NEWS AND TECHNOLOGY ■ INSTALLATION ■ SERVICING ■ DEVELOPMENTS

TELEVISION

AND CONSUMER ELECTRONICS

OCTOBER 2005 £3.75

Plasma TV fault-finding

- The 405-line era
- Active LOPT tester project
- ATX power supply faults

9 770032 647146 10>

FAULT FINDING FOR TV ■ AUDIO ■ SATELLITE ■ VIDEO ■ IT

The Annie 204 Spectrum Analyser
Easy to use! Simply the best!

swires research

Featuring analogue, digital terrestrial and digital satellite demodulation. View the spectrum, level and quality information or the picture display individually or simultaneously.

- **Designed for ease of use.** Automatic detection of all relevant parameters.
- Large 14.8 cm (5.8 inch) full colour display
- 30 to 860 and 950 to 2150 MHz frequency range coverage
- Demodulates terrestrial analogue, digital satellite and digital terrestrial signals producing pictures and sound in addition to B.E.R and signal to noise readout.
- Single button switching to view all programmes in a digital multiplex.
- Nylon carry-case with integral light hood for bright conditions.
- Stores test setups as favourites for rapid repeat measurements.
- UK trade price £1,525 plus vat.

For more information,
visit www.swires.com or phone +44(0)1268 417584.

40, Hornsby Square
Southfields Ind.Park,
Laindon, Nr Basildon,
Essex SS15 6SD.

CONTENTS

October 2005 **Vol. 55 No.12**

Editor
John A. Reddihough
TVeditor@nexusmedia.com

Deputy Editor
Tessa Winford

Production Editor
Jane Massey

Production Executive
Dean Turner
01322 611206

Display Sales Executive
Reuben Gurunlian
01322 611 261
Fax 01322 616 339

Editorial Assistant
Katie Butler
01322 611 472

Managing Editor
Svetlana Josifovska
01322 611 250

Publishing Director
Tony Greville

Note that we are unable to answer technical queries over the telephone and cannot provide information on spares other than that given in our Spares Guide.

Next issue, dated November, on sale October 19

PEAK electronic design ltd

not just intelligent *but smart*

Peak Electronic Design Ltd
Atlas House, Kiln Lane
Harpur Industrial Estate
Buxton, SK17 9JL, UK
Tel. 01298 70012

the *Atlas ESR60*

- Automatically measure capacitance and ESR.
- Can be used in-circuit!
- ESR resolution down to 0.01 ohms!
- Supports capacitance up to 22,000uF.
- Protected against charged capacitors.
- Gold plated kelvin crocs supplied.

ESR60 £79

ESR60 £79.00

LCR40 £69.00

DCA55 £49.00

SCR100 £99.00

Passive components, semiconductors, power devices, network cabling

Choose your perfect analyser

New Low Prices!

limited time only

"Star Pack"
LCR and DCA in carry case
£118.00

Carry cases
£15.00

SMD Tweezer Probes for LCR
£19.00

Spare Battery
£1.75

the *Atlas LCR40*

- Automatically identify Inductors, Capacitors and Resistors.
- Inductors from 1µH to 10H.
- Capacitors from 1pF to 10,000µF.
- Resistors from 1Ω to 2MΩ
- 1% Basic accuracy.
- Automatic frequency selection.

LCR40 £69

accessories & carry cases

Semiconductor Analysis £49

Triac and Thyristor Testing £99

Cat5 Cable Testing £79

www.peakelec.co.uk

all prices include UK Delivery and VAT

Don't just test it...
...Analyse it!

CORRESPONDENCE
All correspondence regarding advertisements should be addressed to the Advertisement Manager, Television, Nexus Media Communications, Media House, Azalea Drive, Swanley, Kent, BR8 8HU. Editorial correspondence should be addressed to Television, Editorial Department, Nexus Media Communications, Media House, Azalea Drive, Swanley, Kent, BR8 8HU.

INDEXES AND BINDERS
Indexes for Vols. 38 to 54 are available at £3.50 each from SoftCopy Ltd., who can also supply an fifteen-year consolidated index on computer disc. For further details see page 763.
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.
Make cheques payable to "Television Binders".

Newstrade Enquires
by Seymour Distribution Ltd.,
86 Newman St, London, W1T 3EX.

ISSN 0032-647X

Newstrade Hotline
If you are experiencing problems getting copies through your newsagent, please call Debbie Jenner on 01322 611210.

SUBSCRIPTIONS
Customer Interface Ltd.,
Cary Court,
Somerton,
TA11 7BR.
Telephone 0870 4287950
Fax 01458 271146

Subscription rates:
UK 1 year £39.00
2 years £70.00
3 years £90.00

Mainland Europe 1 year £57.00
2 years £100.00
3 years £135.00

Rest of World 1 year £74.00
2 years £130.00
3 years £175.00

Cheques should be made payable to Television.

BACK NUMBERS
If available issues are £4.50 each.

NEXUS
MEDIA COMMUNICATIONS

Anniversaries

This year has brought us a couple of important TV anniversaries. Those of a nostalgic disposition will probably be aware that it's the twentieth anniversary of the final end of 405-line transmissions. Keith Hamer and Garry Smith tell the story of 405-line TV in an article that starts on page 716.

But why in the early Thirties did EMI, which created the system, settle on 405 as the number of lines? Well the Selsdon Committee, which had been set up to advise the government on the TV system to adopt, recommended not less than 240 lines in its report published in January 1935. The Baird Company had been working on a 240-line system. Isaac Schoenberg (later Sir), Head of Research at EMI, decided on 405 lines as one way of significantly improving upon the Baird system. It was an audacious decision at the time, in view of the technology then available. An odd number of lines was used because interlaced scanning, which requires two half lines, had also been adopted by EMI – the principle of interlacing had been patented by RCA in 1933. 405 with its simple division ratios (9 x 9 x 5) made generation of the TV waveform with its sync information easier. Alan Blumlein had been given responsibility for this and, fortunately, the whole system turned out to be a great success.

The other noteworthy anniversary is the start of commercial TV in the UK. It began, in the London area only initially, fifty years ago on 22 September 1955. This was in fact a remarkable achievement for the Independent Television Authority (later the IBA and subsequently the ITC), which was responsible for the transmitters (amongst other things) and could be set up only after the Television Act became law in July 1954. That gave it just fourteen months to prepare for the new service in Band III.

The Television Act had been preceded by a ferocious debate between those in favour of and those against commercial TV (they decided to call it independent, but independent of what?). There was a lot of unease over the introduction of advertising with TV (commercial radio came later). Would it impinge too much on the broadcasts, and would commercial interests try to interfere with the programmes? The example of US broadcasting added to this unease. The Television Act laid down strict regulations on such matters. But it was more than just the matter of advertising: the type of broadcasting likely to be made available also gave rise to concern. Lord Reith for one was against giving "the public what it wants. I would not, did not and said I wouldn't." It was probably condescension of this type that did more than anything else to help the advocates of commercial TV. To provide some sort of control, the Television Act also had a lot to say about programme balance, minority interests and so on.

ITV got off to a somewhat shaky start. There was concern about finance – this was before the "licence to print money" episode. But by the summer of 1957 ITV had over 70 per cent of the TV audience, and the BBC had to improve its offering to compete. The rest, as they say, is history.

Blue-laser disc talks break down

Talks between the two groups promoting next-generation, blue-laser DVD formats, Blu-ray and HD-DVD, seem to have broken down. Efforts to establish a common format started earlier this year but, apart from the use of a blue laser, there has been little agreement about the specification.

NEC has started to deliver HD-DVD disc drives to computer manufacturers and producers of video recorders, also for peripheral devices. But Toshiba has decided to delay its US launch of HD-DVD until next year. There is little point in going ahead unless a substantial catalogue of prerecorded material is available. This is unlikely until the Hollywood studios get a clearer idea of how things are likely to develop.

Back-room discussions will probably continue, but there will be no launch of blue-laser discs and equipment in the consumer electronics market in the immediate future.

Our email addresses

Please note the change to our email addresses from this issue. Instead of highburybiz.com after the @, the address is now nexusmedia.com, e.g. TVeditor@nexusmedia.com and t.winford@nexusmedia.com The change relates to the fact that we are now published by Nexus Media Communications, not Highbury Business.

News from BSkyB

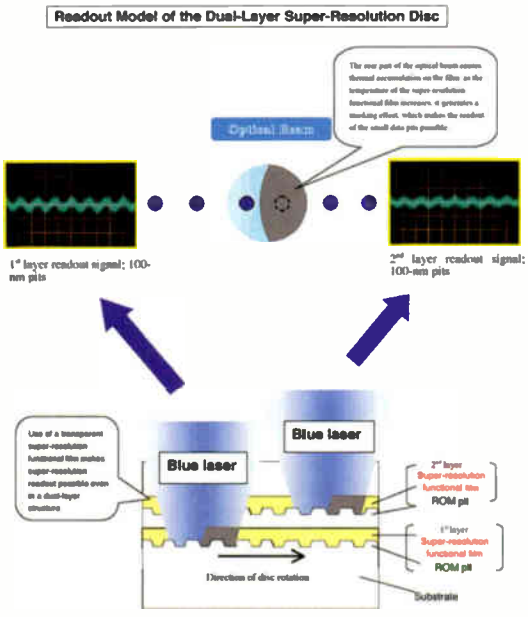
Some preliminary information has been released on BSkyB's HDTV channel package, which is due to become available in the UK and Ireland in the first half of next year. Three additional Astra transponders will be used for the service. In addition to Premiership football, the channels are likely to include Artsworld, National Geographic and The Discovery Channel. A new HD set-top box will be made available.

BSkyB has launched an HD consumer website. Visitors to the site can find out more about HD, view the frequently-asked questions page and register to receive further information on Sky's HD service. The site features a jargon buster and provides information on buying HD-ready TV equipment and what viewers can expect from Sky's HD service. The site is at www.sky.com/hd

Sky has also announced a wireless device, the Sky Gnome, that enables subscribers to listen to the audio content of digital radio and TV channels throughout the home. It's compatible with all Sky digiboxes and has a typical range of 30m, in the home or garden. Users will be able to listen to more than 80 digital radio channels and any of the TV channels in their Sky package without extra charge. In addition Sky+ subscribers will be able to use the Gnome to listen to prerecorded programmes on their Sky+ planner. The Gnome provides stereo sound and has a backlit LCD display that gives full channel and programme information, volume and channel control and the option to preset ten favourite channels. Price details have still to be announced.

Before the end of the year Sky subscribers who take a top-tier package and have a broadband internet connection will be able to download movies on-demand and view Sky Sports programming with their PC free of charge. There will initially be over 200 movies, increasing with time. Subscribers will be able to browse and download movies, trailers, behind-the-scenes footage and reviews at any time. Sky World subscribers will also be able to receive video updates from Sky News and Sky Sports News via their mobile phone.

BSkyB has issued its results for the year ending 30 June. At that date there were 7,787,000 subscribers in the UK and Ireland, with 5,619,000 taking one or more of the premium channels. Sky says it is on track to achieve its target of 8m subscribers by the end of the year. Turnover increased 11 per cent to £4.048bn, with operating profit before goodwill and exceptional items up 34 per cent at £805m. There are now 888,000 Sky+ subscribers.



100GB blue-laser discs

Sharp has developed blue-laser optical-disc technology that uses super-resolution transparent functional film to provide data readout in a dual-layer disc structure. The company claims that use of the technology will enable blue-laser discs to store 100GB of data, so that they could record approximately nine hours of high-definition video. This is twice as much data per layer as Blu-ray.

Each of the disc's layers consists of data pits covered by the super-resolution film, whose thermo-optic properties provide very high data readout. It enables data pits that are smaller (100nm) than the laser beam to be identified.

Intel's CE platform

Chipmaker Intel has announced a new technology platform, called Viiv (it rhymes with 'five'), for entertainment-based PCs. It's based on a multi-tasking dual-core processor and will initially be used in conjunction with the Microsoft's Windows Media Center edition. Launch is expected to be in the first quarter of next year.

Intel says that PCs with Viiv technology will have the following features: remote-control operation and instant on/off switching like a TV set (after the initial boot-up); advanced graphics and sound capability; content on demand, with internet access to movies, music, pictures and games; the ability to record, pause and rewind live TV programmes (with optional TV-tuner card); special software to make it easier to set up a home network and connect to wireless devices; and provision for up to 7.1 channel surround sound.

Such PCs will be available in different shapes and sizes, from small consumer-electronics versions that look like a DVD player to more traditional desktop designs.

BBC via the internet

The BBC plans to make its programmes freely available via the internet. The aim is to launch a service next year under the provisional name MyBBCPlayer. It would give licence payers access to BBC radio and TV programmes from the previous seven days, subsequently expanding to include an ever-increasing proportion of the BBC's archive material, also a wider range of local, national and international news. There are also plans to make video clips available to mobile phones.

The plans are subject to the approval of the board of governors and rights clearance issues being resolved.

Digital TV trials

The Department of Culture, Media and Sport has announced that the digital switchover trial in Wales was a success, adding that those who took part gave it overwhelming support. In March, households in the villages of Ferryside and Llansteffan became the first to switch over to digital TV only, as part of preparations for a UK switchover between 2008-2012. The report and research on the trial show that it was achieved on schedule with no major transmission problems.

81 per cent of the people involved were able to install the equipment supplied without help from the trial team, though one in five households experienced installation difficulties and additional remote-control units were a problem for some, especially the elderly, who preferred much simpler handsets. In 22 per cent of homes the domestic aerial and cable were in poor condition and required some attention. This usually involved a new flylead, not a replacement aerial. Flyleads were often old, damaged or had poor plug connections.

Six homes that previously suffered from very poor analogue reception couldn't be served easily or at all by digital terrestrial transmissions and had to receive digital TV via satellite. In the end-of-trial questionnaire 99·2 per cent of respondents voted to keep digital TV.

Nokia's mobile TV trial at the World Athletics Championships in Helsinki appears to have been a great success. Trade and press visitors were provided with 300 7710 Smartphones that incorporated a prototype receiver module and a built-in aerial. Transmissions were at 610MHz, providing fourteen programmes over an area of approximately 200km^2 – programmes included BBC World, CNN, Eurosport and Finnish sports feeds. As the signal was in packet data form the sound and pictures almost never failed or broke up. A reset was needed with the occasional freeze. MPEG-4 compression was used, with transmission at 250kbits/sec and 15 frames/sec, more than adequate for the 70mm display. A fully-charged battery provided just under three hours' viewing time.

The system is due to be released commercially next year. A cellphone connection is needed to unscramble the signal.

The Roadstar Boombox Model TVD5004 has been designed for those on the move – in a car, caravan, train or boat. It provides five options, TV, radio, MP3 or DVD/CD playback. There's a 5in. 960 x 234-pixel resolution LCD screen for viewing and a pair of 2·5W speakers for the stereo audio output. The unit caters for Dolby Digital stereo sound. Power is from the mains or a 12V battery. An S-video output socket and AV input/output sockets are provided. The unit is expected to sell for under £180.

Video recorders

Hitachi has shown in Europe a multi-format hard-disk/DVD recorder with a storage capacity of 1TB (terabytes). Model DV-DH1000W can store 128 hours of HDTV material or 1,700 hours of standard-definition material. No UK launch details have been announced.

Hitachi has also announced a new Memory Master range of multi-format DVD/hard-disk recorders that can read or write to all DVD formats. The models are DV-DS81E with an 80GB hard drive, DV-DS161E with a 160GB hard drive and DV-DS251E with a 250GB hard drive. They can record and playback DVD+R, DVD+RDL, DVD+RW, DVD-RAM, DVD-R and DVD-RW discs. No price details have been announced.

Alba has released a DVD recorder, Model RDV1001, that can record on DVD+R and DVD+RW discs and play back these and DVD-R, DVD-RW, DVD, CD, CD-R and CD-RW discs. It has auto TV channel set-up, one-touch recording, a timer, and an on-screen disc index with thumbnail preview. Also parental lock, remote control and a component video output socket with progressive scan. It comes with a blank DVD+R disc, a scart lead, an RF lead and batteries for the remote-control unit. All for less than £100.

Further WEEE postponement

The government has decided to postpone for a second time, until June 2006, implementation of the European WEEE directive, which makes retailers and manufacturers responsible for the safe disposal of end-of-life electrical and electronic equipment. The decision arises from the fact that businesses, the Environment Agency and local councils are not at present able to provide a full disposal service.

The Environment Agency is expected to announce interim arrangements for registration of producers of electrical and electronic equipment this autumn, with registration starting in January 2006. Companies will have to pay £730 to register.

The retail industry has announced the first step in an £8.2m plan to upgrade recycling centres to meet WEEE requirements. Valpak, which has experience in recycling packaging, has been appointed by the British Retail Consortium to recruit businesses and co-ordinate the creation of collection sites. The BRC estimates that some 150,000 businesses in the retail sector will be affected, most of them small independent shops. These businesses will be asked to fund the BRC's recycling scheme by paying a percentage, equivalent to their share of the market, of the total cost. Alternatively small businesses might be charged a flat fee of £500. The BRC hopes to have a network of upgraded recycling centres in operation by the end of the year.

When the directive becomes effective, the cost of collection is likely to be included in the price of new equipment.

Socket problem

Toshiba has announced that a small number of its WL56 series LCD TV sets sold in the UK have a VGA socket that's not activated for YUV signal processing. If a set appears to have this problem, the user should contact the Toshiba helpline on 0115 976 6958 or alternatively send an email to cp-toshiba.helpdesk@toshiba-tiu.co.uk

Repairing ATX power supplies

The power-supply modules used in ATX PC systems are relatively cheap and are generally just replaced when faulty. Many of the faults that occur are straightforward however, and the modules follow a similar pattern. So some repairs are worthwhile. Alun Rawson-Williams on how to go about it

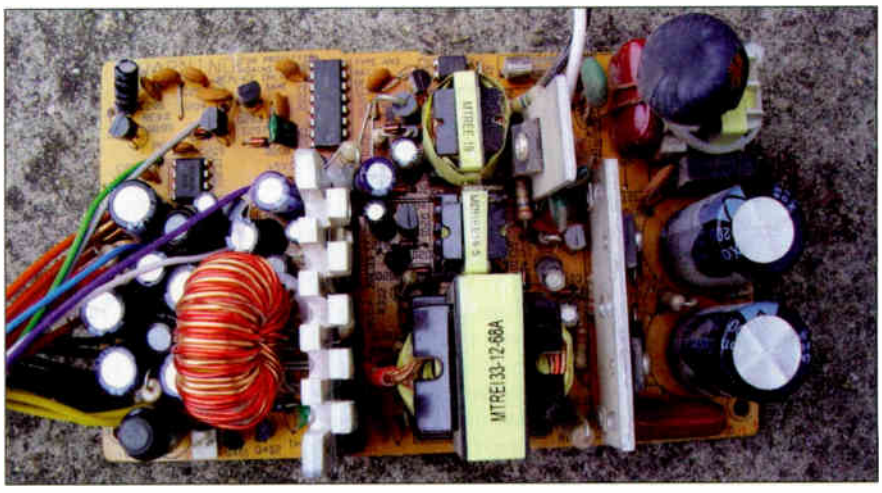


Photo 1: Top view of a typical ATX power-supply.

The power supply modules used with ATX PC boards are nowadays so cheap to buy that they are hardly worth repair. There are occasions however when a particular type is urgently required yesterday! In addition, it's worth checking a faulty power supply before a burn-up means that it has to be consigned to the scrap heap: the fault could be a simple one that's easy to deal with.

These power supplies range from very basic 240V types with no mains switch or monitor outlet socket to dual-voltage (115/230V) types that are capable of providing a power output of 180W to say 350W. Most of the ones you are likely to encounter are of the latter type. The cheapest modules cost less than £10 trade while the latest 650W, P4-ready, dual-voltage types cost £30 to £55 trade.

Photos 1-3 show typical ATX power-supply modules.

Typical primary-side arrangements

In every example I've come across the mains-input circuitry is easy to follow and simple to repair. All are basically the same, with an input capacitor/inductor filter network, a ceramic fuse rated at between 3·15AT and 6·3AT, a switch-on anti-surge thermistor and a bridge rectifier, either a unit or four separate BY133/1N4007/1N5407 silicon diodes. There are usually two series-connected reservoir capacitors that range in value from 180μF to 350μF, rated at 200V. When they are in good condition the voltage across the two of them is normally about 330V. The exception you sometimes find in this position is a single 450μF, 400V capacitor.

