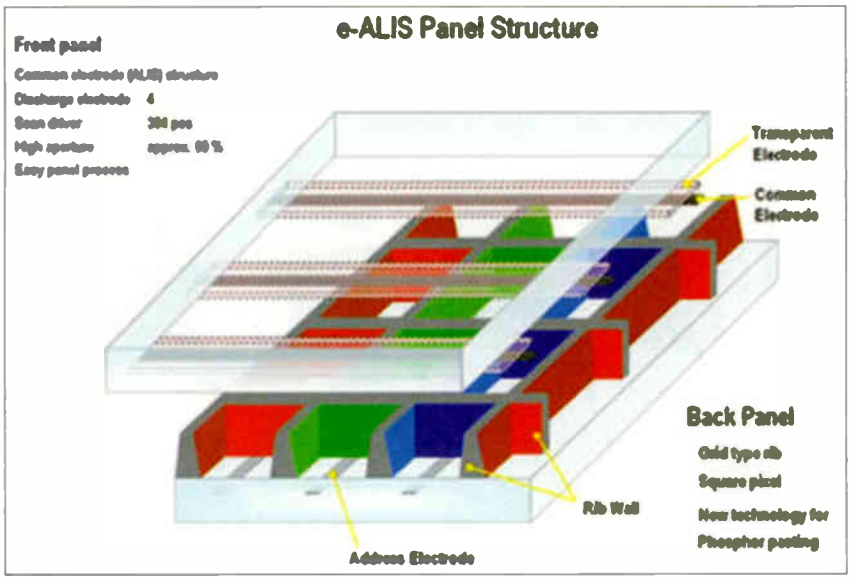

Fig. 10: The enhanced-ALiS structure developed by Fujitsu.

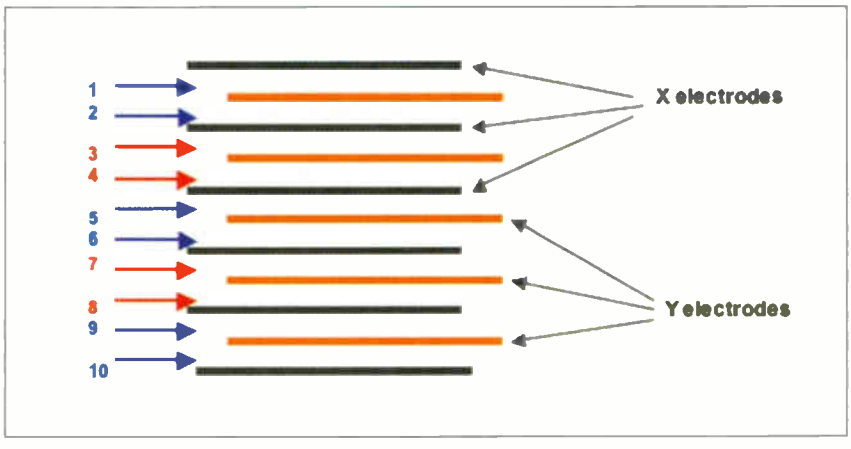

Fig. 11: Enhanced-ALiS drive.

The 'erase wall charge' address method reverses the above process. With this new technique, all cells are 'selected' by the formation of a wall charge. In the following phase, the cells that are not required to discharge are 'deselected' by removal of the wall charge. The three phases are thus: initialisation and wall charge formation, addressing (by erasing the wall charge), and sustaining.

First, a wall charge is formed at every cell. During the address phase only unselected cells are addressed, their wall charge being erased. With each cell that hasn't been addressed a wall charge remains, to be fired during the discharge period. The advantage is that it takes a relatively short time to discharge a cell and remove the wall charge compared with the time taken to charge a cell and form the wall charge. This makes it possible to use narrower address pulses.

A further advantage of this drive technique is that the scan-pulse voltage can be reduced by about 100V in comparison with the conventional method.

Next month

Part 3 next month will deal with video processing and image formatting.

Fawzi Ibrahim is currently engaged in developing and running training courses on plasma and TFT/LCD at the College of North West London. He may be contacted by email at Fawzi.Ibrahim@cnwl.ac.uk or by phone on 07976 350724.

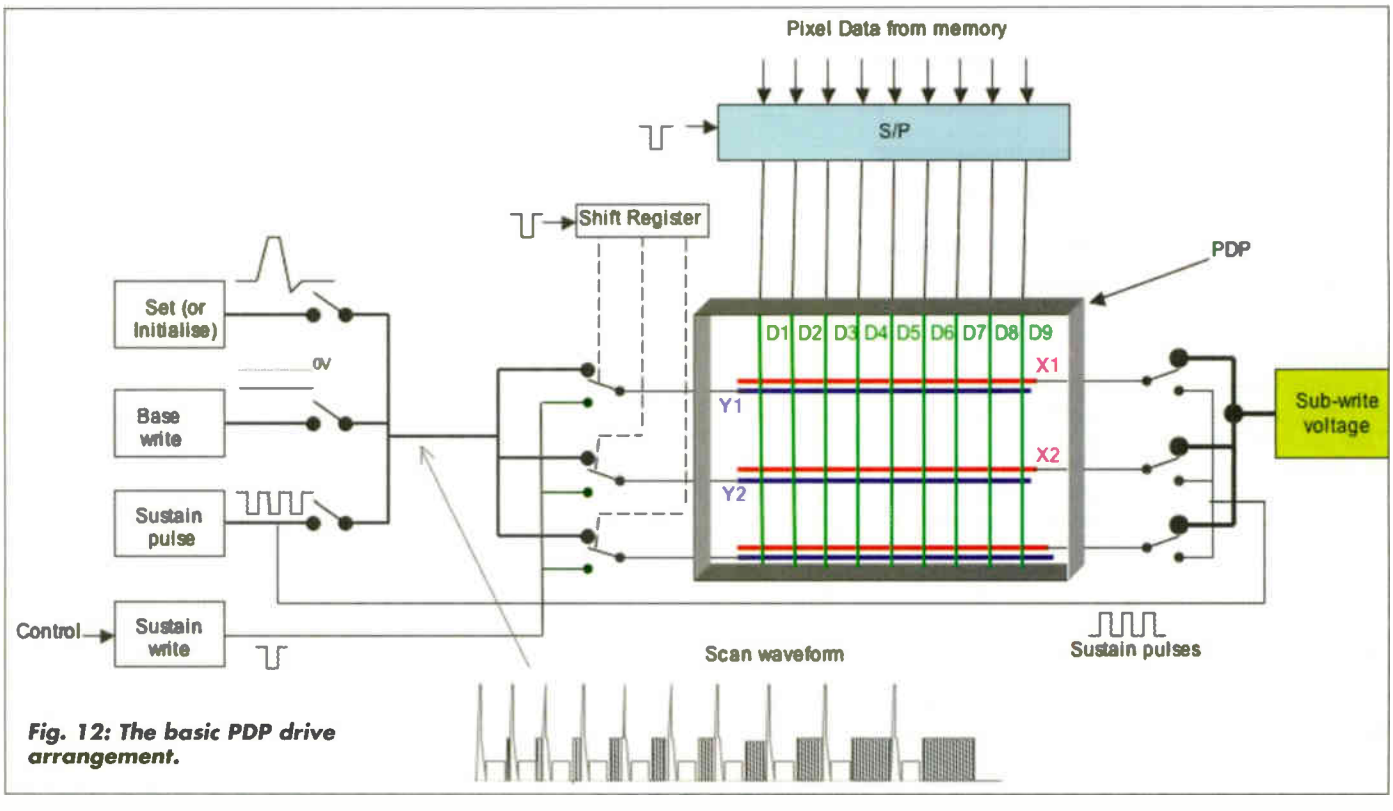

Fig. 12: The basic PDP drive arrangement.

Latest Philips CE technology

The Streamium LCD TV Model 23iF9946 gives the user access to on-line music, film trailers, music videos, photo collections and internet games that are stored on a home PC or streamed directly from the internet.

Philips recently provided a presentation on TV and DVD developments and wireless internet entertainment around the home. George Cole reports

In recent years Philips has refined the number of consumer electronics product areas on which it focuses: three of its main interests today are television, recordable DVD and home network/internet-related audio and video equipment. The company recently described its plans for these product areas over the coming year.

TV technology

Evidence of the onward march of flat-screen display technology comes from the fact that in December 2004 flat-screen sets took 51 per cent of the European TV market in value terms. Philips notes however that the 28in. 50Hz CRT sector is still stable, and the company certainly has no plans to abandon CRT set production in the short term – especially as European sales are running at about four million sets a year at present.

Philips is promoting four major features of its flat-screen display sets this year: Ambilight 2, Pixel Plus 2 HD, Clear LCD technology and HDTV compatibility. Ambilight is the name of Philips' ambient backlighting technology, which is designed to reduce eyestrain and improve picture quality. The technology has been acknowledged to help by the Society of Motion Picture and Television Engineers. A new stereo function means that viewers can make adjustments by using a split-screen system to calibrate the Ambilight 2 operation.

Pixel Plus 2 HD is the latest version of the company's digital video processing technology. It uses upscaling to increase resolution as well as colour enhancement, digital natural motion and dynamic contrast control. The HD variant has 2·6 times more processing power than the previous system, giving improvement even to HD pictures. Philips demonstrated its Pixel Plus 2 HD technology in comparison with competitor products, including flat-screen displays from Sony, Panasonic, Pioneer and Sharp. The Philips set did seem to provide the sharpest pictures.

Clear LCD

The aim of Clear LCD technology is to reduce motion blur and improve the black-level performance. Although LCD technology provides many benefits as a display system, fast-moving objects can suffer from motion blur. This is caused by slow liquid-crystal response – the LCD pixels can take several frames to switch completely, the so-called "sample-and-hold effect". The images are refreshed on a step-by-step basis but, because the human visual system monitors objects by continual tracking, the 'stepped' images appear blurred. Clear LCD uses two techniques to reduce motion blur dramatically, Overdrive Control and Scanning Backlight.

Overdrive Control increases the voltage to accelerate the reaction of the liquid crystals. The result is a fifty per cent reduction in the response time, from 14msecs to 8msecs. Scanning Backlight uses new hot-cathode fluorescent (HCFL) lamps instead of the conventional cold-cathode (CCFL) type, to mimic the scanning effect of a CRT. It

LCD set Model 42PF9380 (left) also includes Active Control, which uses a light sensor to ensure that the on-screen picture is optimised for the room's lighting conditions.

means that instead of all the pixels receiving the same amount of light at the same time and for the same duration, they receive light in bursts and thus for shorter periods of time. This, Philips says, enables images to be better controlled and to appear at the right moment, which greatly reduces blurring. The HCFL lamps can also be dimmed 30 per cent more than CCFL lamps so that, unlike current LCD TV models, dark scenes receive less light than bright ones, boosting the overall contrast range by 500 per cent. Finally, for flicker-free pictures Philips uses field-rate conversion software to increase the LCD screen refresh rate from 50Hz to 75Hz.

As with all TV technologies, the proof of the pudding is in the viewing! Danny Tack, who is responsible for Philips' TV marketing and strategy, demonstrated the system. He showed how a fast-moving ball appeared blurred on a conventional LCD screen but sharp with Clear LCD. In another demonstration an object falling off a cliff was also much sharper with a set that uses Clear LCD. There were a few questions, for example whether increasing the voltage affects the power consumption, lifetime or temperature of the set. Danny Tack said they didn't.

HD-ready sets

Like many manufacturers of flat-screen sets, Philips is now offering many models that comply with the EICTA standard for HD-ready products. This states that any set which bears the HD-Ready logo must have a minimum native resolution of 720 physical lines in wide aspect ratio and have input sockets for analogue component video as well as a digital DVI or HDMI socket that works with the HDCP content-protection system. It should also have HD-capable inputs that accept the following HD video formats: 1,280 x 720 at 50Hz and 60Hz with progressive scanning, and 1,920 x 1,080 at 50Hz and 60Hz with interlaced scanning (720p and 1,080i respectively).

New models

The new Philips TV range includes three LCD sets, Models 32PF9380, 37PF0380 and 42PF9380 – the first two digits are the screen size in inches. All three models include Pixel Plus 2 HD and Ambilight 2 technology and have WXGA displays. The 37in. and 42in. models also include Active Control, which uses a light sensor to ensure that the on-screen picture is optimised for the room's lighting conditions. Model 32PF9380 is the first set to feature Clear LCD technology. Other features include DVI and HDMI sockets (the 42in. model also has a USB socket), a memory-card slot and 802.11g WiFi broadband wireless connectivity.

Philips also introduced two new Integrated Digital TV sets, Models 32PF7520D and 26PF5520D. Both include HD LCD screens, Digital Crystal Clear technology, 3D digital filters and the Active Control system with a light sensor. A USB photo viewer, a PC input socket and multiple PIP modes mean that PC content can be viewed in a second window while watching an analogue TV channel and also recording a digital TV programme.

DVD

Philips reported that the standalone DVD player market is declining as consumers move to DVD recorders. DVD players are now commodity products that can be picked up in a supermarket for less that £50. This explains why Philips is focusing on value-added products like portable DVD players, DVD recorders and combi models. Of six forthcoming DVD products, five incorporate a DTT tuner, hard-disk drive or VCR deck.

Philips has launched three new portable DVD players, Models PET1000, PET810 and PET710. The PET1000 has a 10·2in. HD LCD

Model DVDR7200 is a DVD recorder that includes an integrated Freeview tuner and can handle dual-layer DVD+R/RW recording with 5.1 audio capability and a full-colour GuidePlus + Interactive Programme Guide.

The SLA5500 wireless audio link enables digital music stored in a PC to be played through a hi-fi system.

screen, an optical input and component video and S-video output sockets. Model PET810 has an 8in. LCD screen and an SD/Multimedia (MMC) memory card slot for playing MP3 music and JPEG images and MPEG-4 video files. Model PET710 has a 7in. LCD screen. The PET1000 and PET810 are compatible with the SVCD, VCD, DivX, MPEG-4 and WMA (Windows Media Audio) formats, and all three DVD portables can play DVD, DVD+R/RW, MP3 CD and Picture CD discs.

The RC9800i remote-control unit can be used to avoid the need for many of the RC handsets now found in the average living room.

Model DVDR7200 is a DVD recorder that includes an integrated Freeview tuner and can handle dual-layer DVD+R/RW recording with 5.1 audio capability and a full-colour GuidePlus + Interactive Programme Guide. Its connections include an HDMI socket and two RGB scart sockets (in/out).

Model DVP9000DS is a DVD/SACD player that can provide HD picture quality at 1,080i or 720p resolution via an HDMI socket and is compatible with the DVD+R/RW, DVD-R/RW, MP3 CD and Picture CD formats.

Philips has also released two Freeview set-top boxes, Models DTR320 and DTR200. Both have a full-colour seven-day EPG, two scart socket outputs and an optical output that delivers 5.1 multichannel sound.

Broadband internet

Philips was one of the first CE companies to recognise the growing role of the World Wide Web and a broadband internet connection as a source of home entertainment. The company points out that about ten million new internet connections were established in Western Europe in 2004, while there are forecasts that some fifty million Western European homes will have a broadband connection by 2006. The success of Apple's iTunes on-line music service, which has provided more than 250 million downloads since it was launched a couple of years ago, demonstrates the immense appetite that exists for downloading entertainment from the internet.

It has been estimated that sixty per cent of the PCs in Western Europe have a hundred or so digital images each stored on their hard drives, and that half the PCs have more than a hundred stored music files. About fifteen per cent of PCs have up to twenty stored video files. Philips maintains that there will be times when consumers want to watch or listen to this content away from their PCs, for example when relaxing in the living room.

The company is therefore promoting, under its Connected Planet banner of Streamium models, CE products that make use of a broadband internet connection and/or the IEEE 802.11 WiFi standard for wireless home networks. New products in the range include the 23iF9946 Streamium TV set; the MCW770 wireless Micro HiFi system; the SL500i, SL300i and SL400i multimedia receivers; and the 32/37/42PF9830 Pixel Plus 2 HD LCD TV sets.

The Streamium LCD TV Model 23iF9946 gives the user access to on-line music, film trailers, music videos, photo collections and internet games that are stored on a home PC or streamed directly from the internet. It can receive terrestrial TV and FM radio and operate as a PC monitor, and can be connected to a PC via a point-to-point feed without the need for a home network infrastructure. All that's needed is a cross Ethernet cable to connect the set's Ethernet connector (RJ45) to that of the PC. To use the PC Link and Internet Music Services, a PC, a wired or wireless network connection and a broadband internet connection are required. The set has compatibility with the MP3 and MP3 Pro music formats and the MPEG-1, MPEG-2, MPEG-4, DivX 3, DivX 5 and XviD video formats. JPEG, GIF and BMP images can be viewed.

The WACS700 wireless audio centre

Philips showed some very interesting Streamium audio products, including the WACS700 wireless audio centre, a system for storing, managing and distributing music around the house. It has a 40GB hard-disk drive and can convert up to 750 CDs into MP3 files. These tracks can then be streamed simultaneously in "near-CD" quality (at 128kbits/sec) via an 802.11g WiFi wireless network to up to five wireless music stations around the house. You can send the same stream to every station or send a different selection to each one. Music CDs can be played directly through the system's digital amplifier and speaker system. The Music Follows Me function enables the same track to follow the user from one room to another. Music Broadcast feeds the same content to all the stations.

According to Philips the WACS700 is intended for the 30+ music lover who is not necessarily PC literate. For this reason it's designed as an 'out-of-the-box' system – the user doesn't need a home network to get it up and running. But the WACS700 can be integrated with an 802.11g network and, by adding stations, music can be streamed to any room in the house from either the WACS700 or a PC. There is also an option whereby the WACS700 can access content from a PC via an Ethernet connection, which can also be used to record back-ups from the system's hard-disk drive or upgrade firmware via the internet.

A music database is built into the system: it automatically assigns the performer's name and the track title to each piece of music. This information needs to be updated on a regular basis however. Philips says

that it might release an update CD on a periodic basis, for insertion in the system. According to the company PC-confident users could download updates from the internet and burn the contents on to a CD. But as the WACS700 is aimed at those who are not PC-literate, it's questionable as to how many users would take this route. This grumble aside, the WACS700 is a very impressive product and a good pointer to future CE equipment.

RC unit

The RC9800i remote-control unit can be used to avoid the need for many of the RC handsets now found in the average living room. It can learn IR commands for up to 600 AV products. Its other features include touch-screen control and WiFi 802.11b for wireless networking.

The handset also communicates with Philips' Digital Media Manager PC software, which means that music or digital images stored on a PC can viewed on the RC9800i. When the user calls up content from a PC, on-screen listings of pictures, music and films are displayed for selection.

The RC9800i can also be upgraded with new features using software updates via the internet, making it compatible with future developments.

Wireless audio link

The SLA5500 wireless audio link enables digital music stored in a PC to be played through a hi-fi system. It streams WMA and MP3 files via an 802.11b/g network – or alternatively by using a wired Ethernet connection.

The SLA5500 also enables the user to create personal play lists and select music by artist, album, genre or country.

The WACS700 wireless audio centre which, according to Philips, is intended for the 30+ music lover who is not necessarily PC literate.

Wireless technologies in CE products

Graham Maynard starts a new series on the use of wireless technologies in consumer electronics and electrical products. Many systems have been devised in recent years, and more are on the horizon. The articles will describe how they work and how they compare

This new series of articles will examine the use of wireless technologies in modern consumer electronics and electrical products. A number of wireless systems have appeared over the last five-ten years, and more are likely to be introduced before long. How do these technologies work, and how do they compare with one another? This series will describe their operation, explain why some systems have advantages for certain applications, and mention the products they are being used in now and those in which they may be used in the future.

This first article looks at the wireless systems currently in existence or about to appear and describes and compares some of them briefly. Further articles will consider each technology in more detail and examine how and in which products they are used.

Background

A wish to communicate signals in the consumer electronics field without the need for wires became apparent in about 1996, in the mobile-phone industry. A number of companies were looking at ways of transferring voice from device to device by means of a simple radio system and wireless protocol. The companies included Ericsson, Nokia, IBM, Intel and Toshiba. Ericsson was most successful, developing a system that was initially called MC-Link. This lead to the Bluetooth system, which received wide publicity in about 1998, with the suggestion that it could be used in just about every application and product imaginable.

Bluetooth set out to be a jack of all trades. It was envisaged that, through various 'profiles' which I'll explain later, it could be used for any application where signals, either data or voice, needed to be transmitted wirelessly, with universal interoperability between equipment. Ericsson decided very early on that if Bluetooth was to be successful it would need to be a global free standard. So it gave the technology to the world, and a Special Interest Group was set up (the Bluetooth SIG). The rest is history, as they say.

The money that was poured into Bluetooth and the hype that it generated have done more than anything else to promote wireless technologies in general. Although Bluetooth is not the all-pervasive technology it was expected to become, it has spawned a range of similar, related technologies, each of which has its own niche in the overall wireless communication world.

Wireless technologies in use

The three most common wireless

technologies in use today, with their applications, are as follows:

Bluetooth: Used for Personal Area Networks (PANs), headsets, car hand-free kits, PCMCIA adapter cards, USB adapters, photo printing, access points, computer communications, industrial monitoring, phones (both wire and wireless), PDAs and other personal devices, cameras and camcorders, set-top boxes, MP3 and other audio devices, bar-code scanners, security devices, point-of-sale terminals, debit/credit-card readers and payment terminals.

Zigbee: A low data-rate PAN used for wireless light switches, automation, meter reading and low-power communications.

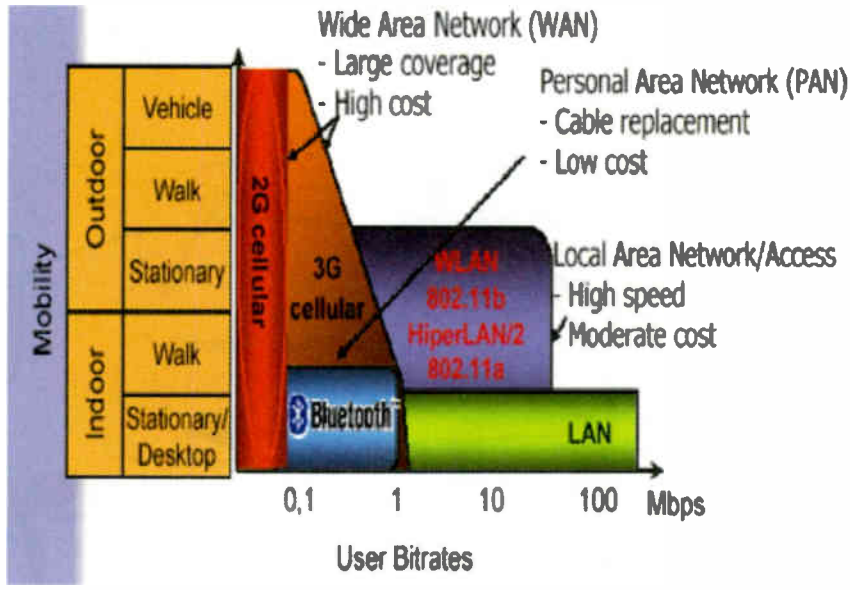

Fig. 1: The voice/data wireless spectrum.

WLAN (Wireless Local Area Network), e.g. IEEE 802.11b, 802.11a, 802.11g. Used for Ethernet replacement, internet access points, PCMCIA adapters, medium- and high-speed data communications, phones (Voice over IP, Voice over WLAN), airport access points, automotive communications, mobile phones, PDAs, set-top boxes, DVD/video recorders and PVRs.

Some other wireless technologies are WiMax, Wi-Media, RKE (Remote Keyless Entry), GPS, A-GPS, DECT, GSM, CDMA, W-CDMA, UWB (Ultra Wideband), GPRS, Wireless USB, IEEE 802.11n, WAP, i-mode, BREW, HomeRF, RFID, UMTS (3G), WLL (Wireless Local Loop) and IrDA. There are many others!

Selection

Each technology has its own main application area and its own set of characteristics, as with traditional wired signal technologies. Consider RS232, Ethernet and USB. Would you use RS232 for a LAN connection? For similar reasons, Bluetooth would not be used for a WLAN connection.

Many parameters have to be considered when selecting the appropriate technology for an application. These include signal power; communication distance; modulation technique robustness; operating frequency band; signal-to-noise ratio; error correction applied; security of link; data rate capability; signal bandwidth; interference conditions; quality of data; latency (especially for voice); cost of implementation; and qualification and type approval costs.

Even with these technologies in relative infancy, the spectrum in which they operate is becoming more and more crowded. Fig. 1 shows where the various technologies fit and their suitability in terms of operating distance, bit rates and mobility.

Networks

Wireless seems to be becoming all pervasive, and various approaches need to be appreciated, as follows: PAN (Personal Area Network), which is basically a 10-100m 'bubble of connectivity' that surrounds the user, enabling all his wireless devices to be in touch with each other; LAN (Local Area Network), giving higher data-rate access to the internet and to other devices via access points; and WAN (Wide Area Network), for example cellular mobile communications on a countrywide and worldwide basis.

Fig. 2 shows how the whole of wireless usage should fit together, the aims being automatic and seamless handover between PAN, LAN and WAN, and convergence of data and voice. It's not far from being achieved, although with relatively low data rates for WAN except where 3G mobile services are locally accessible.

Some basic factors need to be explained before we can begin to understand the technology. Many hundreds of terms are used in connection with it. The main ones are as follows.

ISM band

ISM stands for Industrial, Scientific and Medical. Several spectrum bands are set aside for these purposes. The most important one for the wireless technologies in which we are interested centres around 2·4GHz, which Bluetooth and the others use. These band allocations apply worldwide, with a few local exceptions, but there are rules that govern their use – to enable many different wireless techniques to coexist in the same spectrum.

Spread spectrum

This transmission technique is used particularly by technologies such as Bluetooth and CDMA (Code Division Multiple Access).
All users transmit in the same bandwidth. With this transmission system a data signal is spread across the frequency spectrum, using a code that's unrelated to the signal itself. This enables bandwidth occupancy to be much higher than is actually required.

There are a number of advantages, as follows.

(1) Low power spectral density. As the signal is spread over a wide frequency band, the power spectral density is very small. Thus other communications systems do not suffer inference from this type of transmission. The Gaussian (statistical) noise level is increased however.

(2) Operation is interference limited – in all situations the entire frequency band is used.

(3) Privacy, because of the use of unknown, random codes. The codes applied are unknown to an outside user, which means that it is almost impossible to detect another user's message.

(4) The effect of multi-path reflection is reduced.

(5) There are random access possibilities: users can start their transmission at any arbitrary time.

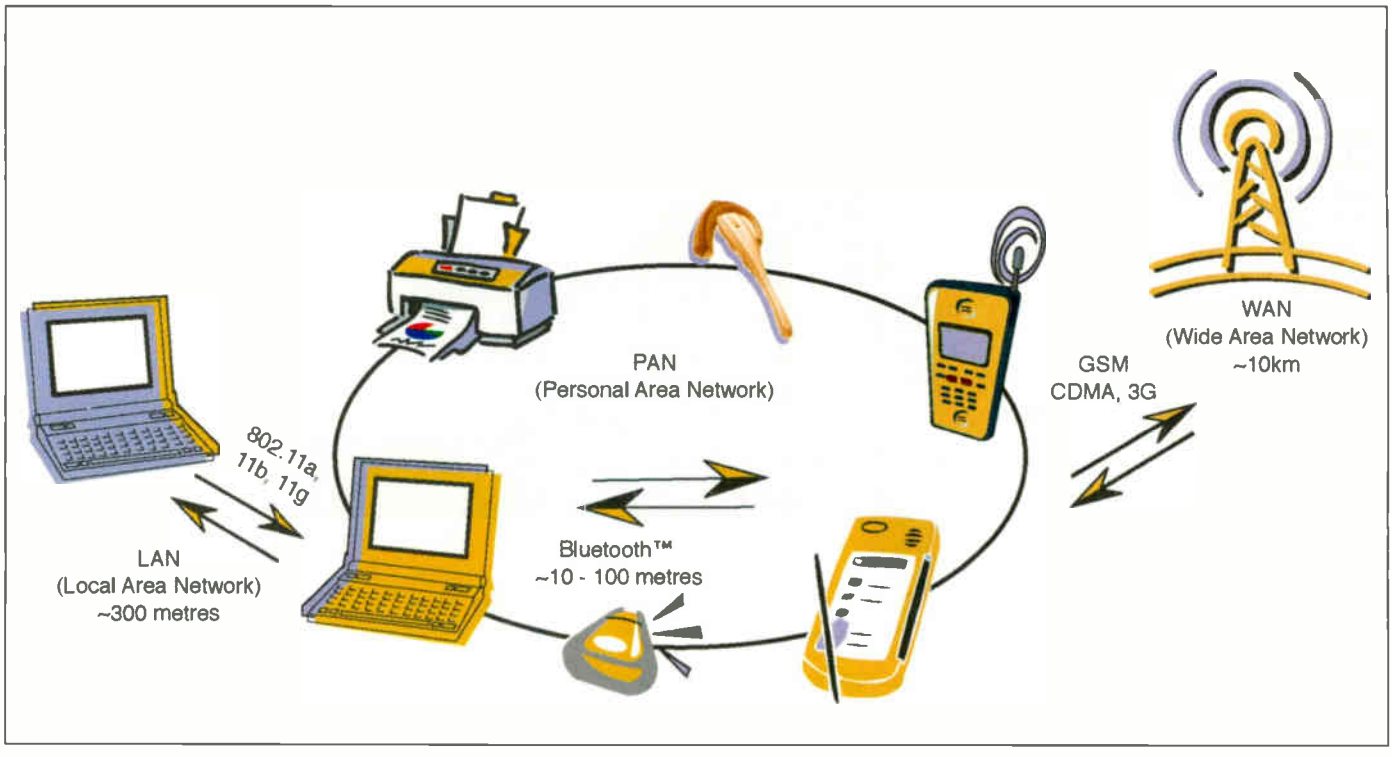

Fig. 2: Seamless wireless communication is becoming all-pervasive.

(6) Anti-jam performance is good.

There are several types of spread-spectrum transmission, including direct sequence and frequency hopping (used by Bluetooth).

Modulation

Modulation is the technique used to superimpose data or information on a carrier frequency. The classic radio techniques are to amplitude- or frequency-modulate a carrier (AM and FM). For more recent, digital applications the modulation techniques are more complex, for example GMSK (Gaussian minimum shift keying), as used for Bluetooth, and QPSK (quadrature or quaternary phase-shift keying), as used for DVB.

QPSK and BPSK (Binary phase-shift keying) modulators vary certain characteristics (amplitude, frequency, phase) of the carrier signal in order to transmit information. With PSK (phase-shift keying) each pulse adjusts the timing of the zero crossing point of a sinewave carrier forwards or backwards to provide the phase shift. With BPSK the phase shift is 180°, with QPSK it's 90°. A phase shift of 90° represents a time shift of a quarter of the full cycle of the carrier sinewave. The closer the spacing of the phase shifts, the more difficult it is to distinguish between them at the receiver end. So, for each higher order of PSK, a better carrier-to-noise ratio is required.

QAM alters the amplitude and phase of the carrier. Techniques such as 64-QAM (64 quadrature/amplitude states, 16 per carrier quadrant) increase the data rate. QAM is used for satellite and cable digital TV transmission.

Data rate

This is the number of bits, kilobits or megabits transmitted per second (bits/sec, kbits/sec, Mbits/sec).

Symbol rate

With 4-QAM (= QPSK) each quadrature shift (90°) represents two digits, 00, 01, 10 or 11. These two-digit states are called symbols. With more complex QAM the number of bits per symbol is increased. For example with 64-QAM there are 64 carrier states and each symbol represents 6 bits instead of two. The symbol rate is simply the number of symbols over a given period of time

SR = DR/(m x CRv x CRrs) is a key formula with these techniques. SR is the symbol rate, DR the data rate and m the modulation factor (number of bits per symbol). CRv is Viterbi forward error correction (FEC), e.g. 1/2, 2/3, 3/4, 5/6, 7/8, CRrs being Reed Solomon FEC, e.g. 188/204. The forward error correction figure indicates the ratio of the correction bits added to the basic information bits.

Chip and chip rate

Chip is the basic component of a spread-spectrum signal when it's decompressed in time, i.e. the longest duration signal when the signal parameters are approximately constant. Chip rate is the rate of encoding. For example with direct-sequence modulation spread-spectrum systems it's the rate at which the information signal bits are transmitted as a pseudo-random sequence of chips.

The chip rate is usually several times the information bit rate. It's related to the symbol rate, but the symbol rate doesn't take into account the encoding used.

The values of these factors depend on the modulation system.

Constellation

This refers to the QAM conditions when shown in bit-map form.

Summary

The various wireless transmission techniques have their individual characteristics and advantages/disadvantages, each of which contribute to determining which technology is best for a particular application. The decisions required are very complex, and each technology has its own Achilles heel in terms of performance. The technology is optimised as far as possible for the application concerned.

Well that's it for this time as a basic technical introduction to the subject.

For those who want to find out more here are a couple of interesting web links: www.bluetooth.com http://www.palowireless.com/

What's next?

In the next article I will describe Bluetooth technology in detail.

Grandata Ltd

distributor of electronic components

Television Repair / Modkits

MAKE & MODEL	KIT TYPE	CODE
ALBA		
1402	PSU	ONWAKIT
2002	PSU	ONWAKIT
11AK19 16:9	PSU & EW KIT	MODKIT52A
11AK19 4:3	PSU & EW KIT	MODKIT52
1427T	PSU	ONWAKIT
1452T	PSU	ONWAKIT
1455T	PSU	ONWAKIT
1456T	PSU	ONWAKIT
1458T	PSU	ONWAKIT
1459T	PSU	ONWAKIT
1499Y	STANDBY	MODKIT37
14SLTX	STANDBY	MODKIT37
1799Y	STANDBY	MODKIT37
2009B	PSU	ONWAKIT
2052T	PSU	ONWAKIT
2099TX	STANDBY	MODKIT37
2152T	PSU	ONWAKIT
BTV17	STANDBY	MODKIT37
CTV485	PSU	ONWAKIT
CTV501	PSU	ONWAKIT
CTV701	PSU	ONWAKIT
CTV840	PSU	ONWAKIT
CTV841	PSU	ONWAKIT
AKAI		
CT1417	PSU	ONWAKIT
CT2159U	PSU	ONWAKIT
CT2162UNT	PSU	ONWAKIT
CT2863UNT	PSU	ONWAKIT
AMSTRAD		
11AK19 16:9	PSU & EW KIT	MODKIT52A
11AK19 4:3	PSU & EW KIT	MODKIT52
BLACK DIAMOND		
11AK37	PSU	MODKIT51
BUSH		
11AK37	PSU	MODKIT51
2871NTX	PSU & EW KIT	MODKIT52
WS6673	PSU & EW KIT	MODKIT52
WS6674	PSU	MODKIT51
DECCA/TATUNG		
F SERIES	PSU	MODKIT30
TVC563	STANDBY	MODKIT37
GOLDSTAR		
CF25A50F	FRAME	MODKIT36
CF25C22C	FRAME	MODKIT35
CF28A50F	FRAME	MODKIT36
CF28C22F	FRAME	MODKIT35
CF28C28F	FRAME	MODKIT36
CF29C42F	FRAME	MODKIT35
GOODMANS		
11AK37	PSU	MODKIT51
1430RA	PSU	ONWAKIT
1430RS	PSU	ONWAKIT
1430RW	PSU	ONWAKIT
1450T	PSU	ONWAKIT
1455TS	PSU	ONWAKIT
147TT	PSU	ONWAKIT
149T	PSU	ONWAKIT
2019R	PSU	ONWAKIT
2029T	PSU	ONWAKIT
2029TA	PSU	ONWAKIT

MAKE & MODEL	KIT TYPE	CODE
GOODMANS..continued		
COMPACT 11	PSU	MODKIT47
F16	PSU	GOODKIT1
F16	VIDEO	GOODKIT1
F16 CHASSIS	FRAME	GOODKIT1
F16 CHASSIS	LINE	GOODKIT1
GRUNDIG		
CUC 2050	PSU	MODKIT48
CUC 2051	PSU	MODKIT48
CUC 2058	PSU	MODKIT48
CUC 2059	PSU	MODKIT48
CUC 2080	PSU	MODKIT48
CUC 7350		GRUNDIGKIT1
CUC 7301/3 (BUZ90)	PSU	GRUNDIGKIT2
CUC 7301/3 (MJF18004)	PSU	GRUNDIGKIT3
HINARI		
11AK37	PSU	MODKIT51
HIT14RC	PSU	ONWAKIT
HITACHI		
11AK37	PSU	MODKIT51
C28W440N	PSU	MODKIT54
JVC		
AV29SX1EK	FIELD O/P	JVCKIT1
AV29SX1EN	FIELD O/P	JVCKIT1
AV29SX1EN1	FIELD O/P	JVCKIT1
AV29SX1PF	FIELD O/P	JVCKIT1
AV29TSIE1	FIELD O/P	JVCKIT1
C14E1EK	PSU	ONWAKIT
C14T1EK	PSU	ONWAKIT
C21ET1EK	PSU	ONWAKIT
CS21M3EK	PSU	ONWAKIT
MATSUI		
1455	PSU	ONWAKIT
1498	PSU	ONWAKIT
2086	PSU	ONWAKIT
2098	PSU	ONWAKIT
1496R/T (BUZ90)	PSU	MODKIT44
1496R/T (H3N90)	PSU	MODKIT43
2096R/T (BUZ90)	PSU	MODKIT44
2096R/T (H3N90)	PSU	MODKIT43
21V1N (BUZ90)	PSU	GRUNDIGKIT2
21V1T(MJF18004)	PSU	GRUNDIGKIT3
TVR180R/208	STANDBY	MODKIT37
TVR185T	STANDBY	MODKIT39
MITSUBISHI		
AV1 SERIES	PSU	MITSKIT3
CT1M5B	PSU	MITSKIT3
CT21A2STX	TDA 8178S	MITSKIT1
CT21A3STX	TDA 8178S	MITSKIT1
CT21AV1BS	PSU	MITSKIT3
CT21AX1B	PSU	MITSKIT3
CT21M5BT	PSU	MITSKIT3
CT25A2STX	TDA 8178S	MITSKIT1
CT25A3STX	TDA 8178S	MITSKIT1
CT25A4STX	TDA 8178S	MITSKIT1
CT25A6STX	TDA 8178S	MITSKIT1
CT25AV1B	PSU	MITSKIT3
CT25AV1BD	PSU	MITSKIT3
CT25AV1BDS	PSU	MITSKIT3
CT25AV1BS	PSU	MITSKIT3

MAKE & MODEL	KIT TYPE	CODE
MITSUBISHI..continued		
CT25M5BT	PSU	MITSKIT3
CT28AV1B	PSU	MITSKIT3
CT28AV1BDS	PSU	MITSKIT3
CT28AX1BD	PSU	MITSKIT3
CT29A4	TDA 8178S	MITSKIT2
CT29A6	TDA 8178S	MITSKIT2
CT29AS1	TDA 8178S	MITSKIT2
CT29B2	TDA 8178S	MITSKIT2
CT29B3	TDA 8178S	MITSKIT2
CT29B6	TDA 8178S	MITSKIT2
CT33B3	TDA 8178S	MITSKIT2
M5 SERIES	PSU	MITSKIT3
NEI/NIKKAI		
C289FTXN	PSU	NIKKAIKIT1
C28F41FXN	PSU	NIKKAIKIT1
CE25 CHASSIS	PSU	NIKKAIKIT1
PANASONIC		
IC561	TDA 8175	PANKIT1
TC28XD60	VERT OUTPUT	PANKIT2
TX25XD60	VERT OUTPUT	PANKIT2
TX28XD70	VERT OUTPUT	PANKIT2
TX29XD70	VERT OUTPUT	PANKIT2
TX-W26D3	VERT OUTPUT	PANKIT2
PHILIPS		
310.10708		PHILKIT3
310.20491		PHILKIT2
310.20496		PHILKIT10
310.31994		PHILKIT6
310.32252		PHILKIT5
310.32253		PHILKIT4
310.32254		PHILKIT9
310.32255		PHILKIT7
310.32262		PHILKIT8
310.62264		PHILKIT1
28PT4457/05	PSU	MODKIT50
28PW5407/05	PSU	MODKIT50
28PW6006/05	PSU	MODKIT50
ANUBIS A	SOPS	PHILKIT2
CP110 CHASSIS	SOPS	PHILKIT8
D-16 CHASSIS	SOPS	PHILKIT6
G110 CHASSIS	SOPS	PHILKIT3
G90A CHASSIS	SOPS	PHILKIT10
G90B CHASSIS	SOPS	PHILKIT10
GR2.1 CHASSIS	SOPS	PHILKIT1
GR2.2 CHASSIS	SOPS	PHILKIT1
HSM VIDEO	SOPS	PHILKIT5
JSM VIDEO	SOPS	PHILKIT4
KSM VIDEO	SOPS	PHILKIT9
L01.1E CHASSIS	PSU	MODKIT50
LSM VIDEO	SOPS	PHILKIT7
SAMSUNG		
CI5944	FRAME	SAMKIT2
CI6844	FRAME	SAMKIT2
VI375	PSU	SAMSUNGKIT
VI395	PSU	SAMSUNGKIT
VIK310	PSU	SAMSUNGKIT
VIK320	PSU	SAMSUNGKIT
VIK350	PSU	SAMSUNGKIT
WINNER 1	PSU	SAMSUNGKIT
SHARP		
28HW53H	PSU + EW	MODKIT53
51CS03H	PSU	SHARPKIT1

MAKE & MODEL	KIT TYPE	CODE
SHARP..continued		
51CS05H	PSU	SHARPKIT1
56FW53H	PSU & DOLBY	MODKIT45
56FW53H	PSU + EW	MODKIT53
59CS03H	PSU	SHARPKIT2
59CS05H	PSU	SHARPKIT2
59CSD8H	PSU	SHARPKIT2
59DS03H	PSU	SHARPKIT3
59FW53H	PSU & EW	MODKIT49
66CS03H	PSU	SHARPKIT2
66CS05H	PSU	SHARPKIT2
66CSD8H	PSU	SHARPKIT2
66EW53H	PSU + EW	MODKIT53
66FW53H	PSU + EW	MODKIT53
66FW53H	PSU & DOLBY	MODKIT45
66FW53H	PSU & EW	MODKIT49
66FW54H	PSU & DOLBY	MODKIT45
66FW54H	PSU & EW	MODKIT49
66FW63H	PSU + EW	MODKIT53
76FG64H	PSU + EW	MODKIT53
76FW53H	PSU & DOLBY	MODKIT45
76FW53H	PSU & EW	MODKIT49
76FW53H	PSU + EW	MODKIT53
76FW54H	PSU & DOLBY	MODKIT45
76FW54H	PSU & EW	MODKIT49
DA-100 CHASSIS	PSU & EW	MODKIT49
SONY		
SLV715HB	VCR - PSU	MODKIT40
SLV777UB	VCR - PSU	MODKIT40
THOMSON		
35029400		THOMKIT2
35065920		THORNKIT1
FV70	PSU	THORNKIT1
ICC17	PSU	MODKIT41
ICC7	TDA 8178FS	THOMKIT1
ICC7	FRAME	THOMKIT3
ICC8	TDA 8178FS	THOMKIT1
ICC8	FRAME	THOMKIT3
ICC9	EAST/WEST	THOMKIT4
ISS20 (TV-DVD)	PSU	MODKIT46
R3000	PSU	THOMKIT2
R4000	PSU	THOMKIT2
TX92F	EAST/WEST	THOMKIT4
TOSHIBA		
11AK37 CHASSIS	PSU	MODKIT51
28N23B	PSU	MODKIT51
BD2581S	PSU	MODKIT51
BD2851S	PSU	MODKIT51
BD2951S	PSU	MODKIT51
BD3251S	PSU	MODKIT51
VESTEL		
11AK19 16:9	PSU & EW KIT	MODKIT52A
11AK19 4:3	PSU & EW KIT	MODKIT52
11AK33	PSU & UPGRADE	MODKIT54
11AK37	PSU	MODKIT51
WHARFDALE		
28PF1	PSU	MODKIT54
32PF1	PSU	MODKIT54

ORDER CODE	PRICE
GOODKIT1	£11.00
GRUNDIGKIT1	£10.50
GRUNDIGKIT2	£10.50
GRUNDIGKIT3	£10.50
JVCKIT1	£11.00
MITSKIT1	£3.00
MITSKIT2	£15.00
MITSKIT3	£6.00
MODKIT30	£10.00
MODKIT35	£9.50
MODKIT36	£5.00
MODKIT37	£6.50
MODKIT39	£8.50

ORDER CODE	PRICE
MODKIT40	£6.00
MODKIT41	£6.00
MODKIT43	£7.00
MODKIT44	£7.00
MODKIT45	£4.00
MODKIT46	£12.00
MODKIT47	£15.50
MODKIT48	£8.00
MODKIT49	£13.00
MODKIT50	£18.00
MODKIT51	£10.00
MODKIT52	£15.00
MODKIT52A	£15.00

ORDER CODE	PRICE
MODKIT53	£13.00
MODKIT54	£15.00
NIKKAIKIT1	£12.00
ONWAKIT	£12.00
PANKIT1	£15.00
PANKIT2	£9.00
PHILKIT1	£10.00
PHILKIT2	£2.50
PHILKIT3	£4.00
PHILKIT4	£4.25
PHILKIT5	£5.75
PHILKIT6	£5.50
PHILKIT7	£7.60

ORDER CODE	PRICE
PHILKIT8	£4.25
PHILKIT9	£7.50
PHILKIT10	£8.50
SAMKIT2	£8.00
SAMSUNGKIT	£16.00
SHARPKIT1	£11.00
SHARPKIT2	£11.00
SHARPKIT3	£9.00
THOMKIT1	£7.00
THOMKIT2	£12.00
THOMKIT3	£9.00
THOMKIT4	£4.00

Vestel 11AK37
PSU Repair Kit

Order Code : MODKIT51
Price : £ 10.00 + vat

Vestel 11AK19
4.3 Chassis PSU & EW Kit

Order Code : MODKIT52
Price : £ 11.00 + vat

Vestel 11AK19
16.9 Chassis PSU & EW Kit

Order Code : MODKIT52A
Price : £ 15.00 + vat

Vestel 11AK33
PSU & Upgrade Kit

Order Code : MODKIT54
Price : £ 15.00 + vat

K.P. House , Unit 15 , Pop In Commercial Centre , Southway , Wembley , Middlesex . HA9 0HB England
Tel: (020) 8900 2329 Fax : (020) 8903 6126 Email : sales@grandata.co.uk

Grandata Ltd

distributor of electronic components

Line Output Transformers

Part No	Code	Price
BUSH		
105595.6	LOT1814	£16.50
10559560	LOT1814	£16.50
105936.4	LOT1148	£19.00
10593640	LOT1148	£19.00
10593640.P2	LOT1148	£19.00
106122.8	LOT1814	£16.50
10612280	LOT1814	£16.50
106552.2	LOT1545	£19.00
10655220	LOT1545	£19.00
106699	LOT2184	£16.00
10669900	LOT2184	£16.00
10669900-P1	LOT2184	£16.00
106966.6	LOT2184	£16.00
10696660	LOT2184	£16.00
10696660.P1	LOT2184	£16.00
11030936351000	LOT2262	£22.00
11030936351136	LOT2262	£22.00
11040102331136	LOT2262	£22.00
BEKO		
057.834 TR 2	LOT2238	£26.00
058.434 TR 4	LOT2238	£26.00
058.834 TR 1	LOT2238	£26.00
058.834 TR 2	LOT2238	£26.00
058.834 TR 5	LOT2238	£26.00
3311159	LOT2238	£26.00
3311167	LOT2238	£26.00
3311187	LOT2238	£26.00
3313110	LOT2238	£26.00
58.834	LOT2238	£26.00
M 12-130	LOT2238	£26.00
M 12-133	LOT2238	£26.00
M 12-138	LOT2238	£26.00
M 12-157	LOT2238	£26.00
M12130	LOT2238	£26.00
M12133	LOT2238	£26.00
M12138	LOT2238	£26.00
M12157	LOT2238	£26.00
RO 682	LOT2238	£26.00
RO 685	LOT2238	£26.00
TR 682	LOT2238	£26.00
TR 685	LOT2238	£26.00
FERGUSON		
473197	LOT304	£11.00
06 D-3-084-001	LOT23	£8.00
06 D-3-087-001	LOT23	£8.00
06 D-3-088-001	LOT84	£5.00
06 D-3-093-001	LOT204	£16.00
06 D-3-508-003	LOT276	£14.00
06 D-3-512-001	LOT204	£16.00
102706	LOT1262	£16.50
102706.4	LOT1262	£16.50
10270640	LOT1262	£16.50
102706E0	LOT1262	£16.50
102756.4	LOT1262	£16.50
10275640	LOT1262	£16.50
103194 1	LOT1262	£16.50

Part No	Code	Price
FERGUSON...continued		
103194.11	LOT1262	£16.50
103194.8	LOT1262	£16.50
103194.80	LOT1262	£18.50
10319410	LOT1262	£16.50
10319411	LOT1262	£16.50
10319480	LOT1262	£16.50
103194B0	LOT1262	£16.50
104061.2	LOT1262	£16.50
104061.6	LOT1262	£16.50
10406120	LOT1262	£16.50
10406160	LOT1262	£16.50
104525.2	LOT1262	£16.50
104525.3	LOT1262	£16.50
10452520	LOT1262	£16.50
10452530	LOT1262	£16.50
GOODMANS		
1142 5057	LOT1164	£15.00
1142 5077	LOT1164	£15.00
1142.5079	LOT1164	£15.00
1142.5081	LOT1164	£15.00
1179.0387	LOT1147	£16.00
1192.0527	LOT1147	£16.00
1342.0006	LOT1148	£19.00
1342.0006	LOT1148	£19.00
1352.5008	LOT1167	£15.00
1352.5016	LOT1934	£19.00
1352.5027	LOT1270	£16.00
1352.5033	LOT1270	£16.00
1152-5016	LOT1934	£19.00
1192.1421	LOT1262	£16.50
1342.0006	LOT1148	£19.00
1342.0006 A	LOT1148	£19.00
1342.0006 B	LOT1148	£19.00
1342.00062	LOT1148	£19.00
1342.0060	LOT1148	£19.00
1352.0052	LOT2262	£22.00
1352.0052 A	LOT2262	£22.00
1352.5006	LOT1814	£16.50
1352.5006 A	LOT1814	£16.50
1352.5006 D	LOT1814	£16.50
1352.5006 R	LOT1814	£16.50
1352.5008E	LOT1167	£16.00
1352.5033	LOT1933	£19.00
1352.5033 A	LOT1933	£19.00
1352.5033 B	LOT1933	£19.00
1352.5036	LOT1545	£19.00
1352.5036 A	LOT1545	£19.00
1352.5036 F	LOT1545	£19.00
1352.5037	LOT2184	£16.00
1352.5037 A	LOT2184	£16.00
1352.5037 D	LOT2184	£16.00
1352.5058	LOT1933	£19.00
1352.5058 A	LOT1933	£19.00
1352.5058 C	LOT1933	£19.00
1362.3005	LOT1262	£16.50
1362.5001	LOT2262	£22.00
1362.5001 A	LOT2262	£22.00

Part No	Code	Price
GOODMANS...continued		
1362.5002	LOT2262	£22.00
1362.5002 A	LOT2262	£22.00
1372 0052	LOT2262	£22.00
1372.0052 A	LOT2262	£22.00
1372.0052 B	LOT2262	£22.00
1372 0062	LOT2262	£22.00
1372 0062 A	LOT2262	£22.00
1372.0066	LOT2262	£22.00
1372 0066 A	LOT2262	£22.00
1372.00662	LOT2262	£22.00
40313-16	LOT1814	£16.50
40330-10	LOT1262	£16.50
40330-11	LOT1262	£16.50
40330-26	LOT1262	£16.50
40330-27	LOT1262	£16.50
40348-01	LOT1933	£49.00
40348-02	LOT1148	£19.00
40348-06	LOT1545	£49.00
40348A-01	LOT1933	£19.00
40348A-02	LOT1148	£19.00
40348A-03	LOT1814	£16.50
40348A-06	LOT1545	£19.00
40348A-09	LOT2184	£16.00
40348A-10	LOT1148	£19.00
40348A-12	LOT2184	£16.00
GRUNDIG		
29201.029.63	LOT1987	£18.00
29221.029.63	LOT1987	£18.00
M 29221.029.63	LOT1987	£18.00
HANTAREX		
1242.0178	LOT1153	£20.00
28020280	LOT1158	£20.00
28029390	LOT1153	£20.00
HITACHI		
2433891	LOT23	£8.00
2433892	LOT84	£5.00
2433893	LOT23	£8.00
2433952	LOT33	£7.50
2434141	LOT33	£7.50
2434393	LOT405	£10.00
2435131	LOT251	£5.00
2436201	LOT90	£11.00
45150504	LOT362	£16.00
053 X 0624-001	LOT1986	£30.00
053 X 0642-001	LOT1986	£30.00
2433891H	LOT23	£8.00
2436771	LOT1149	£18.00
42-0719-00	LOT1986	£30.00
53 X 0624-001	LOT1986	£30.00
BW 00231	LOT1986	£30.00
L.G.		
057.834 TR 2	LOT2238	£26.00
058.434 TR 4	LOT2238	£26.00
058.834 TR 1	LOT2238	£26.00

Part No	Code	Price
L.G....continued		
058.834 TR 2	LOT2238	£26.00
058.834 TR 5	LOT2238	£26.00
3311159	LOT2238	£26.00
3311167	LOT2238	£26.00
3311187	LOT2238	£26.00
3313110	LOT2238	£26.00
58.834	LOT2238	£26.00
M 12-130	LOT2238	£26.00
M 12-133	LOT2238	£26.00
M 12-138	LOT2238	£26.00
M 12-157	LOT2238	£26.00
M12130	LOT2238	£26.00
M12133	LOT2238	£26.00
M12138	LOT2238	£26.00
M12157	LOT2238	£26.00
RO 682	LOT2238	£26.00
RO 685	LOT2238	£26.00
TR 682	LOT2238	£26.00
TR 685	LOT2238	£26.00
PANASONIC		
TLF 14512 F	LOT39	£5.00
TLF 14520 F	LOT40	£8.50
TLF 14521 F	LOT39	£5.00
TLF 14567 F	LOT39	£5.00
TLF 14568 F	LOT40	£8.50
PHILIPS		
3119 108 31260	LOT90	£11.00
3119 108 31290	LOT73	£10.00
3119 198 62930	LOT57	£9.50
3122 138 36920	LOT57	£9.50
3122 138 36922	LOT57	£9.50
3122 138 36923	LOT57	£9.50
3122 138 37050	LOT132	£15.00
3122 138 37620	LOT90	£11.00
3122 138 37992	LOT1116	£10.00
3122 138 38040	LOT73	£10.00
3139 128 30400	LOT90	£11.00
40348-08	LOT1577	£16.00
40348A-08	LOT1577	£16.00
40348A-09	LOT1577	£16.00
4812 140 10369	LOT90	£11.00
4812 140 10421	LOT90	£11.00
4822 140 10306	LOT57	£9.50
4822 140 10381	LOT128	£10.00
4822 140 10406	LOT73	£10.00
AT 2076 / 10	LOT57	£9.50
AT 2079 / 40	LOT73	£10.00
AT 2079 / 99	LOT276	£14.00
SHARP		
RTRNF 1220 CEZZ	LOT39	£5.00
RTRNF 2001 CEZZ	LOT338	£12.00
RTRNF 2096 CEZZ	LOT308	£13.50
RTRNF 2023 CEZZ	LOT310	£11.00