In the cheaper types of power supply module the 330kΩ bleeder resistors connected across the reservoir capacitors are missing. The PCB is drilled to provide for them but they are deliberately omitted, presumably to save a few pennies. This point should always be checked, as good capacitors have been known to hold their charge for weeks. I've also come across these resistors open-circuit. Before you delve under the PCB, the reservoir capacitors should always be bridged with a 10kΩ wire-wound resistor for two to

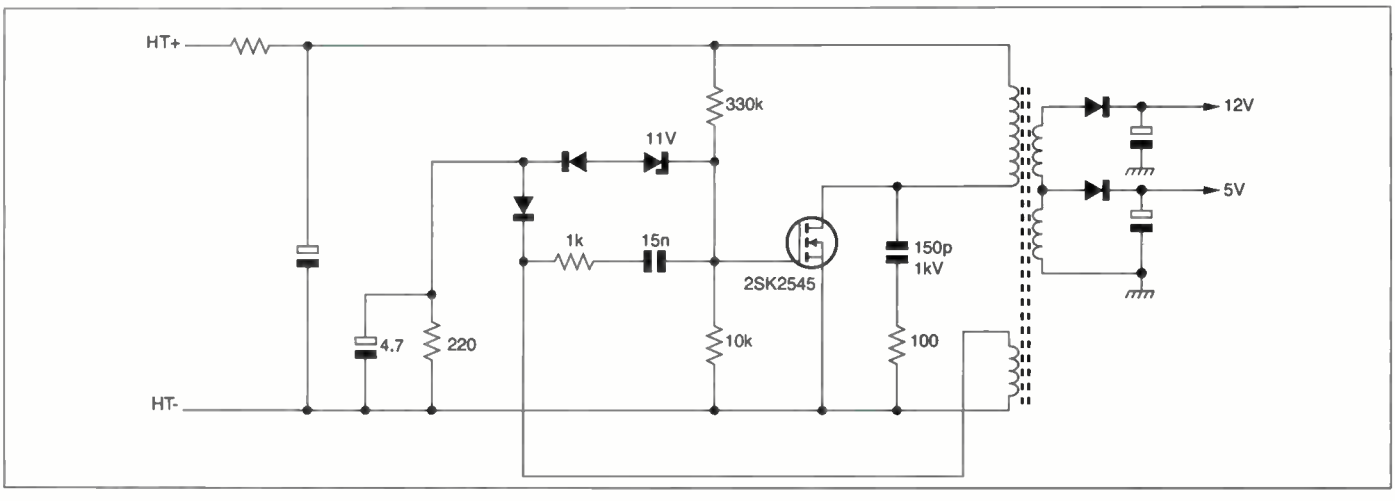


Fig. 1: Simplified circuit of a typical 5V standby section of an ATX power supply.

three seconds, just for peace of mind.

The 330V HT supply generated in this way is fed to two separate switch-mode power supplies, a low-current 5V standby supply (see Fig. 1) and a larger, main one that's switched on from the PC's motherboard. In addition there may be a 12V supply. The 5V/12V supplies are always on when the unit is connected to a live mains power supply.

Fault finding

If, when the PC is switched on, the 330V supply is established but the main switch-mode power supply remains dead (no cooling-fan operation), check the 5V standby supply. It should be running whenever the power-supply module is connected to a switched-on mains input. For this reason it seems to suffer the greatest stress. Its output can be checked whether connected to the motherboard or not. You should find this output at pin 12 (mauve lead) of the 20-pin socket on the motherboard. Check between here and any of the power supply's common (black) leads. This small power supply is usually based on a switching transistor such as a BUT11 or a MOSFET such as a P3N60/BUK78, sometimes with another small plastic-cased transistor.

Failure of the 5V standby supply's start-up resistor is quite common. If the mains fuse has blown however check whether the switching transistor in the 5V or main power supply is short-circuit, with its emitter/source series resistor (typically 0·25-0·5Ω) open-circuit. These transistors can fail as a result of one of the items (resistor/capacitor/diode) in the snubber circuit connected to the collector/drain being faulty. On the secondary side of the 5V supply, check whether the 5V rectifier, usually a UF4003, is short-circuit. On rare occasions you might find that the 7805 regulator in the 5V supply is short-circuit.

As mentioned above, the main chopper supply is switched on from the computer's motherboard. Older units use a switching device such as a BUK34 or one with similar ratings. More modern units generally use either a single MOSFET such as a 2SK727 or a push-pull transformer-drive arrangement with MOSFETs such as the P3N60/BUK78 as the switching elements. Fig. 2 shows a two bipolar-transistor transformer-drive arrangement. Regulation control is provided by one of the UC3842/3843 family of ICs. Rare examples use a Motorola IC.

The usual failure here is the power-switching transistor(s). When a single MOSFET fails the UC3842/3 regulator device is generally taken out as well, as a drive-coupling capacitor is seldom used between the IC and the gate of the transistor.

On the secondary side of the main chopper supply there are generally three full-wave rectifiers to provide +5V, +12V and –12V outputs. These rectifiers are prone to going short-circuit – either one or both diodes.

A nasty fault that occurs from time to time is when the 5V output is about normal but the 12V supplies are both high. The cause of this is the 5V supply's reservoir capacitor, which may be anything from 1,000μF to 2,200μF depending on the space available on the PCB. The capacitor is usually found to be low in value, and an oscilloscope will reveal high-frequency ripple on the 5V output. The voltage-error sensing circuit detects the slightly low 5V output and, via the feedback regulation loop, increases all the outputs – the 12V supplies are generally not monitored. With this fault the main power supply fires up and runs, with the fan running on the fast side, but the PC fails to boot up. I've known this fault to knock out the CPU and RAM chips on the PC's motherboard.

Finally, always check for any electrolytic capacitors that show signs of distress or bulging.

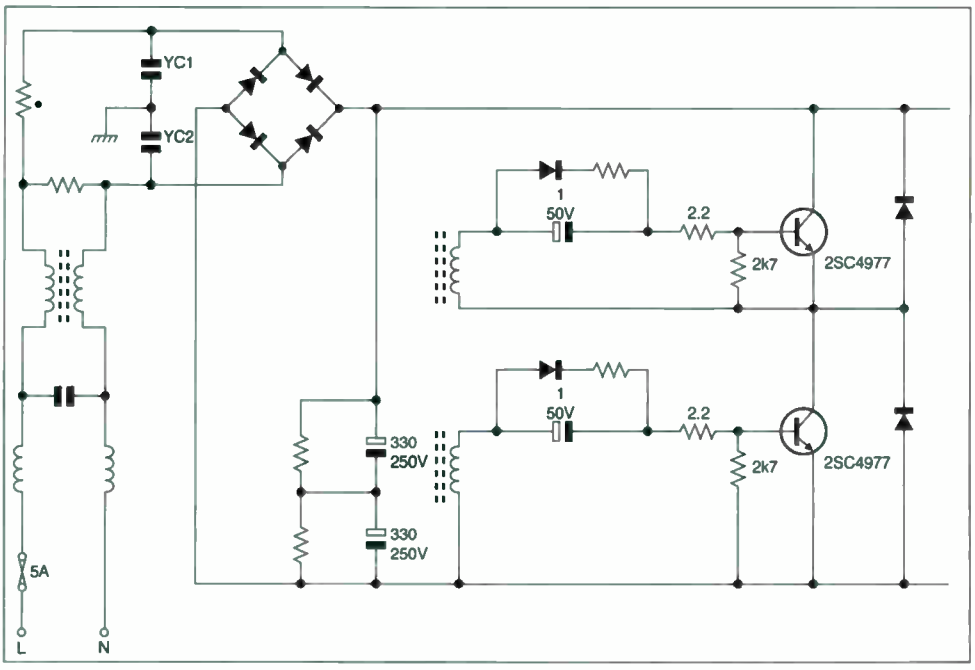
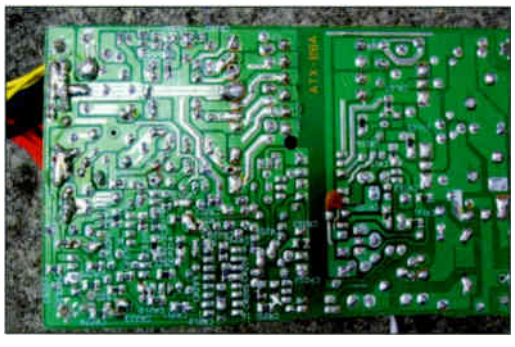


Fig. 2: The two-transistor transformer-drive arrangement used in the main chopper section of some ATX power supplies.

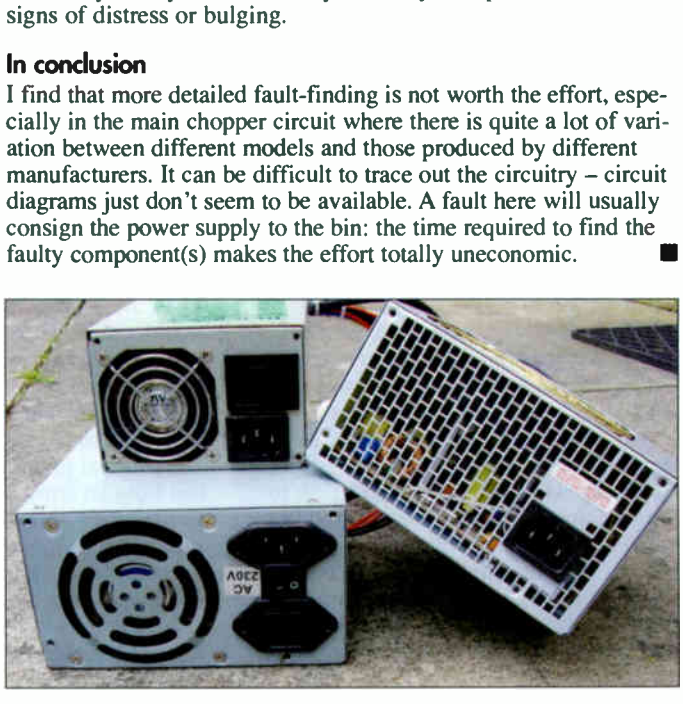


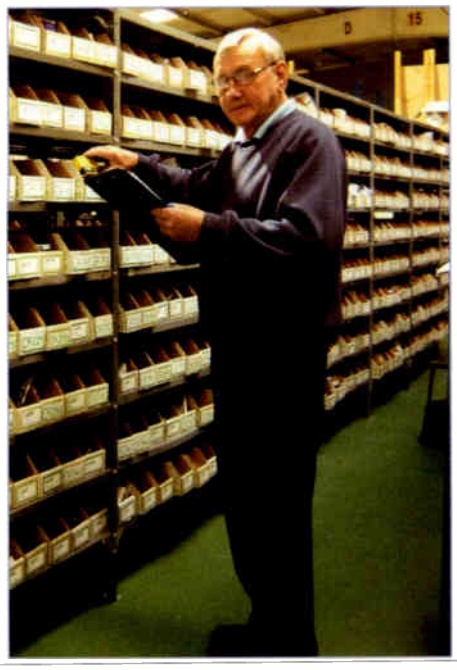
Left – Photo 2: Underside view of a typical ATX power-supply PCB, showing the clear demarcation between the primary and secondary sides of the circuitry.

Below – Photo 3: Three typical ATX power supplies, chosen at random from a pile of them, showing different types.

In conclusion

I find that more detailed fault-finding is not worth the effort, especially in the main chopper circuit where there is quite a lot of variation between different models and those produced by different manufacturers. It can be difficult to trace out the circuitry – circuit diagrams just don't seem to be available. A fault here will usually consign the power supply to the bin: the time required to find the faulty component(s) makes the effort totally uneconomic. ■





Eric in the small picking area.

Number one pallet area.

Alan – technical.

Andrew – publishing.

The CH

Charles Hyde and Son has been repair trade for 45 years. Andre single room in Hull to a Europe-v

Spares distributor CHS has continued to expand throughout the 45 years since it was founded by Charles Hyde in 1960. How do you achieve such success in business? By providing customers with a first-rate service of course but, as importantly, by responding to changes in the trade and in customers' needs. The company started as a local business in Hull, East Yorkshire. It now covers the whole of the UK and provides some Europe-wide services.

Early days

Charles Hyde had been a RadioSpares sales representative for ten years before he set up in business on his own in 1960, at the age of fifty. Working from home in Hull, he sold rebuilt TV tubes to local dealers and repairers. His wife Beatrice looked after the paperwork. More space soon became necessary and, after a period of sharing premises with a customer, Charles Hyde moved to a lock-up shop in Froghall Lane, Hull.

In 1962 Charles Hyde suffered from a heart attack, his third. His son John Hyde, who had been working as a trainee salesman with another company, decided to leave his job to help out with his father's business. This was intended to be a temporary move, until his father recovered fully, but turned out to be a lifelong career. John is Chairman and Managing Director.

He initially concentrated on the sales side, covering an area that extended from Cleethorpes to Scarborough and York to the east. John used a converted mobile butcher's shop, the company's first vehicle. By 1964 the administrative side, handled by Charles Hyde and his wife, had grown to the point where further help was needed. John Hyde's cousin Mary Oxberry joined to run the accounts department – and eventually became the company secretary. At this time CHS began to broaden its product range. One of the innovative items introduced was the Ekco LOPT shroud, which sold for eight shillings per unit. It was bought by dealers all over the UK, and was the start of the company's mail-order operation. Transferring the old Ekco LOPT coils into the new housing saved the cost – over £5 – of a new transformer.

Maurice Zaph was next to join the firm, taking over sales in the York and Scarborough areas while John Hyde concentrated on the Hull and Grimsby region. Maurice stayed with the company for fifteen years, until his retirement.

Pocklington

Hull has always been rather isolated, and was not felt to be the ideal location if the business was to expand. So in 1969 the company moved to Pocklington, with a view to extending its van-based coverage to West Yorkshire. The company carried out its own deliveries, and by now had five vans. Pocklington was seen as being central to the area it intended to serve. There were other reasons for selecting this rural location. Cost, for one. Not being in the middle of a town didn't matter: the company had no trade counter and didn't expect to do business in this way. Furthermore it's a pleasant place to live. The original premises, Prospect House, had been an army drill hall. They provided ample office accommodation, while the rifle range and gymnasium provided space for component storage and handling.

Shortly after the move David Cass, who had been one of CHS's first customers, joined the company as technical buyer.

This was a turning point. David's specialist product knowledge enabled CHS to change the emphasis from selling TV tubes to components, which became its main business.

By the end of the Seventies CHS had 600 or so customers and covered an area from Newcastle to Nottingham and Manchester to the east, employing a staff of about twenty. John Hyde comments that the company believed in gradual expansion and financing its own growth. It has proved to be a wise policy.

All change

During the Eighties there were substantial changes in the business. John Hyde points out that the changes really started when the use of valves went into decline. Once semiconductor devices began to take over, the number of parts that had to be stocked rose dramatically. There was also a need to stock specific equipment spares in addition to general ranges of components. At the same time the average price per item dropped, so the company had to sell a lot more in quantity and variety just to stand still. Fortunately at about this time computers started to become available relatively cheaply. This provided the solution to handling the exploding product range.

With the changing nature of the busi-

John and Charles Hyde.

From left: Tony – buying; Sue – accounts; Garry – telesales; pre-packing area.

Left to right: Derek – company secretary; Dilly – accounts; Eddie and Garry – technical.

IS story

serving the consumer-electronics w Shaw traces its history from a ride operation

ness it became necessary to cover a wider area. This meant switching to an outside carrier and, with the small size of the average order, first-class post could be used for most items. Four of the five vans were dispensed with. At about this time Freddie Whipp, who retired a couple of years ago, joined the company. He had worked for Mullard for 17 years and then for a couple of other distributors. Freddie very quickly built up substantial sales in the Midlands. As a result the company decided that it could cover the whole country, and Freddie became National Sales Manager. Coverage now extends from Scotland and the Isle of Man to the Isle of Wight and beyond.

At about this time many manufacturers began to feel that stocking and supplying spare parts would be better dealt with by outside specialists. Sanyo appointed CHS as its partner in the UK in 1989, a close association that continues to the present. CHS subsequently became sole authorised UK spares distributor for a number of brands, and an appointed spares and accessories distributor for many of the leading manufacturers. The company stocks extensive ranges of spares for other manufacturers as well.

More recent times

In 1993 Louise Holbrough, granddaughter of Charles Hyde, joined the family business, the first of the third generation to do so. After working in all departments she became a director in 2004.

Euras appointed CHS as sole UK partner to promote its faults database in 1995. When Euras closed its UK offices in 2000, CHS was made responsible for handling all customer technical queries in the UK and Ireland.

In 1998 CHS became the UK member of the Aswo European Partnership. This involved a daily delivery of parts for just about every make and model in European CE ranges, plus accessories.

Yamaha appointed CHS as sole UK partner to supply parts to all non-account customers in 2000, and in the following year the company was appointed sole UK distributor for Teac and Tascam spares and accessories.

Further franchises were awarded in 2002, when Hitachi appointed CHS to answer its account-holder part-number queries by telephone and fax, and Marantz appointed CHS sole UK distributor for spares and accessories. Teac moved its total spares inventory to CHS, which now distributes Teac spares to all its European Service Agents.

In 2003 Sanyo closed its Watford warehouse and the complete inventory was moved to Pocklington, where CHS is now responsible for the despatch of orders to Sanyo dealers and customers who don't have accounts with Sanyo. In the same year Denon appointed CHS as sole UK partner to handle all out-of-warranty spare-parts orders.

That same year CHS enlarged its stock profile to include computer and digital-camera accessories, and a large range of wall fixings for LCD and plasma screens was introduced.

Denon closed all but three UK spares accounts in 2004, appointing CHS to look after the rest – including consumers who had not been able to locate a part locally.

Also in 2004 CHS moved to 1 Halifax Way, Pocklington Industrial Estate, giving the company over 30,000 square feet of space. Prospect House continues to be used for some office purposes.

Earlier this year Teac France spare parts distribution closed, all stock now being managed by CHS at Halifax Way.

The company is an appointed spares and accessories distributor for Alba/Bush, Thomson/Ferguson, LG/GoldStar, JVC, Matsui/Saisho, Panasonic, Philips and Sharp. In addition extensive stocks are held for Akai, Nokia, Samsung, Sony and Toshiba TV, video and audio products, and special orders can be met. And of course the company supplies a full range of semiconductor devices, passive components, LOPTs, remote-control units and so on.

In conclusion

It's been a success story indeed – from domestic premises in Hull to a modern, Europe-wide distribution system. You don't achieve this by accident. Meeting customers' needs efficiently, and making it easy to do business, are key elements. Nowadays this is aided by a dedicated CD catalogue and web ordering. The company operates the CHS Part-speed service to make ordering as simple as possible.

Adrian Gardiner has been testing several types of lead-free solder and makes various recommendations

Bench Notes

Lead-free solder

I read with interest Geoff Darby's letter on lead-free solder in the August issue. He points out that there is a distinct lack of knowledge on the subject, and that we are being forced to go lead-free without any real explanation about why. Some setmakers are ordering authorised service agents to do so or lose their franchise.

There are plenty of other ways in which we could have a far greater effect on saving the planet. To add to our problems, a large number of different lead-free solders are available, with different alloy and flux combinations. Although newer products employ lead-free construction, most of our repairs involve equipment that was originally made with leaded solder. As Geoff says, there could be problems with mixing these compounds.

In my last comments on the subject (Bench Notes, June) I discussed some of the problems when working lead-free, and the type of soldering equipment required. To summarise, you require a temperature-controlled soldering iron with a fast thermal response and recovery. It should ideally be fitted with a short tip, to enhance heat transfer to the joint. Where my previous article fell short was on the solder itself.

We have been experimenting with several types of lead-free solder and noting their behaviour. Three primary types are listed below, along with their CPC order codes. Lead-free solder requires a higher melting point than the traditional type. In practice I have found that a working temperature of 360°C (10° higher than I would use with leaded solder) works well for most applications. I increase this to 410°C when working with large areas of copper, such as the connections to a line output transformer. These temperatures ensure rapid melting of the solder, so that the process can be completed quickly.

All three types of solder have the same basic composition, 99·7 per cent tin and 0·3 per cent copper. This seems to be the new general standard, with most solders consisting of this mixture. We had intended testing a silver-mix alloy (96 per cent tin, 4 per cent silver) but it was out of stock at the time of ordering.

Type X39, no-clean flux

The first solder has only a tiny flux content (one per cent by weight). The flux is halide-free, zero activation. In use we found that the joints formed look like the original ones in lead-free manufactured products, with the familiar dull appearance. The solder has poor wetting characteristics, and doesn't flow nicely into a joint. Although the solder is OK when remaking lead-free joints, the results were very poor when mixing into a leaded joint – as a result the joint has to be cleaned of old solder before being remade.

Overall this solder works all right, but it's better suited to the latest lead-free equipment.

The CPC order code for a 1·2mm 250g reel is SD00977.

Type 502 no-clean flux

This solder contains a mildly-activated flux (0·2 per cent) with an increased overall content (three per cent by weight). Performance is much the same as the first solder, being OK for lead-free reworking but unsuitable for remaking leaded joints. The wetting is improved, and the solder flows into joints better. But the most significant factor is a nasty smell that's given off in use. So much for health improvements. The fumes are so bad that I would not be able to use this product on a daily basis.

Overall I would not recommend this one. If you wish to try it yourself, the CPC order code is SD00985.

Resin-flux solder

This solder contains five cores of halide activated-resin flux. I was surprised by the solder's behaviour in use and had to check that I had in fact ordered a lead-free product. The wetting characteristics are much better than those of the other two varieties tried and it flows easily into the joints. I had no problems when using it to remake lead-free joints but, more importantly, it mixes well with the leaded solder used in older equipment. The only slight disadvantage is that a certain amount of flux is left after rework. This should ideally be cleaned off.

Overall this solder gets 10 out of 10 for ease of use, and we have now switched to the use of this product in our workshop. A 1·2mm, 500g reel can be ordered using CPC code SD00521.

In general

It's worth mentioning that all the solders work well with standard desoldering braid.