Part No	Code	Price
SONY		
1-439-332-41	LOT100	£10.00
1-439-332-42	LOT101	£8.50
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1-439-387-11	LOT311	£14.50
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1-439-416-21	LOT255	£11.00
1-439-416-23	LOT255	£11.00
1-439-416-41	LOT255	£11.00
1-439-416-51	LOT255	£11.00
1-453-308-11	LOT2196	£31.50
1-453-308-21	LOT2196	£31.50
1-453-308-31	LOT2196	£31.50
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8-598-834-10	LOT2196	£31.50
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8-598-834-30	LOT2196	£31.50
8-598-834-40	LOT2196	£31.50
8-598-834-50	LOT2196	£31.50
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10531460	LOT1505	£19.00
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10566060	LOT1505	£19.00
10566060.P2	LOT1505	£19.00
105660060	LOT1505	£19.00
105880.8	LOT1505	£19.00
10588080	LOT1505	£19.00
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151128140	LOT1505	£19.00
151281.4	LOT1505	£19.00
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1000uF	CAP119	£1.50	10
2200uF	CAP120	£2.10	10
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22uF	CAP121	£0.35	10
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470uF	CAP31	£1.75	10
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1000uF	CAP33	£2.10	10
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2200uF	CAP34	£5.25	10
3300uF	CAP35	£5.00	5
4700uF	CAP36	£6.10	10
6800uF	CAP171	£4.50	5
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47uF	CAP39	£0.48	5
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100uF	CAP40	£0.70	10
120uF	CAP128	£0.85	10
150uF	CAP41	£0.95	5
220uF	CAP42	£1.20	10
330uF	CAP43	£1.40	5
470uF	CAP44	£1.90	10
680uF	CAP45	£3.15	5

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25 Volts...continued			
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1500uF	CAP47	£3.90	5
2200uF	CAP48	£2.00	2
3300uF	CAP49	£2.20	2
4700uF	CAP50	£3.65	2
6800uF	CAP51	£3.90	2
35 Volts			
1uF	CAP130	£0.40	10
3.3uF	CAP131	£0.40	10
4.7uF	CAP132	£0.45	10
10uF	CAP52	£0.50	10
22uF	CAP53	£0.45	10
33uF	CAP54	£0.50	5
47uF	CAP55	£0.85	10
68uF	CAP133	£0.55	10
100uF	CAP56	£0.85	10
150uF	CAP57	£0.95	5
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4700uF	CAP136	£3.50	2
40 Volts			
2200uF	CAP174	£1.80	2
2200uF	CAP175	£2.00	1
50 Volts			
0.47uF	CAP176	£0.35	10
1uF	CAP137	£0.35	10
2.2uF	CAP138	£0.35	10
3.3uF	CAP139	£0.35	10
4.7uF	CAP140	£0.35	10
6.8uF	CAP177	£0.45	10
10uF	CAP63	£0.50	10
22uF	CAP64	£0.70	10
33uF	CAP141	£0.85	10
47uF	CAP65	£0.85	10
68uF	CAP142	£0.90	10

VALUE	CODE	PRICE PER PACK	
50 Volts...continued			
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220uF	CAP67	£1.75	10
330uF	CAP68	£2.45	10
470uF	CAP69	£4.35	10
680uF	CAP70	£4.90	5
1000uF	CAP71	£5.25	10
1500uF	CAP143	£4.50	5
2200uF	CAP72	£3.25	2
3300uF	CAP144	£3.25	2
63 Volts			
0.22uF	CAP145	£0.45	10
0.33uF	CAP178	£0.35	10
0.47uF	CAP73	£0.35	10
1uF	CAP74	£0.35	10
1.5uF	CAP179	£0.35	10
2.2uF	CAP75	£0.35	10
3.3uF	CAP76	£0.50	10
4.7uF	CAP77	£0.35	10
6.8uF	CAP180	£0.50	10
10uF	CAP78	£0.50	10
15uF	CAP79	£0.95	5
22uF	CAP80	£0.75	10
33uF	CAP81	£0.85	10
47uF	CAP82	£0.95	10
56uF	CAP181	£1.10	10
68uF	CAP83	£1.30	5
100uF	CAP84	£1.20	10
150uF	CAP85	£2.80	5
220uF	CAP86	£2.80	10
330uF	CAP87	£4.00	10
470uF	CAP88	£5.25	10
680uF	CAP89	£5.00	10
1000uF	CAP90	£5.40	5
2200uF	CAP182	£2.20	1
4700uF	CAP183	£4.00	1
100 Volts			
0.1uF	CAP184	£0.80	10
0.22uF	CAP185	£0.80	10
0.33uF	CAP186	£0.80	10
0.47uF	CAP91	£0.50	5
1uF	CAP92	£0.85	10
1.5uF	CAP93	£0.70	5

VALUE	CODE	PRICE PER PACK	
100 Volts...continued			
2.2uF	CAP94	£0.50	5
3.3uF	CAP95	£0.50	5
4.7uF	CAP96	£0.50	5
6.8uF	CAP187	£0.80	10
10uF	CAP97	£0.95	10
22uF	CAP98	£1.05	10
33uF	CAP99	£1.55	5
47uF	CAP100	£1.75	10
68uF	CAP188	£1.30	5
100uF	CAP101	£2.10	10
220uF	CAP102	£6.00	5
330uF	CAP189	£3.00	2
470uF	CAP103	£6.00	5
680uF	CAP190	£3.00	2
1000uF	CAP191	£3.00	1
160 Volts			
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1uF	CAP193	£0.45	10
2.2uF	CAP146	£0.45	10
3.3uF	CAP194	£1.00	10
4.7uF	CAP195	£1.00	10
10uF	CAP147	£1.40	10
22uF	CAP148	£1.80	10
33uF	CAP149	£2.30	10
47uF	CAP196	£2.20	5
100uF	CAP150	£3.25	5
220uF	CAP197	£3.00	2
470uF	CAP198	£3.25	1
200 Volts			
22uF	CAP199	£1.60	5
100uF	CAP151	£3.25	5
220uF	CAP200	£2.50	1
330uF	CAP201	£2.50	1
250 Volts			
0.47uF	CAP202	£0.60	10
1uF	CAP152	£0.60	10
2.2uF	CAP203	£1.30	10
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VALUE	CODE	PRICE PER PACK	
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350 Volts			
1uF	CAP156	£0.70	10
2.2uF	CAP207	£1.20	10
3.3uF	CAP157	£1.50	10
4.7uF	CAP208	£1.10	5
10uF	CAP158	£2.25	10
22uF	CAP159	£3.40	10
33uF	CAP209	£2.60	5
47uF	CAP210	£1.50	2
100uF	CAP211	£3.00	2
330uF	CAP212	£5.00	1
400 Volts			
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2.2uF	CAP108	£2.25	5
3.3uF	CAP214	£2.25	5
4.7uF	CAP109	£3.15	5
10uF	CAP110	£4.00	5
22uF	CAP111	£2.50	2
33uF	CAP215	£2.50	2
47uF	CAP112	£3.50	2
68uF	CAP216	£3.50	2
100uF	CAP160	£4.00	2
150uF	CAP217	£3.20	1
220uF	CAP161	£7.00	2
560uF	CAP162	£4.00	1
450 Volts			
1uF	CAP113	£2.80	5
2.2uF	CAP114	£3.20	5
3.3uF	CAP218	£3.20	5
4.7uF	CAP115	£4.95	5
10uF	CAP116	£5.50	5
22uF	CAP117	£4.15	2
33uF	CAP219	£3.00	2
47uF	CAP220	£2.00	1
100uF	CAP221	£3.00	1

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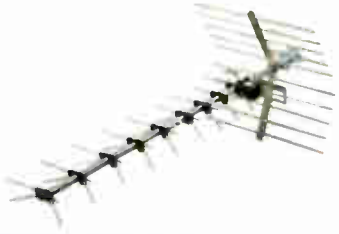

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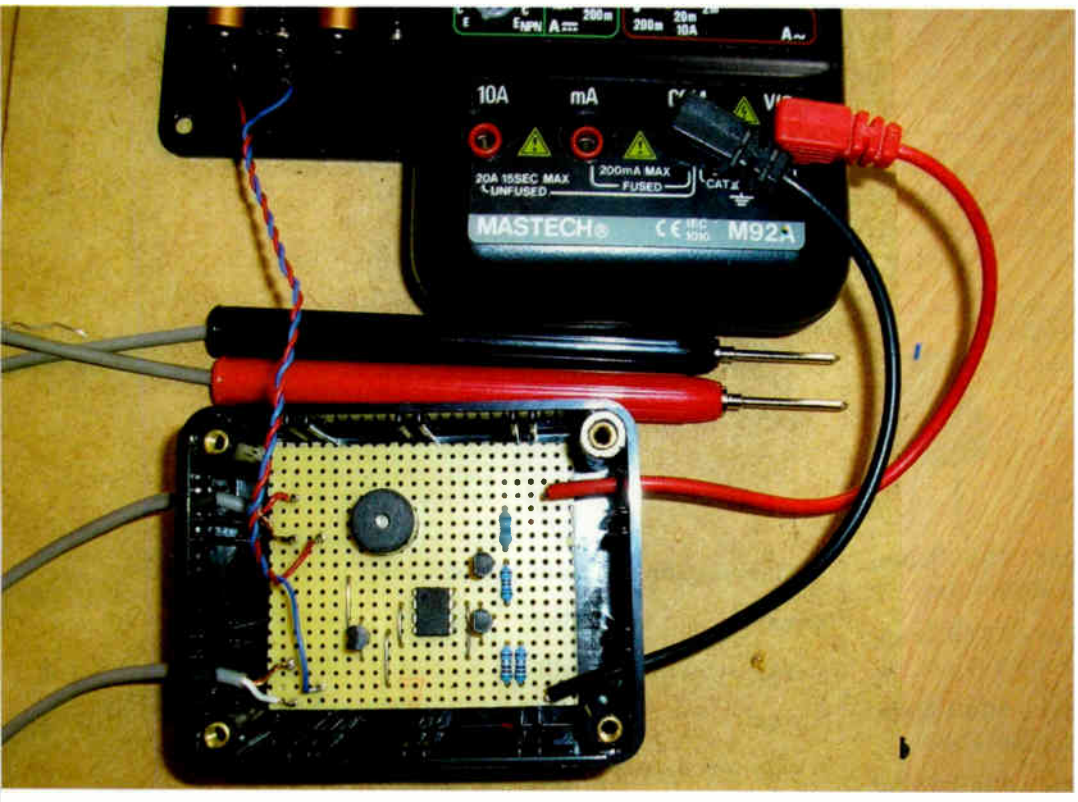

Photo 1: The prototype adapter with DVM and probes.

Alan Willcox has designed this short-location adapter which has a resolution of 1mΩ when used with a digital voltmeter set to the 200mV range. It's ideal for locating shorts on bus lines etc

A precision milliohmmeter

The circuit presented here has a resolution of 1mΩ (one thousandth of an ohm) when used in conjunction with a digital voltmeter set to the 200mV range. To provide some idea of this order of resolution, 2cm of the lead-out wires of the resistors used in this project typically measure 1mΩ. An average PCB track has a far higher resistance. In practical terms, this means that a short-circuit component which shares a common supply or data bus line can be located without the need to snip out or desolder other components. The faulty item is the one that provides the lowest resistance reading. An ordinary digital voltmeter is pretty hopeless when it comes to the measurement of low-ohms values.

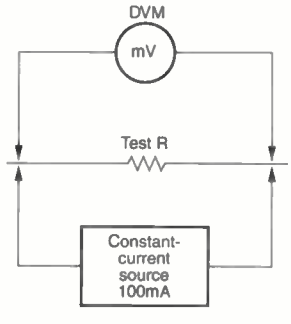

Fig. 1: Method of measuring very low resistance values. A reading of 0·1mV on the DVM = 0·001Ω = 1mΩ; 1mV = 0·01Ω; 10mV = 0·1Ω; 100mV = 1Ω.

Test-lead resistance

To achieve this very low-ohms capability, we need to be able to cancel out the resistance of the test leads used and that of any plugs and sockets. There's a classic way round this problem. If the item whose resistance is being checked is fed with a constant current, and the voltage across the resistance is measured, then by Ohm's law we know the resistance value. Fig. 1 shows how this is usually carried out. It's a four-wire approach that's sometimes referred to as a Kelvin connection. If the current used is sufficiently high, we can achieve a target for resolution.

A convenient constant current is 100mA. With this, a 1Ω resistor will produce a reading of 100·0mV in the display. If the value of the resistor is one per cent on the high side, the reading will be 101·0mV; if the value is one per cent on the low side, the reading will be 99mV. In practice, if you measure the resistance of a new one per cent 1Ω resistor the reading you get will increase as you move the probes along the lead-out wires, away from the body of the resistor. It follows that to measure resistors over 2Ω the digital voltmeter will have to be switched to its 2V range. As a 10Ω resistor will produce a 1V drop, this is about the upper limit for accurate measurement.

The important point to note is that because we are feeding a constant current to the resistance being measured, and reading the resultant potential difference with a high-impedance mV meter, the effect of any resistance of the leads and plugs/sockets does not affect the reading.

But two wires for each probe do seem to be a bit clumsy, and are. My way around this problem is to use standard single-screened audio cable. In this case the constant current out goes via the lead's screen, and the return voltage check is via the inner lead. The screen and the inner connections are joined at the termination points of the probes. Fig. 4(a) shows this clearly. With the probes filed to sharp points you should, with a digital voltmeter, have a residual reading in the region of 0·2mV – that is 2mΩ with the probes shorted. This is caused by contact resistance at the probe tips plus the resistance of the length of the probe tips. As we are dealing with comparative values when locating a defective component, this is of no consequence.

Current saving

100mA is quite a heavy drain from a battery source. If it was left to the engineer to switch the equipment off when not in use, then sod's law says that it will be left on. As the resistance value when short-location testing is so low however, we can let the probes act as an on/off switch: current is drawn only when the test leads are in use. The inclusion of a buzzer in our circuit not only confirms contact but in addition serves as a power-on indicator. It provides a warning in case accidental contact between the probes goes unnoticed, flattening the battery.

Circuit features

The circuit diagram of the precision milliohmmeter/short-location adapter is shown in Fig. 2. IC2's non-inverting input (+) is held at 2·5V by the output of IC1 (TLE2425). I decided to use this particular device as a voltage reference source because of its superior performance and low cost. The Texas Instruments TLE2425 is designed to provide a virtual earth for analogue circuits with a 5V supply. Its operational current is an insignificant 150μA and its output voltage is 2·5V ± 0·02V.

The output of IC2 makes Q2's emitter voltage the same as that at pin 3 of IC2. So we end up, by Ohm's law, with 98mA through Q2. The remaining 2mA consists of bias current for Q1 and IC2's operating current. Q2 acts as a buffer to supply the test current required.

Op-amp IC2 is included to ensure that the current through Q2 is independent of its temperature characteristics. The voltage across the 25·5Ω resistance (R3 / R4) is forced, by the high gain of IC2 configured as a comparator/follower, to be the same as the reference output from IC1.

Practical points

A suggested layout is shown in Fig. 3, using 0·1in.-pitch stripboard. Only four print cuts are required, between the pins of IC2. The prototype is shown in Photo 1.

Although test-lead polarity is irrelevant for the main application of this adapter, I have followed convention here. With the digital voltmeter set to its 2V range, the forward-voltage drop across a semiconductor-device junction can be measured at 100mA. So in this application polarity is relevant.

Battery condition is shown by switching to the DVM's 20V range. Fresh batteries will produce a reading of about 5·3V, because of the 0·7V drop across Q2. When the supply drops below 5V both ICs are outside their working parameters and results are unreliable.

The unit will not work with cheap zinc-based batteries, as they cannot maintain 100mA. Alkaline types are suitable. A good option for high-current equipment is to use rechargeable nickel metal hydride (NmH) cells. But because of the intermittent use of the unit, and the fact that it is prevented from being on when not in use, alkaline batteries should last for quite a long time.

The way the probes are wired is shown in Fig. 4(a). Fig. 4(b) shows

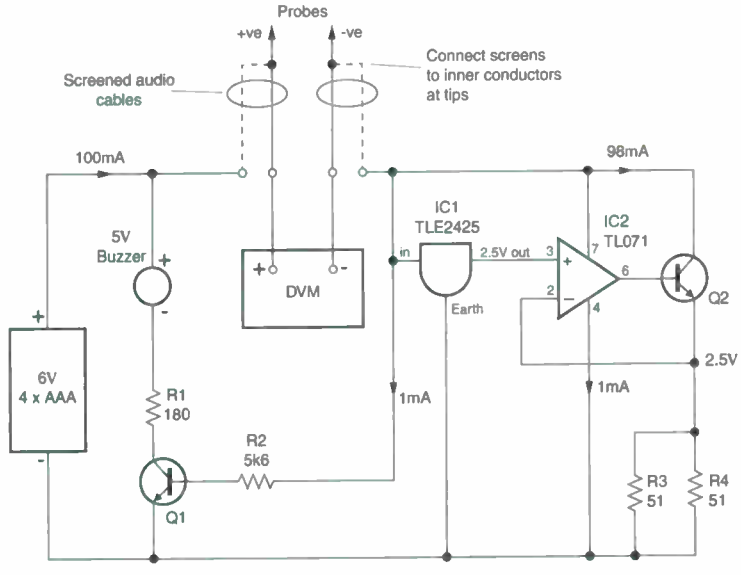

Fig. 2: Circuit diagram of the precision milliohmmeter adapter.

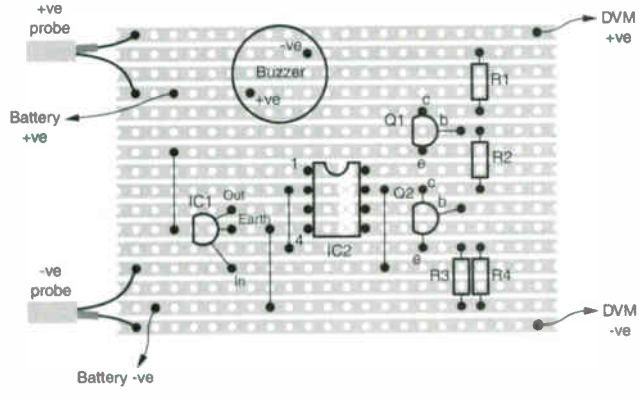

Fig. 3: Layout of the prototype unit on stripboard. The only track cuts required (four) are under IC2.

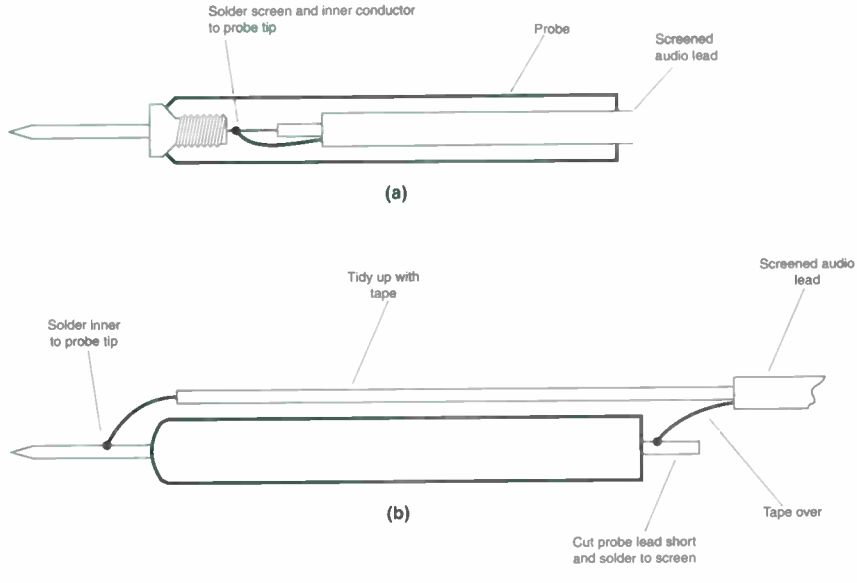

Fig. 4: (a) Connections to a solder-type probe. (b) How the test lead can be connected to a moulded test probe. File the coating away for the solder to take.

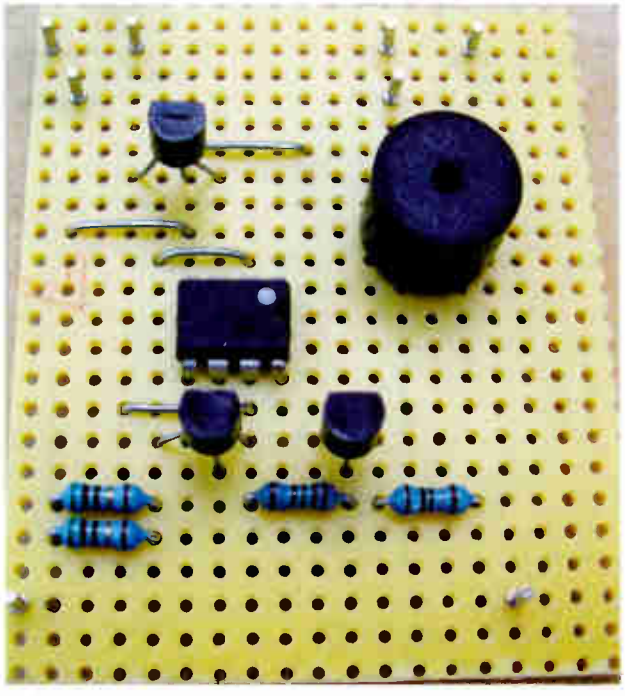

Photo 2: Layout of the prototype adapter on stripboard.

how an integrated test lead type can be wired. As far as contact resistance is concerned, apart from silver plating not much can be done.

Notes on components

IC1 (TLE2425) seems to be available only from RS Components. The RS order code is 284-214 and the cost about £1.50. It's quite a remarkable device, being able to operate with an input of up to 40V while still providing a precise 2·5V output. It can source/sink up to 20mA. Two of them piggy-backed (inputs connected together and the earth reference of one connected to the 2·5V output of the other) will provide a stable 5V supply plus a 2·5V virtual earth for use in low-power applications. Unlike a conventional IC regulator, the operating current is only about 0·15mA.

The TLE2426 is a similar device that will split any supply up to 40V to provide a half-rail voltage output. The RS order code is 284-220, but the device is of no use here. They are both Texas Instruments devices, with technical information for them available via the internet.

The op-amp can be type TL071/81 or similar – it's not critical. R3/4 should be 1% tolerance types. The CPC order code for the resistors used in this project is REMFR4 followed by the value. The 5V buzzer I used was from CPC, order code LS00654. Any 0·1A, 500mW npn transistor will be OK for Q1 and Q2. Gain is not important. I used type BC547 because I had it in stock and I like the e-b-c lead-out order. Q2 will run a bit warm with continual use but this doesn't matter as the feedback to pin 2 of IC2 overrides any variation in characteristics because of temperature change. The box I used to house the unit is CPC type ENMB1/B.

There's a minor problem with the test probes because the connection between the screen and the inner conductor of the lead should be as close as possible to the tip. Fig. 4(a) shows the solder-type probe connections while Photo 1 shows this type of probe, e.g. Maplin order code FK32. I couldn't find a similar type in the CPC catalogue. Where moulded type test leads are used, e.g. CPC order code IN00632, the probe leads can be cut off with wiring as shown in Fig. 4(b) – the remaining plug leads are then available for use as the connectors to the external digital voltmeter.

As mentioned previously, for correct operation the supply battery must at the very least be of the alkaline type.

Queries or questions

Alan can be reached on alan.willcox@gmail.com

Test Case 511

As TV screens have become larger, it's increasingly necessary to send two people to bring a set into the workshop for repair. Thus it was that two good companions from the Test Case retail arm brought a Panasonic Model TX32DK1 in for attention one bright summer morning. The fault description was clear enough: "picture gets progressively brighter then the set shuts down". On to the soak-test bench it went. The display was somewhat bright, so the user brightness control was turned right down to give a 'normal' picture as a reference and starting point for the diagnosis. Nothing happened on the first day.

Half way through the second day the picture's brightness started to increase, though not to the point where the set tripped off. So we took the back off and banged the main board and the CRT base panel with the handle of a screwdriver. This had no effect and, when the set had been brought to a service bench, the brightness was back to normal. It was going to be one of those! Real Technician wound the A1/G2 control on the line output transformer throughout its range to check it. As the control worked smoothly, it was left near the middle of its travel when the set was put on test again. The fault remained dormant for about a week. We were considering the set's return to the owner when the brightness level suddenly came up again. Definitely one of those!

It was Cathode Ray who, flicking through the various Panasonic Euro-4 chassis manuals for different models, found three components ringed in pencil and captioned "brightness/flashing picture problems". They were R558 (120kΩ), C563 (22μF, 250V) and C564 (2·2μF, 100V). C563 is the reservoir capacitor for the 200V supply to the RGB output stages. The resistor links this supply to the beam-limiter circuit, where C564 sits. Real Technician changed all three components, and he and Ray were very pleased with themselves. Was it wise, at this stage, to quote a price to the customer, get it accepted and make out the bill? That's what they did and, no, it was not wise, because the picture brightness crept up again while the set ran on the awaiting-delivery shelf. Oh dear!

The possibilities were many. Maybe the A1/G2 voltage was rising because of a fault in the line output transformer. Perhaps the CRT's cathode voltages were falling, because of a problem with the TDA6103Q RGB output IC or something to do with it. RT and CR decided to run the set with meters connected to the A1/G2 feed and one of the CRT's cathodes. It was easy to arrange cathode monitoring: with the workshop test card as the set's input, a little DVM produced a reading of 147V. The A1/G2 voltage test was more of a problem. An ordinary multimeter switched to the 1kV range loaded it down to virtually zero, and adding a 10MΩ resistor in series didn't help much. An EHT meter with an input impedance of 300MΩ was finally used. This showed, though it was hard to read on such a small segment of the scale, that there was no significant change in the A1/G2 voltage when the fault finally returned.

The cathode voltage being monitored was seen to rise at this time however. But surely a fall in cathode voltage produces a rise in brightness! What was happening at the tube's control grid when the fault was present? RT and CR didn't get around to checking this however, because they finally achieved a diagnosis by other means. What was this means, and what was causing the fault? The solution is on page 571.

Service Casebook

Michael Maurice

Toshiba 21N21B

Failure of the 2SD2499 line output transistor is becoming quite common with these sets, which are fitted with an Orion chassis. The cause is dry-joints at the line driver transformer. In this case a replacement transistor and resoldering the transformer cured the fault but, if you are unlucky, a power supply rebuild may be required.

Sony KV2215UB (YE2 chassis)

This golden oldie was a delight to repair. The channel-change switches had broken, with the result that the set wouldn't respond to remote- or local control commands. Replacing all ten switches put matters right, after which there was an excellent picture. I didn't even have to take the back off!

Panasonic DMR-50E

There was no actual fault with this new DVD recorder. What had happened was that the wrong type of disc had been inserted – a PC CD-ROM instead of the normal type of CD or DVD. When this happens the machine fails to recognise the software on the disc and, instead of ejecting it, just sits there and says error. Pressing the eject button doesn't help either.

I dismantled the unit and removed the disc, after which it worked perfectly. There's a way of ejecting such a disc by pressing a combination of buttons, but this information was not included in the user manual. According to Panasonic new machines do include the procedure for ejecting non-standard discs in the user guide.

Bush 7690D

The fault with this set was line collapse. The cause was one of the two 1μF/250V capacitors in the line output stage – it had gone open-circuit as a result of a dry-joint at one of the legs. A replacement restored the line scanning but there was another fault, no EW correction. The cause was the loading coil. It seemed to be all right but obviously had shorted turns.

Philips 32PW6506/05

This set was dead though the relays were chattering. Checks showed that the line output transistor was OK. In fact the cause of the trouble was the line output transformer. A replacement restored normal operation.

Toshiba 3387DB

The customer had complained that the set would go off intermittently, then became dead. I found that the line output transistor was short-circuit and the HT fuse had blown. The cause of all this was the 10V regulator transistor Q430, which was dry-jointed.

Finlux 5028

This set was stuck in standby. It didn't take long to spot that the line driver transistor had burnt to a cinder and the line driver transformer didn't look any healthier. When these two items had been replaced the set tried to start, but the transistor went short-circuit again. The cause of all this was the TDA2579A timebase generator IC. A replacement restored normal operation.