As mentioned before, there may be problems when mixing different types of solder. It could be that some of these will be dealt with by a future directive. Until then however we have to proceed on the basis that we are service technicians, not manufacturers. So the thing to do is to choose a solder that you are happy with and that works for you. The resin-flux type is ideal, as you don't have to remove the old solder with products that were made with the leaded type.

What's next?

PCs can be very useful, also a total nightmare. Whether you love or hate them however they are here to stay. Next month I begin a new series of articles whose aim will be to help you keep your PC in tip-top condition.

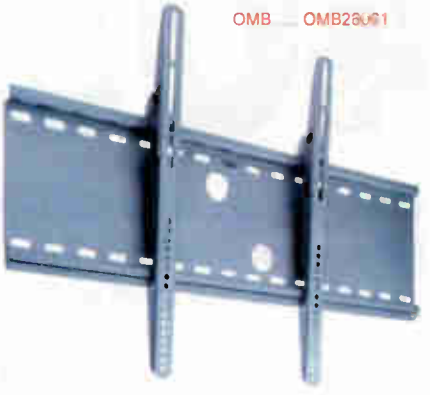
The series will also be useful for those of you who would like to add PC repairs to the services you offer. Most problems that arise are software-related, and getting to grips with them can produce a strong new income stream. I charge an average of £60 for a PC repair and have no shortage of referrals. Unlike the local computer shops, I get to the root of the problem rather than just reinstalling the operating system.

Throughout the series I will welcome your computer problems, aiming to solve as many as possible in this column. Contact me through the magazine, at the address given on the comment page or email at TVeditor@nexusmedia.com

One Stop Shop

B-Tech Omb Vogels

For Your PLASMA & LCD MOUNTS



Kenmark TV Stands

New Range

The sleek and stylish Kenmark stand range:
Are now available from Charles Hyde & Son Ltd

suitable for
PLASMA, LCD, CTV & (small Hi-fi systems)
And will support at least 135KG on the top shelf.

Leaflet Available on request.

www.charleshyde.co.uk

www.charleshyde.co.uk has been created to give our customers quick and easy access to information about our products.

- **Secure on-line ordering.**
- **Fast product search and access.**
- **Very latest new arrivals.**
- **On-line special offers.**

FIX YOUR REPAIR WHILE OTHERS STILL SEARCH FOR THE FAULT

EURAS:

Is a modular based database system. Within its internet community it supports the professional CE service technician with invaluable service information on a dally basis. You and your workshop can profit from the knowledge of manufacturers, specialists and thousands of colleagues.

THE PROBLEM:

Many repairs are not considered worthwhile because too much time is spent searching for the necessary service information (service manual, documents, diagrams etc). Due to the increasing number of appliances - in particular no name appliances - the necessary information is often not available or needs to be ordered. Consequently, Labour costs increase whilst new appliance prices decrease.

THE SOLUTION:

Shorten your repair time!
Save time and money searching for important technical information!
The EURAS internet system offers quick and reliable access to important information 24 hours a day, 365 days a year.
Make use of the wealth of expertise at your

Phone 0870 990 9474

www.euras.com

45 YEARS IN THE CONSUMER ELECTRONICS SPARES BUSINESS & STILL INDEPENDENT OWNED

Charles Hyde & Son Ltd
Prospect House
1 Halifax Way
Pocklington Industrial Estate
Pocklington York YO42-1NR

Telephone: Sales: 0870 990 9474

The days of 405-line TV

It's twenty years since the last 405-line TV transmitter was switched off. But it was the 405-line system that got TV as we know it going. Keith Hamer and Garry Smith recount the story, from the start of the service in November 1936 to the January 1985 closedown

A milestone in the history of British TV broadcasting was reached in January 1985 when the remaining transmitters of the 405-line network, which had used Channels 1-13 in Bands I and III, were finally switched off. When it commenced in 1936, the 405-line BBC service was hailed as "the World's first regular public high-definition television service". That phrasing was careful: there had been transmissions in the US, Germany and elsewhere, but no regular public service. And 405 lines were high-definition in comparison to previous systems. With the small CRTs then in use, they were more than adequate. The 405-line network continued to expand, particularly in Band III, even when UHF began to be used on a regular basis, at first for BBC-2 in 1964. In its heyday the 405-line network consisted of 157 transmitters, 99 of which used Band I frequencies.

The beginning

The 405-line service started at 3 p.m. on Monday, 2 November 1936 from the BBC's 17kW transmitter at Alexandra Palace in north London. Channel B1 was used, with the vision and sound carriers at 45MHz and 41·5MHz respectively. Double-sideband transmission was used for the vision signal, with a channel bandwidth of some 7MHz.

The first fifteen minutes were taken up by the opening ceremony, which included Adele Dixon singing *Magic Rays of Light* – it had the alternative title *Television is Here*. The programme finished at 4 p.m., to be resumed five hours later with a programme summary followed by a BBC film called *Television Comes to London*. This traced in great detail the preparations required to build and equip the studios and transmitter at Alexandra Palace. The film was subsequently used many times during trade test transmissions to demonstrate TV to prospective viewers. Programmes ended promptly at 10 p.m., which meant that initially only two hours of programmes were broadcast each day.

Photo 1: A view of Alexandra Palace in 1996, some sixty years after the start of the world's first high-definition television service.

Early demonstrations

A lot had gone on prior to this of course. On 27 January 1926 John Logie Baird provided a demonstration of true television (moving objects) to a less than enthusiastic audience. He didn't invent television – several other experimenters were actively engaged in this work – but he did manage to put together a practical system. During the following three years he notched up several firsts. In May 1927 an image was transmitted by telephone cable between London and Glasgow, and in August 1928 he demonstrated a simple coloured picture.

In September 1929 an experimental broadcast service was jointly inaugurated by the BBC and The Baird Company. A dual-transmission system commenced in March 1930, with video at 261m and sound at 356m. These transmissions took place for half an hour, on a daily basis, after normal broadcasting had ended.

At that time very few top BBC people took any interest in television. Nevertheless in August 1932 the Baird system was completely taken over by the BBC. It used a mirror-drum scanner that was installed at Broadcasting House, London. The system had thirty vertical scanning lines that were repeated at a rate of 12·5 times per second (12·5Hz). This restricted the material to close-up shots and bold, high-contrast scenes. Efforts were made to improve the picture quality, but it was realised from the outset that Baird's 30-line system would not be suitable for broadcasting general entertainment programmes.

High-definition TV

While these 30-line, low-definition transmissions were taking place, experimental work was being carried out by a number of firms internationally on developing all-electronic systems that would eliminate the restrictions of mechanical scanning and provide pictures which would compare favourably with cine-film.

Such a system had been proposed, theoretically, by Alan A. Cambell Swinton as early as 1908. His idea was to use a photoelectric mosaic screen on which the scene would be focused, with the screen scanned by a cathode ray, thus producing a varying magnetic field. Vladimir K. Zworykin and RCA in the US and Marconi EMI in the UK produced practical versions. Worried by the electronic competition, Baird managed to increase his scanning system from 30 to 240 lines (horizontal), with 25 frames per second, scanned sequentially.

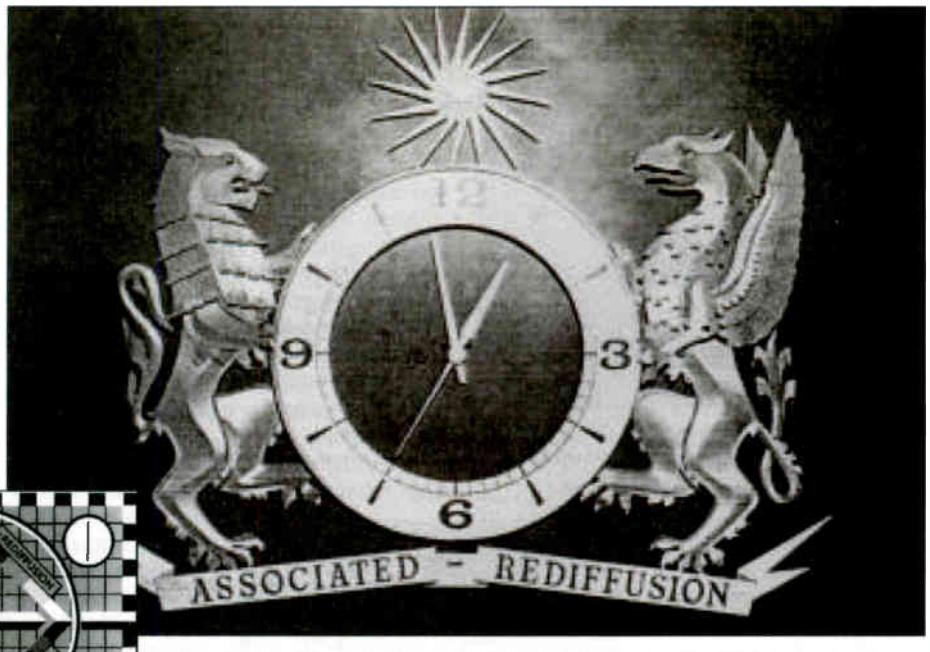
With his new, improved system Baird just managed to scrape into the high-definition category, as called for by the government, when transmissions began in November 1936. But EMI had come up with the much superior 405-line, 50 fields per second interlaced all-electronic scanning system. The two were put on public trial.

The first public demonstrations began with the Radiolympia exhibition in August 1936. Each day there were two one-hour demonstrations, the two systems being used on alternate days. When the exhibition closed, on 5 September, the station closed down and preparations were made for the start of the full service.

There were two official openings of the BBC London television station in November, the first with the Baird 240-line system and the second, repeat performance

with the EMI 405-line standard. Both continued from Monday to Saturday on an alternate-week basis, so that the two could be given a fair assessment. It wasn't too long before the government decided that Baird should pack away his Nipkow discs. The 405-line system had won the day, and took over sole operation from 8 February 1937.

The popularity of the service was given a boost when the BBC screened the first major outside broadcast in May 1937, the coronation of King George VI. Some 23,000 receivers are estimated to have been in use by September 1939, when the Alexandra Palace transmitter was closed down for the war years. The service reopened in 1946, with the Victory Parade screened on 8 June.



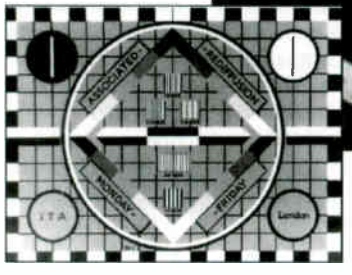


Photo 2 – left: The Associated Rediffusion Monday-Friday ITA London test card.
Photo 3 – above: The Associated Rediffusion clock.
Photo 4 – below: Holme Moss transmitter

Spread of TV

Television subsequently spread throughout the UK, with a transmitter at Sutton Coldfield being opened in 1949 to serve Birmingham and the Midlands, followed by Holme Moss in 1951 to serve Lancashire and Yorkshire then Kirk O'Shotts and Wenvoe in 1952 to serve parts of Scotland and Wales. It was clear from the start of post-War TV that spectrum space limitations would require a more economical system than Alexandra Palace's double-sideband transmission. Vestigial sideband transmission was therefore adopted, with one sideband transmitted in full and the other as a 'vestige' extending to about 0·75MHz. The original London transmitter at Alexandra Palace was closed down in March 1956. It was replaced by a 200kW transmitter at Crystal Palace, providing much greater coverage into the Home Counties. As with the other post-war transmitters, it used vestigial-sideband transmission.

Commercial TV

The first commercial TV station opened on 22 September 1955, with a transmitter at Croydon to serve the London area. Its ERP was 120kW. This marked the start of TV in Band III. The service was provided by Rediffusion, identified by a twirling star logo that cut in between the advertisements. It was greeted with a lukewarm response in some quarters, and some thought it wouldn't last a year. As with the BBC services, ITV soon spread to the main centres of population across the UK – with its own transmitter network.

Many of the programmes, particularly the quiz shows such as *Take Your Pick*, *Criss Cross Quiz* and *Double Your Money*, were based on tried and tested US formats. But the ITV companies were taking a gamble as to whether the new alternative types of programmes they were offering would prove popular. In fact they were a huge success, and the adverts proved popular as well. Many of the jingles are still fresh in the minds of those who were around at the time. And there were those TV chimps, brewing their favourite pot of tea.

There were no domestic video recorders in those days, but one advantage of the regional ITV service was that programmes were often broadcast at different times or on different days. Thus viewers in overlap areas could take advantage of this, watching their favourite game show on a different day or time by tuning to another channel. Multi-channel programming via cable systems also proved popular, with up to three ITV regions on offer in some areas.

Foreign interference

Lots of Continental TV stations entered service in the early Sixties. Many used Band I channels, with a 625-line signal. Summer signalled not only the start of Wimbledon coverage but strange, white sloping lines accompanied by rasping buzzes that drowned out the sound channel. The effect was described, during apology announcements, as 'Continental interference'. It was caused by propagation anomalies within the upper atmospheric layers. Apart from sit it out and be patient, there was little that the viewer could do.

The interference affected Band I channels, in particular areas served by a channel B2 transmitter as the sound carrier frequency was the same as the European channel E2 (48·25MHz) – hence the severe buzzing!

To alleviate the hardship, the BBC decided to improve coverage in some of these areas. Several Band III transmitters were installed at sites owned by the ITV network. Thus several transmitters carried BBC-1 in addition to the ITV service, enabling a single wideband Band III aerial to be used.

To supplement and improve the Holme Moss transmitter's coverage, which extended well into North Wales, the North West and Lincolnshire and across the Midlands, co-sited outlets were installed at Moel-y-Parc (ch. B6, 21kW), Sandale (ch. B6, 28kW), Winter Hill (ch. B12, 125kW) and Belmont (ch. B13, 20kW). To improve reception in the South West, served by North Hessary Tor (ch. B2), Caradon Hill (ch. B12, 200kW) and Wenvoe (ch. B13, 200kW) were added.

ITV in South Wales

Viewers in South Wales could receive two ITV channels, Harlech Welsh and English, which were transmitted from the St. Hilary mast on channels B7 (100kW) and B10 (200kW) respectively. This provision of two services from the same mast was something

Photo 5: The ITA tuning card, which was transmitted for about fifteen minutes before the start of programmes.

that the replacement UHF service failed to replicate, because of spectrum planning restrictions, so viewers who wished to receive the English version of HTV had to rely on the Mendip, Huntshaw Cross or Caradon Hill transmitter – with the added problems of tidal fading. The introduction of digital TV finally degraded reception from these transmitters along the Welsh coast, making them unusable in many areas.

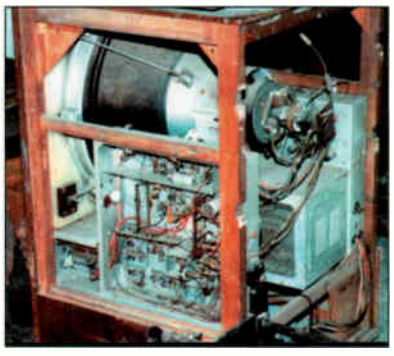


Photo 6: An experimental Murphy PAL/NTSC colour receiver that was produced in 1959.

Extent of 405

By 1971 a total of 99 Band I transmitters and 58 Band III outlets were in service in the UK. There were a few 405-line services elsewhere as well. Ireland in particular used the 405-line system for the RTE-1 service, running in parallel with a 625-line version, also using Bands I and III. In 1971 there were seven 405-line outlets, one of which was in Band I (ch. B3). And Hong Kong used 405 lines for its cable system.

During periods of F2 activity, which peaks every eleven years, the London transmitter was received worldwide. The first record of such reception occurred in 1938, when receivers were shipped to the US to carry out experiments to see if transatlantic propagation was possible.

DX-TV enthusiasts in South Africa and Australia were receiving BBC signals on a regular basis at one stage, using converted receivers to view the inverted video signal with the different line standard.

Colour TV trials

The first BBC 405-line, compatible colour transmission took place on 7 October 1954, from the Alexandra Palace transmitter. The transmission consisted of slides and 16mm motion pictures and used a modified version of the NTSC colour system, which had been in use in the US since December 1953. Only one colour TV set was actually available on this historic occasion to display the pictures, but by all accounts a large number of viewers watched the compatible pictures in their own homes, using their normal monochrome sets. The press was given a demonstration of colour TV on 20 October 1955. Trials on a regular basis had started on 10 October.

Many hundreds of tests were subsequently carried out, as a joint effort by the Research Department of the Marconi Wireless Telegraph Company and the BBC's Engineering Division. Observers concluded that the adapted NTSC system was able to provide excellent colour/compatible monochrome pictures of a very high standard.

A regular series of test transmissions from Alexandra Palace during the winter of 1955-6 was used to test the compatibility of the signal with a comparatively large sample of domestic TV receivers. Again, only slides and 16mm films were used, the equipment this time being of BBC design and manufacture. Prior to the start of the tests Studio A had been equipped with a single colour camera of Marconi design. The first time when colour pictures including live scenes from the studio were broadcast was on 3-5 April 1956, during a special demonstration for delegates of Study Group IX of the CCIR who were visiting London as part of a worldwide assessment of the development of colour television.

By the autumn of 1956 Studio A had been equipped with a second experimental colour camera. A little later a 35mm Cintel film scanner was installed to supplement the slide and 16mm film scanners. With this equipment, and the enthusiastic help of a small staff group, an ambitious and comprehensive series of programmes were broadcast during the winter of 1956-7. These were transmitted from Crystal Palace as the Alexandra Palace transmitter had been closed down on 28 March 1956. They were viewed in people's homes using specially-developed, experimental colour receivers. A much larger audience saw the programmes using domestic monochrome sets of course.

On 30-1 January 1957 a special programme was broadcast for the benefit of a large gathering of members of both Houses of Parliament. Six receivers had been installed in a room inside the House of Peers.

UHF, colour and stereo trials

Experimental 405-line monochrome TV transmissions in Band V (UHF) from Crystal Palace began on 11 October 1957. A further series of experimental colour programmes were produced at the Alexandra Palace studio during the winter of 1957-8 and were seen on colour receivers by a much larger audience than in the previous year. The main objective at this time was to assess critically the quality of the colour picture that could be obtained in the home under normal viewing conditions. The tests also gave engineers an opportunity to investigate any problems that could have arisen at the transmitting end. They included a substantial number of broadcasts from the studio with live cameras, as these would be the principal source of colour material. When the results were analysed it became clear that an acceptable colour service could be provided.

Further colour trials, but with a change of emphasis, were held during 1957-8 in conjunction with BREMA, which had co-operated in the experimental colour work from its beginnings. The idea was to gain experience and test the possibilities of the system. At the conclusion of these tests in 1958 the Alexander Palace studio was dismantled. The cameras were temporarily installed in a van that carried out two outside broadcasts while the slide and film scanning equipment was moved to the Lime Grove studios, from which a regular series of colour test transmissions was conducted outside normal programme hours. This series of tests began in the autumn of 1958 and continued, with only short breaks, until 1960.

Experimental stereophonic broadcasts were transmitted in the Sixties, during the trade test periods. Orchestral pieces were broadcast simultaneously by BBC-TV and the Third Programme, the idea being that stereo sound could be listened to by sitting midway between a mono radio and a mono TV set. There was obviously a quality imbalance, but the system worked.

Enter 625 lines

Tests of a 625-line system, similar to that already used on the Continent, were carried out by the BBC in the late Fifties. BBC-2, which used this system from the start, began in 1964, with limited coverage initially – the London area. Coverage then spread to the other main BBC transmitter sites. Programme hours were also limited, even for those days of comparatively short broadcasting hours. Many viewers considered the new channel to be too high-brow.

Reception

The pre-war television sets were designed for reception from Alexandra Palace only and were of the TRF type. A few receivers of this type were built for reception from Sutton Coldfield, but the TRF approach fell out of favour with manufacturers as the transmitter network expanded. It meant that receivers would work on one channel only. Much better to use the superhet prin-

ciple, which enabled receivers to tune in to different transmitters.

Another feature of the early days, with only Alexandra Palace in operation, was that some viewers well outside the service area were so desperate to receive the signal that they erected huge aerial systems and had to put up with the constantly changing atmospherics. Some people were able to achieve reception at up to 200 miles from Alexandra Palace.

Early tuneable receivers covered the Band I channels B1-5 only. When ITV started up in 1955, Band III was brought into use and add-on converters were introduced for use with 'BBC-only' receivers. They were produced in large quantities to provide for the demand for the new service.

Before long new sets equipped with turret tuners began to appear. The tuners had clip-in tuning coils, wound according to channel, and could be clicked around sequentially through channels 1-12. Early tuners had Band III coils fitted for channels 8-10 only, as these were the only ones used initially. In the Sixties some turret-tuner dials were marked with adjacent numbers corresponding to the BBC and ITV channels in a particular region. By arranging the coils carefully, the viewer could switch between ITV and BBC without having to clunk the knob from say channel 1 round to 9. Some Philips sets had a motorised tuner to save the viewer the inconvenience of having the turn the knob manually. Push-button tuning became popular with many setmakers in the Sixties.

Dual-standard sets

With the introduction of BBC-2, setmakers had to produce 405/625 dual-standard receivers. This involved a system switch, a long mechanical assembly to alter IF response, the video polarity, the sound system and the line timebase frequency. They were notoriously unreliable in operation. Some receivers were classified as 'convertible', which usually meant that an additional IF strip and tuner had to be fitted for UHF. One local TV rental company proudly boasted about an 81-channel TV in its advertisements, even though only three programmes were available at the time!