B&O 7535

The fault with this set was no remote-control operation, the cause being in the handset itself. A new one from B&O costs over £100. The cause of the problem was the SAB3021 IC inside. Fortunately I was able to track one down and, after fitting it along with a new battery connector, normal operation was restored.

Sony KP41S4U (RE2 chassis)

The fault with this rear-projection monster was that it went to standby with the front LED flashing. The cause turned out to be dry-joints at the field output chip IC500. A Sony dealer friend of mine said it was the first time he'd heard of this trouble.

JVC AV32R25EK

Unfortunately this set was taken out of my hands before I was able to resolve the fault, which was no picture. Some quick checks showed that the A1 supply was at 0V. It appeared that the line output transformer could be the cause, as disconnecting the A1 cable brought the supply up to a maximum of only about 300V. So a new LOPT was ordered and fitted, but the results were the same. In fact disconnecting the A1 cable again brought the voltage up to about 300V, but this time there was a picture! It was flashing and generally poor, but was nevertheless there. My next check was to reconnect the A1 cable and run the set without the board plugged into the CRT. Again the A1 voltage was about 300V. It appeared that the CRT was faulty, and JVC technical agreed with this.

At this point the customer's brother magically found the receipt and claimed that the set was under warranty. He called their repair department and the set was apparently fixed in five minutes, with no parts necessary. What had been done? I suspect that the CRT's neck had been knocked to clear the fault, but I'll never know. I'd be interested to hear from anyone who knows what might have been done. Communications sent to the magazine will be passed on. Thanks!

The answer is diversify!

Elaine Everest provides advice on what to do when, as a self-employed service engineer, you find that your hours at a firm for which you do work have been cut back

What do you do when the boss has decided to cut back your hours? Stop crying in your beer glass for one thing! It's the way in the repair trade these days, I'm afraid. Your boss may be doing all right, but that's because he is one step ahead of the game. He knows that if business doesn't improve during the summer months he will have to make cutbacks. One thing he will do is to look around the workshop to see what he considers to be expendable. It could be you. By chopping back your working week by one or two days he will probably still get the repairs done – at a cheaper price.

Think back. You may have stayed late to clear up a backlog of work but, if you are paid by the day, you will get your wage whether you repair ten videos or nine. The pay envelope will be handed over whether you fix six tellies or stand by the phone all day advising little old ladies about Freeview boxes and how to plug them in. It's possible that by being helpful and co-operative you could have had a hand in your own downfall.

Don't get me wrong about this however. I'm not advocating that you should adopt a bolshie attitude – you could end completely out of work! All I'm saying is that perhaps you could have arranged things better. But if it's too late, you will need to boost your income this week. As a self-employed person you pay into the system with your National Insurance contributions and tax, but you don't receive unemployment benefits. You might be able to claim some benefits if you have young children but, because you've lost only a day or two off work, you may still be earning over the limit to make a claim.

What you have to do is to look around you. After all you have the resources. The answer is to diversify, which is a long word for let's change direction. The farmers did it when their milk quotas were cut, so why can't you? No, I don't mean turn the back garden into a golf course and put up holidaymakers in the shed. Just have a think about how you can turn your skills to your advantage.

How to exploit your resources

You probably have a fair number of years of experience in the service industry. So why not teach others? Phone your local college and Adult Education Centre to ask if they are looking for instructors. If not, you could suggest that they start a basic electronics course. Tutors at these centres are needed for their work skills and are not necessarily trained teachers.

You could use your knowledge in another way, by writing about fault repairs and sending them to this magazine for publication.

Do you advertise your services? Two or three free weekly newspapers are distributed in most parts of the country. Phone the classified advertisements department and find out the cost. Don't be talked into spending a fortune on large, flashy adverts. You're supposed to be making money, not wasting it! A few lines will do.

How about newsagents? For 50p a week you can put a postcard in the window to attract local customers. You could also advertise anything in the home you no longer need – on another postcard of course! Another way to make your services known is by putting a leaflet through people's letterboxes.

While on the topic of selling personal property, have you looked at the online auction site eBay? You could move on any electronic equipment you no longer need – plus old videos, DVDs, clothing and so on. But beware: it becomes addictive!

Take a look in the local job centre. You never know, there may be a card with an engineer's job on it. Advertising through job centres is free for employers, so many repair firms use them rather than pay out for advertisement in the local press. The local paper in which you placed an advert may also have had an interesting vacancy.

Thomson Local directories and the Yellow Pages list local repair shops. Phone around and see if anyone needs an engineer for a few hours a week. You never know. You might find yourself with a better job than the one you already have!

Your finances

Take a look at your finances. The first stop should be your business bank account. My last article provided some useful money-saving tips. Implement some of them!

Next, your mortgage. Have you thought about transferring to another lender? Many big institutions are offering excellent rates to new customers. The same applies to home, vehicle and life insurance – you don't need to wait until the policy year has ended. Phone around. Not only are you sure to find a better monthly payment rate, you will also end up with a fistful of gift vouchers for using their services.

The spare room

Do you have a spare bedroom? How about taking in a lodger? Perhaps not a permanent one: you will find that local colleges and universities are on the look out for family homes during term times.

The local supermarket

Still looking for extra money? Try your local supermarket. Many now open 24 hours a day and need staff to work the twilight hours shelf filling. Men are more likely to be employed during these hours, because of the security aspect. Not only are such staff paid reasonable wages, there are added bonuses like employee discounts, training and a uniform. You never know – you might prefer this change of career, and move on from self-employment. If you do, please tell me. I know of someone who's looking for a few hours work...

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Vintage repair: a PYE Black Box

This Black Box record reproducer probably dated from the late Fifties. Pete Roberts describes the action that was required to restore its excellent audio capability

There were various versions of the Pye Black Box record reproducer (referring to one of them as a 'record player' is a bit infra dig). This one was a new-fangled type fitted with miniature valves. The somewhat unusual valve line up consisted of an ECC82 preamplifier followed by two PCL83 valves in a push-pull output stage. It was in pristine condition but suffered from low volume with distortion. The HT supply is based on one of those horrible Senter-Cel selenium bridge-rectifier blocks. There are satisfyingly hefty tar-coated mains and audio output transformers.

Initial work

Knowing the PCL83 valve of old, I ordered a pair of new Mullard bottles from Colomor Electronics (01403 786 559). When these had been fitted and the unit had been powered an odd hum was heard from the test speaker. In addition the unit broke into oscillation at certain settings of the tone control.

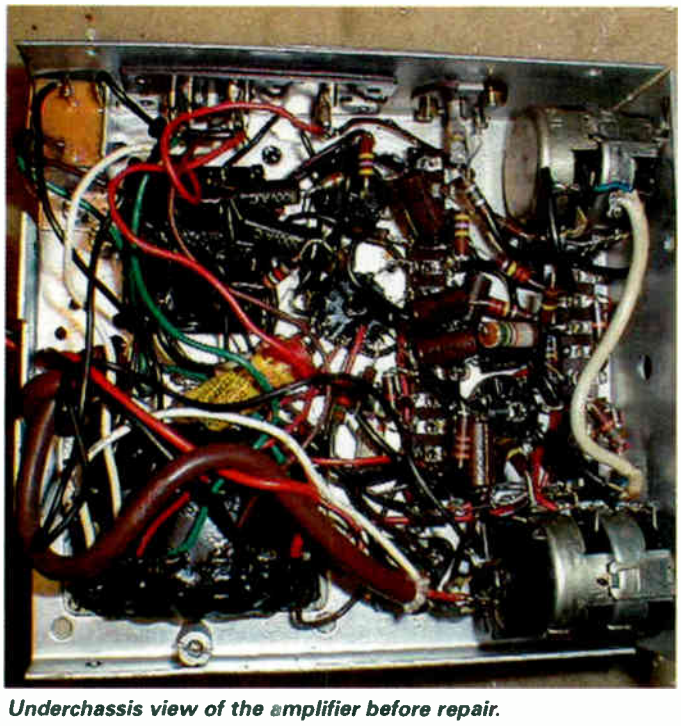
After making sure that they were discharged, I used my Seasure *LCR* bridge to check the capacitance of each of the three sections of the Plessey 32+16+8μF, 275V smoothing block. All were within tolerance, while the reasonably sharp nulls pointed to a low ESR – the reliability of these over forty-year old capacitors never ceases to amaze me.

The next job was to replace all the little brown, moulded-paper TCC coupling capacitors with Vishay polyster ones rated at 630V. The originals were rated at only 180V and, while subjected to less than this when the valves had fully heated, had to withstand the full HT for a short while after switch on.

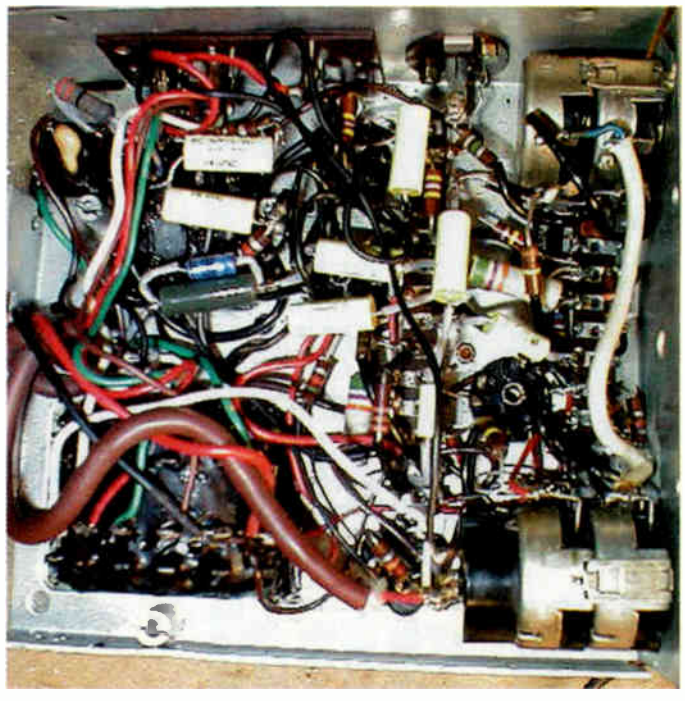
I thought it best to treat the new output valves to a replacement cathode-bias resistor, and used a 220Ω, 3W green Welwyn vitreous job that looked the part. Needless to say the 25μF bypass capacitor was replaced with a modern, far smaller 22μF, 25V type.

Low HT

At switch-on the HT voltage was about 250V. It dropped to 50V when the output valves had warmed up. No prizes for guessing the culprit! I replaced the selenium rectifier with an 8A, 800V silicon bridge – far in excess of what was needed, but I happened to have one, they are cheap enough and they can be bolted to the chassis. Although not strictly necessary when the feed is from a transformer (the resistance of the secondary winding helps to limit the size of the current pulses), I thought it best to fit a surge-limiting resistor to give the reservoir capacitor an easier life. With a 33Ω, 3W metal-film power resistor fitted in series with the rectifier's negative terminal the HT, measured at the reservoir capacitor, was a reasonable 251V.



Underchassis view of the amplifier before repair.



Underchassis view of the amplifier after repair. The replacement audio coupling capacitors and new output valve biasing components can be clearly seen.

Noises

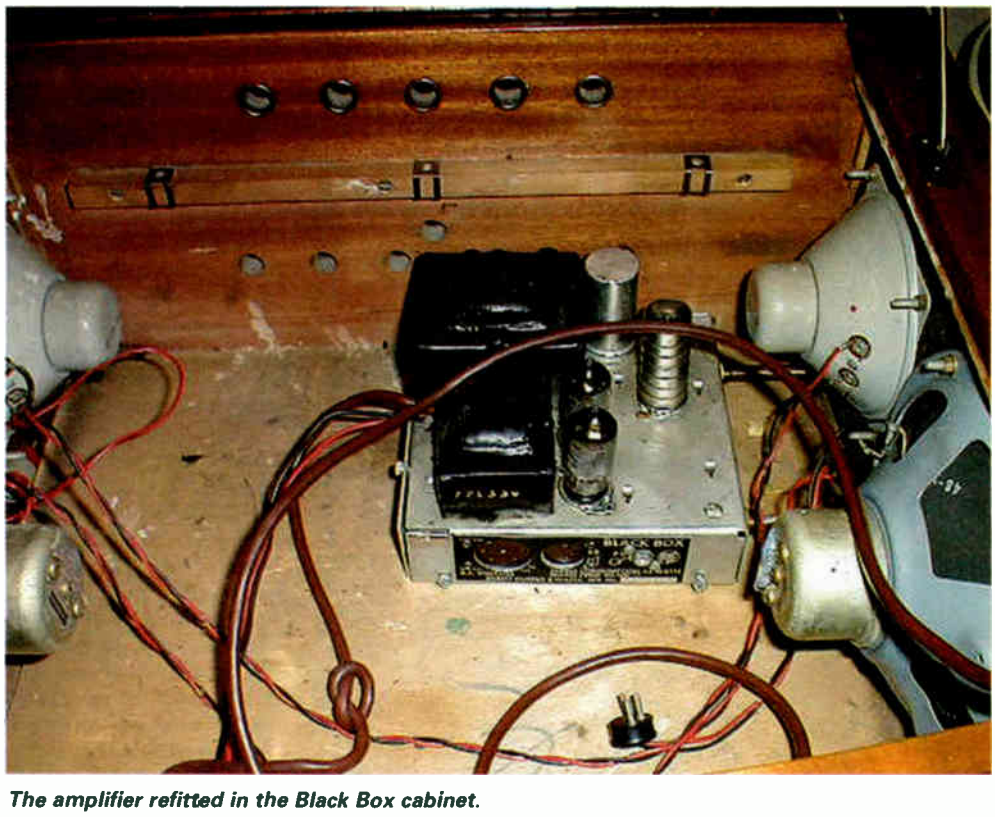
The fun then started! Warm-up resulted in a loud hum at 100Hz. I knew that the smoothing block was blameless, so the cause had to be something else. In fact there was a bad joint at the reservoir capacitor's terminal. The hum disappeared once this joint had been resoldered, but was replaced by a banshee wail whose frequency and intensity could be varied with the tone control.

After lengthy checks on my repairs, the cause of this latest fault turned out to be a dry-jointed earth connection at the output transformer's secondary winding, which forms part of the negative-feedback circuit. Once this joint had been resoldered there was blissful silence, broken only by the faintest sibilant hiss.

Final checks

The amplifier was then run for a few hours, with the smoothing block regularly checked for heating. It never got more than warm, and that warmth was caused by heat radiated from the bottles.

Reproduction was excellent once the amplifier had been refitted in the cabinet and the pickup and speakers had been reconnected. As expected, a small portion of each PCL83 pentode anode glowed a faint, dull red. But they do that Sir! Anyway I had checked the common cathode voltage and found it to be correct. The new grid-coupling capacitors were also known to be blameless. This propensity to overheat probably explains why the PCL83 was such a horribly unreliable little thing back in the days of valve TV sets.

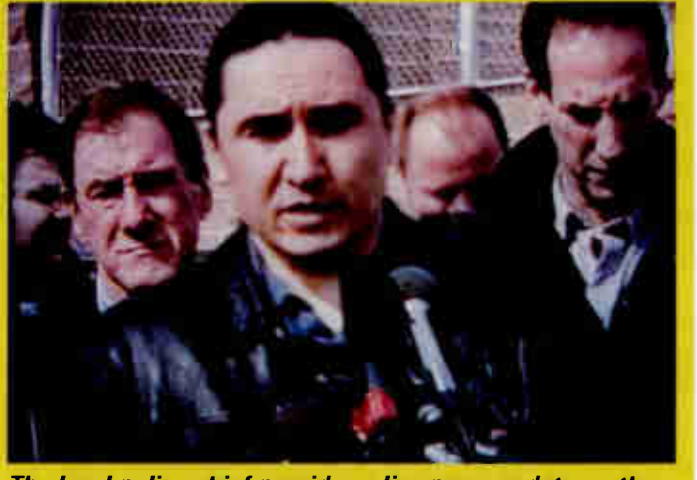


The amplifier refitted in the Black Box cabinet.

Editorial note: Pye produced a number of versions of the Black Box during the late Fifties and early Sixties, including stereo and transistor models.

DX and Satellite Reception

Terrestrial DX and satellite TV reception reports. The next sunspot cycle. Broadcast and satellite TV news. More on wavefront tilt. Roger Bunney reports



The local police chief provides a live press update on the Minnesota school shootings – the regional FBI chief stands behind him on the right-hand side. Reception via Eutelsat W1 (10°E), a UP4 transmission.

April provided little indication that the forthcoming Sporadic E season would be a good one. There have been no reports of a mid-April SpE opening, the usual pointer to an active season to follow. A scanner watch similarly revealed no obvious activity, though there has been an alarming increase in Band I 'noises'. I operate several satellite receivers in addition to those used for domestic entertainment purposes: most of them have a switch-mode power supply, which tends to generate interference at VHF. As I type this at 2000 hours one evening in very late April there are various continuous-carrier buzzes and, from 50·1-50·15MHz, a strange hissing was detected on a N-S path – it cut and pulsated regularly, leaving an RTTY-type noise. The cause was later identified as radiation from the Trust-manufactured keyboard and related mouse of a nearby PC.

Iain Menzies (Aberdeen) reports SpE activity from late March to early April, curiously between 0500-0600 hours in ch. E3. He also mentions short half- to one-minute periods of Band II FM reception from Italy at 87·6MHz during March 28-29. This was via his car radio while driving in Scotland. Peter Schubert (Rainham, Essex) received unidentified SpE signals on the 17th and 23rd, in channels E4 and E3 respectively. The US website www.dxfm.com notes high-MUF for European SpE on the 27th: I presume that this relates to the previous day, but no details of any reception are provided.

The Benelux DX Club (BDXC) is to cease publication of its monthly magazine, going on-line with an electronic e-zine version instead. This is the second DXing club to end publication of a hard-copy bulletin in the last year.

Satellite sightings

The passing of Pope Paul 2, his funeral and subsequently the selection of his replacement, Pope Benedict 16, generated a lot of satellite activity during the first half of April. Many feeds originated from various parts of Pope Paul's home country, Poland, reporting on reaction to the events and open-air masses. Between 1900-1940 hours on April 1st I counted no fewer than ten separate feeds via Eutelsat W2 (16°E), from either Poland or Rome, related to the Pope's passing. Most of these feeds were easy to identify by source, but a new one that appeared on several occasions during this period was 'RTL OFFROAD D220': maybe a German-based RTL sat-uplink vehicle?

A scan across Intelsat 907 (27·5°W) on the 15th revealed two Reuters feeds. Reuters started to encrypt its transatlantic feeds about two years ago. Last year CNNewsource adopted the same policy, depriving most enthusiasts of live breaking news from the States. But, at 11·608GHz H (SR 4,000, FEC 3/4), I found Reuters Television London running a news round-up referred to as 'BREAKING NEWS 15'. There was a further identification, 'REUTERS WNS', within the data structure. The nearby 'REUTERS INS EUROPE' at 11·565GHz H (6.109, 3/4) carried a compilation of various news items during the evening, but this remained encrypted. A check later in the evening at 11·608GHz revealed that Breaking News 15 was now encrypted! It's worth an occasional check, as encryption may not be on all the time.

Perhaps the most dramatic sighting of April was a news-type programme via Atlantic Bird 1 (12·5°W) on evening of the 7th. It ran for at least two and a quarter hours and was a security exercise of some sort. The GlobeCast multiplex at 11·016GHz H (20,145, 3/4) is well-known to UK satellite enthusiasts because of its five very strong channels – often with hot-car racing or PGA golf. This time the channel 2 slot was carrying the caption 'VNN TV': eventually, a 'news' programme started from the US, including items such as the bombing of Waterloo tube station, various US cities hit by germ warfare, mustard gas, WMD, terrorist attacks, water pollution and other disasters, with details of mounting death tolls. Interviews with terrorism experts and phoned-in damage updates were reported on 'VNN LIVE', with a caption across the lower part of the screen 'VNN LIVE EXERCISE', 'for official use only/uk restricted/protected other governments'. The two-hour plus programme described increasing

reports of terrorist damage and the reaction of the authorities in gradually controlling the situation. There's an info website – VNN.COM.

There were other interesting sightings that day in mid-afternoon. One was women's cricket from South Africa via Europe*Star (45°E), a hard-fought match between NZ and SA teams, uplinked by GlobeCast Africa and received at 11·522GHz V (6,109, 3/4).

During an early April evening a satellite truck, not RR SAT, was present at the Wailing Wall, Jerusalem with a female journalist waiting to go live with a couple of reports in Hebrew. The transmissions were via Eutelsat W2 (16°E) at 12·540GHz H (5,632, 3/4). The solitary service identification '0' was curious, and an RSD check for the 'hidden' data identification revealed nothing.

Football fans might like to check W2 on active nights for the game. On the 10th a Real Madrid CF match was transmitted from Madrid in the clear at 11·128GHz H (5,632, 3/4) with the service identification 'ADTV'. There was no commentary but FX, suggesting that it was a generic feed for other European TV stations or subscription sports channels. A dedicated commentary could be carried via ISDN and synchronised with the pictures at the studio.

Alan Richards (Skegness) is fortunate in having clear access to PAS-9 (58°W). He reports a new carrier, TV AZTECA, at 11·556GHz V (SR 3,680, FEC not known). It's a Mexican channel which on Friday evenings carries a talent-show elimination epic for aspiring teenagers. The signals are NTSC, but Alan uses an @sat tuner that includes NTSC-PAL conversion – this makes for easy viewing! Alan also mentions that the Chinese CCTV-4 and CCTV E&F (Spanish and French) channels via PAS-1R (45°W) have ceased, being replaced with a data flow.

The Dakar rally, when performance cars tear across the Sahara, is well known. A lesser one, the 'Rallye des Gazelles' was seen over the April 23/24 weekend. This time the performance cars were in Morocco, digging themselves out of the sand. A VTR playout provided the best of the day's events in the desert. This was via W2 at 12·533GHz H (5,632, 3/4).

On the evening of the 24th there were live pictures from the International Space Station (ISS) as the crew prepared to return to Earth aboard a Russian Soyuz craft. The next US shuttle visit to the ISS was due in mid May, following many months of investigation after the Challenger disaster. NASA-TV provided pictures of the Soyuz departure via Eutelsat W1 (10°E) at 11·081GHz V (5,632, 3/4), duplicated by the European distributor UP4 at 10·972GHz V.

Solar cycle 24

As the present solar cycle, no. 23, slowly comes to an end researchers are having thoughts about the next one, no. 24. Their initial observations do not provide good reading. A very active solar cycle enables low-VHF signals to be propagated over great distances as the MUF (maximum usable frequency) rises. Thus, in past cycles, we have regularly received signals in the UK from the Middle East, North America and down into Africa and Australia – and, just a few times, ch. 1 New Zealand. The new cycle is important for DXing. The average solar cycle lasts for about eleven years, so high MUFs during the next one could be our last opportunity for F2 DX. During the following cycle DTT is likely to have taken over everywhere, with Band I re-engineered for other purposes.

The predictions I've read in two publications suggest that, based on past patterns, the sunspot count could be very low during cycle 24, ranging between 67-83 at the peak. If this happens the count would be the lowest since cycle 14, which started in 1906. Cycle 24 is expected to peak during 2011. These are just predictions of course. Things may turn out differently in practice. I hope so!

Broadcast news

UK: Companies that were interested in exploiting PLT (power line transmission) have suggested that further research is being suspended, the reason given being the growth of broadband communications.

Following the auction of equipment at the Meridian studio centre, Southampton, the complex has been boarded up. Demolition has been delayed however pending a final decision on its future use.

Test pattern from WXIA-TV Atlanta, received via Eutelsat W1.

Finland: YLE is closing down the DAB channels as commercial broadcasters showed little interest in using them. All YLE radio channels plus several non-domestic services were on offer in Southern Finland. YLE will maintain an interest in DAB.

Germany: All Bavarian analogue TV transmitters closed on May 30th, when new digital multiplexes took over at Dillberg, Munchen, Nurnberg and Wendelstein. Interesting that the BR Multiplex 1 service from these sites will use channels D06 and D10 in Band III, with vertical polarisation and 25kW ERP. The other multiplexes are spread across the UHF bands, again with vertical polarisation.

The Netherlands: The man-made REM Island, which is situated offshore from Noordwijk, is for sale and will be removed if there are no buyers. REM became the base for a pirate radio and TV station (TV North Sea on ch. E12) for a short time in the Sixties – until the Dutch Navy boarded REM and destroyed the transmitters.

New Zealand: TVNZ is testing DTT at Auckland, using a 1kW transmitter. Apart from two "problem" locations good-quality reception has been achieved across the region.

Sweden: The first SVT1, SVT2 and TV4 analogue TV transmitter closures will take place later this year. DTT is at present being transmitted in the southern area on chs. D22, D25, D41, D61 and D64.

Korea: KBC launched terrestrial digital multimedia broadcasting (DMB) at Seoul during May. The services will spread to the other main cities later this year and across the country by the end of 2006. DMB will provide 18 audio and six video channels plus about six data services, all FTA.

Satellite news

Motor-sport enthusiasts will be delighted with the Raceworld TV channel that has opened via Astra 1H (19·2°E) at 12·610GHz V and is FTA. It offers big-time, major-circuit racing, such as Daytonna, GrandAm, Le4 Mans and the Sebring circuit, and will

Nelson Mandela acknowledges the cheering crowds at Johannesburg. Reception via Europe*Star (45°E).

run for 24 hours a day.

SES is to replace Astra 1H with a new satellite that will be known as 1M. It will have 32 Ku-band transponders and will also provide backup capacity at this orbital slot. Astra 2C will be moved from 19·2°E to 28·2°E when two further new satellites, 1KR and 1L, enter service at 19·2°E.

Despite excess worldwide satellite capacity Eutelsat is buying two new satellites and is preparing specifications for two more. Chairman and chief executive Giuliano Berretta points out that broadcasters in the developed countries, including the US and the UK, are demanding satellites that can provide high-definition video and interactive services.

A new C-band satellite, AMC-12 (Americom 2), is in orbit at 37·5°W to provide high-power (up to 67W) transmissions between the Americas, Africa and Europe. It has 72 36MHz transponders. SES has leased 33 of them for services to Africa and will call the satellite Astra 4A.

Vintage aerials. A tilted three-element Telerection Band I array and a six-element Band III array still up amongst the chimney pots. See more on wavefront tilt. Photo courtesy Hugh Cocks.

The Worldspace satellite radio service has increased the number of programmes that are encrypted, seeking monthly payments for reception. Irish programming (RTE) has been scrambled against the wishes of RTE itself, which apologised on its website.

BSkyB is to use Tandberg encoding and multiplexing equipment for its MPEG-4 HD-TV transmissions, which are to start in 2006.

In an experimental move the BBC World satellite channel is to provide an "opt-out" localised news service feed to India. If successful, further opt-outs will be provided for other parts of the globe. The feed is carried by the PAS-7/10 satellites at 68·5°E.

China Radio International is to be distributed globally via PanAmSat capacity, using PAS-8 (166°E), PAS-9 (58°W) and PAS-10 (68·5°E).

More on wavefront tilt

In the April column I mentioned components that provided Band I aerials with an upwards tilt, called 'wavefront tilt', for improved reception in fringe areas, and asked whether anyone could provide further information on the subject. A detailed explanation subsequently arrived from Geoff Darby (see Letters, June). In case you missed that, I'll include a brief summary here.

The wavefront tilt effect is caused in part by diffraction at the transmitted wave/ground interface with vertical polarisation. It depends on the signal frequency and the permittivity of the ground over which the signal passes. The difference in dielectric constant between the air and the ground produces an effect called gradient bending, which is similar to light being bent when it passes through a glass lens. It relates to the difference between the radius of curvature of the wavefront and that of the earth. The end result is that energy is absorbed by the ground, and this is turn produces a delay or drag on the lower edges of the wavefront – the wavefront is bent forwards slightly. Increasing air density at lower heights also has an impact in Band I.

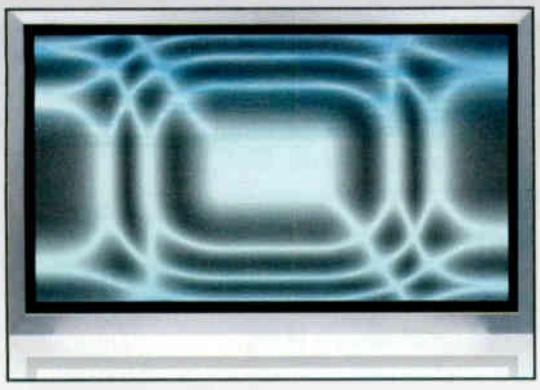
Thus in a fringe area where we are some distance from the transmitter the approaching Band I wavefront will be tilted forwards. To optimise reception, even fractionally, by improving the signal-to-noise ratio the aerial should be tilted upwards slightly. Telerection and Fringevision provided aerial equipment that included this feature. The tilt with Fringevision aerials was set at 6°, but that with Telerection aerials looks more dramatic. Since the effect increases with distance from the transmitter, it appears that Telerection optimised for extreme fringe-area reception.

An upwards tilt can also enhance reception at locations close to the transmitter. I recall problems with reception from the ch. 11 Chillerton Down IW transmitter in the village of Chillerton, some 1km distant. The village is at 33m ASL, the Down is 167m high and the mast itself is about 250m high, so the transmitting array would be some 384m higher than the village. In nearby Ventnor it's common to see vertical group B Yagi arrays pointing 60° upwards for reception from the local relay atop St Boniface Down.

Hugh Cocks has sent me the accompanying photograph that shows a tilted three-element Telerection ch. 2 aerial aimed at North Hessory Tor and a six-element ch. 9 aerial aimed at Stockland Hill. Recently, at Bridport high street, West Dorset, I noticed another tilted three-element Telerection aerial that was aimed at Wenvoe (ch. 5), together with a double-six delta-matched Band III array for Stockland Hill. Wenvoe is the better choice despite the greater land path, since this channel would have suffered far less from Sporadic E interference in mid-summer than ch. 2, which would experience interference from the prime DX channels E2, R1 and IA.

My thanks to Geoff Darby for the detailed explanation he provided.

Vintage Band I and III aerials still survive some twenty years after the last 405-line transmitter closed down. If anyone spots an unusual or ornate surviving aerial that might make an interesting picture in this column I'd be grateful for a photograph.



As an introduction to fault finding with plasma display panels, **Charles Arundel** describes some conditions experienced with Daewoo models

Plasma panel fault conditions

The fault-finding experience we have had so far relates to Daewoo plasma display panels. As an introduction to the subject, here's a summary of some of the problems we've come across and their causes.

Model DSP4210GM (SP110 chassis)

Vertical white line down the screen, just left of centre: This indicates a short-circuit, usually at the data-drive connectors to the screen. The cause was located by observing the position of the line on the screen then making a note of where the top and bottom of the line was in relation to the appropriate connector on the PCB side of the screen.

The actual cause was eventually traced to a metal burr that shorted out two sections of the top centre connector on the Data High PCB. This burr had probably come from one of the back cover screws when it was tightened by an electric screwdriver on the production line, and had fallen through the ventilation grill

Vertical black line down the right-hand side of the screen: This indicates an open-circuit, usually at the data drive connectors to the screen. The cause was located by looking in the area of the top and bottom of the line, towards the relevant Data High or Data Low PCBs. These are in rows along the top and bottom of the plasma display panel, viewed from the rear. The far left Data Low connector was found to be poorly inserted. Reconnection cured the fault.

It's very difficult with these connectors to ensure correct location of the many flexible copper edge pads that loop over from the screen to the Data PCBs. They are referred to as piano-lid edge connectors, because you have to lift up the brown plastic flap to release the flexible connector, then ensure that it's properly seated before closing the lid again.

Flickering pixels in some blue areas of the picture: This was most noticeable when the display consisted of colour bars. The cause was found to be an incorrectly adjusted Vadd (address voltage) from the power module. The correct voltage is written by hand on a paper label that's attached to the back when the screen is set up on the production line.

Note that some pixels may be permanently off when a monochrome RGB colour-bar input is used. They are not necessarily dead, and it may be possible to switch them on by slightly increasing the 166V Vsus (sustain voltage), very slowly, at the power module.

Similarly, while observing the same monochrome RGB colour bars check whether there are any pixels that are on instead of off, e.g. red or green pixels in the blue part of the pattern. If any are seen, readjust the Vscan supply at the power module from –160V towards –150V, and decrease the Vshelf voltage on the X sustain board very slowly to remove incorrect electronic discharge.

Vertical pink line on blue test raster, black line on red raster, green raster OK: To establish these conditions the set had to be put into the service mode. This is done by using the customer remote-control unit, pressing the following buttons in sequence: up, mute, recall, mute. A list then appears. Toggle down to the MISC section then across to TEST pattern, Manual section. You can then select red, green, blue, white and black rasters sequentially by pressing the remote-control unit's volume up button.

Flashing on/off orange-yellow lines down the central area of the screen and black lines across the screen, on a blue background: The orange-yellow lines were caused by the on-screen display (OSD) message, which appears on a blue background when there is no signal input. This message was being spread out vertically over the entire length of the picture. The black lines across the screen provided the clue to the cause of the fault, i.e. a problem in the horizontal-scanning section.

The cause turned out to be a faulty lower left-hand Scan PCB. Resistance checks between the input feed and the earth pads on the reverse side of the board gave a short-circuit reading. It should have read like a diode.

Model DP42SP (SP115 chassis)

Set dead, won't come out of standby, LED stays red: The fault was found to be on the Y Sustain board by removing the plug that provides the feed to this board from the power module. The actual cause of the fault was that one of the hybrid ICs under the black heatsink was short-circuit. Individual components are not available however, so the complete board has to be replaced.

It's important that all voltages on replacement boards are set up with a white raster, in accordance with the readings on the label attached to the rear of the screen. To obtain a white raster, access the service mode by pressing the following buttons on the remote-control unit: up, mute, display, mute. Toggle down to MISC, then across to TST PTRN MA. Select the white raster using the volume up key.

LETTERS

Send letters to "Television", Nexus Media Communications, Media House, Azalea Drive, Swanley, Kent, BR8 8HU or e-mail t.winford@highburybiz.com using subject heading 'Television Letters'.

Please send plain text messages. Do NOT send attachments. Be sure to type your full name, address, postcode, telephone and e-mail address (if any).
Your address and telephone number will not be published but your e-mail address will unless you state otherwise.

WEEE and the 'little man'

It may be a little late but could we, perhaps, get a debate going about the invidious WEEE Directive and how our trade proposes to deal with it? As I see it the 'little man' is likely to end up with most of the TV sets and VCRs that are not worth repair, and the continuation of retail activity for us is likely to depend on our willingness to dispose of end-of-life products. What are other readers doing about this now, and what do they intend to do in future?

For my part, at present I take TV sets and VCRs to my local mobile recycling unit, having first let the CRT down and removed any batteries – though when I told an attendant that I had made the tube safe he told me I shouldn't have done so as I would have released radon gas! Perhaps it would be safer to let customers dump them! Recently I had to sign a transfer document. Am I now to expect a bill? If the cost is to be borne by the trade, my advice to customers might be to find a suitable hedgerow!

I understand that we have been given a few months' grace for the collection/recycling process to be organised. How, I wonder, is this going? Has your local KwikSave or Tesco put in place the collection chain for expired Lloytron/Hinari/Taiwan Electric toasters and microwaves? Am I the only one to recognise that the only way for any of this to work is for local authorities to accept responsibility at no 'up-front' cost, any costs to be covered by the general rate burden? If they don't, they will still have to bear the cost of fly-tipping. Not much chance of this happening, when you consider that there has been a duty to provide battery-collection facilities since a similar directive in 1992!

Trevor Warner Audio Visual, Porthmadog, Gwynedd.

DAB aerials

In the May issue (Letters, page 413) Martin Page queries the use of a directional DAB aerial with a distribution system when the multiplexes are received from different directions. As he suggests, in most cases the best aerial to use is a vertical dipole. But there are exceptions.

The DAB transmission network is far from being complete, and sometimes a must-have multiplex (often the BBC one) is received at much lower strength than one or two of the others. But it's important that the multiplexes are carried in the distribution system with as little difference as possible in their relative levels. In the absence of any other practical way of adjusting their relative strengths, the judicious use of a directional aerial can be very helpful. The fact that the stronger signals will be received completely off-axis doesn't matter as much as you might think, because the DAB error-correction system was designed specifically to deal with severe multipath conditions. The reasons for this are twofold: multipath conditions are a major issue with mobile reception; and DAB uses single-frequency networks, which means that reception of a multiplex might be from two or more transmitters simultaneously. DAB is very good in this respect and I can assure Martin that, given a strong enough signal, a DAB aerial can be swung through 360° with little or no degradation of the digital error rate.

A DAB single dipole aerial fixed to the TV aerial mast. The DAB aerial is the short vertical dipole on the left. In many cases this is the correct DAB aerial for a communal aerial system, a directional aerial being unneccessary. In fact the proximity of the mast will unavoidably give the aerial slight directivity.

With many of the UK DAB transmitters still to be built, field strength is very poor in many areas. In such locations a directional aerial would be used because it has more gain than a dipole. This wouldn't arise at the city locations Martin mentions. Last year however I installed a system for a block of flats in the Derbyshire Dales. I had no DAB reception whatsoever from my van radio but, up on the roof, there was a weedy signal from Holme Moss. A four-element aerial provided a just-adequate signal. Incidentally the trouble with multi-element DAB aerials is that they have to be made to cover all DAB channels, present and future, so they are rather wideband and thus have only mediocre gain. I was well aware of this at Ladyblower and wished I could have used a narrow-band aerial.

Despite the above considerations I suspect that many directional DAB aerials, for both communal and individual use, are installed because of a general feeling that a good aerial should be employed, no thought having been given to the question as to whether the aerial should be directional or not.

When a single dipole (sounds very Fifties, doesn't it?) is used for DAB, it is often mounted on a side arm on the mast, below the TV aerial – see the accompanying photograph. Since DAB transmissions are all vertically polarised the dipole is then no longer omnidirectional, because the mast acts as a reflector. To minimise this effect, mount the dipole well away from the mast. To make use of the reflector effect, mount the dipole a quarter wavelength (half its own overall length) from the mast. In theory the characteristic impedance will then be incorrect, but this doesn't seem to matter.

Bill Wright, Rotherham. wrightsaerials@aol.com

Who invented the AVO?

In the June issue (Letters, page 480) D. Lee asked who invented the AVO 8? The

question is best answered by saying that the Universal Avometer was invented by Donald Macadie. He started off as a Post Office engineer, and was a prolific inventor. Whilst working for the PO he invented the Keysender No. 5, which enabled telephone operators to dial numbers quickly.

The meters started with Model A, a true multimeter with a sensitivity of 500Ω/V. It looked something like the Model 7, with the characteristic 'banana' meter-scale window and two knobs, one for the AC and the other for the DC ranges, also the patented cut-out. Models B and C followed. Model D was produced for the RAF during the World War II. It was like the Model 7 but had different ranges and AM at the top of the scale plate. AVO stands for Amps, Volts and Ohms, and is on the DC-range switch knob of Models up to and including the 7.

The AVO 8 was launched in May 1951. It had black phenolic knurled terminals and offered the then fantastic sensitivity of 20kΩ/V. The AVO 7 had a sensitivity of 1kΩ/V. Various versions of the 8 were introduced, culminating in the Mk 7. The AVO 8 Mk 3 is the best, as it was hand-wired and had the ball-indent switch rings on the underside of the front phenolic panel. The Mk 4 was the first to have a PCB, with the then innovation of having the switch ring contacts as part of the PCB tracks. The Mk 4 was the result of a cost-cutting exercise, and was prone to problems.

The front of the case has always been black phenolic, while the base material can be steel, polypropylene or phenolic. The bases are secured to the front by 6BA instrument screws, with a concealed screw for anti-tamper purposes. With meters that have a phenolic case this is hidden behind a pitch plug with AVO on it. The polypropylene cases have a plastic plug. Thus if the plug is missing you know that someone has been at the meter. AVO repair centres replace them. Other changes have been polypropylene red and black terminal covers on the positive and negative terminals.

A word of warning. If you have an AVO 8 with the switches mounted on the front plate, don't be tempted to take them apart as you'll never get them back together. AVO used a special jig and tool to assemble them.

The meter movements have a basic full-scale deflection at 37·5μA. They have engraved on them a serial number that's linked to the scale plate. Each scale plate is matched to the movement. The scales are silk-screened on to an aluminium back, and there are up to twelve variations with subtle differences in the scale divisions. So, if you swap a damaged scale plate, make sure that the number in the middle at the bottom of the scale is the same.

The scales were drawn on a metal-card sandwich at something like 100:1. The movement arc was constructed by geometry and then divided into a hundred equal divisions. To ensure calibration accuracy, a figure for each scale division was calculated on a base of 100. For example 10 might be 10·5 equal divisions. The scale was drawn in Indian ink and the scale numbers were put on in Lettraset. The final job was then photo-reduced and silk-screened.

If you come across an Electronic Avometer Model EA113, check the resistance scale divisions at the top end. Early versions had a division marker missing. I made the mistake! This was corrected, and later production versions are OK.

AVO kept a list that links the movement to the serial number and to the meter's purchaser. Whether this is still done I don't know.

Finally if you want to know how old the meter is, look at the serial number: the last figures are the month and year of manufacture.

The best looking AVOs are Models 14, 15 and 16. They are nicely styled with a single range switch, the cutout in the middle of the knob and a thermoplastic case. I think they were nearly all exported. If you come across one, buy it.

Conrad Edel.
conrad.edel@onetel.net

P&P costs

Robert Philpot's complaint about P&P charges (letters, May) is an old potato, one that we addressed on our FAQ website page a long time ago. It costs us £2 to 'raise an invoice', 20-50p for a Jiffy bag and 28p for a first-class stamp. So our minimum charge of £2.50 is actually very reasonable. On a small order we could even make a loss! Most other companies charge more.

A small company will not have a postal collection, which means that somebody has to drive to the nearest Post Office (often a round trip of several miles, thanks to closures) and queue. This could be repeated up to three times a day when a lot of small orders are handled. The cost of short-distance travel with a cold engine should not be underestimated.

But the real test is this: how much would it cost you to travel to the nearest supplier to buy the item? Could you do so for less than £2.50? If not, you are saving money by ordering from us!

Martin Pickering,
SatCure.

Dropper capacitor

I well remember an engineer I employed back in the Sixties puzzling over a 16in. portable Ferguson TV set with an alleged fault. It was a newish set and he was puzzled because, although a raster appeared, there was a delay of about thirty seconds before the picture and sound came through. I was amused, as I had read the unusual specification of the set (960 chassis) a few months earlier – it had surprised me.

The designer of the chassis had adopted two unusual features. He had decided to use a 4·33μF capacitor instead of the usual mains dropper and, instead of a smoothing choke, had wired the heaters of four of the valves separately in the negative side of the HT supply. So the set didn't became operational until current flowed through these heaters. It was very confusing for the average customer – and for an engineer who had not come across such unorthodox practices before. Poor Jim spent a lot of time investigating a non-existent fault!

The system seemed to work well enough, but was abandoned in later versions of the chassis.

Philip H. Bearman,
New Barnet, Herts.

HELP WANTED HELP WANTED HELP WANTED HELP WANTED

Wanted: Three mains filter coils, L4009 part no. 152.27027, for Philips G11 restoration projects. New if possible. Also a TBA560Q IC or luminance/chrominance control unit U6200, part no. 212.27384. Phone Ron Dimmock on 0151 487 5113 (Liverpool).

Wanted: A Sharp IR2E18 IC or a panel containing one. Also I have a Medion LCD unit that's displaying inverted colours, i.e. as in a colour photo negative. Is this a fault, or can the mode be changed by front-panel buttons? Any help appreciated and all costs met. Phone Victor Holbrook on 01332 768 122 or email hol814@aol.com

Wanted: Quad 33, 34 or 44 preamplifiers, 405 power amplifiers and FM3 tuners for spares. Also boards and modules for these. Contact Mike on 01758 613 790.

For disposal: Hameg 20MHz double-beam oscilloscope Model HM203-4 with two probes and manual; Thandar frequency-counter meter Model PFM200A (battery-operated); Intracept colour-bar generator Model N7128 (mains bench type). Offers for all three. Phone Paul on 01824 705 810 after 6 p.m.

Wanted: Old half-inch diameter ferrite rods. Must be six inches or more long. Will pay very good money for them. Peter Tankard, 16A Birkendale Road, Sheffield, S6 3NL. Phone 0114 231 6321.

For disposal: Many copies of *Television*, read but in exceptional condition, as follows: 1975 July-Dec; 1976/7 all issues except April, Aug, Sept; 1978 Jan-May, July, Aug, Oct; 1979 July; 1980 Feb, March, June; 1981 Jan, Feb, April, July, Sept-Dec; 1982 Jan, March-May; 1983 all issues; 1984 Jan, Feb, April-July, Oct; 1985 all issues except March, Oct; 1986 all issues; 1987 March, July-Oct; 1990 all issues; 1991 Feb, April, June, July; 1995/6/7/8/9 all issues; 2000 Oct-Dec. Email hiyamikey@aol.com

Mediacast 2005 show

High-definition, mobile and multi-room TV were amongst the highlights of the recent Mediacast show at Olympia.

Peter Brough reports on the developments presented there

This year's Mediacast show, formerly known as the Cable & Wireless Show, was held at Olympia in mid-May. I'd not been to the show for a couple of years and was surprised to find how much things have changed. The days when the aisles were packed with hardware – dishes, receivers, decoders and so on – have gone, and many big names such as Pace and Eutelsat were missing. But a number of interesting developments were being demonstrated on stands around the hall.

HDTV

It was no surprise to find that HDTV was the main feature of this year's show. Broadcasters, content providers and consumer electronics manufacturers all have high hopes of HDTV, and the technology's profile has been raised by the fact that BSkyB plans to launch an HDTV service next year.

A large plasma screen was being used to demonstrate HDTV at the Astra Marketing stand. The company already has a 24-hour HDTV demonstration channel at 19·2°E and in January 2004 Europe's first full-time HDTV broadcaster, Euro 1080, started to transmit its HD1 channel from this satellite slot. A new pay-per-view channel, HD2, is to be launched this November and a new demonstration channel, HD5, will be launched later this year. In addition to BSkyB several other satellite broadcasters are to start transmitting HDTV services via Astra. The German broadcaster Premiere is to launch three channels devoted to films, documentaries and sport in November. Subscribers will be able to upgrade to a new MPEG-4 set-top box. French broadcaster Canal+ is expected to start an HD version of its premium channel in October, and further services are planned for next year. Another French broadcaster, TPS, is to launch a version of its Star Movies and sport channel in the autumn.

The Digital Television Group (DTG) was busily promoting HDTV and HD content. DTG was collaborating with a number of firms and organisations including Astra, BBC R&D, Dolby, Euro 1080, ITV, Pioneer, Sharp, Sony, ST Microelectronics and Tandberg. The DTG stand included a small demonstration area that was set out like a domestic lounge and contained a Sony flat-screen set and a digital TV decoder made by Eldon Technology. The latter is marketed as a low-cost MPEG-4/H.264 HDTV receiver that's backwards

compatible with MPEG-2. It was originally designed for the US market, but has been reconfigured with a UK terrestrial COFDM tuner. The specification includes 16MB of flash memory; 128MB of RAM; HDMI, RF, Ethernet and USB 2.0 connectors; and a nominal power consumption of 43W.

One of the most interesting things shown on the DTG stand was the ability to transmit HDTV via a DTT network. The limited DTT bandwidth might appear to rule this out, but the BBC demonstrated a way of getting round the problem. A digital HDTV signal was transmitted from a server, which included a coder and multiplexer, on the Tandberg stand. Material from ITV, Euro 1080 and the BBC was coded and multiplexed. The data stream in fact carried three channels: two standard-definition MPEG-2 channels and a third MPEG-2 channel that provided a slow download of HDTV material – more on this below. Incidentally the plan had been to use MPEG-4 encoding for this third channel, but an encoder wasn't available in time. The signal was picked up by an aerial on the DTG stand and fed to DTT decoders dotted around the stand.

The BBC had its own area on the DTG stand, where more information on how HDTV could be delivered via DTT was provided. The process relies on something known as 'opportunist data', that is delivering large amounts of data to a digital receiver or recorder during quiet periods of the day. It works by downloading an HDTV programme overnight to a personal video recorder (PVR), at a data rate of 1-2Mbits/sec. When the programme is broadcast in standard-definition form a signal is included to trigger the PVR so that viewers can watch the HDTV version. The BBC was showing clips of *Planet Earth* and *Last Night at the Proms*. There remain technical and rights-management issues to be resolved before the system could be brought into use. But the BBC stressed that DTT should not to be seen as inferior to other methods of broadcasting in terms of quantity and quality. Several people I spoke to on the DTG stand felt that HDTV via DTT could arrive sooner than many seem to think.

ST's STi7710 set-top box was on display at the DTG stand. It is a substantial device that's designed as a low-cost HDTV decoder. Another interesting STB was the Source 1000, which is intended for retailers who want to demonstrate HDTV to their customers. It was developed by Euro Electronics of Cambridge and the Chinese company E-world, and handles various formats – 1,080i, 720p, 576p, 480i and 480p. There are six digital outputs, for multiple displays, and a 40GB hard drive. The latter stores HD content that's supplied with the STB. Retailers can edit the content and even customise it by adding their own.

The Source 1000 set top box, which is designed for electrical retailers wishing to demonstrate HDTV to their customers.

There was also a Sony Blu-ray recorder on the stand.

NDS

NDS is best known for its data-encryption technology, which is used by broadcasters around the world including BSkyB. The company was demonstrating a digital rights management system intended for mobile phones. There are signs that mobile-phone users will be watching video clips and even live programmes via their handsets. In the UK Orange has already launched a streaming video service called Orange TV, and NTL Broadcast is to launch a pilot mobile TV service this autumn.

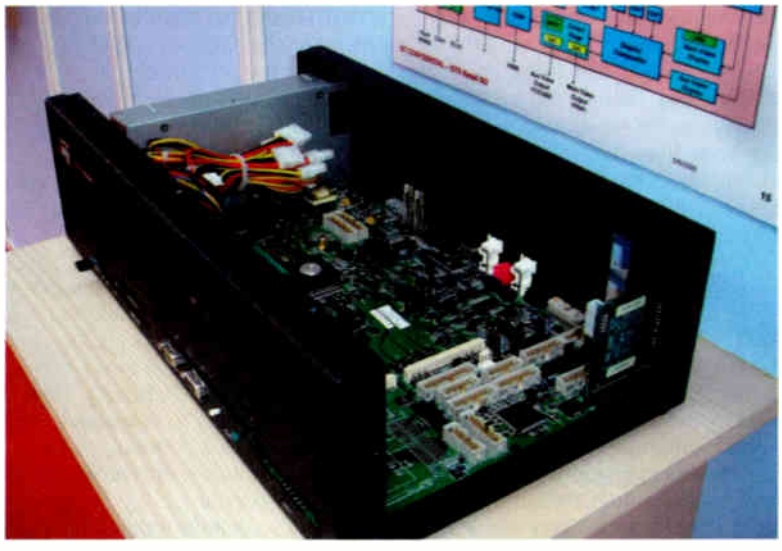
There are two standards for mobile TV, one developed by the Digital Video Broadcasting project (DVB-H) and the other by the Open Mobile Alliance (OMA). NDS says that its Mobile Videoguard system caters for both standards. The idea behind Mobile Videoguard is that the network operator or the service provider can create a business model to charge for audio and video content via mobile phones.

NDS is behind the XTV interactive TV software used by Sky+, and says that there are plans to extend the specification to include a system known as PVR2GO. This enables PVR users to download recordings on to a portable media player – a hard-disk device that's growing in popularity.

NDS also demonstrated a prototype home network that's based on a server. As many people live in multi-TV homes, NDS feels that viewers would appreciate a system which enables them to watch what they want, when they want, where they want. The demonstration showed how someone watching a programme in one room could go

A prototype home network based on a server PC was shown on the NDS stand.

Prima's DM801 module can convert a PC or laptop into a DVB-T receiver.



ST's STi7710 low-cost HDTV decoder.

to a TV set elsewhere and pick up the same programme. The home server can send four different video streams to four different sets simultaneously. Various issues have to be decided before such a system could be introduced however, such as how a pay-TV contract could be structured. It's nevertheless an interesting pointer to the future.

Other developments

IPTV (Internet Protocol TV) was one of the buzzwords at this year's Mediacast. It enables highly-compressed TV and video content to be sent to the home via a broadband connection. Telecoms operators are interested in the technology and many European telcos are now testing it.

Vestel's 50in. plasma IDTV set.

Although Mediacast is no longer packed with hardware there was still some to be seen. Wonik Telecom's TPT5920 is a DTT personal video recorder with twin tuners – the SPT5920CI is a satellite version.

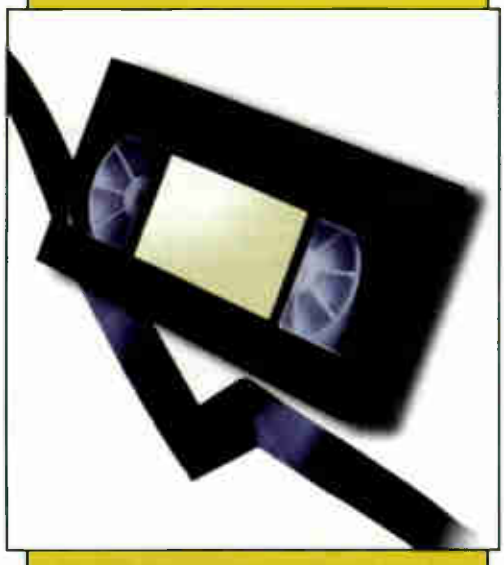
Chinese company Prima was promoting LCD and plasma IDTV sets with screen sizes from 27-37in. for LCD and 42/50in. for plasma. The company also has three DVB-T set-top boxes in its range, Models DM516, DM518 and DST9610A. But its most interesting product was Model DM801, a module that can convert a PC or laptop into a DVB-T receiver. It uses a USB 2.0 connection and runs with PCs that have Windows 2000 or XP installed. The PC doesn't have to be that powerful – one with a CPU which runs at 500MHz or more and has at least 128MB of RAM can be used, though the more powerful the PC the better the performance.

Model DM501 is a mobile 'set-top box' designed as an in-car receiver. It has a DIN connector and is fully DVB-T compliant. Both picture formats (4:3, 16:9) are supported and the unit's connections include an RF terminal, three AV output sockets, one video-input socket, an RS232 port and an optional scart socket.

Prima's other offering was a portable DVB-T unit which has a 2·2in. OLED display and a high-capacity, one-inch hard disk for recording and storing programmes. Compatible formats include MPEG-4, Windows Media 9 and AVI. It can be connected to a PC via a USB 2.0 connection for downloading audio, video and image files, and includes a JPEG viewer and a digital audio player that's compatible with MP3 and WMA data.

Turkish manufacturer Vestel, which supplies chassis on an OEM basis to most of the biggest names in the CE industry including Sharp, Sony, Panasonic, Hitachi, JVC and Toshiba, also Alba, Goodmans and Dixons, showed a new range of very compact DTT set-top boxes. The company has a range of LCD and plasma IDTV sets with LCD screen sizes from 17 to 37in. and plasma screens up to 50in.

SVP (Secure Video Processor), an alliance of media and technology companies, was promoting its content protection technology which makes it possible to add digital rights management to a standard processor chip and embed it in CE products such as IDTV sets, set-top boxes, PVRs and mobile phones.