Many of the very earliest sets were also dual-standard of course – 240/405. There seems to be little information on how this operated.

Aerials

Band I aerials were massive affairs compared with today's compact UHF arrays. A London-area H aerial had elements that were about 11ft. long. Huge arrays with four or five elements were used for fringe-area reception – some of these still survive today. Band III reception meant much smaller aerials, similar in size to the new DAB type. Some aerials had as many as eleven elements.

Combined Band I/III arrays became popular. A Band I dipole sandwiched between shorter elements resonated in both bands, thus avoiding the complication of a second downlead or diplexer. They were mainly used in primary service areas.

When BBC-2 started one particular aerial, golden anodised, had a multi-element horizontal UHF array with vertical Band III rods and a Band I dipole all sharing the same boom.

Colour arrives

Colour TV started in late 1967, BBC-2 only at first, using the PAL instead of the NTSC system. There had been quite a battle over which system to use (PAL, NTSC, the French SECAM and some variants). The first sets were relatively expensive and complex, bulky items with their innards hidden inside a massive wooden cabinet. Dual-standard operation was necessary, as only BBC-2 was available in colour. The sets were power-hungry: some of the valve models would warm up the room on a cold winter's day. At one stage it was cheaper to buy a mini-van than a colour TV set.

On 15 November 1969 BBC-1 and ITV started to transmit with colour – the services were duplicated at UHF with 625 lines. This signalled the beginning of the end for the 405-line system. Setmakers were not slow to introduce new, single-standard chassis. The simpler receivers had improved efficiency, performance and reliability (though some simply had the 405-line components removed).

Dual-standard monochrome sets continued to be produced, but in our area were available only until about 1971. With colour TV now firmly established, there was little demand for 405-line capable sets.

Final days

The final closure of the 405-line system followed an announcement by the Home Secretary in 1983 that the frequencies used should be released for mobile radio communication. Band III radio was eventually introduced, using bands of multiplexes. There are guard bands between the multiplexes to reduce the impact of interference on TV reception overseas during tropospheric lifts.

The closedown of the last 405-line transmitter, at Melvaig in West Scotland, was carried out by the local transmitter manager Syd Garrioch. Closedown of the network had been a staggered process, with Melvaig being switched off in early January 1985. At one stage it was estimated that only about half a dozen viewers in Wales continued to use the old system. Towards the end, many transmitters limped gracefully towards retirement on reduced power. Because of the minimal use, hum bars and other defects went unnoticed and unreported.

With its switch-off only days away, the Sutton Coldfield transmitter became defective and the chances of capturing the last few minutes of transmission on video were looking pretty slim. A call from the authors to BBC Engineering produced a surprisingly swift reaction: the fault was cleared that same day!

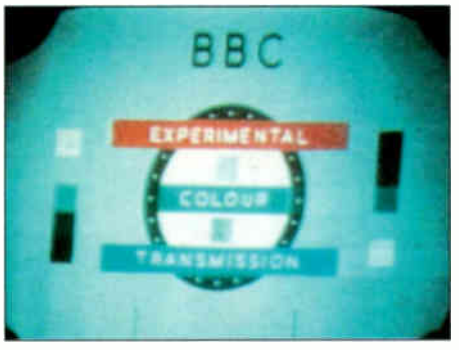
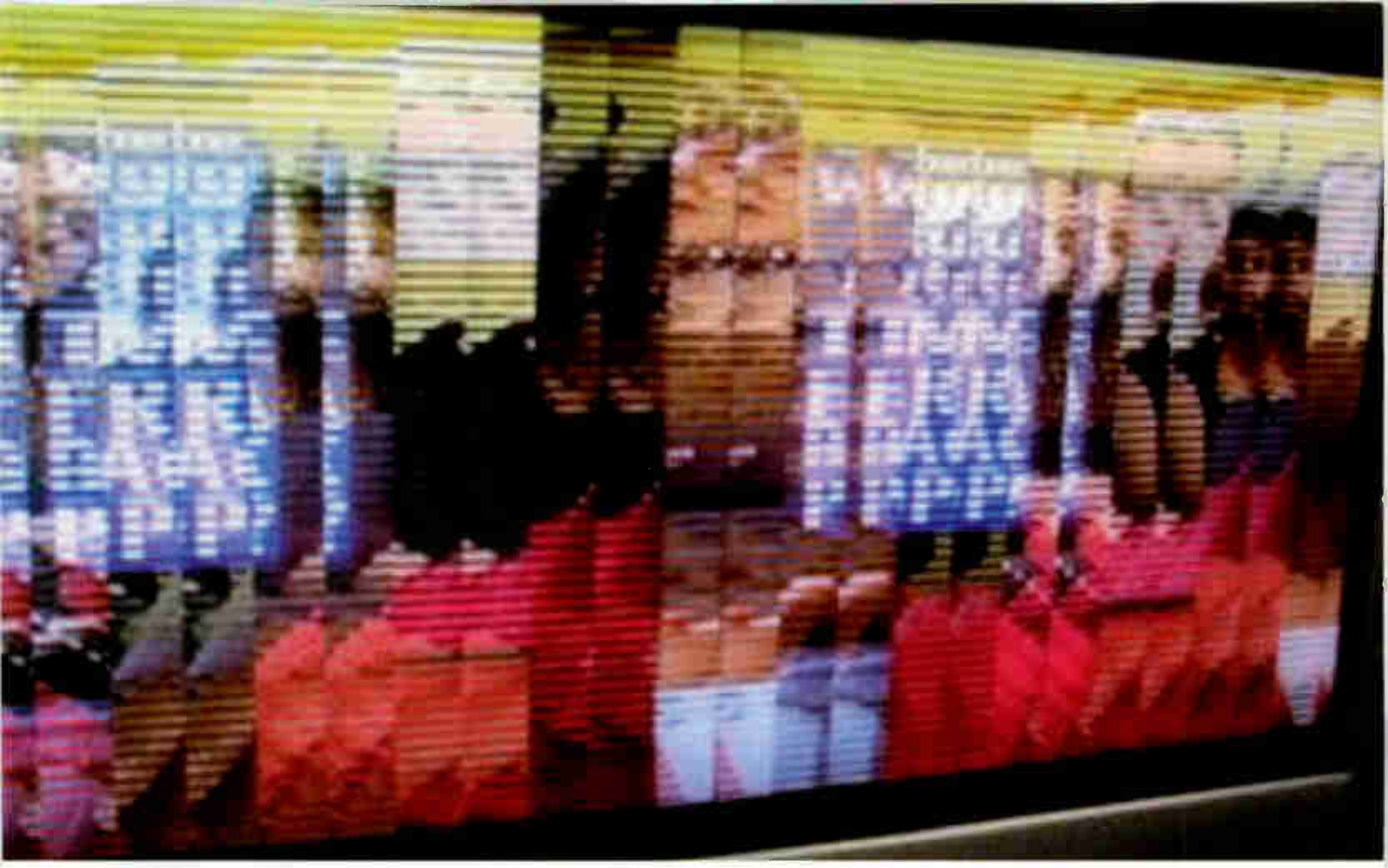


Photo 7: An extremely rare off-screen photograph showing the BBC experimental colour test card that was transmitted during 405-line NTSC trials in 1959.

Photo 8: A well-preserved Band I/III aerial for 405-line reception in a good-signal area.

The official switch-off came at the closedown of BBC-1 at 24.06 on 3 January. Luckily, someone forgot to pull the plug at Home Moss and it continued until about 15.50 the following day. Channel B2 broadcasting had finally ended. As soon as the carrier was switched off, the sound of illegal 49MHz walkie-talkies could be heard.

There was a brief announcement by David Miles at closedown before the official end of the BBC 405-line service, with a view of an ageing receiver that had been specially dusted down for the historic occasion. The Clock caption and Globe symbol followed, with the National Anthem, and that was it. No more 405-line transmissions. It's just as well that the authors captured the final moments on videotape – thanks to the BBC engineers at Sutton Coldfield who repaired the transmitter in the nick of time!



Plasma display technology

Having described the operation of plasma TV sets in previous instalments in this series, Fawzi Ibrahim concentrates this time on fault-finding, beginning with a description of the start-up process

When considering faults, their symptoms and fault-finding techniques with plasma TV sets, it's important to understand the sequence of events following a cold switch-on. Fig 1 shows the main sections of a plasma TV set able to receive analogue terrestrial broadcasts. The audio section is not shown, as it is relatively independent once stereophonic audio has been extracted following demodulation in the tuner. Most modern plasma sets also incorporate a DVB decoder circuit for receiving and decoding digital terrestrial TV broadcasts, commonly known as Freeview.

Start-up sequence

DC power builds up in three distinct stages when the set is switched on: first, in the power-factor correction (PFC) circuit; next in the flyback DC-DC converter; and then in the resonant DC-DC converter. The PFC control system has to generate the pulse-width modulated (PWM) drive required to produce a pre-regulated 400V output. This is used by the flyback DC-DC converter to generate the V DA (data drive) supply and the voltages for the signal processing and control sections of the receiver, including the audio section. The 400V supply is also fed to the resonant DC-DC converter, which produces the supplies required to generate the plasma display panel's sustain and scan waveforms.

The microcontroller system

A separate standby supply provides an output to power the main microcontroller system etc.

Build up of DC power is followed by the microcontroller start-up routine. First, the microcontroller chip downloads the start-up program from the flash memory chip and passes it to the SDRAM chip so that the start-up routine can begin. If the flash memory is faulty or the program is corrupted, the process will be halted and the set will remain in standby. The microcontroller chip also examines the contents of the non-volatile RAM (NVRAM) to check for individual and other specified settings for incorporation in the start-up routine.

The microcontroller's start-up routine involves checking and initialising all programmable and processing chips to be ready to receive and decode the video and audio information. This process is carried out via an I^2C (Inter IC) serial control bus. More than one of these is used. I^2C is a two-line serial control bus, with one line for clock pulses and the other for the control data.

Increased integration

As a result of increasing integration, some of the separate blocks shown in Fig. 1 may be incorporated into single chips, as mentioned in Part 3 (August). The flash memory and NVRAM may for example be imbedded in a massive microcontroller

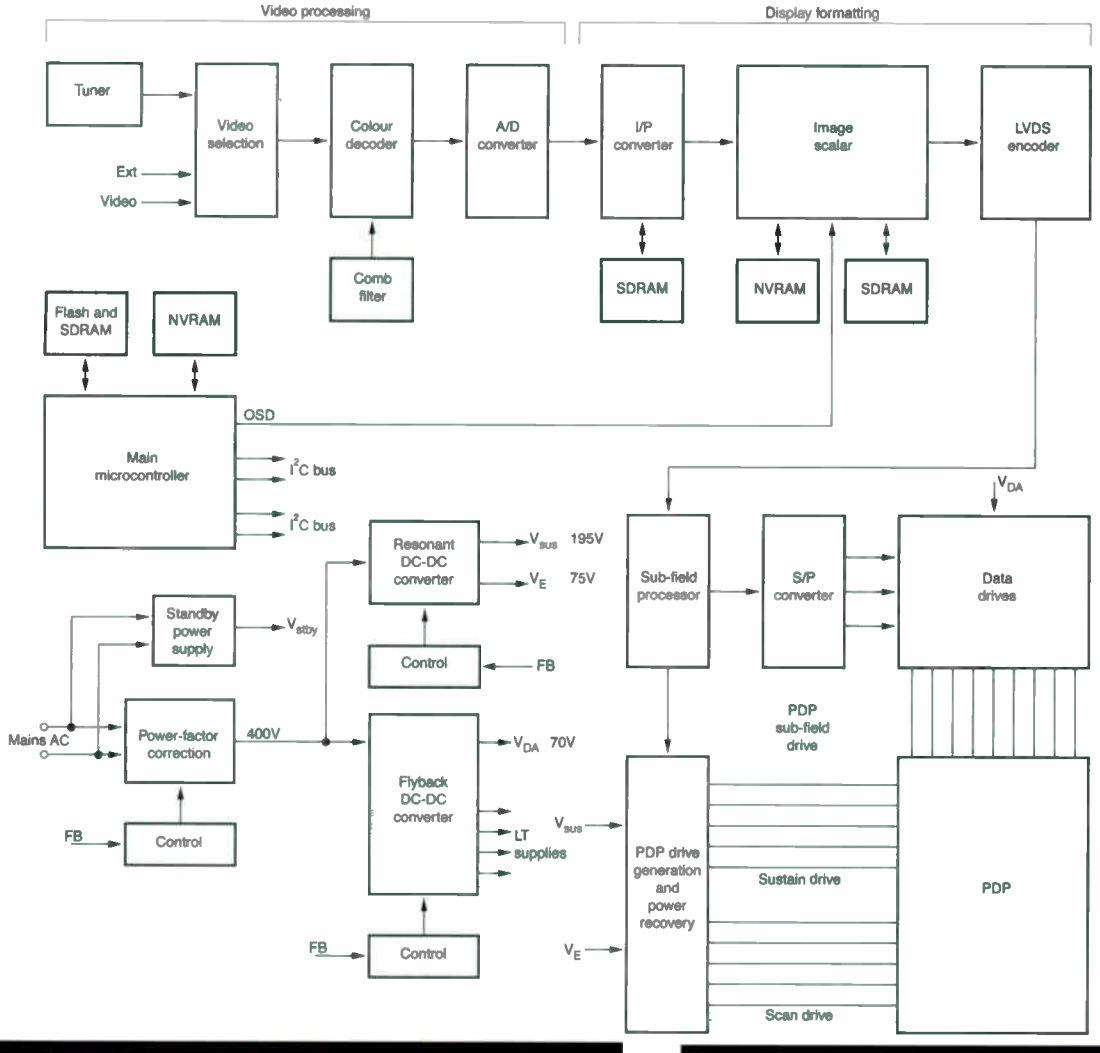


Fig. 1: Basic sections of a plasma TV receiver.

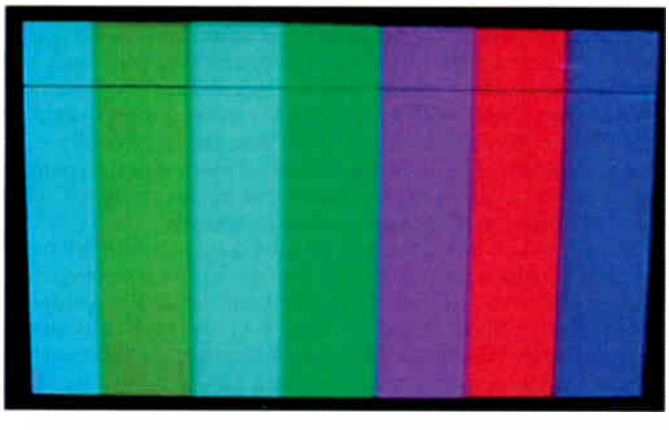


Fig. 2: A single horizontal black line indicates a scan- or sustain-drive fault.

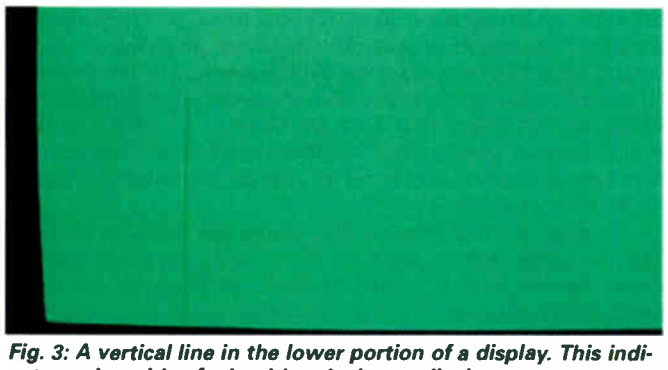


Fig. 3: A vertical line in the lower portion of a display. This indicates a data-drive fault with a dual-scan display.

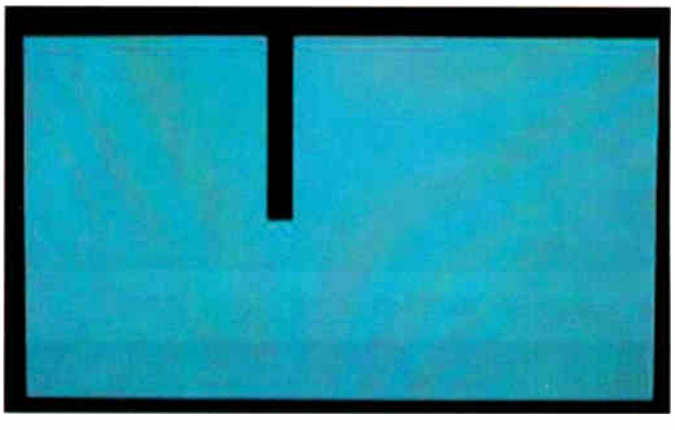


Fig. 4: Vertical segment down the top half of a display. This indicates a data-drive fault with a dual-scan display.

chip. In this case upgrading or reprogramming the flash memory is no longer a simple matter of replacing the memory IC itself with an already-programmed one. Instead, upgrading must be carried out by running software on a PC and downloading it to the imbedded flash memory via a serial port.

Other advanced integration includes incorporating the interlace-progressive, scan and format converters into a single image scalar chip.

Data, scan and sustain drive faults

A single black horizontal line, see Fig. 2, indicates a fault in one scan or sustain drive.

A single black vertical line, see Fig. 3, indicates a data-drive fault. With a dual-scan display the line may be in the upper or

Fig. 5: (left) Central area pixel failure. Fig. 6: (centre) Several pixel defects. Fig. 7: (right) Pixel cluster failure.

Fig. 8: Effect of a scan-converter memory fault (address line short-circuit to 0V).

Fig. 9: Effect with one colour bit (R0) missing.

Fig. 10: Effect when one LVDS encoder data line is short-circuit to 0V.

lower portion. The latter is shown here.

A black vertical band, see Fig. 4, indicates failure of a group of data-drive lines, corresponding to where the band is on the screen.

A black horizontal band indicates either scan-or sustain-drive failure. Check the sustain-pulse waveforms, line by line, at the drive outputs corresponding to the position of the band to ascertain whether there is a sustain fault. Repeat for the scan waveforms if necessary.

With all the above conditions the fault could be in the display panel itself, in which case the panel will have to be replaced.

Pixel defects

There may be a single pixel failure, see Fig. 5, a several-pixel failure, see Fig. 6, or a pixel-cluster failure, see Fig. 7. They all mean a fault in the panel itself. Manufacturers regard a small number of pixel faults, split between the central and outer areas, as being within specification. Any excess means that the panel is a write-off.

Picture faults

This includes no picture or a broken picture and/or multiple images and/or colour distortion. The classic no-picture condition is when the set is stuck in standby. In this case there will be no sound either, which generally but not exclusively points to a power supply fault. See later.

No picture with normal sound suggests a video or a display-formatting fault; a sustain, scan or data-drive fault; or a fault in the power supply or the panel itself. Press 'menu' or another option for an on-screen display (OSD). If this appears on the screen the fault precedes the image-scalar section. If the OSD does not appear, the fault may lie in the image scalar, the LVDS-encoder chip and connector, the scan/sustain/data drives, the power supply or the plasma panel itself. Check the image-scalar chip's inputs and outputs, the LVDS encoder chip's data and clock lines, the sustain- and scan-drive waveforms and the power supply.

A fatal fault in one of the processing chips, such as the colour decoder, image scalar, LVDS encoder or sub-field processor, will normally result in no picture with the sound OK. A fatal memory-chip fault (flash, NVRAM, SDRAM) in the control system will result in no picture and no sound with the set normally stuck in standby. Similarly the absence of clock signals, control signals such as enable or chip-select, and signals on the I^2C bus lines will result in no picture or stuck in standby.

A partial fault however, such as a dry-joint at a memory or processing chip, a data or address line stuck at zero or one, or a loose connection will result in picture break up and/or multiple images and/or colour distortion. Figs. 8-11 show typical symptoms with non-fatal faults. Figs. 12-14 illustrate the different type of symptom that occurs when there's a dry-joint at the sub-field processor chip.

The classic stuck in standby fault

A fault in the power supply, the microcontroller system or even the video or formatting section will lead to the set reverting to standby – because of the extensive feedback protection employed in PDP sets. Once the set has reverted to standby, with all other power turned off and all control and signal processing halted, it's difficult to find the actual cause of the fault. Checks during the start-up sequence, between switch on and the set reverting to standby, may however provide important clues as to the location of the fault.

The exact start-up process differs from one model to another. They all follow a basic sequence however, as previously outlined. The following is a series of checks to be carried out immediately after a cold switch-on, before the set goes into standby. They involve switching the set off then on to carry out each test. Start by switching the power on.

(1) There should be AC rectification with low DC voltages building up. Check DC voltages.

(2) The microcontroller chip should be reset. Check that its reset pin goes high.

(3) The start-up routine should be downloaded from flash memory to SDRAM. Check for activity on the address and data lines from the flash memory chip during start-up. No activity points to a fault in the flash memory or the microcontroller chip. Repeat this check for the SDRAM.

(4) The microcontroller chip tests and sets up various processing chips via a serial bus, which is usually of the I^2C type. Normally more than one such control bus is employed by the microcontroller chip. Check for activity on these bus lines. No activity could mean a faulty microcontroller chip.

(5) Other voltages begin to build up, e.g. the processing voltages (e.g. 12V, 5V, 3·3V), also the sustain voltage (about 195V). Check these.

(6) With a PD panel the various DC voltages required are built up in a particular sequence, normally PFC then the flyback DC-DC converter outputs and finally the sustain and scan voltages. Check each in turn with a DVM then, if necessary, use an oscilloscope or logic probe to check for the presence of PWM control pulses. Absence of these pulses indicates faulty PWM generation, while presence of the pulses points to faulty switching transistors.

Image burn

This refers to a residual image caused by a bright, stationary object. It occurs when the phosphor of some pixels has been continuously bombarded by UV radiation because an image, for example a corner logo or one or two lines of text, has been displayed for a long time. The brightness of the pixels involved darkens, while those not affected retain their efficiency: this phosphor differential appears as a burnt image.

Such an image may be permanent or temporary. A temporary burn occurs when the affected pixel cells have been subjected to full-level emission for a relatively short length of time – as short as half an hour. Such a burn is reversible. Permanent image burn develops after the temporary burn phase, when the constant high emission causes permanent phosphor damage. This type is irreversible.

Image burn can be avoided by ensuring that a picture with movement is displayed at all times, or by regular video display changes – and not displaying bright images for too long.

Of particular importance is burn caused by displaying a 4:3 aspect ratio picture on a widescreen panel. The result of leaving such a picture on display for a long time can be burn at the picture edges. Furthermore, 4:3 curtain lines may appear when the display reverts to the widescreen mode. Later panels are equipped with side-curtain colour and level adjustments to avoid such burns.

Temporary burns can be removed by displaying a normal, moving picture for as long as possible, of the order of a few days, to reset the pixels' response; by activating the scroll bar from the user set-up for a few hours; or by applying a totally white display for a number of minutes. It depends on how long the fixed display was present.

Transportation

Plasma panels must always be transported in an upright position. This is to minimise the risk of damage to a panel's structure as a result of flex forces that are set up when a panel is in a horizontal position. Horizontal pressure can cause leakage of the gas that's sealed in the pixel cells.

Fig. 11: An image-scalar memory fault – address line short-circuit to 0V.

Fig. 12: Effect produced by a dry-joint at the sub-field processor.

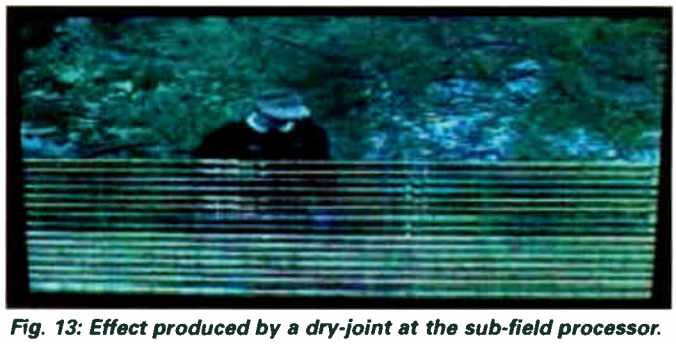


Fig. 13: Effect produced by a dry-joint at the sub-field processor.

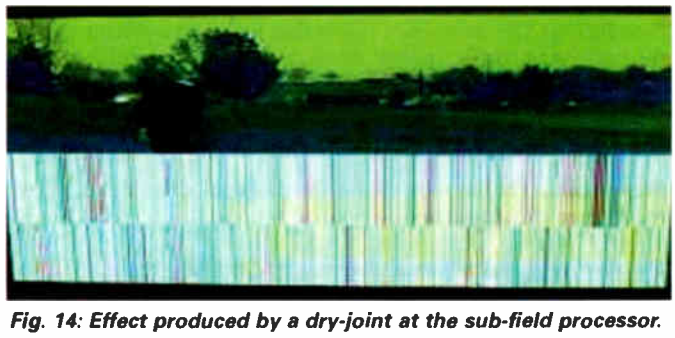


Fig. 14: Effect produced by a dry-joint at the sub-field processor.

The same applies to hanging a panel. Incorrect methods will result in distortion of the panel's base and damage to its structure. The correct brackets with spacer must always be used when hanging a panel.

Barometric damage

The gas inside a pixel cell is sealed with a barometric pressure of 0·6 torr, which is lower than the 1 torr external air pressure in most parts of the world. The front glass is made to be able to sustain this external pressure, and is supported by the pixel ribs.

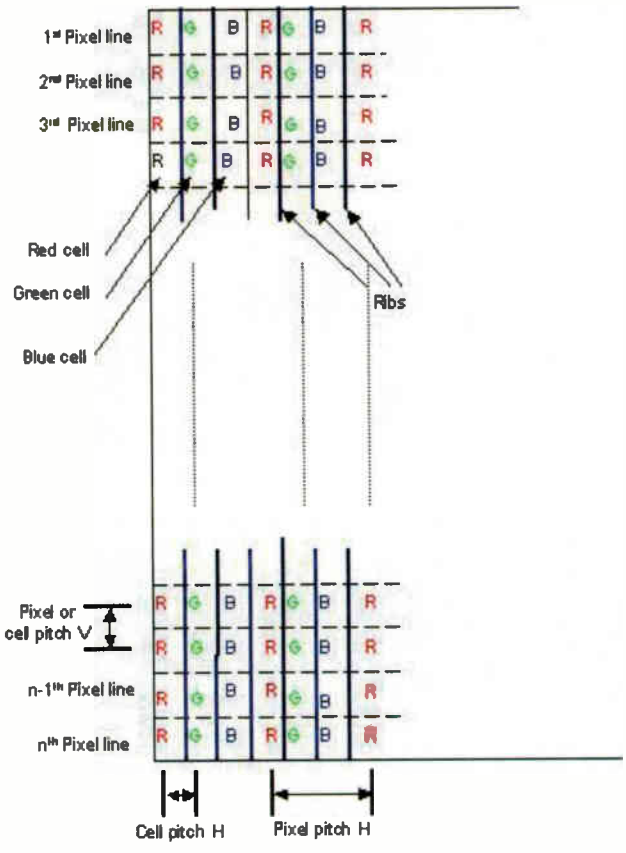


Fig. 15: Cell and pixel pitch.

However some towns that are located at over 3,000m have an air pressure of less than 0·6 torr, i.e. lower than the pressure inside the cells. In this situation the front glass begins to distort. A slight bend and bulge can cause leakage of one or more pixel cells, especially at the centre of the screen. In this condition the correct plasma discharge will not be obtained and pixel defects will become visible.

For the same reason – reduced air pressure at heights above 3,000m – plasma screens cannot be transported in aeroplanes without suitable precautions.

PDP specifications

Resolution: The number of pixels that make up a screen, given as the horizontal by the vertical number. Standard resolutions are 640 x 480 (VGA), 800 x 600 (SVGA), 1,024 x 768 (XVGA/XGA), 1,280 x 1,024 (SXGA) and 1,600 x 1,200 (UXGA).

Screen size: This usually means the diagonal size (in inches) of the effective display area.

Display area: Visible area, given as width x height.

Aspect ratio: The ratio of screen width to height, i.e. 4:3 is four parts wide and three parts high. Standard aspect ratios are 4:3 for TV and PC monitors and 16:9 for the widescreen versions.

Pixel: Picture element, a controllable dot consisting of three cells, red, green and blue.

Pixel size: The size of a pixel is normally defined by its horizontal pitch, which is the distance between the middle of one cell and the middle of the next cell of the same colour. There is also a vertical pitch dimension. See Fig. 15. Pixel size depends on screen size as well as resolution. Higher resolution for the same screen size means a smaller pixel size and vice versa. Typical pixel size with a 50in. VGA panel is 1,080μm (horizontal) by 810μm (vertical).

Cell size: This is normally defined as its horizontal pitch or width, which is the distance between the centre of adjacent cells. There is also a vertical pitch or height dimension, which is the same as the vertical pixel pitch. See Fig. 15. Because of the asymmetrical pixel construction, blue has a wider cell pitch than green, and green a wider cell pitch than red. Cell size depends on screen size as well as resolution. Typical cell sizes for a 50in. VGA-resolution panel are width 260μm blue, 190μm green and 180μm red, height 810μm.

Rib pitch: Rib size is normally defined by its width. A rib also has a vertical/height dimension. See Fig. 16.

Brightness: Display luminance is measured in cd/m^2 (candelas per square metre), e.g. 600cd/m^2.

Contrast: This is the difference in light intensity between the brightest white and the darkest black, e.g. 1,000:1 and 3,000:1.

Grey scale: A graded brightness specification indicating the number of luminance levels available for each primary colour. These levels are determined by the number of bits (or sub-fields) allocated to each primary colour. For example 8-bit video would give 2^8 = 256 grey-scale levels and 10-bit video 2^{10} = 1,024 grey-scale levels.

Colours: The total number of different colours that can be displayed by a pixel. This is again determined by the number of bits allocated to each pixel colour cell. For 8-bit colour with 2^8 = 256 grey-scale levels the total number of colours is 2^{24} (256 x 256 x 256) = 16·7m. For 10-bit colour the total is 1·07bn.

Viewing angle: The angle, horizontal and vertical, from which the display can be seen correctly without discolouring or brightness degradation. Most PDPs have a viewing angle of 160° V and H.

Lifetime: Life of a panel defined by luminance hours. Lifetime depends on the average picture level. A typical value is 60,000 hours at half luminance level. ■

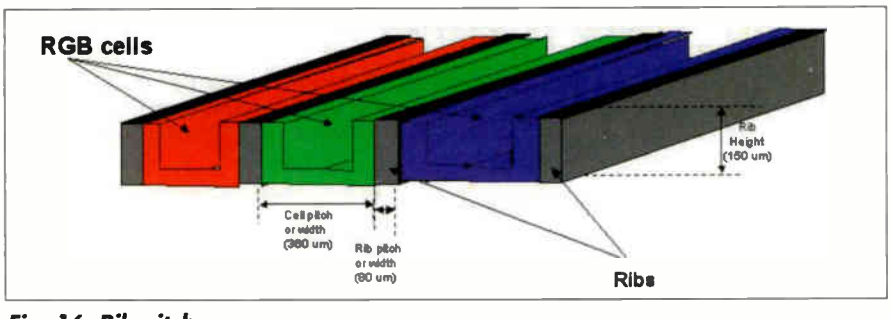


Fig. 16: Rib pitch.

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 350 724.

Grandata Ltd

distributor of electronic components

Television Repair / Modkits

MAKE & MODEL	KIT TYPE	CODE
ALBA		
1452T	PSU	ONWAKIT
1427T	PSU	ONWAKIT
1402	PSU	ONWAKIT
1455T	PSU	ONWAKIT
1456T	PSU	ONWAKIT
1458T	PSU	ONWAKIT
1459T	PSU	ONWAKIT
1499Y	STANDBY	MODKIT37
14SLTX	STANDBY	MODKIT37
1799Y	STANDBY	MODKIT37
2002	PSU	ONWAKIT
2009B	PSU	ONWAKIT
2052T	PSU	ONWAKIT
2152T	PSU	ONWAKIT
2099TX	STANDBY	MODKIT37
BTV17	STANDBY	MODKIT37
CTV501	PSU	ONWAKIT
CTV701	PSU	ONWAKIT
CTV840	PSU	ONWAKIT
CTV841	PSU	ONWAKIT
CTV485	PSU	ONWAKIT
11AK19 4:3	PSU & EW KIT	MODKIT52
11AK19 16:9	PSU & EW KIT	MODKIT52A
AKAI		
CT1417	PSU	ONWAKIT
CT2159U	PSU	ONWAKIT
CT2162UNT	PSU	ONWAKIT
CT2863UNT	PSU	ONWAKIT
AMSTRAD		
11AK19 4:3	PSU & EW KIT	MODKIT52
11AK1916:9	PSU & EW KIT	MODKIT52A
BLACK DIAMOND		
11AK37	PSU	MODKIT51
BUSH		
2871NTX	PSU & EW KIT	MODKIT52
WS6673	PSU & EW KIT	MODKIT52
WS6674	PSU	MODKIT51
11AK37	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		
147TT	PSU	ONWAKIT
149T	PSU	ONWAKIT
1430RA	PSU	ONWAKIT
1430RS	PSU	ONWAKIT
1430RW	PSU	ONWAKIT
1450T	PSU	ONWAKIT
1455TS	PSU	ONWAKIT
2019R	PSU	ONWAKIT
2029T	PSU	ONWAKIT
2029TA	PSU	ONWAKIT
COMPACT 11	PSU	MODKIT47

MAKE & MODEL	KIT TYPE	CODE
GOODMANS..continued		
F16 CHASSIS	FRAME	GOODKIT1
F16 CHASSIS	LINE	GOODKIT1
F16	PSU	GOODKIT1
F16	VIDEO	GOODKIT1
11AK37 CHASSIS	PSU	MODKIT51
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		
HIT14RC	PSU	ONWAKIT
11AK37 CHASSIS	PSU	MODKIT51
HITACHI		
C28W440N	PSU	MODKIT54
11AK37 CHASSIS	PSU	MODKIT51
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
1496R/T (H3N90)	PSU	MODKIT43
1496R/T (BUZ90)	PSU	MODKIT44
1498	PSU	ONWAKIT
2086	PSU	ONWAKIT
2096R/T (H3N90)	PSU	MODKIT43
2096R/T (BUZ90)	PSU	MODKIT44
2098	PSU	ONWAKIT
21V1N (BUZ90)	PSU	GRUNDIGKIT2
21V1T(MJF18004)	PSU	GRUNDIGKIT3
TVR180R/208	STANDBY	MODKIT37
TVR185T	STANDBY	MODKIT39
MITSUBISHI		
AV1 SERIES	PSU	MITSKIT3
CT1M5B	PSU	MITSKIT3
CT21M5BT	PSU	MITSKIT3
CT25M5BT	PSU	MITSKIT3
CT21A2STX	TDA 8178S	MITSKIT1
CT21AX1B	PSU	MITSKIT3
CT21A3STX	TDA 8178S	MITSKIT1
CT21AV1BS	PSU	MITSKIT3
CT25A2STX	TDA 8178S	MITSKIT1
CT25A3STX	TDA 8178S	MITSKIT1
CT25A4STX	TDA 8178S	MITSKIT1
CT25A6STX	TDA 8178S	MITSKIT1
CT25AV1B	PSU	MITSKIT3
CT25AV1BS	PSU	MITSKIT3
CT25AV1BD	PSU	MITSKIT3

MAKE & MODEL	KIT TYPE	CODE
MITSUBISHI..continued		
CT25AV1BDS	PSU	MITSKIT3
CT28AV1B	PSU	MITSKIT3
CT28AX1BD	PSU	MITSKIT3
CT28AV1BDS	PSU	MITSKIT3
CT29AS1	TDA 8178S	MITSKIT2
CT29A4	TDA 8178S	MITSKIT2
CT29A6	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		
CE25 CHASSIS	PSU	NIKKAIKIT1
C289FTXN	PSU	NIKKAIKIT1
C28F41FXN	PSU	NIKKAIKIT1
PANASONIC		
IC561	TDA 8175	PANKIT1
TX25XD60	VERT OUTPUT	PANKIT2
TC28XD60	VERT OUTPUT	PANKIT2
TX28XD70	VERT OUTPUT	PANKIT2
TX29XD70	VERT OUTPUT	PANKIT2
TX-W26D3	VERT OUTPUT	PANKIT2
PHILIPS		
28PT4457/05	PSU	MODKIT50
28PW5407/05	PSU	MODKIT50
28PW6006/05	PSU	MODKIT50
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
ANUBIS A	SOPS	PHILKIT2
CP110 CHASSIS	SOPS	PHILKIT8
G90A CHASSIS	SOPS	PHILKIT10
G90B CHASSIS	SOPS	PHILKIT10
G110 CHASSIS	SOPS	PHILKIT3
GR2.1 CHASSIS	SOPS	PHILKIT1
GR2.2 CHASSIS	SOPS	PHILKIT1
D-16 CHASSIS	SOPS	PHILKIT6
HSM VIDEO	SOPS	PHILKIT5
JSM VIDEO	SOPS	PHILKIT4
KSM VIDEO	SOPS	PHILKIT9
LSM VIDEO	SOPS	PHILKIT7
L01.1E CHASSIS	PSU	MODKIT50
SAMSUNG		
CI5944	FRAME	SAMKIT2
CI6844	FRAME	SAMKIT2
VIK310	PSU	SAMSUNGKIT
VIK320	PSU	SAMSUNGKIT
VIK350	PSU	SAMSUNGKIT
VI375	PSU	SAMSUNGKIT
VI395	PSU	SAMSUNGKIT
WINNER 1	PSU	SAMSUNGKIT
SHARP		
51CS03H	PSU	SHARPKIT1
51CS05H	PSU	SHARPKIT1

MAKE & MODEL	KIT TYPE	CODE
SHARP..continued		
56FW53H	PSU & DOLBY	MODKIT45
59CS03H	PSU	SHARPKIT2
59CS05H	PSU	SHARPKIT2
59CSD8H	PSU	SHARPKIT2
59DS03H	PSU	SHARPKIT3
59FW53H	PSU & EW	MODKIT49
28HW53H	PSU + EW	MODKIT53
56FW53H	PSU + EW	MODKIT53
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
76FW53H	PSU & DOLBY	MODKIT45
76FW53H	PSU & EW	MODKIT49
76FW54H	PSU & DOLBY	MODKIT45
76FW54H	PSU & EW	MODKIT49
76FW53H	PSU + EW	MODKIT53
76FG64H	PSU + EW	MODKIT53
DA-100 CHASSIS	PSU & EW	MODKIT49
SONY		
SLV715HB	VCR - PSU	MODKIT40
SLV777UB	VCR - PSU	MODKIT40
THOMSON		
35029400		THOMKIT2
35065920		THORNKIT1
FV70	PSU	THORNKIT1
ICC7 CHASSIS	TDA 8178FS	THOMKIT1
ICC7 CHASSIS	FRAME	THOMKIT3
ICC8 CHASSIS	TDA 8178FS	THOMKIT1
ICC8 CHASSIS	FRAME	THOMKIT3
ICC9 CHASSIS	EAST/WEST	THOMKIT4
ICC17 CHASSIS	PSU	MODKIT41
ISS20 (TV-DVD)	PSU	MODKIT46
R3000	PSU	THOMKIT2
R4000	PSU	THOMKIT2
TX92F CHASSIS	EAST/WEST	THOMKIT4
TOSHIBA		
28N23B	PSU	MODKIT51
BD2581S	PSU	MODKIT51
BD2851S	PSU	MODKIT51
BD2951S	PSU	MODKIT51
BD3251S	PSU	MODKIT51
11AK37	PSU	MODKIT51
VESTEL		
11AK37 CHASSIS	PSU	MODKIT51
11AK19 4:3	PSU & EW KIT	MODKIT52
11AK19 16:9	PSU & EW KIT	MODKIT52A
11AK33	PSU & UPGRADE	MODKIT54
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 11AK45
PSU & EW Kit

Order Code : MODKIT55
Price : £ 15.00 + vat

Philips L 01.1E
PSU & Upgrade Kit

Order Code : MODKIT56
Price : £ 15.00 + vat

Philips M63.1E
PSU and Upgrade Kit

Order Code : MODKIT57
Price : £ 17.00 + vat

PSKYB 2500
PSU Repair Kit

Order Code : SATKIT38
Price : £ 10.00 + 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

Soldering Accessories and Digital Multimeters

Variable Temperature Soldering Station

Adjustable by a potentiometer with Digital read out

Temperature range: 160¡C to 480¡C

Heater voltage : 24 Volt

Heater power : 48 Watt

Order Code : HQSOLDER30
Price : £ 35.00 + vat

Carriage charged at £ 5.00 + vat

30 Watt Soldering Iron

Comes with a 3.2mm Sloped Tip

Order Code : TS130
Price : £ 8.00 + vat

Soldering Iron Stand

Order Code : TSS09
Price : £ 2.00 + vat

Optional accessories

Description	Code	Price
Spare tip Ø 5.3 mm	HQTIP1	£ 2.00 + vat
Spare tip Ø 3.0 mm	HQTIP2	£ 2.00 + vat
Spare tip Ø 3.0 mm 45°	HQTIP3	£ 2.00 + vat
Spare tip Ø 2.0 mm	HQTIP4	£ 2.00 + vat
Spare Sponge	HQSPONGE	£ 0.50 + vat

Spare Soldering Iron Tips

10mm x 3.2mm Sloped Tip
Order Code : TSB32 Price : £ 1.50 + vat

10mm x 0.5mm Clonical Tip
Order Code : TSB05 Price : £ 1.50 + vat

Desoldering Wicks

Width	Length	Code	Price
0.80mm	1.6m	WICKS1	£ 0.75 + vat
1.50mm	1.6m	WICKS2	£ 0.80 + vat
2.00mm	1.6m	WICKS3	£ 0.90 + vat
2.50mm	1.6m	WICKS4	£ 1.00 + vat
0.80mm	3.0m	WICKM1	£ 1.00 + vat
1.50mm	3.0m	WICKM2	£ 1.20 + vat
2.00mm	3.0m	WICKM3	£ 1.30 + vat
2.50mm	3.0m	WICKM4	£ 1.40 + vat
2.50mm	15m	WICKL4	£ 6.00 + vat
3.00mm	15m	WICKL5	£ 7.00 + vat
1.50mm	30m	WICKL2	£ 8.00 + vat
2.00mm	30m	WICKL3	£ 10.00 + vat