VCR CLINIC

Reports from
Eugene Trundle
Martin McCluskey
Michael Maurice
and
John Tennant

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Reports can be sent by post to:

Television Magazine Fault Reports,
Nexus Media Communications,
Media House,
Azalea Drive, Swanley, Kent BR8 8HU

or e-mailed to:
t.winford@highburybiz.com

Samsung SV615B

Now that these machine have begun to show their age we've had several cases of broken reel-drive belts. The effect, of course, is a large loop of tape trapped in the machine when a cassette is ejected. **E.T.**

Panasonic NVFJ710 (Z mechanism)

A cassette would go into this machine but then be ejected, without descending on to the deck, as if the front flap didn't open. In fact the cassette was hitting the top of the back-tension feeler pole, which was badly twisted for some reason. It is item 44, part no. VXL2798, and is better replaced than bent back. **E.T.**

Philips VR685 (Turbo deck)

The customer's complaint was that this machine didn't work properly with E240 cassettes, though it was OK with E180 ones. I found that the tape was creasing as it went around the pinch roller, but only at the start of a cassette. A new pinch-roller assembly cured the problem. The need to replace the pinch-roller assembly is becoming common with Turbo decks. **M.McC.**

Akai VSG735EK

This machine would play back prerecorded tapes OK but with its own recordings the picture would occasionally mute to a green screen, with loss of sound and tape counter operation. A replacement audio/control head cured the problem. When aligning the new head, be sure to switch off the machine's hi-fi sound track and set up the head with a normal linear sound track. **M.McC.**

Toshiba V711B

This elderly up-market machine was 'dead' with no display or functions. The power supply is based on an STK791 chopper chip. Once a replacement had been fitted I was rewarded with excellent pictures and sound. **M.McC.**

Aiwa HVGX350K

If one of these machines works but the display is out, replace CP25 (100μF, 10V) which is inside the power-supply can. This VCR is identical to some **GoldStar** models. **M.McC.**

Toshiba V229B

When this machine had been taken into one of the larger stores' 'repair shop' the owner was told that "the heads have gone and it wouldn't be worth repair". So she bought a new one and asked me to set it up. She also showed me the fault symptom with the Toshiba machine: the picture was covered with 'comet tails'. It took me five minutes to remove the top cover, then the front, and remove the deck to clean and retension the copper spring that earths the mechanism. When I had reassembled the machine I showed the customer that the comets had vanished! **M.M.**

Sony SLVSE700G

Tapes would be snarled up badly, but only during rewind search. The cause was that the piece of plastic, on the take-up soft brake, that holds the spring had broken. As a result the soft brake wasn't in contact with the take-up spool. A new brake arm cleared the fault. **M.M.**

Panasonic NVFJ620B

When I got a call from this particular customer I expected to be in the house for no more than three minutes, because all she ever calls me out for is when she presses the timer button and then wonders why the machine won't switch on! She has done that a few times, once even phoning me at 5.30 a.m. on a Sunday morning! But this time it was different – the machine actually had a fault! Some of the teeth on the take-up loading arm gear had broken.

A replacement got the machine going again and put me back half an hour. That'll teach me not to make assumptions! **M.M.**

Sony SLV373

The problem with this 'golden oldie' was that the capstan motor's bearing was shot. As a result the rotor was scraping the stator coils, producing wow. In times gone by you could buy the bearing assembly only from Sony, but this is no longer stocked. So I quoted for a new capstan motor and pinch roller, and this was accepted.

You might ask why the customer was prepared to have the machine repaired when a new one would have been a cheaper option. The answer is that the customer could use this one. A new one she had tried wasn't so user-friendly. **M.M.**

Sanyo VHR289

This machine was dead with no output from the power supply. After dismantling the unit to gain access to the underside of the PCB I found that the main smoothing capacitor C5010 (47μF, 400V) had retained its charge despite the machine having been unplugged for some considerable time. This usually suggests starting problems in the PSU. High-value resistors are often the culprits, and sure enough R5003 (560kΩ) was open-circuit. Along with R5002 (560kΩ) it provides a start-up feed to the chopper IC. To be on the safe side I replaced both resistors. This brought the machine back to life. **J.T.**

AUDIO FAULTS

Reports from
Geoff Darby
Dave Kerrod
Philip Rosbottom
Chris Hawkins and
Chris Bowers

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JVC XL-EX70

This CD 3-player is part of the CA-EX70 system but can be run standalone. It stacks the discs one above the other, in a drawer, with each on its own tray. Although the mechanism went through all the actions, no disc was actually conveyed to the rear of the changer, where the deck and disc-clamp arrangement are located.

Each tray has a slot with a pin moulded in it, at the rear right corner. A plastic finger should engage with the slot and locate behind the pin to 'drag' the tray, complete with disc, to the playing position. The tray that's selected is decided by the deck position. The mechanism locates this at three different heights, for the three individual trays.

The simple cause of the problem was that the plastic finger had sheared off its carrier, presumably because of ham-fisted operation by the user. The item is referred to as 'hook', part no. VKS3767-001. It's item 10 in the exploded view in the manual and is an easy clip fit on to item 11, the 'hook slider'. To get at it to fit a replacement, it's necessary to remove the unit's front panel, which is secured by three screws underneath, then the top cover of the changer (item 52). To improve access I also removed the disc clamp (one screw) and item 50 'tray guide right' (one screw).

On the right-hand side of the deck there's a rolling gear that engages with a rack moulded in the underside of the changer cover. This is the mechanism that works the drop-down flap at the front of the CD drawer. If you leave out the two screws at the right-hand side of the changer cover when reassembling, this side can be lifted slightly, disengaging the gear from the rack. If power is now applied and one of the 'open' buttons is pressed, the gear can be located correctly in the rack, ensuring that the flap is properly down as the drawer comes out. The remaining two screws can then be refitted.

Finally, make sure that you have found and removed the broken finger. In this machine it had worked its way into the deck up/down mechanism. All was well until disc three was requested, when the deck refused to go quite all the way up. Fortunately I was able to remove the plastic remnant with tweezers, so I didn't have to strip it all down again . . . **G.D.**

Teac AV-H500

The owner's complaint about this AV amplifier was that the right channel didn't work. When I tried with speakers the channel's output was very low and distorted, but was fine when headphones were tried. I was quickly able to establish that the fault was not in the final amplifier stages, so that left a problem somewhere between the headphone take-off point and the power amplifier's driver stage. At this point I was not able to reach any further conclusions, so the unit was put to one side to await the outcome of the lengthy process of obtaining a service manual.

When this finally arrived, some weeks later, I found that the headphones are fed from their own buffer amplifier, IC34, which is in turn fed from the output of the right channel's pre-driver buffer. Between this point and Q502, the first transistor in the power amplifier stage, there's an electrolytic coupling capacitor, C502, that was a likely suspect. It didn't leap out at me when I had a quick hunt around the area on the main PCB, so I turned to the layout diagram. I soon located the capacitor, which is not far from where I had been looking, but when I returned to the board I couldn't see it – because it's inside a fully closed-in square-section heatsink. The front 'open' end is closed off by a fan while the rear one butts up against the back panel.

After spending some time removing the entire front panel I was able to get at the four screws that secure the fan to the heatsink. There are two more that go down into the PCB. Once the fan had been removed I was able to see that the heatsink is not just an empty tube but has many thin aluminium fins inside. Most of the power amplifier circuitry is ranged immediately under the lowest of these. This includes many small electrolytics that virtually touch the fins. To carry out any further checks the PCB had to come out, which involves removal of a further four screws and the rear panel.

Once the connections to C502 had been located I carried out an ESR check and obtained an open-circuit reading. While I had the meter in my hand I decided to check the other electrolytics in the area – coupling capacitors C501 for the left channel, C551 for the centre channel and C552 for the rear surround channels. They are all 2·2μF capacitors rated at 50V. The lowest ESR reading I obtained from any of them was 17Ω. Very close to these capacitors there are four 47μF, 25V capacitors, one for each of the four channels. These are connected directly across zener diodes that produce +15V supplies for the early power amplifier stages. The capacitor reference numbers are C505 (left), C506 (right), C555 (centre) and C556 (surround channels). All were open-circuit.

Some might consider the next part of the repair to have been a bodge, but I make no apology for the way I proceeded. To get to

these capacitors directly would have involved removing the heatsink, either by unscrewing all the devices attached to it (twelve of them) or by unsoldering them all. Instead, after unsoldering the legs of the eight capacitors I pushed them out of the board and shook them out on to the bench. I then fitted replacements on the print side of the board – there is plenty of clearance between the board and the chassis base pan. I reckon that this saved me at least another half an hour. I also think that the capacitors are likely to last longer in this position, as they no longer almost touch a heat source.

It wasn't exactly safe to try the unit in its dismantled state, so I put it back together loosely then applied power. This time its right main channel produced a good output. After confirming that the other channels were also working correctly, I finished by reassembling the unit properly. It was then given an extended soak test. **G.D.**

Technics SL1210 Mk 2

This high-end phono deck, with a direct-drive turntable, would run steadily with accurate speed control for only about five minutes. After that the speed would start to pulse up and down – this could be clearly seen by observing the speed-strobe spots on the periphery of the turntable. Over the next two minutes the symptom would become worse and worse, with the strobe system's illumination LED starting to pulse. This would end with the turntable coming to a basic stop, followed by a regular 'rocking' backwards and forwards by a few degrees.

As the fault appeared to have a distinct warm-up period, freezer spray seemed to be the best diagnostic tool to use initially. Its use proved to be a good move. I was quickly able to establish that just two drops of freezer on the top of the AN6680 control chip IC201 restored normal operation. A replacement IC completed the repair.

You may wonder whether repair of a record turntable is worth it nowadays. But this model is the DJing fraternity's standard player. If you need to be convinced about this, just search eBay and see how much the deck fetches.

You will quite often see them with a broken tone arm. Don't be put off by this. Replacement is quite quick and straightforward if you don't make work for yourself by trying to remove the entire assembly from the deck. It comes as a complete unit, but the tone arm and one of its gimbal mounts can easily be removed and transplanted on to the other gimbal, which can be left attached to the deck. It's also very reasonably priced. **G.D.**

Technics SCDV250

All that this unit did was to trip to standby and produce a buzzing noise. Checks showed that the RSN311W64B-P output IC had failed. **D.K.**

Panasonic SAXR45

The sound output from this amplifier went very low intermittently. Use of freezer proved that IC751 and IC752 in the DC-DC converter were faulty. **D.K.**

Hitachi D2200M

This audio tape deck (see photo below) wouldn't do anything. On inspection I found that the belt which drives the left-hand capstan and the head mechanism was stretched. The front panel has to be removed to get the mechanism out – be careful with the switch actuators. When the direct-drive assembly (right-hand capstan) was removed two small bushes dropped out (the shaft runs in at the front and rear). The front one had been turning in its sleeve. Gluing back in position was all that was required.

This was top-of-the-range in 1983, and could be the only Hitachi equipment to be awarded a best buy in *HiFi Choice*. The record/playback head is mirror finished and produces excellent-quality recordings.

There are two AA batteries that store in memory the ATRS settings for tape calibration. The contacts were corroded – the front LED was flashing, which indicates no battery present. **P.R.**

Kenwood DP1060

This hi-fi CD deck had the annoying habit of stalling after about two minutes and returning to zero. I cleaned the laser assembly drive gears and lubricated the sled rails, but it still came to a halt half way through the first track. It took me a time to realise what was wrong but, with the help of a magnifying glass, I discovered that the plastic pinion on the drive motor axle was split. Under load the teeth were separating and meshing badly with the next drive gear. This one had eleven teeth – most decks seem to use a twelve-tooth version. I'll be on the lookout for this type of problem with DVD players as well. **C.H.**

Sony CFD-S37L

Intermittent failure to switch on was the problem with this portable unit. Checks inside showed that there was a poor connection between the AC jack socket J901 and the power PCB. The solution was to resolder the socket. **C.B.**

Sony HST-700W

This old stereo deck produced no sound from the left-hand speaker. Checks inside with a multimeter set to continuity and a pair of headphones soon revealed a faulty stereo headphone socket, reference no. J701, part no. 1-507-825-00. A replacement restored normal left-hand speaker output. **C.B.**

The Hitachi D2200M audio tape deck.

Adrian Gardiner on essential diagnostic equipment for the workshop – and the advent and evolution of the mobile phone

Bench Notes

Last month we looked at soldering practices and the tools required for the purpose in today's busy workshops. I'll continue this month with a look at some of the other workshop equipment required. In no particular order, the most important items are a multimeter, an oscilloscope, a colour-bar generator, a DTT signal-strength meter, a PC and a magnifier lamp.

Multimeters

A huge choice of multimeters is available and there's not a great deal to choose between any of them. Digital is obviously the norm but, given how cheap they are, an analogue meter is worth having around as well. Analogue meters are better for some tests, such as showing up marginal transistors.

When it comes to your everyday digital meter, the only practical advice is to select one with which you are happy. Personally I prefer an auto-ranging multimeter, but other engineers I know prefer to have the control of selecting their own range. Do select a model with a high input impedance, as modern digital circuitry is often sensitive to being probed by test equipment.

A feature that I've found very useful on occasions is the ability to monitor a test point and record any change. This can be invaluable when checking for the cause of intermittent faults in power supplies.

Oscilloscopes

Modern consumer equipment imposes higher demands than yesterday's analogue circuitry. The good old 20MHz dual-channel oscilloscope is still suitable for most everyday fault-finding, but a far more powerful instrument is required when investigating the complex digital processing systems that are taking over more and more functions. To cope with such demands the modern TV workshop really requires as a minimum a 100MHz digital storage oscilloscope. This will become more and more important as plasma and LCD TVs become your everyday repairs.

If your budget doesn't stretch to a new one, there are plenty of good second-hand ones around. When your business employs more than one engineer you probably need only one high-end oscilloscope, with each workbench having its own standard 20MHz model for everyday use.

Colour-bar generator

This item is still necessary for setting up display geometry. In fact mine seems to be used more and more these days with the large number of EEPROM crashes that occur in modern cheap imports. Although not essential, it's nice to have a model that can provide a proper widescreen pattern. But you don't need to spend a fortune, and kits for building your own are available at less than £100. The D-GEN pattern generator was reviewed in a previous issue (February 2004): we have one and it works very well.

DTT signal-strength meter

As more people install Freeview STBs and the analogue transmissions start to be switched off this item will become increasingly important. Right now it's probably more relevant for aerial installers. Most current Freeview equipment consists of cheap, throwaway boxes. But digital tuners are now being integrated into higher-end TV sets and, over the next couple of years, they will replace their analogue counterparts.

With so many digital TV faults being obscure ones – picture freezing, digital box crashing etc. – a signal meter is becoming essential in order to establish whether the set or the aerial system is the cause. Invest in a model that not only indicates the signal strength of the various multiplexes but also indicates reception quality and the bit error rate.

PC

In my experience you could make a good case for not having a PC in the workshop. The constant crashing, reinstalling, viruses and spyware attacks are enough to drive you mad! That aside however, the PC is an increasingly valuable item. Internet access is required for technical support and spares ordering, and most service manuals are now in electronic form. There are other PC tools however, including computer versions of equipment already mentioned. But I find that one of the biggest uses is for reading and writing EEPROMS with an I^2C interface. We now routinely store known good copies of EEPROMs in our workshop PC. It saves hours in eliminating EEPROM crashes as a cause of faults and for setting them up. If you don't already have this facility, I highly recommend that you add it without delay.

Magnifier lamp

What can I say about this item?! You need one. That's about it!

Others

The above are the real essentials for everyday diagnosis and repair. But there are obviously many other useful, time-saving devices and gadgets. No doubt you all have a favourite labour-saving item, and there would probably be too many to list here. The following three items are worth a quick note however.

Engineers often mention the ESR meter in these pages, for checking the effective series resistance of electrolytic capacitors. This is particularly significant with switch-mode power supplies, and can save lots of time in tracking down the offending component.

An *LCR* meter is useful for checking the actual values of capacitors and inductors.

When you are unsure whether the line output transformer is the cause of a problem, substitution is often the best way to eliminate it from your enquiries. Given the price of LOPTs however you would probably need to order one, which costs time and money if you turn out to be wrong. A LOPT tester is very useful in such circumstances, providing a fairly accurate indication of the suspect LOPT's condition.

The selection of equipment mentioned above may seem fairly obvious, but the intention of this series is to cast light on what is often regarded as a dismal trade. In reality there is still good business to be done in running a consumer-electronics repair workshop. And, although modern equipment has become more complex, the tools and equipment required to repair it are still relatively straightforward.

A brand new business could equip itself with the above equipment for about £2,000. But remember, as I stated last month, that your soldering equipment is probably the most important of all your purchases. After all, what's the point of having diagnostic capability if you don't have the equipment for efficient repair!

Now here's something else to think about.

Mobile phones

Fifteen years ago I owned my own small repair shop in a market town. One day a rep called and plonked a substantial suitcase-sized item on the counter. A large rubber aerial protruded at the top and a telephone handset rested at one side, connected by a flexible coiled cable. "This is the future" boomed the rep, "get involved now and you will make millions." He then picked up the handset and pressed the buttons beneath in an attempt to make a call. After three failed attempts he pronounced that there was no signal and that we must be in a rural backwater! "I have a special offer this month" he continued, "yours for only £690! How many do you want?"

I was amazed that he might think I would want a quantity of his suitcase contraptions. "Can't see it catching on" I replied. What a mistake! Two years later my shop had become a victim of the late Eighties recession, while the nearby shop that had dared to stock the suitcase man's newfangled product was growing fast. Fifteen years on and the rival small shop has grown into a fifteen-branch, multi-million pound company.

Last year 680 million mobile-phone handsets were sold worldwide, the biggest-selling consumer-electronics product ever. Why is mobile communication so successful? There's far more to it than the convenience of having a portable telephone.

Early cellular telephones were large, cumbersome affairs, powered by heavy, bulky batteries. The separate handset made them look like a portable phone box, while the rubber-duck aerial gave them a military appearance. Sales were small, the phones mainly appealing to techno geeks. Network coverage was patchy to say the least, so the main use of the phones was often for weight-lifting! But the manufacturers persevered, coming up with new, innovative variants that got smaller and smaller. The whole product was soon contained in the handset. Meanwhile the two companies that were providing the radio service for the new technology were working hard to build further networks to build up national coverage.

Techno geeks subsequently gave way to yuppies as the main users The yuppies considered the mobile phone to be a 'statement' as well as a useful communication device. It meant that you were with-it, and always available to talk to your customers or clients. In reality however communication was still very patchy, being confined not just to cities but also to outdoor use. Calls were of low quality and frequently dropped.

The network providers, of which there were now four, continued to work hard to extend coverage, and battled with one another for customers. Slowly the general public began to buy into the technology, as a convenience and emergency service.

Going digital

Then a very important improvement came along: the analogue networks were replaced by a new digital service, which initially ran alongside the analogue service. The new digital technology brought with it a huge improvement in call clarity and reliability. The network providers were quick to upgrade their systems to achieve much wider coverage, and a new breed of digital mobiles appeared in the high street. Smaller and more stylish than their predecessors, they started to be seen as a must-have accessory. Battery life improved dramatically, so that handsets would run for a couple of days between charges. And the networks produced new, more attractive packages that made the system more affordable. Significantly, they subsidised the cost of the handset heavily when you signed a contract.

PAYG

The most important development of all then came along: Pay As You Go. PAYG removed the need for a contract and the monthly commitment than went with it. You could now buy a phone like any other consumer product and simply pay for the calls as you made them. Your 'account' could be topped up at any time by buying a voucher and entering a code. At the same time another generation of handsets came along, packed with new features. The digital services had started to offer far more than just phone calls. SMS (short message service) text had arrived, with users able to send and receive messages that could be read on the phone's LCD screen. Text could be sent for a fixed cost, making communication even more affordable. And information services started to appear, providing regular updates via your chosen system – news headlines for example.

The advent of PAYG brought an explosion in ownership. New businesses sprang up to cater for the demand, and mobile phone shops started to appear in every high street. Removal of the legal contract meant that age restriction was no longer a problem. This was reinforced by the fact that you couldn't run up large monthly bills without being aware of it. A whole new market opened up as children became the latest mobile customers.

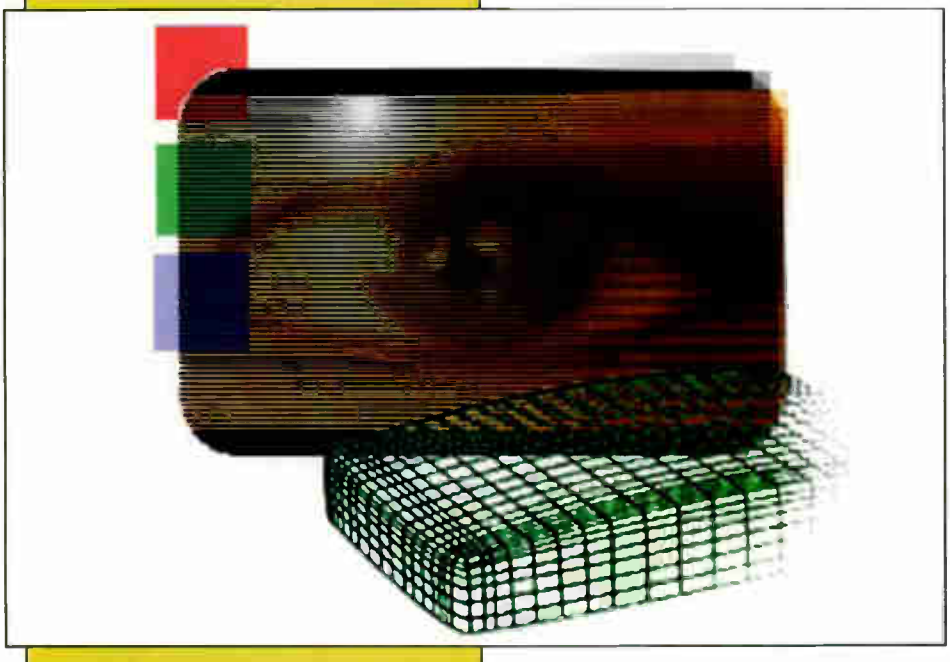
Gadget factor

It could so easily have ended there. The market would have enjoyed a buoyant time in supplying handsets, but many of them would have probably ended up as discarded toys in the bottom of a drawer. The significant factor that has kept the market alive is the 'gadget factor'.

Humans, especially the young, have always showed off. For the majority, this is subconscious. Generations of children have showed off their latest possessions. As they grow up they start to show off their cloths, jewellery, choice of music and stereo systems etc. This later becomes cars, as older teenagers drive up and down the high street showing off their spoilers, body kits and portable night clubs!

The mobile phone has become the ultimate fashion statement and gadget to show off. The market has cleverly exploited people's desire to make their own unique statement, with handphones becoming totally customisable. Snap-on covers enable you to house your handset as you wish, wallpapers and screensavers further customise its look, while thousands of ring tones extend customisation to the noises it makes. Then there's a host of new functions: games, integrated cameras, diaries and organisers. The mobile phone has become a complete fashion statement.

Love it or hate it, a huge industry has been built around cellular communications. And to think I turned it down. BIG mistake!



TV FAULT FINDING

Reports from
Philip Salkeld
Mike Leach
Bob Flynn
John Tennant
Glyn Dickinson
Chris Hawkins
Martin McCluskey
and
Les Mainstone

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Bush WS6673 (Vestel 11AK37 chassis)

In the past few months I've repaired a large number of these sets. The usual fault symptoms are dead with no LED display, and the usual repair consists of replacing the MC44608 chopper control chip IC800 (part no. 30011968) and R801, which has been changed from 1kΩ to 4·7kΩ, 0·5W. Before replacing IC800 you have to discharge the mains bridge rectifier's reservoir capacitor C809. Failure of the opto-coupler IC801 (part no. 30015087) is also a common cause of this fault.

The problem comes when the above measures don't cure the dead-set symptom. A number of things on the primary side of the power supply can cause the fault. The following is a list of failures I've come across recently: start-up diode D809 (1N4007) short-circuit; any of the BA159 diodes D804, D892 and D893 short-circuit; surge-limiter R831 (1Ω, 5W) open-circuit; and R850 (22Ω, 0·5W) open-circuit.

R850 is in the pulse feedback line from the chopper transformer, D804 is the rectifier that provides the running supply for IC800, and D892/3 are in the chopper FET's source circuit. See Fig. 1, page 139, in the January 2005 issue. **P.S.**

Sharp 32LW-92H (11AK45 chassis)

There was sound but no picture. Adjustment of the A1/G2 control produced a display with distorted field scanning. The logical thing to do seemed to be to check the supplies at the STV9379FA field output chip IC600. There should be +11V at pin 2, –11V at pin 4 and 60V at pin 3. As these supplies were all present I ordered a replacement chip, part no. V30007793. Normal operation was restored once it had been fitted. **P.S.**

Toshiba 21S23B2

Dead set is a common fault with these sets. You normally find that the 2SD2499 line output transistor Q401 (part no. TDUU024990) is short-circuit because of a dry-joint at the line driver transformer. These failures were present in this set but when I had attended to them the set was still dead. I turned to the power supply where I found that R509 (part no. R63581R22J) was open-circuit. D528 (part no. D9TU01801B) was short-circuit and the 2SK2651 chopper FET Q501 (part no. T41F026510) was also short-circuit. All was well once these items had been replaced. **P.S.**

Sharp 66FW-53H (DA50W chassis)

This set had the usual stuck in standby fault. A dry-joint at C613 (560nF), which destroys the BUH515 line output transistor Q601, is a well-known cause. A problem I've encountered on several occasions is that when you get the set up and running again the verticals are serrated. the cause is the BZT03C47 zener diode D516 in the EW drive circuit. It develops low forward and reverse resistance. The part no. is EX0837BMZZ. **P.S.**

JVC AV28GT1SJF (11AK45 chassis)

This set was stuck in standby. It's more usual to find these sets totally dead with a blown up power supply. After spending some time fruitlessly looking for a power supply fault I came to the conclusion that the cause of the fault lay elsewhere. The EPROM IC502 is an eight-pin plug-in device. When I pulled it out and switched the set on it produced a raster. Replacement of IC502, part no. VE-20120620, restored normal working order. **P.S.**

Bush WS6674 (PT92 chassis)

This set worked perfectly apart from the fact that a ticking noise came from the speakers when it was in standby. I have previously reported on the cause with the 11AK19 chassis. There can be a number of causes with this chassis. When DP19 (TL431C) is leaky the supply to the audio output IC rises in the standby mode. CP16

and CP19 (both 1,000μF, 50V) in the 30V supply should be replaced. In addition RP06 (3·9MΩ) can go open-circuit. **P.S.**

Sharp 51DT-25H

The customer complained about the picture breaking up when the set was first switched on. Line tearing was the fault. It was a job for the hairdryer and freezer, which quickly brought me to C622 and C604 (both 220μF, 10V). All was well once these components had been replaced. **P.S.**

Hitachi C28W410SN (A7 chassis)

The picture was OK but the on-screen graphics (channel ident etc.) bounced severely from cold. Teletext also bounced, like a bad case of field jitter. As many on-going repairs were cluttering the workshop, I decided to give Hitachi technical a call in case they knew something I didn't. The very helpful man pointed me in the direction of C601 (220μF, 35V), which decouples the 27V supply. It's situated right next to the white fixing stub that secures the chassis to its plastic frame. Apparently it can dry up, but in this case a dry-joint was found at the positive leg. You had to use a magnifying glass to see it however. Resoldering cured the problem. **M.L.**

Sharp 28JF-74H (GA20 chassis)

Goes off with a smell of burning is a common problem with these sets. You will find that capacitor C607 (100nF, 250V) is split open and that resistors R611 (10kΩ) and R627 (150kΩ) are both burnt. The cause is the line output transformer, type BW02862. The HR8830 is an equivalent. It's also best to replace the UPC358C EW chip IC501 and check R512 and R514 (both 1kΩ). **B.F.**

Sony KV21X1U (BE5 chassis)

There was a brief rustle of EHT followed by nothing, except for the power LED flashing four times. The cause was a faulty line output transformer. **B.F.**

Mitsubishi CT33B3STX (Euro 12 chassis)

Wire link 159 next to the line output transformer must have been dry-jointed, because the board was now badly burnt. It was a straightforward matter to repair the print but, not surprisingly, the set then produced a picture with excessive width and bowed sides. The TEA2031A EW chip IC551 was almost short-circuit though a replacement made no difference. A check on its 28V supply at pin 6 showed that this was low at about 7V, because R951 (1Ω) was open-circuit. In most models that use this chassis the resistor is a wire link. A replacement restored correct scanning. **B.F.**