Solder

Solder Gauge & Weight	Code	Price
18 SWG 500 grammes	SI10	£ 5.00 + vat
20 SWG 500 grammes	SI11	£ 6.50 + vat
22 SWG 500 grammes	SI12	£ 7.00 + vat

Carriage charged at £ 2.00 + vat
£ 5.00 + vat for 3 or more

3 1/2 digits LCD Display
Low Battery indication
Transistor Testing Socket
Audible continuity

Technical Specifications:

DC Voltage: 200mV, 2V, 20V, 200V, 1000V
AC Voltage: 200mV, 2V, 20V, 200V, 750V
DC Current:20uA,200uA,2mA,20mA,200mA,2A,10A
AC Current: 200uA, 2mA, 20mA, 200mA, 2A, 10A
Resistance: 200R, 2K, 20K, 200K, 2M, 20M, 200M

Order Code : METER01
Price : £ 11.00 + vat
Carriage charged at £ 3.00 + vat

3 1/2 digits LCD Display
Low Battery indication
Transistor Testing Socket
Audible continuity

Technical Specifications:

DC Voltage: 200mV, 2V, 20V, 200V, 1000V
AC Voltage: 200mV, 2V, 20V, 200V, 750V
DC Current:20uA,200uA,2mA,20mA,200mA,2A,10A
AC Current: 200uA, 2mA, 20mA, 200mA, 2A, 10A
Resistance: 200R, 2K, 20K, 200K, 2M, 20M, 200M
Capacitance: 2nF, 20nF, 200nF, 2uF, 20uF

Order Code : METER02
Price : £ 14.00 + vat
Carriage charged at £ 3.00 + vat

3 1/2 digits LCD Display
Low Battery indication
Transistor Testing Socket
Audible continuity

Technical Specifications:

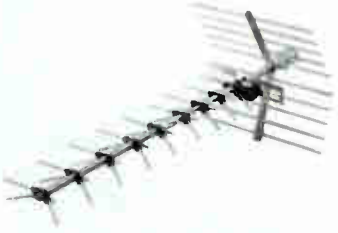
DC Voltage: 200mV, 2V, 20V, 200V, 1000V
AC Voltage: 200mV, 2V, 20V, 200V, 750V
DC Current:20uA,200uA,2mA,20mA,200mA,2A,10A
AC Current: 200uA, 2mA, 20mA, 200mA, 2A, 10A
Resistance: 200R, 2K, 20K, 200K, 2M, 20M, 200M
Capacitance: 2nF, 20nF, 200nF, 2uF, 20uF
Frequency: 2kHz, 20kHz

Order Code : METER03
Price : £ 17.00 + vat
Carriage charged at £ 3.00 + vat

Grandata Ltd

distributor of electronic components

48 Element Digital Compatible Aerial



Receives both digital and analogue signals
For poor to weak strength signal areas
Robust design for low wind loading - 2 peices boom with aluminium wire rod elements
Supplied with F connector and clamp for horizontal and vertical (fits up to 57mm masts)
Ideal for areas with bad picture ghosting
Supplied part assembled - no tools required

Order Code : 27884R Price : £ 20.00 + vat
Carriage charged at £ 6.00 + vat

SLx Masthead Amplifiers

UHF TV and FM radio antenna preamplifiers designed for professional aerial installers.
1 way amplifiers come with screw terminals
2 and 4 way ampliflers come with F connectors
Requires 12V DC power supply connected via a downlead

Description

1 way UHF TV Masthead Amplifier - 15dB Gain
Order Code : 27830RPrice : £ 4.30 + vat

1 way UHF TV Masthead Amplifier - 26dB Gain
Order Code : 27831RPrice : £ 4.50 + vat

2 way UHF TV Masthead Amplifier - 10dB Gain
Order Code : 27837RPrice : £ 9.00 + vat

4 way UHF TV Masthead Amplfier - 10dB Gain
Order Code : 27838RPrice : £ 9.50 + vat

4 way UHF TV & FM Masthead Amp - 10dB Gain
Order Code : 27839RPrice : £ 10.00 + vat

Masthead Amplifier Power Supply
Order Code : 27832RPrice : £ 5.00 + vat

Carriage charged at £ 2.00 + vat or £ 6.00 + vat for 2 or more

SLx Distribution Amplifiers

A range of Aerial amplifers designed to allow distribution of TV , Satellite and FM signal without the loss of picture and sound quality.

Available with intergrated Digital bypass - to allow the use of SKY™ digieye (B).

Main Operated , comes with full instructions

Description	Gain	Order Code	Price
2 way	18dB	SLX2	£ 8.00 + vat
2 way with Bypass	6dB	SLX2B	£ 9.25 + vat
4 way	12dB	SLX4	£ 13.00 + vat
4 way with Bypass	6dB	SLX4B	£ 14.00 + vat
6 way	12dB	SLX6	£ 18.00 + vat
6 way with Bypass	6dB	SLX6B	£ 19.00 + vat
8 way	12dB	SLX8	£ 18.50 + vat
8 way with Bypass	6dB	SLX8B	£ 20.00 + vat

Carriage charged at £ 2.00 + vat or £ 6.00 + vat for 2 or more

Universal Single LNB

Signal/noise ratio of 0.6dB.
Feedhorn: 40 mm
Input Frequency 10.7 - 12.75 GHz
Order Code : LNBSINGLE
Price : £ 5.00 + vat

Universal Twin LNB

Signal/noise ratio of 0.7dB.
Feedhorn: 40 mm
Input Frequency 10.7 - 12.75 GHz
Order Code : LNBTWIN
Price : £ 14.00 + vat

Universal Quad LNB

Signal/noise ratio of 0.7dB.
Feedhorn: 40 mm
Input Frequency 10.7 - 12.75 GHz
Order Code : LNBQUAD
Price : £ 25.00 + vat

Universal Quattro LNB

For use with Multiswitches
Signal/noise ratio of 0.7dB.
Feedhorn: 40 mm
Input Frequency 10.7 - 12.75 GHz
Order Code : LNBQUATTRO
Price : £ 15.00 + vat

Satellite Finder

Compact design - Backlit meter scale
Audible signal strength reading
Adjustable level control
Adjustable sensitivity adjustment
Frequency Range : 950 - 2250Mhz
Order Code : 27860R
Price : £ 10.00 + vat

Coax Plug Aluminium

Order Code : PLG51
Bag of 10
Price : £ 1.25 + vat
Bag of 100
Price : £ 9.00 + vat

Screw Type Coax Plugs

Order Code : PLG62
Bag of 10
Price : £ 1.60 + vat
Bag of 100
Price : £ 12.50 + vat

Twist on F Connectors

Order Code : PLG101
Bag of 10
Price : £ 1.00 + vat
Bag of 100
Price : £ 6.00 + vat

Check out our Online Catalogue at

www.grandata.co.uk

This advertisement is just a selection of our stock.

Please contact us if you cannot find the part you are looking for.

* Please add £1 p+p and VAT to all orders (Unless Otherwise stated) * All components are brand new E & OE
* We accept payment by Access , Switch , Visa , Cheque and Postal Order
* All prices quoted are subject to availability and may be changed without prior notice

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

Aerial Installation Accessories

Wireless technologies in CE products

In the fourth instalment in this series Graham Maynard takes a look at Bluetooth-enabled camcorders and set-top boxes then turns to a newer wireless technology, Zigbee

The main subject for our attention this month is a newer wireless technology, Zigbee. Before looking at it however there are a couple of Bluetooth CE applications I didn't get around to mentioning last month.

Photo 1: The Sony Model DCR-IP7BT camcorder.

Camera products that use Bluetooth

The use of Bluetooth technology in camcorders has been occasional to date. At the forefront, Sony has been the most prominent and successful user of it. Sony's newer camcorders tend to feature Bluetooth less frequently however, which is a sign that higher data-rate wired and wireless technologies such as USB 2.0 and FireWire are becoming prevalent.

A good example of a Sony camcorder that uses Bluetooth technology is the Handycam Model DCR-IP55, which has an on-board pop-up flash and can capture still photos at 1,152 x 864 pixel resolution, saving them on a Memory Stick. It has a x10 zoom lens and can also record MPEG-1 video on a Memory Stick or send it to your computer for live videoconferencing or storage on the hard drive. Use of Bluetooth technology in this camcorder means that, with an optional modem adapter, you can upload video clips to the Sony ImageStation photo/video-sharing web site, surf the internet or send and receive email. The IP55 uses Sony's tiny, proprietary MicroMV videotapes – to see what these look like, go to http://www.asahi-net.or.jp/~pu4i-aok/pc/video/micromv.jpg

Other Sony camcorders that have used Bluetooth are Model DCR-IP7BT (see Photo 1), which is another MicroMV type, and the Digital 8 Model DCR-TRV50E.

The Panasonic Model NV-EX21, see Photo 2, has a detachable still camera. The advantage of this is that it doesn't have to share the battery power, and there is a massive reduction in bulk when all you want to do is take still images. At a flick of a switch the lens unit can be removed and placed on a dedicated battery unit. The unit features Bluetooth, but only via an adapter that Panasonic has not released in the UK. Still images are stored on an SD card. The camcorder has DV in/out, S video in/out, digital still picture out and digital out to USB.

A number of companies have released still-only digital cameras

with Bluetooth technology. An example is the Concord Eye-Q Go Wireless, which has 2 Megapixel resolution and uses Bluetooth technology to transfer pictures to a computer, a PDA or a cell phone without the need for wires. It sells for about £75 and comes with a small Bluetooth dongle that plugs into the back of a computer. One picture is transmitted at a time. To transfer 7MB of images, the contents of the camera's internal memory, takes about fifteen minutes – a little slow for this application.

A more advanced Bluetooth camera option comes, again, from Sony. Model DSC-FX77 is the first Sony Bluetooth-enabled digital stills camera. It uses the Basic Imaging Profile (BIF), which works peer-to-peer between the camera and peripheral devices, ensuring that fast, reliable and accurate data transfer takes place. The Bluetooth feature enables the user to share information with a range of computers and other devices that support BIP, at a distance up to 10m. For example a BIP-compatible laptop computer can be used to store still images. A full 4 Megapixel resolution picture takes about 47 seconds to transfer, while a VGA-resolution image takes just 1·5 seconds.

Another significant feature created by Bluetooth connectivity is that a laptop computer can be used to control a camera remotely. This can be done today: in the future it will be possible for other devices that support BIP to control cameras. A 'real-time' camera can be created, with a thumbnail picture transmitted from the camera to the remote device at a data rate of 6·5 frames per second.

See previous articles in this series for a description of the Bluetooth profiles, including BIP.

Set-top boxes

Nokia experimented with Bluetooth in a set-top box in its Mediamaster 230S and 260 models. The idea is that if you have a cameraphone with Bluetooth you can view pictures on a TV screen by transmitting them to a set-top box – in whatever order you want. You can also store up to 36 digital images from a cameraphone in the NaviBar user menu, which is used for easy navigation around the radio and TV channels. This makes them easy to select and view at any time, once uploaded. The Mediamaster 230S is a DVB-compliant digital satellite receiver. For a data sheet, go to http://www.nokia.com/downloads/homeproducts/230S_brochure.pdf

The Mediamaster 260 (MM260) is a digital cable receiver with digital video recording, digital image viewing via Bluetooth and an 80GB hard disk that enables over 3,000 digital images to be stored. There is also pause-live TV, and up to 80 hours of TV programming can be stored. You can see a demo of it here http://www.nokia.com/nokia/0,,54808,00.html

ZIGBEE

Zigbee is a low-power PAN system. I'll describe how it works by comparing it to Bluetooth: this will make it easier and keep it brief. The system is nowhere near as advanced commercially or technically as Bluetooth, so at this stage it's not important to understand the technical specification in detail. It is interesting to see how it compares with Bluetooth, its closest 'relative', and the applications where it scores over Bluetooth and/or competes with it.

Whereas Bluetooth has the IEEE specification 802.15.1, Zigbee fits in at 802.15.4. The 802.15 working group specifies Personal Area Networks (PANs). Clearly Bluetooth and Zigbee both fit in with this general description. Zigbee is named after the random zigging motion of the bumble-bee, a reference to the nature of the connections. These typically form a mesh or star structure.

The Zigbee specification is in effect a combination of the old but not well-established HomeRF Lite technology and the 802.15.4 specification. It operates mainly in the 2·4GHz (ISM) radio band (though see below), the same band as the WLAN 802.11b standard, Bluetooth, microwaves and some other devices. Up to 255 devices per network can be connected. The specification provides for data transmission at up to 250kbits/sec over a range of typically up to 30m. Zigbee's technology is slower than the WLAN technologies such as 802.11b (11Mbits/sec) and Bluetooth (1Mbits/sec), but it consumes significantly less power. Zigbee formerly existed in a similar form under various guises – PURLnet, RF-Lite, Firefly and HomeRF Lite.

Some of the main characteristics of Zigbee are:

(1) A dual PHY, 2·4GHz and 868/915MHz. PHY is the physical layer in the stack – the hardware.

(2) There are data rates of 250kbits/sec at 2·4GHz, 40kbits/sec at 915MHz and 20kbits/sec at 868MHz. The availability of frequency bands for Zigbee varies with country.

(3) It's optimised for low duty-cycle applications – <0·1per cent.

(4) Use of CSMA-CA for channel access, as used by Ethernet, provides high throughput and low latency for low duty-cycle devices like sensors and controls. CSMA-CA stands for Carrier Sense Multiple Access – Collision Avoidance. For an explanation, go to

http://en.wikipedia.org/wiki/CSMA/CA

The Concord Eye-Q Go Wireless, which has 2 Megapixel resolution and uses Bluetooth technology to transfer pictures to a computer, a PDA or a cell phone, without the need for wires. It sells for about £75 and comes with a small Bluetooth dongle that plugs into the back of a computer.

Sony Model DSC-FX77 is the first Sony Bluetooth-enabled digital stills camera.

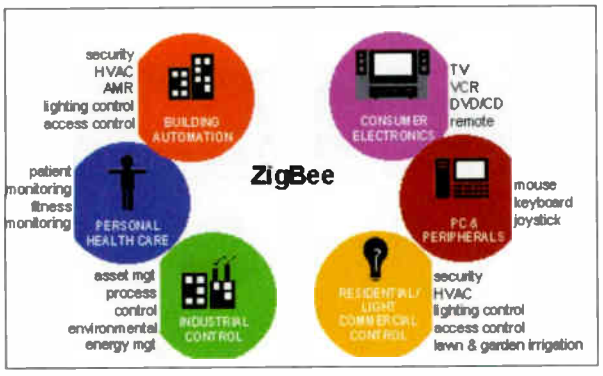


Fig. 1: Typical applications where Zigbee can be used.

(5) Low-power operation. Battery life is many months or even years.

(6) Multiple topologies: star, peer-to-peer, mesh.

(7) Addressing space for up to $18{,}450 \times 10^{15}$ devices (64-bit IEEE address), 65,535 networks.

(8) Optional guaranteed time slot for applications requiring low latency.

(9) Fully hand-shaked protocol for transfer reliability.

(10) Range typically 50m (5-500m depending on environment).

Table 1 shows the scope of the three frequency bands used by Zigbee. There are additional partially-available bands in various regions.

Zigbee is optimised to handle the following types of data traffic most efficiently: periodic data at an application defined rate, e.g. sensors; intermittent data at an application/external-stimulus defined rate, e.g. a light switch; repetitive low-latency data. Other standards may be more suitable for other types of data.

Bluetooth has a Special Interest Group (the Bluetooth SIG) while Zigbee has its own working group called the Zigbee Alliance. The aim of this working group is "to bring about the existence of a broad range of interoperable consumer devices by establishing open-industry specifications for unlicensed, untethered peripheral, control and entertainment devices requiring the lowest cost and lowest power consumption communications between compliant devices anywhere in and around the home."

The Zigbee Alliance has eight major promoters (Ember, Freescale, Honeywell, Invensys, Mitsubishi, Motorola, Philips and Samsung) and a further 150+ members. It's responsible for defining and maintaining higher layers above the MAC (up to the MAC is defined by 802.15.4). The Alliance is also responsible for developing application profiles, certification programs, logos and marketing strategy.

The main website for the Zigbee working group and companies that have signed up to the specification, also very good for research on Zigbee, is www.zigbee.org. You can download the full Zigbee specification in its latest form from here if you want to check the detail.

A number of companies are involved in the production of devices and development platforms for use in Zigbee products. These include Chipcon, whose headquarters are in Oslo, Norway (www.chipcon.com); CompXS (www.compxs.com); Ember Corporation (www.ember.com); and Freescale Semiconductor, formerly Motorola Semiconductor (www.freescale.com).

Next month we will look at a typical chip, stack and development environment in more detail to help understand what is involved in designing or servicing a Zigbee product.

- 8-bit microcontroller (e.g. 80c51)
- Compact protocol stack
- Supports even simpler slave-only stack

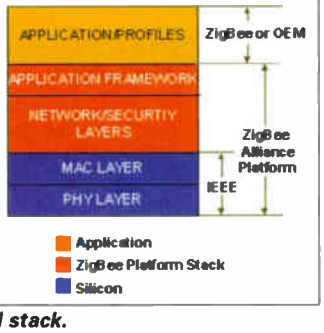


Fig. 2: The Zigbee protocol stack.

DSSS

Zigbee uses the DSSS (Direct Sequence Spread Spectrum) transmission technique, in contrast with the FHSS (Frequency Hopping Spread Spectrum) technique used by Bluetooth. With DSSS the signal doesn't hop from one frequency to another but instead passes through a spreading function and is distributed over the entire band at once. DSSS usually provides slightly higher data rates (not with Zigbee!) and shorter delays than FHSS, because the transmitter and receiver don't have to spend time retuning. All spread-spectrum techniques avoid interference from conventional sources. DSSS avoids interference by configuring the spreading function in the receiver so that it concentrates on the desired signal and spreads out, thus diluting, any interference signals.

The more frequency-hopping transmitters that operate in a band, the more likely it is that one or more of them will hop to the same frequency at the same time, garbling data that must therefore be retransmitted. Up to a certain point DSSS is better at resisting noise. If the combined interference throughout the band rises above a certain level however, throughput drops dramatically – nearly to zero. Unfortunately it takes only a few nearby FHSS systems to cripple a DSSS system. On the other hand because a DSSS system is always transmitting at every frequency in the band, a nearby FHSS system may be unable to find any clear channel to hop to. In the presence of interference FHSS usually degrades more gracefully than DSSS, but neither works well in competition at close range. Unfortunately, because the total energy that each device can emit is limited by the FCC or other authority in the country concerned, the transmitter trying to send data at the highest speed, say 10Mbits/sec instead of 1Mbits/sec, usually loses. The newest transmission equipment can thus usually be hobbled by gear that's older and cheaper.

Zigbee-Bluetooth comparison

Zigbee has a symbol rate (this is related to the data rate, see previous article) of 62·5 symbols/sec, which compares with 1Msymbols/sec with Bluetooth. Zigbee has a chip rate of

11 chips/symbol. The peak information rate for Zigbee is about 128kbits/sec compared to about 720kbits/sec for Bluetooth.

As with Bluetooth, Zigbee uses a master-slave relationship between devices (it was formalised, and the working group was established, by people who had worked together for a long time on Bluetooth and had become frustrated by some of the latter's shortcomings).

Zigbee is designed to maximise battery life in slave devices (see later), which is crucial in the applications concerned. With Bluetooth the basic model is based on the mobile phone, with which regular charging is possible.

Zigbee is also optimised very much for timing-critical applications. With Zigbee the new slave enumeration process takes about 30msec, which is much faster than with Bluetooth. The active slave channel-access time is about 2msec! Zigbee is suited to static-type networking, while Bluetooth performs ad hoc networking.

To enable it to succeed in its niche application area, the implementation cost of the slave devices is crucial for Zigbee. Also there is no host platform, as there often is with Bluetooth, and the hardware and software required are minimised. Typically, an 80C51-type microcontroller chip is all that's required to run a Zigbee application. Bluetooth takes advantage of the power of the host processor, typicaly an ARM7. Bluetooth now costs typically $2-3 to implement in high volume, e.g. a mobile phone application. Zigbee has the potential to undercut this by 25-50 per cent, but only once there is enough volume going through the chip production lines to get the price down to this level. At present there is no cost advantage from using Zigbee instead of Bluetooth.

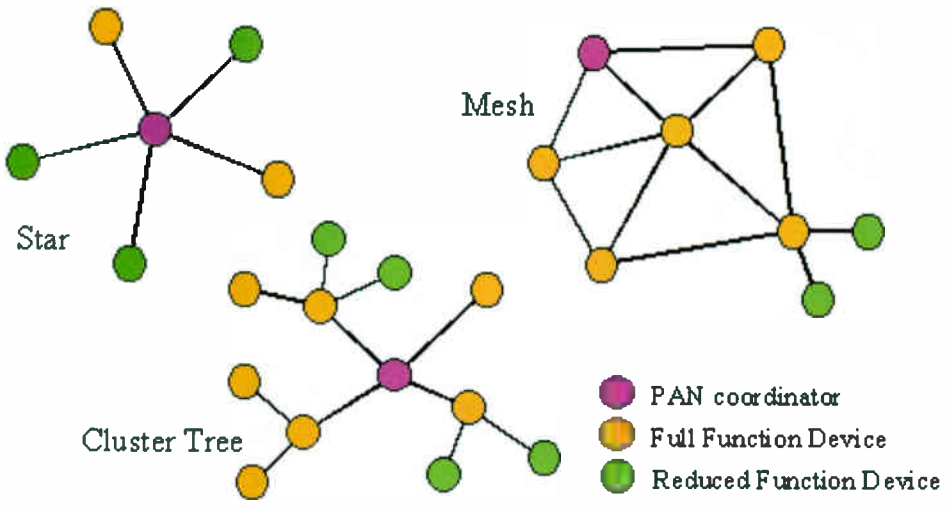


Fig. 3: How function varies depending on where a device is within the network and the network arrangement.

Table 1: Zigbee bands

Band	*Coverage*	*Data rate*	*Channels*
2·4GHz (ISM)	Worldwide	250kbits/sec	16
915MHz (ISM)	Americas	40kbits/sec	10
868MHz	Europe	20kbits/sec	1

It will probably be some two-three years before Zigbee technology reaches full maturity.

Table 2 shows how Zigbee compares with Bluetooth and WLAN 802.11b in respect of several key features.

Zigbee applications

Zigbee and Bluetooth compete in some applications but, on the whole, they are different solutions for different applications. Fig. 1 shows typical applications where Zigbee can be used.

Zigbee protocol stack

The Zigbee protocol stack, see Fig. 2, is similar in principle to the Bluetooth one but less complex. As you can see the physical hardware (PHY layer) contains the MAC (Media Access Control) layer, and these layers are defined by IEEE 802.15.4. The layers above the MAC, i.e. the application layers, are defined by the Zigbee organisation. The application/profiles layer is slightly different from Bluetooth – it's more loosely tied down than the Bluetooth equivalent.

There are Zigbee-defined profiles and recommended Applications Interfaces (APIs), but manufacturers can also develop their own (within limits) without violating the rules of

Table 2: Key systems' comparison

Feature	*802.11b*	*Bluetooth*	*Zigbee*
Power profile	Hours	Days	Years
Compexity	Very	Complex	Simple
Nodes/master	32	7	64,000
Latency	Enumeration up to 3sec	Enumeration up to 10 sec	Enumeration 30msec
Range	100m	10m	70-300m
Extendability	Roaming possible	No	Yes
Data rate	11Mbits/sec	1Mbits/sec	250kbits/sec

Security with IEEE 802.11b is Authentication Service Set ID (SSID); with Bluetooth 64 bit, 128 bit; with Zigbee 128 bit AES and application layer user defined

Photo 2: The Panasonic NV-EX21 camcorder.

the organisation.

There is even further simplification of the stack with a simple slave device.

Zigbee networks

Zigbee networks can have a variety of arrangements and different device functionalities depending on how the network is to be implemented. Fig. 3 shows how the function varies depending on where a device is within the network and on the network arrangement.

Further study

The following books provide further information on Zigbee:

Wireless Sensor Networks – Architectures and Protocols, by Edgar H. Callaway Jr., Auerbach Publications 2003.

Enabling Wireless Sensors with IEEE 802.15.4, Low-Rate Wireless Personal Area Networks, by Jose A. Gutierrez, Edgar H. Callaway Jr. and Raymond L. Barrett Jr., IEEE Press 2003.

Also take a look at http://www.zigbee.org/en/resources/ www.palowireless.com

Next month

Next month we will consider in more detail at how Zigbee works and take a look at one of the devices available to implement it, also a software implementation and a development platform. We will also look at available devices that use Zigbee and what is coming soon.

Test Case 514

Even though our rental business is declining rapidly it's by no means dead, and the Test Case workshop continues to look after many hundreds of TV sets and VCRs that are out on rental. Their users receive excellent service, normally the same day as it's requested. Thus it was that a 25in. Hitachi set, Model C2564TN, arrived in the workshop within a couple of hours of a distress call from Mrs Harris. It had stopped working she said.

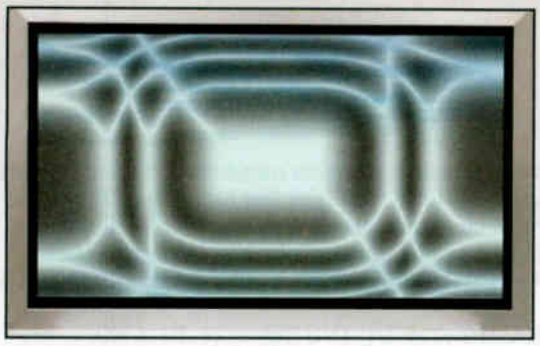
Now the C2564TN (G10Q chassis) is a very old model, about thirteen years old in fact. The service manual was found to be well worn when Television Ted took it from an equally well-worn box file. On test he found that at switch on the set immediately reverted to the standby mode. This, decided TT, was likely to be some sort of protective action, probably because of a short-circuit somewhere. He checked the line output transistor Q703 and the HT (148V) rectifier D921. Neither of them was shorted, nor were the various diodes associated with the line output transformer T701. The rectifier diodes connected to the chopper transformer were next checked: D921 (again), D922-4 and D941. They were all OK. Could it be that the TDA8178 field output IC was loading down the power supply? Disconnection of R609 in the rectifier circuit that provides its supply suggested not. Ted decided to examine the circuit diagram closely. Previously-encountered faults are usually noted on it, either as a pencilled note or a yellow highlighting of some component. There seemed to be little that was relevant to this fault, and nothing that provided a cure.

Now Hitachi TV sets can be prone to dry soldered joints. Ted examined the PCB closely under the light from his fluorescent magnifier lamp and found a few that could have been suspect. He removed the solder from them with a sucker and braid, then fluxed and resoldered them. On trying the set again the situation was the same: switch-on, LED lights with a 'plonk', followed by a quick reversion to standby. Out, then, with the trusty ESR meter to check various electrolytic capacitors – there was certainly a strong possibility that they may have dried up in a set of this age. These tests were confined to the power supply section. One or two of the capacitors were a bit out of tolerance but not, in Ted's opinion, sufficiently so to prevent the set from working. In fact the cause of the fault was not capacitor trouble.

Come on Ted, ace TV repairman! An old and simple TV set; a fault that was permanently present; a service manual and lots of test equipment to hand; and decades of TV repair experience to call on. Come on, come on! The next test would normally have been the substitution of a light bulb as a dummy load in place of the line output stage. But a note on the circuit diagram suggested that the power supply doesn't take kindly to this type of test. So Ted got his LOPT tester out. It indicated that the line output transformer was OK, and so it was. Over an hour had now been spent on this one, to no avail, and the customer wouldn't countenance another model.

The root cause of the trouble was eventually found – in relatively minor components! Have you guessed what the trouble could have been?

See page 763 for the solution.



Charles Arundel provides a further summary of fault conditions experienced with Daewoo models

Plasma tv fault conditions

Model DSP4210GM (SP110 chassis)

Thin white line down screen: This indicates a short-circuit condition. There are data connector boards along the top and bottom of the plasma panel, looking from the rear. It's possible that while the back screws were being tightened with an electric screwdriver during production burrs came off the screw-heads and fell through the top grills in the back cover. One of these could have fallen on to a data-drive connector to the plasma panel, causing a short-circuit. It may be possible to blow the burr away through the grill. If not, remove and refit the flexible connector concerned.

It's very important to know how these connectors operate, because they can be easily damaged. This would require a new data-drive board.

Thin black line down screen: This indicates an open-circuit condition. Look for an open-circuit connector to the data-driver IC boards, either at the top or bottom of the panel depending on where the line is on the screen. Check by removing the flexible connector and replacing it. Make sure you know how the connector opens before you do this, as it can easily be damaged. See above.

Very faint line down screen. Shows up clearly with one of the test-mode colour rasters: If the line is still present after replacing the relevant data high and data low boards in the area of the fault symptom, check for damage to the flexible connector to the screen. If this is damaged, the screen will have to be replaced.

Coloured stripes down the screen only with a digital input to the video socket, from a digital set-top box for example. There are no stripes when the video input is fed with an analogue signal: A clue is provided by the fact that when a monochrome picture is being received there are no stripes but there are coloured dots, as though the colour-killer circuits don't work. Fit a new video board.

No sound: Check that the plug from the audio board to the jack board is secure. Then, if necessary, check the audio board by replacement.

Model DP42SP (SP115 chassis)

Set dead, won't come out of standby, LED stays red: The most likely cause is a faulty power module or Y or X sustain board. See report on this fault in the July issue (page 545). It described this type of fault when caused by a short-circuit hybrid IC on the Y sustain board. A similar procedure can be used when the cause is a short-circuit hybrid IC on the X sustain board. When these hybrid ICs go short-circuit they can put a strain on the power module circuitry. The extra current may result in a short-circuit power transistor and six blown resistors. If this has happened you will see three burnt surface-mounted resistors at the top right-hand corner of the power module and three more burnt resistors farther down, near the top transistor mounted on the right-hand edge of the PCB.

If any of the above boards are replaced, the voltages must be reset to those given on the white label attached to the back of the screen. These adjustments must be carried out with the set in the service mode, displaying a white raster. The appropriate service manual is required to establish the location of the relevant test points.

Another possible cause of failure to come out of standby is any of the 28 data-drive ICs going short-circuit. These ICs are connected to the screen on a flexible connector. If one of these ICs is faulty it's likely that the relevant 470Ω surface-mounted feed resistor on the separate left or right connector board has gone open-circuit. The data-drive ICs can be checked for a short-circuit condition by carrying out diode measurements across the tiny square copper pads situated nearby on the flexible connector. Unfortunately if one of these ICs is short-circuit the whole screen will have to be replaced.

Screen blank except for a band of blue speckles down some part of the display: The voltages on the Y sustain board need to be reset. See note above.

Excessive buzz from the rear of the plasma panel, especially on scene changes with high white content: A slight buzz is always emitted by the power module and the X and Y sustain boards. If the buzz is excessive, slight adjustment of the voltages on the power panel may reduce it. If not, replace all three boards one by one to locate the culprit.

Broad black line down screen: See fault note on page 613, August issue. There is also a slight possibility that the cause could be a loose connector or a fault on the digital board, especially if random flickering dots are present within the black band and there is no black band when the set is put into the service mode with a white screen displayed.

Horizontal lines across the screen at switch-on, picture OK after five minutes: The cause is a faulty video board.

On-screen "no signal input" message: Has the customer set the input button on the remote-control unit or the set itself to the correct input for what has been plugged into the back of the screen? Also check for loose connectors, either at the rear of the screen or at the tuner, STB, satellite receiver, DVD player etc. If all is OK, a jack connector board will probably be required. Note that there are two types: the Korean type has the facility to connect an AV jack and has five bayonet connector sockets along with its PC input; the UK type has only phono sockets for the various inputs, along with the PC connector.

No picture but on-screen messages displayed: The cause could be a faulty jack or video board.

Picture too dark with some inputs: Reset the sub-brightness for the input concerned, in the service mode. For example, if the video input picture is too dark but all other inputs are OK, reset the video input sub-brightness in the service mode, back to 128. Refer to the service manual for exact details.

One or two black dots on the picture: The pixels involved are not switching on. The plasma panel specification allows for a maximum of three dead pixels in the central area of the screen and three in the outside area. If there are more dead pixels than this the panel should be replaced.

DX and Satellite Reception

Terrestrial DX and satellite TV reception reports. Broadcast and satellite TV news. C-band extension. Streaming video, the future . . . Roger Bunney reports

A satellite truck identification received via Eutelsat W2 (16°E).

Periods of good Sporadic E reception continued during July, as this year's season seems to be surpassing that of last year. There have been no reports so far of transatlantic reception in the UK, though Hugh Cocks reports several instances of really enhanced picture reception in Portugal. The following is a collated SpE log for the UK:

2/7/05	RAI (Italy) ch. IA; TVE (Spain) ch. E2; CRO (Croatia) ch. E4; C+ (Canal Plus, France) ch. L4.
3/7/05	RAI IB; RTP (Portugal) E3.
4/7/05	LTV (Lithuania) R1, 2; LRT (Latvia) R2; NRK (Norway) E2-4; SVT (Sweden) E3; MO-1 (Moldova) R2; BT (Belarus) R1.
5/7/05	RAI IA, B; TVE E3; CRO E4.
6/7/05	ETV (Estonia) R2; BT R2, 4; SVT E2-4; NRK E2-4; C+ L3; Tele-A (Italy) E2– (47·22MHz).
7/7/05	RAI IA, C; TVA (Italy) E2–; ETV R2; CRO E4; RTL Klub (Hungary) R2.
8/7/05	Tele-A E2–; RAI IB; RTP E3; TVE E3.
14/7/05	TVE E2, 3; RTP E3; RAI IA, B; TVA E2–; NRK E2-4; SVT E2-4; ETV R2; LTV R2; YLE (Finland) E3; C+ L3, 4.
15/7/05	RAI IA, B; TVA E2–; TVE E2; ORT (Russia) R2.
17/7/05	TVE E2; C+ L3, 4; RAI IA, B; Tele-A E2–; RLT Klub R2; Nova (Czech Republic) R2.
21/7/05	RAI IA.
23/7/05	TVE E2.

Meanwhile Hugh Cocks was having a TV-DXing ball in the Algarve! From 1930-2030 hours BST on June 29 he received a strong RCTV (Venezuela) ch. A2 signal, identified from the audio and video content, which included a soap opera, commercials and the Dos Milliones Bolivares competition. During the same time radio amateur 9Y4AT was in contact with Portuguese amateurs at 50·110MHz. On July 15 Hugh received WLBZ-TV (Maine) at 2300 hours BST, and on the 16th at midday for about an hour "lots of Canadian stuff up to ch. A4, the CBC breakfast programme on chs. A2 and A4 (with different audio), commercials etc." I have listened to emailed sound clips of RCTV, WLBZ and the Canadian ch. A4. They are quite remarkable – WLBZ-TV has excellent audio quality. An impressive reception list from Hugh.

Cyril Willis has just returned from a very hot holiday in Protaras, Cyprus. It's also hot for DX-TV there. His apartment was on the third floor, facing SE. Using his laptop, WinTV, Icom PCR1000 and a temporary aerial he received many Lebanese, Syrian, Turkish, Cypriot, Greek, Egyptian and Jordanian TV stations in all bands.

There have been two reports of TVE reception in ch. E4 during the recent SpE openings. This suggests that all Band I channels are still active there, though TVE is expected to switch off Band I in September.

DTT receiver for DXing

Gareth Foster has recommended a DTT receiver that's available from the supermarket chain Lidl. It covers chs. E2-12 and E21-69, scans and saves in the order received, in separate banks for TV and radio, or you can select a specific channel, in bandwidths of 6, 7 or 8MHz. Output is PAL or NTSC. Variables are guard intervals of 1/4, 1/8, 1/16, 1/32; FFT mode 2k, 8k or auto; demodulation QAM, QSPK, 16QAM, 64QAM. PIDS are adjustable, and it handles 16:9 or 4:3. There are two scart sockets and the following outputs: video and audio phono, S-video, AC-3 audio coaxial and optical; also RF input and loop-through; but there's no modulator. The masthead supply is 5V at 75mA – curious voltage! Many languages are catered for, but not Welsh or Gaelic. You have to switch the box off completely to return to analogue reception. Mains input is 100-240V AC. In late July it was selling for £29.99. It would make an ideal digital TV-DXing receiver.

Satellite sightings

The satellite arc brought much bad news during July. For some days after the London bombings on the 7th newsfeeds were being uplinked

from tube stations, street corners and bus stops. Thirteen newsfeeds via Eutelsat W1 (10°E) alone were counted on the late afternoon of the 7th. There were further feeds for Europe and the US via Eutelsat W2 (16°E), and Intelsat 903 (34·5°W) carried an MPEG 4:2:2 feed for RTE Dublin. This was at 11·137GHz V (symbol rate 5,632, FEC 3/4). The NTSC CBS feed via W2 was at 12·540GHz H (5,632, 3/4), from a noisy London pavement site. Torrential rain arrived, causing pixelation, picture freezing then total loss, the signal returning gradually to reveal a dripping reporter under an equally dripping brolly. Many overseas networks continued to take live reports from the streets for several days after the bombings. The satellite trucks must have converged on London at speed: a transmission for Sky News from the SIS 8 UKI 716 truck via W2, at 12·525GHz H, still showed Sky News Malvern on the colour bars.

Further terrorist activity two weeks later, fortunately this time with no loss of life, produced another flurry of satellite news reporting, featuring police raids around the country. On July 25 police were seen at the entrance to the Curtis House, London tower block, checking the identity of those coming and going. 'Stored packages' were found and more suspects sought. This was live coverage for the BBC via Atlantic Bird 1 (12·5°W) at 11·098GHz V (4,226, 5/6), using the UKI 690 Elstree BBC truck. Interesting that the BBC has been using this slot recently for Middle East feeds from the Jerusalem Bezeq Sat truck. The slot has also been used for transmissions from Beirut. These more distant feeds always use MPEG-2.

The BBC also used its Atlantic Bird 1 slot for a feed from Linx UKI 832 in Srebrenica, Eastern Bosnia, at 11·100GHz V. It followed the discovery of mass graves there. The reporter walked between rows of new graves and commented that the area is still "deeply divided".

Alan Richards (Skegness) reports that an Argentine TV channel is present via Hispasat (30°W) at 12·100GHz H (2,200, 3/4). During the afternoon there is horse racing and in the evenings old-time big band/crooning and jazz, plus commercials. The 60th anniversary of the end of World War II produced outside broadcasts from the UK via Hispasat, identified as London 1, 2 and 3, at 11·642GHz V (13,500, 3/4). Oddly, different PIDs were used for each feed within the multiplex.

GlobeCast Africa regularly features live OBs via Europe*Star 1 (45°E), which has now been renamed PAS 12. Rugby seems to be popular. In early July the Eagles v. Sharks appeared during a weekend afternoon via the regularly-used 11·525GHz (or 526) V (6,109, 3/4) GlobeCast Africa slot. That same night the Johannesburg version of Live8 was carried, with the main feed at 11·598GHz V and secondary feeds at 11·525GHz V and 11·589GHz V (GCA-2), all using SR 5,632 and FEC 3/4. The 11·525GHz transmission produced pictures of Nelson Mandela, who was greatly appreciated by the vast audience. He's now an experienced hand at pop concert appearances!

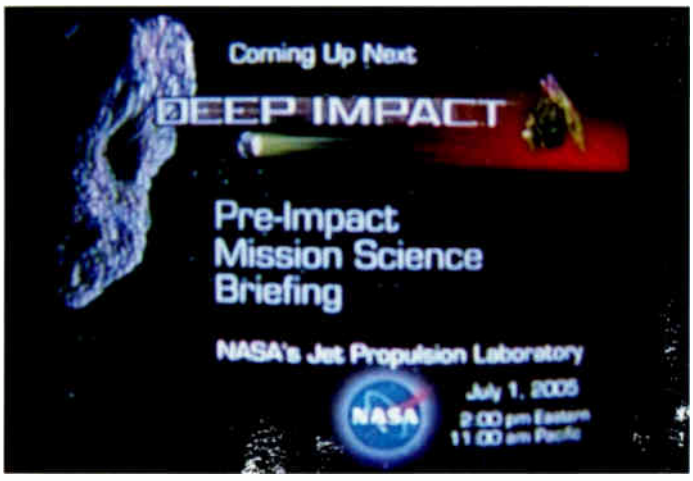
I was delighted to receive a letter from Dave Tong (Southampton), who retired recently from the NTL Winchester Teleport. At home Dave can just access the output from PAS 10 (68·5°E), at 4° elevation. He says the Ku-band signal levels in Europe can be very high. One of his regular receptions is the fortnightly Blue Wave financial programme from the Telemedia Teleport near Johannesburg. It's broadcast on alternate Tuesdays at 0430-0830 GMT – tune to 12·695GHz V (6,620, 3/4). Dave finds that at such low elevations the signals suffer from rain attenuation – he uses a 1m dish.

The Winchester Teleport can't reach farther east, though a report last year suggested that the LMI 1 satellite (75°E) is being received at Hove, Sussex. This slot is at 0·6° above the horizon, so it's likely that water effects would similarly occur.

Nick Harrold (Southend) mentions that his C-band dish suffers from side-lobe reception of two cross-channel microwave links. He has confirmed FR3 programming from the direction of the Northern French coast.

Broadcast news

Ireland: The minister of communications Noel Dempsey has con-



NASA hits an approaching comet. Reception via Eutelsat W1 (10°E).

firmed the government's commitment to establishing a digital terrestrial TV system, with the eventual closure of analogue TV services. The government is now calling for discussions with interested parties. Initial DTT tests will be carried out from the Three Rocks (Dublin) and Clermont Carn (County Louth) transmitters.