Philips 28CL6770 (FL1.1 chassis)

This set was stuck in standby with no noises or fancy combinations of symbols lit in the display. The cause was a faulty line output transformer. **B.F.**

Thomson 72MK89D (ICC11 chassis)

The only sign of life was the standby light flashing four times. The cause was CL015 (410nF, 400V), which had been dry-jointed and now needed replacement. When this had been done there was a picture but the sound appeared, briefly, only on changing channel – it was permanent via the scart socket. I was able to restore the sound by using the sound menu to select Dolby instead of normal. I couldn't find a reason for this. Perhaps the EEPROM had been corrupted, which is common with these sets. It wasn't like that before the capacitor problem. **B.F.**

Hitachi C2558TN (G8Q chassis)

The only signs of life with this set were the channel display, which showed two dashes that flashed in unison, and a thumping noise from the speakers. The cause was the TDA3654 field output chip IC601, which was short-circuit between pins 4 and 5. A replacement IC, also C607 (100μF, 50V), cured the fault. **B.F.**

Toshiba 82ZD16B

This 32in., 100Hz monster would come out of standby with full EHT but no sound or picture then, after about thirty seconds, would revert to standby. The set is the same as **Model 32ZD06B**, which produces a similar fault as a result of poor connections at Q420. The connections here were OK with this set however, the cause of the fault being the 1A circuit protector Z897 in the feed to Q831. It was open-circuit for no apparent reason. **B.F.**

Watson FA5161T (11AK30 chassis)

This set was tripping with the line output transistor short-circuit. As ever, the question was why? The discoloured board around the line driver transistor Q601 seemed to be a good place to start making some checks. I found that the feed resistor R624 was dry-jointed while the 10μF coupling capacitor C613 had fallen in value. A good solder up, a new capacitor and a replacement BU808DF1 line output transistor restored normal operation. **J.T.**

Goodmans 285NSB (Daewoo CP775 chassis)

The picture was OK but there was no sound, just a low hiss from the speakers. It was not the usual MSP3410 Nicam chip this time however. The cause turned out to the preceding TDA4445B IF chip I603. **J.T.**

Tatung TBS9822P (180 series chassis)

Poor contrast was the fault with this set. While I was studying the circuit diagram to look for likely suspects R430 (120kΩ) came to my attention. It's connected between the HT line at the beam limiter take-off point at the line output transformer. Past experience has shown that high-value resistors with a large voltage drop across them tend to suffer a hard life. I found it hidden under the LOPT and, sure enough, it was open-circuit. **J.T.**

Philips MG7.1E chassis

This 32in. widescreen set was reluctant to start up every time, the indicator either remaining yellow or not coming on at all. Fortunately the cause in this rather complex modern power supply was an old-fashioned one. Two 5V relays are mounted at the front of the power/line deflection PCB. Gently tapping the relays then starting the set up suggested that one or both of them were faulty. Replacements cured the fault. Suitable 5V relays are available from CPC. **J.T.**

Panasonic TX32PL1 (EURO-4 chassis)

The initial complaint, switching to standby, subsequently became tripping as soon as the EHT and the field scanning developed. Those nice people at Panasonic told me that it's a common fault, the cause being C454, a 22nF surface-mounted capacitor that's near the field output IC, beside a hole in the PCB. It's incorrectly shown as 220nF in the circuit diagram. **G.D.**

Bush WS6671

The unusual fault with this set was no sound, though the audio output stage was very much alive. The clue was no mono or stereo ident on the screen, and selecting audio from the menu only brought up the volume. This suggested a set identity crisis or failure of communication with the Nicam PCB. A spare Nicam panel

didn't improve matters, so a replacement EEPROM was fitted. This restored the sound. **G.D.**

Samsung CI683CNG

The amber light came on then turned green as the degaussing relay clicked out. Otherwise the set appeared to be dead. Checks showed that all the voltages on the secondary side of the power supply were present and correct, and there was a blip of line drive at switch on. After spending a while looking at the service manual I admitted defeat and phoned nice Mr Samsung. The suggestion was to check C407 (1nF, 2kV), which turned out to be looking sorry for itself. A replacement cured the fault. **G.D.**

Bush BTV17

The picture would flicker and the set would go off, then revert to standby. The fault could be instigated by flexing the top PCB, but resoldering didn't help. When the fault was present the HT dropped from 130V to 80V and there was a slight arcing sound. I tried replacing the chopper IC then began to suspect the transformer. Luckily as a last resort I replaced the optocoupler. The set then remained on. **G.D.**

Matsui 14V1R (Grundig CUC7301 chassis)

This set had succumbed to the usual power supply failure and, surprisingly, the owner accepted the estimate for fitting a replacement kit. Predictably, the set didn't work after that. While carrying out checks on the primary side of the power supply I found that CD654 and CD656 (both type LL4148) were short-circuit. When replacements had been fitted the standby LED flashed but there was no further activity. I eventually discovered that the HT preset R654 (470Ω) had risen in value. A replacement cured the fault. **G.D.**

Sliding SLC1404

This set produced a good picture for a cheap model, but there was no sound to go with it. One look at the TDA1905 sound output IC removed any doubt about the cause – it was burnt beyond recognition. I couldn't find any faults with the speaker or the wiring, and suspect that someone had tried to use it to drive a hefty hi-fi speaker.

Another of these sets produced no picture and no EHT. Checks showed that there was no drive at the base of the line output transistor. The 24V supply to the line driver transistor Q301 was missing because R306 (68Ω) in the feed was open-circuit. **C.H.**

Philips AA5 chassis

Dead was the complaint with this ex-rental set. Checks in the line output stage produced a reading of 10Ω between the collector and the emitter of the line output transistor, though the transistor itself was OK. Visions of having to replace the transformer sprang to mind, but the culprit was the large, blue scan-coupling capacitor C9474 (680nF, 250V). Once it had been replaced the set came to life and I was surprised at how bright and sharply-focused the picture was in comparison with today's widescreen models. **M.McC.**

Grundig GT2003 (G1000 chassis)

Field collapse was the complaint with this set. I noticed that several pins of the TDA8170 field output IC were dry-jointed but, after resoldering them, there was a blank raster except for three coloured lines across the centre of the screen. A new TDA8170 restored the picture. **M.McC.**

Sony KV29LS30 (FE2 chassis)

At switch on there was a burst of EHT then the set shut down with the front LED blinking twice, pausing, then blinking twice again. This indicated that the set was in the protection mode, and can be caused by a defective line output transformer. In this case however the cause was R618 (270kΩ) in the over-current sensing circuit. It had risen in value to over 1MΩ. You will find this small 0·25W resistor approximately in the centre of the PCB. **M.McC.**

Crown CTF142RSL

This modern silver portable has a chassis that looks like a Matsui one dating from the late Eighties! There was no raster even with the A1 control fully advanced, though EHT was present and the tube's heaters were alight. Checks on the CRT's base panel showed that the A1 supply was missing. The blue disc decoupling capacitor was OK, the cause of the fault being a short-circuit to the metal spark-gap assembly built into the CRT socket. A similar socket from a scrap chassis restored the picture. **M.McC.**

Decca D28WT92S

This fairly new set was dead. There was no light from the standby LED and the customer had convinced himself that the mains switch was faulty. My first action with a dead set is to check the mains rectifier's reservoir capacitor, in this case CP06. It had stored a very high charge for nearly a day, which suggested to me that the power supply hadn't started up. When I checked the resistors around the chopper control IC I found that RP06 (4·7MΩ) was open-circuit. A replacement restored normal operation. **L.M.**

Panasonic TX28DT2/E (EURO-4D chassis)

At switch on the EHT rustled up and a dull white raster appeared briefly, with good sound. The sides of the raster were bowed, not unlike an EW fault. Then the set reverted to standby. I began my search on the tube base, suspecting a problem with IC351, but this proved fruitless. Then I checked the 200V supply, in particular R557 and R558 which are inclined to increase in value, but everything was OK. Next I decided to investigate the field output stage, in particular the minute surface-mounted capacitor C454 (22nF). When I lifted it off the board I found that one end had fallen away. This capacitor connects pin 7 of the field output chip IC451 to the vertical protection circuitry. A replacement restored normal operation. **L.M.**

Grundig MW70-502 (CUC2059 chassis)

This eighteen-month old digital receiver produced light from the red indicator but there were no other signs of life. I normally start my search by checking the line output transistor for leakage. In this case however its collector was badly dry-jointed. It's T53001 (S2000N). A replacement brought the set to life. **L.M.**

Goodmans 2575 (F11 chassis)

The line output transformer arced at switch on and the customer accepted my estimate for a replacement. When this arrived from SEME I confidently fitted it and switched on. Then I found myself staring at a dead set: no front LED illumination, no EHT rustle. Quietly uttering certain words, I began to carry out checks with my AVO meter. The HT voltage read 21V, so I disconnected the line output stage by removing the scan-coil plug and connected a lamp across the HT supply instead. This resulted in a steady reading of 140V.

I looked at the new transformer suspiciously, but it declared itself innocent. When I turned my attention to the diodes in the EW modulator circuit I found that D47 (BA157) read 500Ω both ways. A replacement restored normal operation. **L.M.**

DVD

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Jamo DVR50FU

The complaint about this DVD player/tuner/amplifier was "not playing DVDs". When I applied power it certainly wasn't going to play any discs as the drawer wouldn't even open! In fact apart from the front panel lighting up it didn't do a lot at all.

Once the cover was off a quick look at the power supply revealed a likely suspect – C30's top was bulging. So I set about getting it out, which is where the problems really started . . . My 45W Weller TCP iron had to struggle to flow the joints sufficiently to remove the capacitor. My trusty old DS900, which will suck holes clear in six-layer boards, wouldn't even touch the remaining solder. I ended up clearing the holes with desoldering braid, pumped with heat from my aged Weller 140W gun – and even that took its time! It's hard to understand how the board could leech the heat away that efficiently, especially as the pads have 'heat-relieving' breaks around them.

Once a new 1,000μF capacitor, uprated from 10V to 16V working, had been installed and the power supply had been refitted there was normal operation of all functions. **G.D.**

Sony HCD-S400

Once again lead-free solder rears its ugly head. This home-cinema unit came to me with the complaint that there was no front-left channel output. I knew immediately that the cause was going to be bad joints at the output chokes, as this is a common problem. My pre-diagnosis was confirmed when I poked at the power amplifier PCB and the missing channel came and went.

When the PCB was removed there were multiple bad output-choke joints and in addition there was joint cracking at the output relays and the output sockets. Once I had attended to all these joints I started to lower the PCB back in place, holding on to the large electrolytic C313 to guide it home. This capacitor promptly fell right out of the board, in my hand! I resoldered it back in place and checked the rest of the larger joints on the board.

Satisfied that I had now attended to all the dubious joints, I refitted the board and powered up. I was rewarded with a display that read 'headphones'. When I poked the connector that carries the cable from the headphone-socket board to the power amplifier board there was clicking from the output relays and the display changed to show the selected audio mode correctly.

Out came the power amplifier board yet again. A close examination of the joints to the connector just mentioned revealed that they were cracked right round. After reworking these I subjected the entire board to a close inspection via my powerful headband magnifier. This revealed several other very suspicious-looking joints, which were all dealt with.

This time all was well when the board was refitted. A run of the internal set-up software, to ensure that the machine was working at peak performance, completed the repair. **G.D.**

Sony RDR-GX700

This new DVD recorder wouldn't record. With a good, formatted RW disc inside it showed no dirty disc. Checks proved that the DVD drive module, circuit reference no. 54, was faulty. A replacement DVD drive unit put matters to rights. **C.B.**

Sony HCD-S500

This unit displayed 'no disc' and made a loud screeching sound. Checks inside, on the optical block assembly, revealed a faulty spindle motor – there was no disc rotation. A new optical assembly, component reference no. 419, part no. A-606-2705-A, restored normal operation. **C.B.**

Sony DVP-NS355

This unit would start to make a high-pitched whining sound after half an hour's use. The cause of the fault was the spindle motor. A new optical pick-up block assembly, circuit reference no. 104, part no. 8-820-237-06, cleared the fault. The spindle motor is attached to the optical block. **C.B.**

Kenwood RXD-DV9

If there's low, distorted sound with playback of CDs and DVDs, check capacitor AE2 (100μF, 16V) on the DVD/CD PCB, below IC VIC52. You may well find that it's short-circuit, removing the –8V supply. **R.L.**

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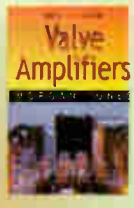

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and

Arthur Jackson

We welcome fault reports from readers – payment for each fault is made after publication.

Reports can be sent by post to:
Television Magazine Fault Reports,
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Fault

Finlandia/Finlux

A Finlandia-badged set was brought in because it was allegedly dead. The first thing we discovered was that the on-off switch was stuck permanently on, thereby confusing the microcontroller chip as the wiper contacts were connected all the time. After replacing the switch the set worked when the front controls were used, but any command from the remote-control unit made the set go to standby

I thought this was likely to be a software problem, so I ordered an EEPROM – it was only a couple of quid, while the micro was a lot more. This didn't cure the fault but, before giving up on the set, a thought occurred to me. I've never known such a thing, but what if the remote-control unit had become faulty in such a way that it sent out only the standby command, no matter which button was pressed? So I programmed a universal remote-control unit to the set, which turned out to be a Finlux in disguise, and to my surprise it worked!

Had it been any command other than standby that came from the original remote-control unit the penny would have dropped much sooner. **S.H.**

Grundig Xentia MFW70-490/8

This back-breaking monster had an EW fault. It didn't take me long to discover that the 4·7Ω fusible resistor R55014 was open-circuit. EW drive is provided by IC55010 (TDA8145) which was short-circuit. I then started to search for the root cause of the trouble, expecting to find a dry-joint at the line-scan coupling capacitor or an associated component. But the search was fruitless.

I replaced the two failed components, but was wary because no basic cause had been located. When I switched on however there was a perfect picture and, after ten minutes, my confidence was starting to increase. A few minutes later however, while the set was soak testing, the sound gave a crack, R55014 immediately went open-circuit and the set reverted to standby. IC55010 was once again short-circuit, and zener diode D55012 was leaky. I came to the conclusion that there had to be a concealed dry-joint somewhere.

While carrying out an investigation with a magnifying glass I found that one of the EW modulator diodes, D53071, had been soldered to the PCB with a soldered rivet around its legs. One leg was dry-jointed. This was impossible to see without the aid of the magnifying glass. Resoldering plus replacement of the faulty components at last cured the fault. They are all available from CPC: R55014 part no. GR8701-230-817; D55012 part no. GR8309-720-331; IC55010 part no. SCTDA8145. **U.H.**

Vestel 11AK19 chassis

This set, which bore the **Hitachi** name, had a nasty intermittent fault: the picture would be blanked out, leaving the sound unaffected. At the most the fault condition would last for a couple of minutes, after which the set would run perfectly for a few days. This left little time for diagnosis.

The customary solder up brought no improvement, so there was nothing for it but to prop up the chassis in an accessible position on the spare bench and wait. A week later the fault condition returned and remained long enough for some scope checks to be carried out. The field output IC seemed to be a good place to start. I found that the field output was present but the 5V peak-to-peak pulse at pin 8, used for blanking, was missing. More interesting however was the presence of a small but definite field waveform at the IC's earth pin 5. A resistance check from pin 5 to the tuner produced a reading of 2Ω.

Careful tracing along the print led me to a surface-mounted link, J500, on the back edge of the PCB. This zero-ohm link had become resistive. A replacement obtained from a scrap chassis provided a permanent cure. **J.T.**

Panasonic TX28MK1L (Euro-4 chassis)

The problem with this set was very intermittent reverting to standby. It occurred only at switch on. The relay (RL801) could be heard to latch then, a few seconds later, unlatch. Once the set had started up normally no amount of PCB tapping with the handle of a screwdriver would instigate the fault.

C454 (22nF) in the field flyback pulse feedback line is a common cause of reverting to standby with this chassis, but a replacement didn't make any difference.

I decided to connect a meter across C851 (220μF, 160V) to monitor the HT supply and another one across the mains bridge rectifier's reservoir capacitor C811 (180μF, 400V), then moved the set over to the soak-test bench. The next time the fault occurred I noticed that the HT supply wasn't developed, while the mains-rectified supply remained even when the relay had unlatched. This suggested a fault in the start-up circuit, maybe R805, R814 or C816. These items were OK however. Further checks revealed a dry-joint at the chassis connection, pin 5, of the STRF6654 chopper chip IC801. Reflowing the soldered joints at IC801 cleared the fault. **C.R.**

Samsung CI5052 (P68SA chassis)

I've had two of these sets in recently. The first one appeared to be dead, but in fact the fault was no sound or vision. The line and field timebases were both working, and turning up the setting of the A1/G2 control produced a blank raster with flyback lines. I noticed that when the set was switched on it came on fully. Normally when these sets are switched on they come on in standby, then come out of standby when a channel button is pressed. I also noticed that the front LED didn't light and, when the set had been on for while, there was a slight smell of burning.

I decided to investigate why the LED wasn't lit, and soon found that the output from the 5V regulator IC803 (MC7805) was low. In addition it was getting hot. Further checks showed that the 5V smoothing capacitor C858 (220μF, 10V) was leaky. A replacement restored the sound and picture.

The second set had a fault I've encountered a few times before. The 2SD1651 line output transistor Q402 had gone short-circuit because the HT voltage was excessive. Replacing Q402, C852 (470μF, 16V) in the power supply and the HT feed resistor R826 (0·47Ω, 0·5W) restored normal operation. **C.R.**

Grundig ST70-700NIC (CUC2030 chassis)

This set was tripping, and I soon discovered that the line output transistor TS3001 was getting very hot! I opted for the line output transformer as the prime suspect, but was proved wrong when I removed and tested it. The HT supply was correct at 152V.

I then found that the socket for the scan coils had been arcing, and had burnt the black plastic housing. The damage done here was safely repaired. This cured the tripping, but the set produced a narrow, bowed picture. This led me to R55006 (5·6Ω), which was burnt and open-circuit. As I didn't have a circuit diagram, I decided to remove and check various diodes etc. in the line output stage. All proved to be OK. So I replaced the resistor and switched the set on. There was no smoke from the resistor but there was now excessive width with slight bowing. A replacement TDA8350Q field/EW output IC removed the picture distortion. **B.L.**

Sharp 32JF-73H (GA20 chassis)

The owner of this large set complained about an unusual ghosting effect on the picture, but said it wasn't always obvious. When our aerial man called at the house he could find no problem with the TV set or the aerial system. The customer said that the other TV sets fed from the common aerial distribution system were all OK when the fault was present, so our aerial man decided to leave a loan set and bring the suspect one in for testing.

I ran the set for a week without any obvious fault putting in an appearance. Before returning it, I decided to check with the customer to see if he could provide any further information on the symptoms. I was told that the problem had been very bad when watching the snooker and the rugby on a Saturday afternoon. This proved to be very helpful. I wondered initially about a possible problem with the green output stage, but this was quickly ruled out. The other common factor was that the snooker and rugby were both on BBC2.

Our customer receives his signal from a group C/D transmitter, with BBC2 on ch. 62. At the workshop there's a better signal from a group A transmitter, with BBC2 on ch. 27, though I can receive acceptable reception from the same C/D source as the customer. For test purposes I had tuned unused channel locations to the group A transmitter. When I switched from ch. 27 to ch. 62 the fault was fairly obvious with any programme that had strong colours – but it occurred on ch. 62 only, the other channels all being perfect.

I can best describe the symptoms as faint grey striations approximately 20mm wide and 20mm apart across the entire screen. These bars completely disappeared when a finger was placed on the tuner. The cure was to replace the Thomson type tuner unit (part no. VTUCTF5511+++). **A.J.**

Nikkai NT20

We still get a few of these Turkish-made 20in. mono sound sets in for repair despite the fact that they are now about fifteen years old. They are very popular with those involved with pub entertainment, as they are capable of handling eleven colour systems. This is ideal for karaoke material, so the owners are delighted to have them repaired and seldom query the cost.

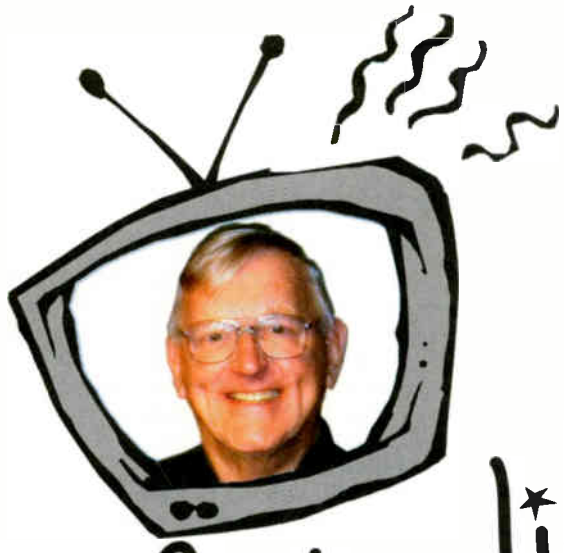
A fairly common problem is no sound or picture, just a high-pitched squeal. Checks usually reveal a short-circuit across the collector and emitter of the line output transistor Q404. The transistor itself rarely fails however, the fault often being caused by the little disc capacitor C444 (3·3nF, 2kV) which is in parallel with Q404. It's usually quite badly burnt.

The tubes in the sets I've come across to date have all been quite good and a little setting up of the focus and grey scale leaves them as good as new. **A.J.**

Ferguson M8421U (ICC17 chassis)

This 33in. 4:3 model is fitted with a chassis that's more commonly found in recent widescreen sets. The symptoms were set reverting to standby and producing error code 27, which indicates a fault in the deflection circuitry. The cause of the trouble was a defective line output transformer. It differs from the widescreen version and comes as a kit, part no. 35175740. There are only two extra components in the kit, the series heater coil LB02 and a 100kΩ surface-mounted resistor, RL48, which is in the EW circuit.

Once these components had been fitted the set powered up but, after setting the first anode and focus voltages, the picture was very dull and lacking in contrast. This is typical of a set with a beam-limiter fault. The cause was traced to transistors TL02 (BF422) and TL59 (BC857B) which were both leaky. They are connected to the earthy end of the EHT system within the transformer, and were pulling the BCL line low. In a correctly working set the BCL line, checked at pin 8 of the LOPT, is typically at between 6-7V. There was a perfect picture once these transistors had been replaced. **A.J.**



What a life!

Donald Bullock's servicing commentary

A trip down memory lane: the AVO 8, dealings with banks and how to carry out a vintage radio restoration. Also latest correspondence.

You'll have to forgive me this month while I take a trip down memory lane. Several items in last month's issue started this off, especially D. Lee's letter about the AVO 8, Elaine Everest's timely comments on the banks, and Malcolm Burrell's article on restoring a vintage wireless set – or, as some of the younger fellows seem to call them nowadays, radio. They sparked off treasured memories of the trade and in no time I had slipped back into the past. A comfortable place it was too, compared with today's trade scene.

The AVO 8

When I walked into my first job in the trade, in the early Fifties, the very first thing I noticed was an AVO 8. It was occupying the full attention of a seasoned engineer who was working on the mysterious innards of an early Bush radio set. At the other end of the bench another engineer was similarly engrossed in his AVO 8's readings. Then the van engineer came in, carrying his AVO 7 by its leather strap.

I soon came to realise that just as doctors had their stethoscopes service engineers had AVOs. In the early days the company that produced these celebrated meters was The Automatic Coil Winder & Electrical Equipment Co., Ltd. which, by the early Fifties, had become simply AVO Ltd. At some stage it became part of the Thorn group, as Thorn EMI Instruments.

They were the standard meters in the trade or course and nearly all service manuals quoted them as being the source of the voltage readings provided. So did the very popular and excellent service sheets that came with every issue of the *Wireless and Electrical Trader*. Blessed days!

Incidentally anyone using such manuals should be warned to expect generally higher voltage readings with a modern meter. Although the AVO 8 boasted the then remarkable sensitivity of 20kΩ per volt, modern meters have a sensitivity of several megohms per volt, which means that there will be quite significant differences in the voltage readings obtained in comparison with the AVO ones quoted – because modern meters don't load the circuit as much as the older analogue meters do. This is particularly evident when checking voltages in high-impedance circuits, such as the screen grids of valves acting as IF amplifiers or the anodes of valve amplifiers.

I'm particularly grateful to whoever invented the AVO for incorporating the shallow glass tray over the scale. This, as someone else has pointed out, provided a highly convenient place for parking the fixing screws for whatever one was working on. The AVO factory was in Dover and I believe it still exists there, as Megger Ltd.

Gerard Hoffnung

The screw-parking facilities of the AVO remind me of that dear and long departed radio performer Gerard Hoffnung, who was quite my favourite raconteur. Many will probably recall his Bricklayer reminiscences in his most famous recording, entitled *Respected Sir*, in which he purports to be reading a letter from an injured labourer begging his boss for sick leave following his efforts to lower a bale of bricks at the top of a building by casting off the pulley line, then finding himself rising at the end of the rope and, as he put it, "deciding to hang on". The biggest laugh comes with his comment "half way up I met the bale coming down". The audience clearly appreciated it, with continuous laughter – the recording was made at an Oxford University reunion get-together.

Banks

I second Elaine Everest's perceptive comments on the banks. They are all the same and all in league. Upset one and you will have problems with the rest. My advice would be to shun the lot. Many years ago I became fed up with their shameless spongeing and, insofar as I needed one, decided to use the Giro. At that time it insisted on private accounts only, but I managed and I think most repairmen could regard themselves as private.

In my view the banks are true parasites. They produce nothing. There is no end product, they buy and carry no stock on their shelves, and they feather their nests wonderfully. One close to us has had umpteen lavish refits in the past couple of years, two of them only weeks apart.

But they weren't so bad when I first started in business. The average manager would have a lot of say in how he managed his branch. This turned out very well for me at the time . . .

Young, keen and principled (it was the age of principles), we ran an efficient repair service from 9 till 9 six days a week. No wonder we were successful. Most of our customers became our friends, and I still maintain friendships with their families. Before long we were selling reconditioned sets and, one day, we were asked to supply a new set. I had virtually no capital, so I had a word with a wholesaler who trusted me with a set. The customer paid in cash, and we paid the wholesaler the moment we got our money. This happened again and again. Eventually we opened a credit account

with the wholesaler.

Then, out of the blue, we were offered hire-purchase facilities by a new and local finance company that had been started by a charming young man, Mr Salariya. We weren't to know that he had no money and was charming successive bank managers into advancing huge sums to him. We would sell a set, send him the completed form, and receive his cheque by return.

One day I saw him being shown in to see the manager of our own bank. I hoped he would do all right as he hadn't paid us for the last few forms we'd sent him. It seems that he was successful, as our cheques arrived a few days later. But, a few months after that, he had slipped behind again with our payments. When I phoned to ask why, I could barely hear him speak for the noise of diggers: he was having a private landing strip built in the grounds of his huge country mansion.

Eventually he owed us thousands of pounds, a fortune in the Fifties, and I went to see our bank manager to express my concern. He was amused and replied "I assure you, he's as safe as the Bank of England".

I couldn't have looked too convinced, as he lifted his internal phone and called in his secretary. "Donald here is worried about Mr Salariya" he told her, with evident amusement, "transfer a thousand pounds from his account into Donald's." The secretary went out and a minute later, after lifting his buzzing phone, the manager told me that the transfer had been completed.

The next day the Salariya story broke in the press. It seemed that he had borrowed millions and "bought" so many herds of "phantom cows" that England wouldn't have been large enough for them all to graze on. The trial lasted for several weeks.

The next time I popped into our bank I was called into the manager's office. "You were right to be worried, Donald" he said, "he took us for a million, same as he took everyone else!" Then he looked at me and said, with haunted eyes, "that thousand you had was mine."

Vintage radios

Malcolm Burrell must get enormous satisfaction from restoring top-name radio sets. I knew them all in their day. They were the last word in manufacturing quality and were a joy to repair. Nothing was skimped. The days of "pride of ownership" indeed! After reading his article on the Ferguson 352U I flipped back to his earlier one, in the March issue, on restoring a Bush DAC10. It reminded me of my own efforts with a similar Bush set in the Sixties.

I was called to a restful cottage in a remote village called Upton St Leonards, where the one-time top man of the telephone company lived in retirement with his wife. I would think they were about ninety. She was graceful and he was a perfect gentleman. He showed me to his Bush DAC90 wireless.

"It works, Mr Bullock, but it's no longer clear" he explained. "I do like good sound. No time for television!" I understood exactly. "Can you make it as good as it used to be?" he asked.

"It'll be a pleasure" I replied, then took the set to the workshop and set about renovating it. My first step was to vacuum clean the cabinet and chassis. After that I removed and washed the dial glass in soapy water. I replaced the pilot lights and every electrolytic capacitor, then all the waxy yellow paper ones – every one of these was leaky, some quite badly so. I then checked every resistor and replaced those of value over about 68kΩ. I checked the valves with our Mullard tester (which always seemed to confirm that a used valve was dud!), cleaned the valve bases with Servisol switch cleaner and lubricated them with the best product I knew – the oil out of an old Murphy line output transformer can. In those days Murphy sealed their line output transformers, complete with the U25 EHT rectifier valve, in a rubber-topped can of oil. I also washed out the volume control potentiometer and fed its track and wiper with some oil. Finally I fitted a full set of five new valves.

Having completed this work I carefully realigned the RF and then the IF circuits before trying the set. The difference was enormous. That radio now delivered ice-clear speech.

The couple were delighted when I returned it, and paid the bill immediately. The old man thanked me with moving and polite eloquence. "It's so nice to receive such excellent service these days" he said, "I can't tell you how pleased we are to hear our wireless in its prime again."

Those words were reward indeed.

Those 78s

I've received so many welcome communications recently that I was unable to mention some of them last month. Chris Avis of Exeter refers to the days of 78 r.p.m. records. My reply was in two parts, and Chris wondered whether too many drams had formatted my brain and wiped my memory clean. "I often manage that on just one glass of wine" he commented, "or even water!"

"I can just recall an early cream-coloured EMI 78 r.p.m. autochanger at a youth club I attended in the Fifties, propped up on four jam jars" he writes, "the changer, that is" he went on to explain. "The most popular record then was a Capitol 78 with Crosby's *True Love* on one side and *Did you Evah* on the other" Chris says. Well, Chis, I'd regard that as one of my more modern Crosby/Sinatra records!

Chris Avis at the bench – he's now contemplating retirement.

DIY types

Chris, who is now contemplating retirement, recalls some of the amusing incidents he has had with customers. There was the chap who brought in a video head drum from which he had managed to remove the leads. "Can you pop a couple more heads in here?" he asked. A DIY chap had tried to prise the head off his video with a screwdriver, and another one brought in a Crown TV Model CRT9521 (Telra chassis) because the picture was bright red.

The cause was simply an open-circuit 6·8kΩ, 1W collector load resistor in the red output stage. Chris replaced it then noticed a strange delay in the picture brightness response when he tried to reset the A1 control. "I then spotted that a diode had been inserted in series between the A1 potentiometer in the line output transformer and the tube base. Removing it enabled me to set up the receiver properly."

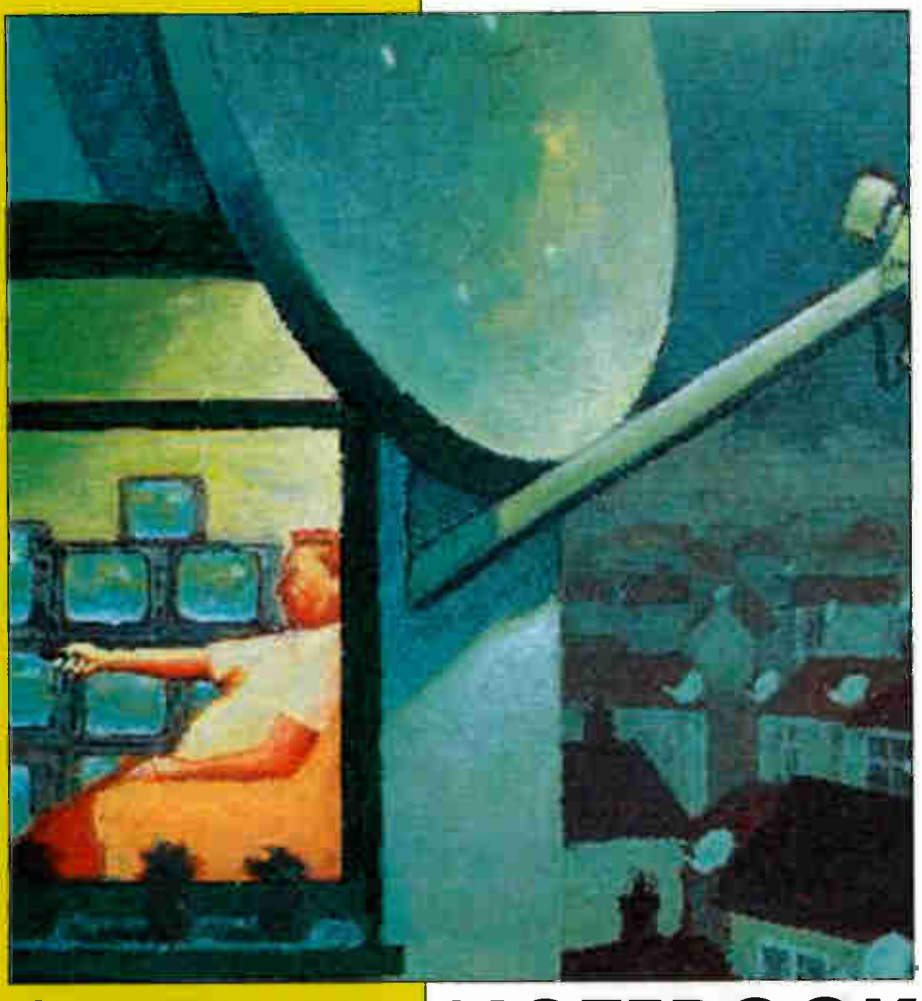
Trade scene

Sadly, Chris's trade has fallen enormously in recent years. At one time he employed two service engineers in addition to doing repairs himself. "Now it's just myself in the shop and at the bench, with my wife Anne in charge of the books" he writes. "We hope to remain afloat until we retire in a couple of years' time, but no longer sell new products – apart from a few spares and accessories. We get enough repair work to feed the till, and sell a few reconditioned TV sets with our twelve-month guarantee – our customers are having to tighten their belts as well."

Nice to hear from you Chris, and thanks for the photograph. Well, I see that I've run out of space again, leaving me no room to report on our latest oddballs or to tell you about our new occasional helper, Cyril Woodbine. But, as they say in Spain, siempre manana – there's always tomorrow.

Emails in particular are welcome – you can reach me at

donald@wheatleypress.com



SATELLITE NOTEBOOK

Reports from Christopher Holland Pete Haylor and Michael Dranfield

Photo 2: Newsfeed pool via Telstar 12.

Photo 3: The NBC UK 525 colour bars via Telstar 12.

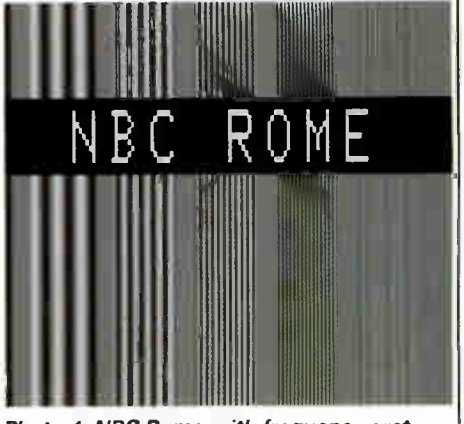


Photo 4: NBC Rome with frequency gratings Telstar 12.

Photo 5: The CBS test card via NBC!

Satellite distribution trouble

We were recently called to inspect a fairly large satellite TV IF distribution system because some channels were missing when digiboxes were connected to it. The system had been installed only quite recently and, as can be seen from the state of one of the several equipment cupboards (see Photo 1), the installers couldn't have been reading Bill Wright's excellent series on the subject a few months back! In fact the cure for the missing channels was to rebuild the system, from the dish onwards, with the equipment mounted neatly in cupboards. Any form of in-depth investigation would have been impossible without disturbing the mass of wires and poor connections in the equipment cupboards.

Photo 1: Part of a poor satellite distribution system that had to be rebuilt.

Photo 6: NBC test transmission viaTelstar 12.

Photo 7: NBC Washington DC via Telstar 12.

Photo 8: NBC Atlanta Bureau via Telstar 12.

Photo 9: NBC field newsfeed via Telstar 12.

Table 1: Latest digital channel changes at 28·2°E

Channel and EPG no.	*Sat*	*TP*	*Frequency/pol*
Bad Movies (339)	EB	C4	11·307GHz/V
Big Game TV	EB	C4	11·343GHz/V
Jackpot TV (275)	EB	D7S	11·588GHz/H
Life TV + 2 (161)	EB	C1	11·265GHz/H
Love World (679)	EB	C4	11·343GHz/V
Matinee Movies (336)	EB	C4	11·307GHz/V
Vegas 24/7 (274)	EB	D11S	11·662GHz/H
Virgin Classic Rock (934)	EB	C6	11·390GHz/V

with the possibility of causing more problems. **C.H.**

Eurobird transponder numbering

The Eurobird transponder numbering system can appear a little confusing at first sight. This is especially so now that some of the C-prefixed transponders have become active and use two frequencies – for example transponder C4 uses 11·307GHz and 11·343GHz V. The C transponders have a 72MHz bandwidth and can thus accommodate two channel multiplexes, while the higher-frequency D-prefixed transponders have a bandwidth of 36MHz. The S suffix with D transponders indicates that the footprint is steerable.

There are six C transponders, three with vertical polarisation and centre frequencies at 11·241, 11·325 and 11·408GHz (C2, C4 and C6 respectively), and three with horizontal polarisation and the same frequencies (C1, C3 and C5). The D transponders, which have been active for longer and have been mentioned many times in these pages, begin with D1S at 11·469GHz H – this one has just become active, transmitting the Spanish TVE International service. The last one is D12S at 11·680GHz V.

Eurobird also has coverage above 12·5GHz, with six 72MHz transponders whose frequencies are centred at 12·541, 12·625 and 12·703GHz, with vertical and horizontal polarisation. The vertical transponders are F2, F4 and F6, the horizontal ones being F1, F3 and F5. These transponders are steerable and provide UK coverage but, being aimed at Eastern Europe, there is no Sky digital programming. **C.H.**

Digital channel update (28·2°E)

The latest channel additions at 28·2°E are listed in Table 1. Where allocated, the EPG number is shown in brackets after the channel name.

The channels that used Eurobird transponder D2S have been transferred to transponder C3 (11·307GHz V). Transponder D2S is at present inactive.

Movies 333, mentioned last month, has been renamed True Movies and has increased transmissions to 24 hours a day. It has been transferred to Eurobird transponder C4 (see below).

Eurobird transponder C4 (11·343GHz V) was listed last month as being on test. Various channels have now been transferred to it, including Poker TV and B4 (from transponder D4S) and Wine TV, True Movies, The Amp, Scuzz and Flaunt (from transponder C6).

TVE International (Spain) has moved from Astra 2D transponder 43 to EB transponder D2S (11·469GHz H).

Fashion TV, which left the EPG a while ago, has restarted at no. 220. It's now transmitted via Eurobird transponder D3S (11·508GHz H) but is no longer an FTA channel – a Sky subscription is required. **C.H.**

Telstar 12 (15°W)

Having mentioned the WNBC (NBC New York city) feed via Telstar 12 (15°W) last month, I feel it would be appropriate to provide information on the other TV signals available from this satellite. Telstar 12 has footprints that cover Europe plus southern Africa, also the Americas. Since reception of the latter is impossible in Europe, we won't deal with these.

Table 2 lists the unscrambled channels that are available. Scrambled channels include the following: UK Channel 5 (11·655GHz V, SR 12,800, FEC 3/4); American Sports Channel ESPN (12·524GHz V, SR 26,470, FEC 3/4); Earth TV (12·645GHz H, SR 3,255, FEC 3/4); and various American channels, including CNN and Fox News, at 12·546GHz V (SR 15,000, FEC 2/3).

The NBC frequencies 11·518 and 11·523GHz provide a mass of material during the day – the full-time WNBC signal at 11·531GHz H, mentioned last month, is no longer active however. The NBC *Today* breakfast show studio is normally seen getting ready for transmission after 11.00 BST, and starts transmission at 12.00 (13.00 on Sunday). At any time during the day WNBC may be seen alternating with news feeds from the US and abroad, as you can see from Photos 2-11.

I've seen live *ITV News* broadcasts coming back from the US at the same time

Table 2: Unscrambled channels available from Telstar 12

Frequency/pol	*SR/FEC*	*Service(s)*
11·150GHz/V	19,275 3/4	Frequence Jazz Radio
11·494GHz/V	17,470 3/4	Appadana TV, Pars TV, AFN Farsi, National Iranian TV, Cannel One, Lahse, Your TV, Rang A Rang TV, Payam TV, Mardom TV
11·502GHz/H	6,620 2/3	Makro FM, Index Radio, PC World Radio
11·518GHz/H	3,744 7/8	NBC feeds
11·523GHz/H	1,500 7/8	NBC feeds
11·566GHz/H	5,625 1/2	BYU TV
12·573GHz/V	6,111 3/4	CBN
12·588GHz/V	4,503 1/2	Iranian TV plus Iranian radio station
12·608GHz/H	19,280 2/3	Tzuchi TV, MAC TV, VOA TV, Gunaz TV, New Channel TV, Hwazan TV, Radio Sedaye (Iran), VOA Radio, Farda Bahai Radio
12·658GHz/H	3,255 7/8	Feeds (scrambled at times)
12·663GHz/H	2,893 3/4	Feeds
12·666GHz/H	1,665 2/3	Spectrum 2
12·676GHz/H	1,808 3/4	Islah TV

Photo 10: Financial News channel MSNBC via Telstar 12.

Photo 11: Newsfeed from Latvia via Telstar 12.

as being seen on ITV1, though with a small time delay – as you would expect, the return signal coming via at least two satellite hops! European feeds often come and go rapidly after the 'NBC UK 525' colour bars are seen (see Photo 3), which suggests that feed switching is probably being done here rather than in the US.

Eurovision, Reuters and APTN news roundups also appear. Sometimes even the NBC competitor CBS's test card is present (see Photo 5).

After midnight UK time the *Jay Leno Show* is transmitted from Los Angeles Monday to Friday, followed by *Late Night with Connor O'Brien* from New York. During commercial breaks the screen goes black part from a small NBC logo that breaks up and reassembles itself at the centre of the screen, presumably to indicate that the signal hasn't been lost! NBC network programme promotions can be seen prior to and after the dead commercial break spaces. **C.H.**

Italian channels

At the end of April the Italian analogue channels ceased to be available from 13°E (Hot Bird). I then had a rush of customers wanting their channels back! Most of them required only a new receiver, as most of my customers have had universal LNBs fitted with digital in mind. But I find that the customer soon gets lost when I try to demonstrate a digital receiver in comparison with an old analogue one. So I usually programme the Italian channels into a favourite list and, as there are 50+ of them, they are happy with that. **P.H.**

Pace 2500B

This digibox was brought in because it wouldn't read the viewing card. When I tried a card in the slot it didn't feel right. As I've had problems before with Pace card readers I decided to fit a replacement. This didn't cure the problem but I noticed another symptom: when a viewing card was inserted the box seemed to slow down. Channel changing and menus were slower than with an identical digibox on test, and from switch-on the box took one minute twenty seconds to boot up compared with the working box's twenty seconds.

I took some readings around the TDA8004T card-reader chip U1100. These showed that the card was being reset correctly, had the right 4·5MHz and supply inputs, and that data was flowing to and from the card at pin 26. So it seemed that U1100 was OK, but I decided to replace it anyway. This made no difference.

I scoped the card data through to pin 130 of the ST20TP3 main micro chip and all was well here. But when Channel Five was selected all I got was the message 'initialising viewing card please wait'. No card serial number was displayed in the system set-up page, but the box was detecting the card because, when the channel listings were called up, instead of jumping from 102 to 106 they went in sequential order 102, 103, 104 etc.

At a loss, I decided to phone Pace technical who suggested replacing the 208-pin STP20TP3 microcontroller chip. It seemed unlikely that this was faulty, but I went ahead and fitted a replacement. At switch on the fault remained as before. Although the software was up-to-date I tried a forced download, which also did nothing. The only other suspect was the 128K serial EEPROM U302. And bingo, once a replacement had been fitted the fault had gone. Note that it's a pre-programmed item. I had intended to read the old one and have a look at the data, to see what was wrong, but accidentally pressed erase on my programmer and wiped it. So I will never know, but the replacement did the trick. **M.D.**

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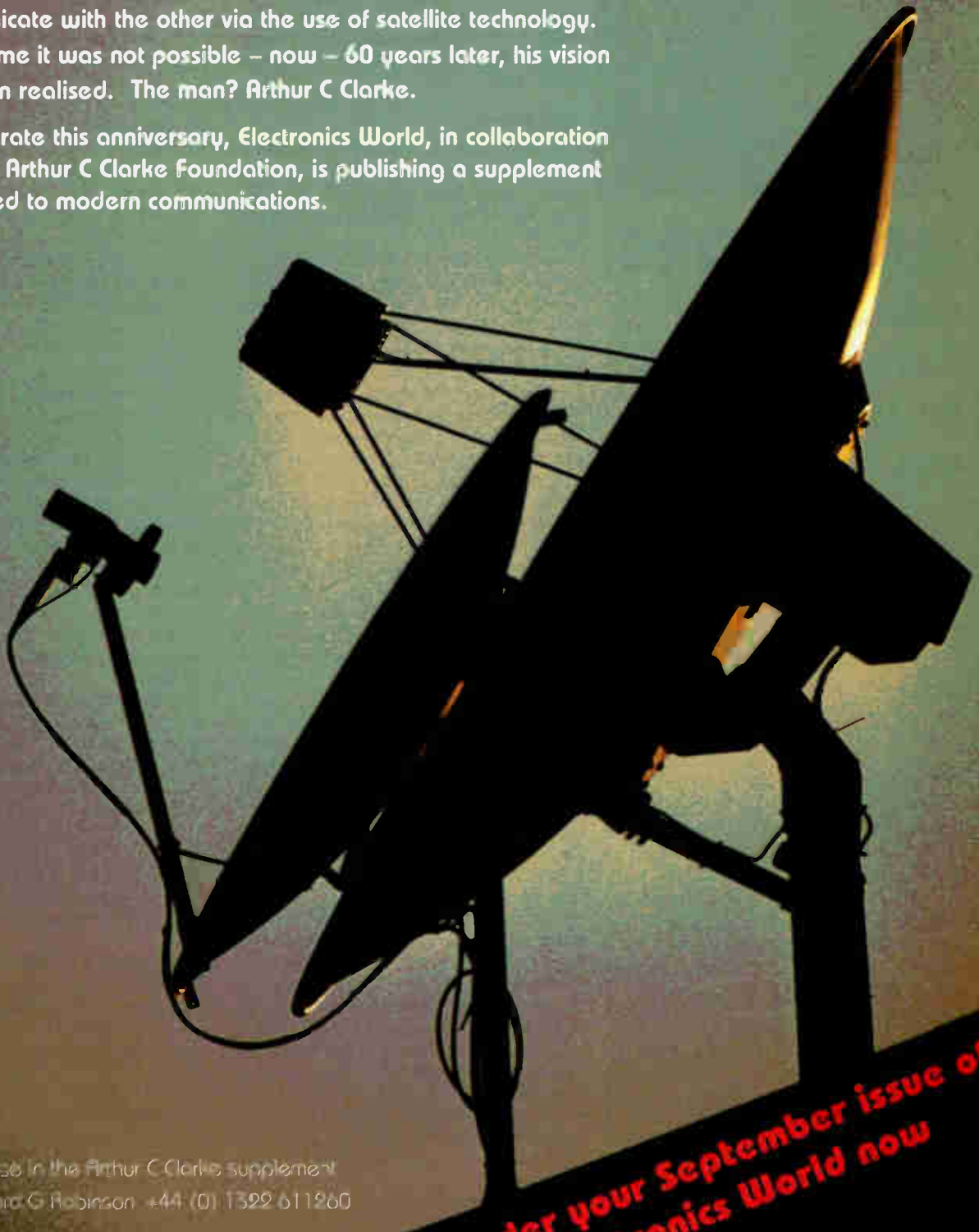

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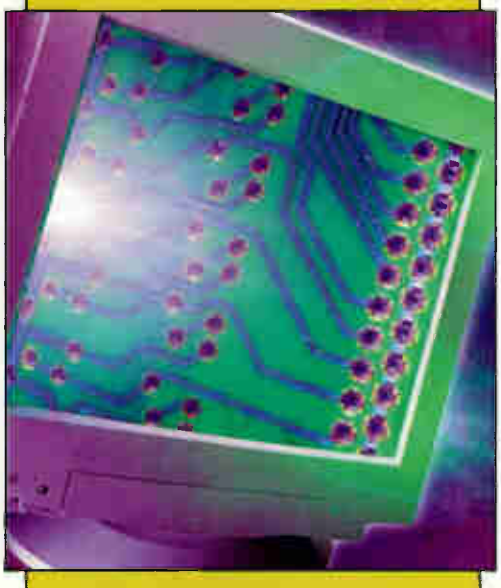

MONITORS

Fault reports from Glyn Dickinson Bob Bradley and Chris Hawkins

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Iiyama MA203DT

This monitor, which is used in an edit suite, was dead following a mains-supply surge. There was no visible damage, and HT was present across the mains bridge rectifier's reservoir capacitor. I noticed that R959 (2·2Ω, 0·5W fusible) had burnt out. A replacement restored the start-up voltage but nothing else. Further checks showed that IC901 was open-circuit. It's type TEA1504AP, which is hard to find. Fortunately a Google search brought up Nikko Dalbani Electronics, who were more than happy to send me a couple without a frightening small-order charge. Fitting a replacement restored the monitor to life. **G.D.**

Dell P1110

This 21in. monitor, which is fitted with a Sony chassis, was dead. It has a separate power supply that's mounted on the left-hand side of the chassis when viewed from the rear.

I unplugged all the connectors then removed the power supply from its surrounding metalwork, so that I could carry out some cold checks on the bench. The mains input fuse was the first item I checked. It's a 20mm ceramic type rated at 6·3A, and was open-circuit. Sometimes these fuses become tired and fail for no apparent reason, but further checks were required before fitting a replacement. When I checked the mains input circuit, the bridge rectifier and its reservoir capacitor I found that there was a low-resistance reading across the latter. Unsoldering it didn't clear the short, nor did removal of the mains bridge rectifier. What did clear the short was removal of the MZ1530 chopper chip. A replacement IC and fuse restored normal operation – after reassembly of the monitor and testing to confirm. **B.B.**

Compaq S910

Since my last report on this model, in the April issue, two more have been brought into the workshop by our field engineer. The reported symptoms were similar, but the causes were different. These monitors are certainly not easy to work on, as quite a lot of preparatory work is required to gain access to the chassis.

After removing the stand and the back cover you will find two metal straps between the CRT base screening can and the front of the monitor. To enable the chassis to be slid out of the cabinet, these straps have to be desoldered at the CRT base end then unscrewed at the front of the monitor. But a number of earth tags that terminate at the CRT base screening can must first be removed, followed by removal of the earth cables that are secured by two screws on the line output screening can, then the various plug-in earth connectors on the main chassis. After this, remove the tilt control cable from the sub-PCB at the right-hand side of the CRT.

It should then be possible to slide off the CRT base, after releasing its securing screw, then carefully slide the chassis out. Reassembly is in the reverse order. It may be helpful to note where all the connectors come from while dismantling the monitor.

With both of these monitors the reported symptom was "takes a long time to come on". Both had different faults however, and they were fitted with different-revision chassis.

The note with the first one said that the green power LED didn't light up when the monitor was initially switched on, and that it remained dead for a number of minutes. When I applied heat from a hairdryer to the power supply the monitor burst into life, which suggested a faulty capacitor in the power supply. I checked a number of capacitors with a capacitance meter and found that C843 and C844 (1μF, 250V non-polarised) had both fallen in value. Replacements cleared the fault. These capacitors are near the on/off switch, at the front of the chassis.

The second monitor powered up at switch on, but there was no display for a number of minutes. It was easy to spot the cause of this fault, as there was a bulging capacitor in the power supply. It was C826 (2,000μF, 16V), which is the reservoir capacitor for the 6·3V heater supply. A replacement electrolytic cured the fault. **B.B.**

Laptop PC AC adapters

Some people don't have the time to order a new AC adapter. Instead, they ask me to do my best. Here are a couple of recent examples.

The **Imation** 52-0000-7289-3 uses a UC3842 chopper-control chip. There was a start voltage at pin 7 of this IC (typically 16V to start, 7·7V to run) but no drive output at pin 6. So I popped in a replacement and, behold, the adapter sprang back to life.

The UC3842 IC in a **Delta Electronics** ADP-90FB had no supply at pin 7. When I traced back I found an open-circuit 68kΩ feed resistor, R19. All that was necessary was to fit a replacement. **C.H.**

Compaq S7500

Not the slightest squeak was emitted by this monitor at switch on, yet the mains fuse was intact. The supplies on the secondary side of the chopper circuit produced a brief output pulse. I opted for replacing the two electrolytic capacitors on the primary side. C995 (100μF, 50V) and C960 (2·2μF, 50V). The hunch paid off, with all systems go. **C.H.**

Solution to Test Case 511

– see page 536 –

We love intermittent faults, don't we? Do you know what motor mechanics do about intermittent faults? They keep replacing expensive parts, one at a time and entirely at the customer's expense, until the latter reports that the trouble has been cured. This trial-and-error method of fault diagnosis bothers them not at all. In fact around here it's accepted as standard practice in that trade. Meanwhile we mess about for days and weeks, chasing little diodes and resistors and suchlike!

No diodes or resistors were responsible for the horrible fault with this posh widescreen Panasonic set however. In fact the cause of the trouble was the CRT itself, most likely because of some sort of interelectrode leakage. Maybe the voltage at the tube's control grid, which is common to all three guns, would have provided a clue. But, at the crucial moment, it was found that a tap on the tube's neck made the fault come and go, even driving the tube so hard that auto-shutdown (excessive-current control) occurred. For those interested, the set was fitted with a Panasonic tube – these are normally very consistent and reliable.

The cost of obtaining and fitting a new CRT is seldom justifiable. It certainly wasn't in this case. RT and CR didn't even bother about taking out their little resistor and couple of capacitors before tossing the set on the scrap heap. And now it costs money to have the scrap removed from the premises . . .

NEXT MONTH IN TELEVISION

Converting to digital

Changes to our TV reception have been demanded before, with the end of the 405-line system, and there has been any amount of technical change in the video/TV field since then. The transition to digital TV reception is something quite different however. It has caused all sorts of problems, with winners and losers. Garry Smith and Keith Hamer review the current situation.

Latest Sony CE technology

Sony recently held a pan-European press event to show and demonstrate its new strategy in the consumer-electronics field and a raft of new products and technologies. These include HDTV, DVD recording and hard disk audio and video devices. George Cole reports on the event.

Plasma display technology

In Part 3 of his current series Fawzi Ibrahim deals with video processing and display formatting. Much has to be done following reception of a conventional TV signal, whether analogue or digital, to generate drives that are suitable for a plasma display panel. The basic steps are explained.

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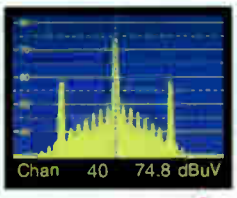

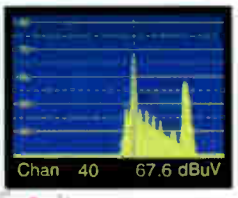

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