Belarus: The government has announced that DTT, using the DVB-T standard, will be in operation across the country by 2015. Following successful tests carried out last year, a DTT transmitter will start broadcasting at Minsk this autumn. The whole TV network will be fibre linked over the next few years, and Belarus expects to develop and manufacture its own digital receivers within five years.

US: The main networks have agreed to end dual analogue/digital transmissions by 2009 and close down all analogue transmitters by December 31 that year. Broadcasters are concerned however that the original guideline specified that 85 per cent of viewers in any given area should be digital-ready, and feel that blanket closedown will leave many viewers with empty screens.

The US Congress has passed a finance bill that will provide "balanced, objective and comprehensive news broadcasts" via radio and TV to Venezuela, similar to the Radio and TV Marti transmissions to Cuba. There will initially be half to one hour broadcasts. The Venezuelan government has announced that it will jam the broadcasts.

Germany: During a twelve-month test period in the Berlin and Brandenburg regions, from September, radio stations will be given access to DVB transmitters. Up to now digital radio has been available in Germany only via DAB. Technisat is offering twelve radio channels from sites at Alexanderplatz and Schaferberg. In total some thirty sites will provide FTA programming.

New Zealand: The government has sought support from TVNZ and other broadcasters to assist with planning for a move to digital TV. No time scale has been suggested.

Sweden: DTT is to start at Visby on September 19 and will be gradually extended across the country, with analogue TV being progressively shut down. The official list for DTT opening/analogue closures is as follows:

Visby (Gotland) 19/9/05; Gavle 10/10/05; Motala 21/11/05; Kisa and Norrkoping 27/2/06; Vasteras, Uppsala, Orebro and Osthammar 3/4/06; Bollnas, Borlange, Hudiksvall and Mora 2/5/06; Boras, Emmaboda, Finnveden, Halmstad, Jonkoping, Nassjo, Skovde, Varberg, Vislanda and Vastervik 6/11/06; Stockholm 12/3/07; Solleftea, Sundsvall, Tasjo, Ange, Ornskoldsik and Ostersund 16/4/07; Arvidsjaur, Gallivare, Kalix, Kiruna, Pajaja, Alvsbyen and Overkalix 14/5/07; Filipstad, Karlstad, Lycksele, Skelleftea, Storuman, Sunne and Vannas 3/9/07; Backefors, Goteborg

News from Bosnia. A BBC feed via Atlantic Bird 1 (12·5°W).

Trollhattan and Ulddevalla 24/9/07; Helsingborg, Horby, Kaarlshamn, Karlskrona and Malmo 15/10/07. Analogue SVT-2 transmissions will cease immediately on these dates, with SVT-1 and TV-4 closing three weeks later. Captions will warn viewers about the close downs.

Thus many familiar and often received analogue VHF transmitters will leave the air over the next two years as the march towards the digital future continues. In view of the country's vast area, it remains to be seen whether DTT will be UHF only or mixed VHF/UHF.

Satellite news

PanAmSat has acquired the Europe*Star 1 satellite (45°E) and renamed it PAS 12. In addition access to the 47·5°E slot has been acquired. It seems that PanAmSat intends to increase TV transmissions, such as DTH and HDTV, to Europe. Stay tuned!

The increased use of terrestrial fibre has seen a reduction in commercial satellite traffic, but fibre isn't without its problems. On July 20 a major circuit failed, taking out Europe-Pakinstan communications such as call networks, the internet etc. Intelsat was quick to provide backup and restore communications via its 904 and 902 satellites at 60° and 62°E.

Many countries now provide a 'World' satellite TV channel. Iran has announced that Islamic Republic of Iran Broadcasting is to establish an English-language international news channel in the near future. Russia is also considering an English-language international news channel to be called Russia Today.

KVH Industries Inc., Middletown, Rhode Island has introduced a marine Ku-band tracking-aerial system for use on small craft. Models Tracvision G4-HP (18in.) and G6-HP (24in.) have aerial-mounted gyro systems that, with Conscan signal-strength tracking, enable fast Ku-band satellite location. They are also available without the gyro-tracking sensor package. A larger 'outer footprint' version, Model G8 has a 32in. carbon-fibre aerial plus GPS positioning. KVH Industries has a European sales office in Kokkedal.

The 80cm glass dish Alan Richards (Skegness) uses to minimise its visual impact.

The new high-powered Ku-band Horizons 2 satellite being jointly developed by PanAmSat and JSAT will eventually be positioned at 74°W to carry SNG links, internet and IP network content, replacing the SBS-6 satellite which will be moved elsewhere.

GlobeCast has leased transponder capacity from SES Astra at 28·2°E. Bandwidth will be subleased to UK broadcasters for HDTV transmissions.

Seven Stars, a new satellite TV service, is due to come on air in September via Nilesat at 7°W. It's a joint commercial project with Jordanian and Spanish investors and will provide English, Arabic and Spanish language services, covering the Mediterranean area and part of the Middle East. Uplinking will be from Amman.

C-band extension

TELE-satellite, the magazine started some years back by our German TV-DXing friend Akexander Wiese, is now published in 14 versions and 11 languages. It's always full of news, equipment reviews and satellite information. Though mainly concerned with Ku-band matters, there is also coverage of C band. A recent issue carried news of a proposed extension of C band, which is mainly used for communications purposes and originally covered 3·5-4·2GHz. Some years ago it was extended down to 3·4GHz. The Indian Space and Research Organisation (ISRO) is now seeking ITU permission to use the 4·5-4·8GHz band, to cater for distance-learning groups across India. Educational programming is uplinked from various universities and then broadcast back via the Edusat satellite (74°E), which was launched last December to sit alongside Insat 3C. Interesting that Insat 3E (55°E) and 3A (93·5°E) both have dual-band extended-C/Ku capacity.

Checks at 74°E and 83°E (Insat 3B/2E) confirm that the distance-learning TV transmissions have started. Two-way interactive capacity will eventually be added. The Gardner group in Dallas is now manufacturing extended C-band LNBs for the new service. Unfortunately only Insat 3E is above the UK horizon and its beam is aimed at India, making UK reception almost impossible.

For the latest information on satellites in orbit check at www.Lyngsat.com or
SatcoDX

These sites are continuously updated.

Streaming video, the future . . .

Bob Cooper's trade magazine *SatFACTS*, published in New Zealand, is an invaluable source of information on developments, changes and new equipment. In a recent issue he commented on the expanding use of broadband video. His office has a connection to the Telecom NZ broadband feed Jetstream.

It has been estimated that by the end of 2006 worldwide broadband, or video-capable internet, will be available in more homes than had a phone sixteen years earlier. Connections increased by 750 per cent in 2004 alone. In early 2005 a click on the mouse gave Bob free access to over 700 video streaming sites: by mid year the number had trebled. Then there are pay-to-view subscription streamers, such as TV 2 Me, which offers a mass of TV channels in New Zealand. Once you have a broadband feed with a minimum of about 350kbits/sec bandwidth and the appropriate boards and software in your PC you're away.

Broadband streaming is now expanding very rapidly and pushing into the world of broadcast entertainment, both audio and video. This is affecting all other media – Bob Cooper mentions newspapers, US broadcast networks and the purchase of CDs. Even the humble mobile is now receiving RF-delivered broadband, with broadcast TV such as news and sports. Bob sums it up with the comment "ignore this development at your peril"!

HELP WANTED

The help wanted column is primarily intended to assist readers who require a part, circuit etc. that's difficult to obtain. Requests are published at the discretion of the editor. Send them to the editorial department – do not write to or phone the advertisement department. If you have access to email they can be sent to t.winford@nexusmedia.com

Wanted: Service manual for the Panasonic camcorder Model NV-M10, to beg/borrow/buy, or can someone scan the audio circuit diagrams and email them to me? Alternatively, does anyone know why one of them should have no audio play or record or headphone monitoring? Please email Geoff Darby on mag.replies@ntlworld.com

Wanted: Basic microwave oven shell, i.e. no door, components etc., for the Sanyo Model EM-C1850. Willing to pay plus costs for a good, sound example. Phone Brian Long on 01593 741 249 (Caithness).

For disposal: Approximately 50kg of service manuals in lever-arch folders, mostly dating from the 70s and 80s, TV, radio, hi-fi etc. Free for cost of postage. For further details contact William Williamson, Leeskol, North-a-Voe, Yell, Shetland, ZE2 9DA or email william.williamson1@btinternet.com

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 between 9 a.m. and 10 p.m.

Wanted: Batteries for an Avometer Model 40. Phone Spud Cox on 01256 472 906.

For sale: Retired TV engineer has classic and modern test instruments for sale. For a list please contact John Stacey (G8BXO), 3 West Park, South Molton, Devon, EX36 4HJ. Phone 01769 573 382.

For disposal: Free to a collector/enthusiast, a vintage Pye radiogram manufactured in 1952. In good working order with dark oak cabinet in good condition. R. Weston, 44 Grange Crescent, Rubery, Birmingham. Phone 01214 533 786.

Wanted: Quad 33, 34 or 44 preamplifiers, 405 power amplifiers and FM2, FM3 or FM4 tuners for spares. Also boards and modules for these. Contact Mike on 01758 613 790.

Wanted/for disposal: Require a Toshiba Model V804B VCR (redundant machine will do) and a working Panasonic Alpha 1 TV chassis. Have for disposal *Television* magazines 1990-2001, mostly in mint condition; a Sony TXT-100B teletext unit; a Sony Trinico HVC3000P video camera with case; two Sony SL-C9UB Beta VCRs in working condition with modified DC-DCs plus a number of panels etc. and a service manual. Contact Bruce, 11 New Zealand Way, Rainham, Essex, RM13 8JP. Phone 01708 558 792.

Wanted: Service manual or circuit diagram for the Philips tape recorder Model N4450 (photocopy OK). Please call Iain Hare on 01726 72 050 or email iain.hare@tesc.net.

For disposal: Two working Philips G8 TV sets. One still has the original tube, the other a regunned tube that was fitted in 1986. Both in good working order with some spare boards. Also a quantity of valves (about 100), mostly audio and early colour and monochrome TV types. Free to a good home. Phone Steve Ball on 01733 347 678 (Peterborough) or email steve135@btinternet.com

Wanted: Grundig Yacht Boy radio. Must be Model 210 dating from 1970-74. Will pay very good money for a set in mint condition. Peter Tankard, 16A Birkendale Road, Sheffield, S6 3NL. Phone 0114 231 6321 between 9 a.m. and 10 p.m.

Wanted: Non-working Panasonic VCR Model NVFJ611B, preferably to collect within Bristol postal area. Please phone Cedric Crook on 01275 879 620 (Clevedon, N. Somerset).

For disposal: A large number of Grundig modules, also Philips G11 and KT3/30 and Thorn 3000/3500. Alan Bray, 12 Westward Way, Kenton, Harrow, Middlesex, HA3 0SE. Phone 020 8907 2920.

A visit to the drugstore

Elaine Everest's recent visit to her local drugstore prompts her to outline a plan for moving the TV trade into the 21st century

A recent comment column in the magazine led me to think about the state of the radio and TV trade. No wonder it's going down the pan. Consumer electrical and electronics products are being sold in every conceivable type of shop. Only last month I was browsing at the make-up stand in one of our more popular high street shops when I noticed a customer who had a query.

"Excuse me luv, can you tell me something?" an elderly man called to a young girl who was piling nappies in the baby section.

"We're rather confused about these boxes you're selling" added his wife.

The girl dropped her nappies and joined the couple, who were peering at the display of Freeview boxes.

"What's the problem, sir?" she asked.

"Well, we wanted one of these boxes, because Doris wants to watch her *Coronation Street* repeats and I want to watch the football. Can both of these boxes do that, and why is one twenty quid dearer than the other one."

"Er, I'm not really sure sir, I'll have to ask the manager."

She scuffled off towards the storeroom as the elderly gentleman called after her "ask her if someone can come and fix it, and what happens if it breaks down?"

Nitty gritty

By now I was only a few feet away from the couple. The man had asked the very questions that had occurred to me. It's all very well popping out to the local supermarket to buy a pint of milk and coming home with a widescreen TV set, but what happens when you can't set it up and it breaks down?

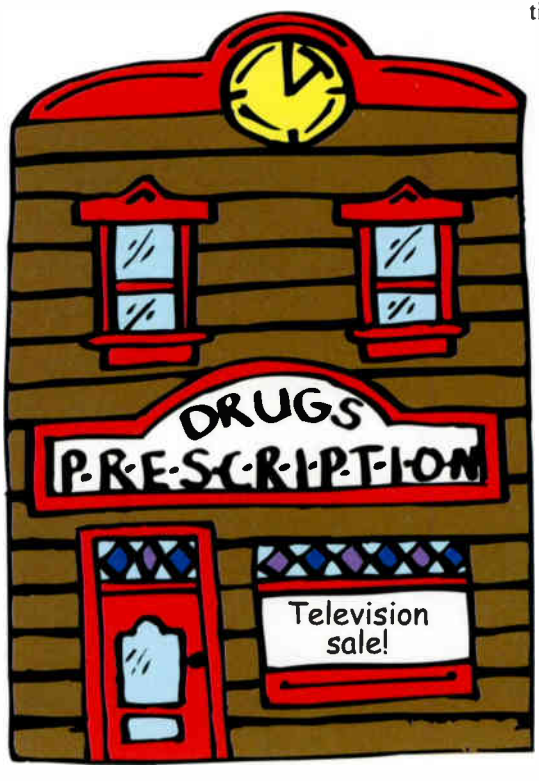
The nearest our local Asda can get to a home delivery service is to provide a young lad to wheel your purchases out to your car on a wobbly shopping trolley. They have as much idea about getting your TV set into the car as they do about packing your carrier bag – the eggs are always at the bottom!

Back at the drugstore another young woman had appeared. She was apparently the Manageress. Not being more than a few years older than the shelf-stacker, one can only assume that she had passed her O level in nail-varnish knowledge – and chav talk in order to be able to control her staff.

A word of help

By this time I had joined the conversation with the elderly couple and had looked at the two Freeview boxes. It was obvious that the cheaper one didn't have scart leads and other paraphernalia that would be needed to set up the system. It also had a brand name I'd never heard of. If all else fails, I always advise my husband's customers to buy a brand they recognise. This may save you having to phone Hong Kong with a query.

I had just jotted down the phone number and address of the repair shop where himself earns a crust. I had pointed out to them that for the same money they would get full advice on setting up the system, and also a call-out repair service whenever it was needed.



An altercation

The manageress was not amused when the elderly couple handed back the box they had been looking at and went to the counter to pay for their purchase of the buy one get one free denture fix.

She fixed me with an icy stare. "I'll ask you not to interfere with our customers, madam" she hissed.

It was at this point that I saw red. If we don't start to stick up for our own business interests, the demise of the electrical retailer will come even sooner than expected. Our trade would be handed over to the likes of the nail-varnish queen, who was aiming her most venomous stare in my direction.

I pulled myself up to all of my five foot and three inches and glared back at her. "Look here, dear, let's make a deal, shall we" I said, "if you promise to stop selling consumer electronics products in your chemist shop, we won't stock waxing kits and eyelash curlers. OK?"

But I suppose I had better steer clear

of that particular shop for now. I wonder if Currys or Dixons sell sun-tan cream?

A plan

My little encounter really made me think about the situation. The electronics repair trade needs a swift kick up its backside to stop it sliding into oblivion. Then, to quote Baldrick, I had a cunning plan!

The repair business needs a drastic revamp. It must be made more attractive to the customer. Take a look at the gardening trade. A couple of TV programmes and a few hunky men to demonstrate how to prune our roses and, Bob's your uncle, everyone wants to employ a landscape gardener!

Just think. If you had the likes of Diarmuid Gavin, Lawrence Llewellyn Bowen and Alan Tichmarsh working in your repair department the ladies would be queuing at the door to get their bits and pieces repaired!

Now take a look at the typical TV repair shop. Not a pretty sight, is it? I know of one highly salubrious place that never opens before midday. The staff look as though they've just fallen out of a tent from the 1964 Isle of Wight pop festival, and dead flies in the window display date back to before the millennium.

My plan would revolutionise the repair industry and wouldn't cost a fortune – and even that's tax deductible.

The details

So here goes. What you do is:

(1) Make the workplace completely open-plan and decorate it in vibrant colours. It will then attract customers instead of flies, and keep your workers awake. Have a room tucked away at the back of the shop – I will explain why later.

(2) Install an internet café or burger bar, depending on the type of area in which you are located. This will entice a younger element to take an interest in your business and, let's face it, they are the ones with the money these days.

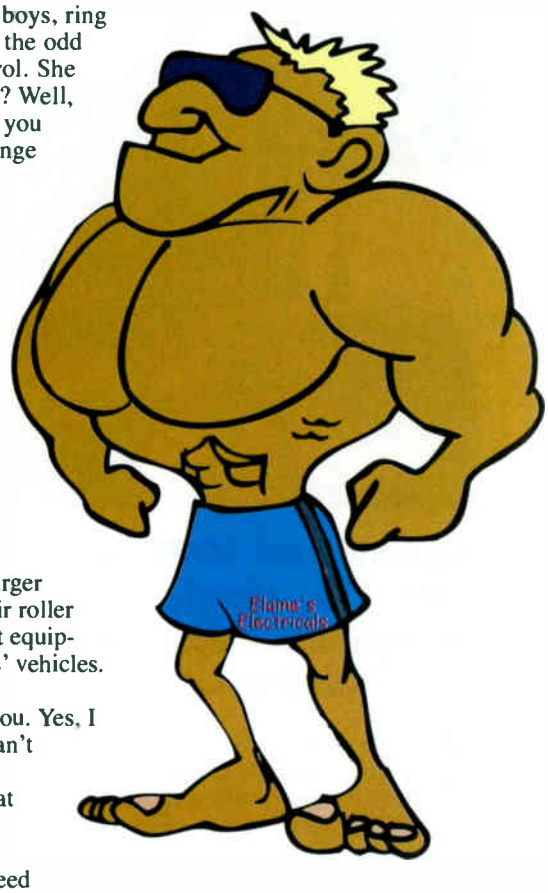
(3) Revamp your engineers. This may take a little time. A yearly membership to the local gym would help. Added to this you could have staff exercises before the workshop opens each morning, and a five-mile jogging session when you close for lunch.

(4) Uniforms are needed. To attract the customers and show off the new physiques, I suggest cut-off T-shirts and shorts. And add to this a weekly session at the tanning shop to give them a golden glow.

(5) You may have a problem with older staff who won't fit into the revamped business. This is where the room at the back of the shop comes in. I'm afraid I'm going to be very ageist here. You need to lock away these employees. They don't do your business any good and don't fit in with the young image you are now portraying. Regular supplies of tea and meat pies will keep them happy – and *The Archers* on the radio.

(Now then Elaine, if B&Q can manage to make good use of older staff, why can't we? They add assurance to the scene. Editor.)

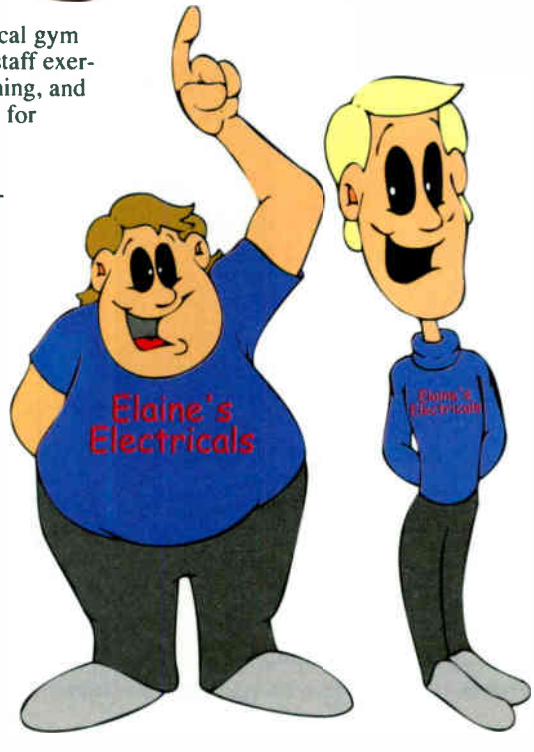
(6) Most of you will have a female who serves customers. For quite a few it's probably the wife. This probably doesn't fit with the new image I'm suggesting. An older person might be OK for doctors' surgeries, but not for us. Yes, you've guessed it, she's in the back room too. Give her a copy of *Woman's Weekly*, and she can chat with the old boys, ring her mates and do the odd bit of credit control. She does that anyway? Well, no problem then, you don't need to change her contract – if indeed she has one.



In her place we'll have someone younger, on roller blades and in cheerleader outfits – company colours of course! Her or their tasks are twofold: to serve customers in the internet café or burger bar – then use their roller blades to transport equipment to customers' vehicles.

(7) Finally, you. Yes, I know we can't hide you away in that already overstaffed back room. You need to be out front, finger on the pulse and all that. So how about a facelift, tummy-tuck or do something about that hair? I'm sure you know a way of making this look like a valid business expense. That's a skill you've probably honed to perfection over the years!

And how about some designer clothes? Tell the tax man they're overalls. Then a quick top-up on the tan. No sunbed for you: have a cruise at the company's expense.



And there you are, the new business is complete!

Thanks

You don't need to thank me for these valuable business tips. Just send chocolates via Tessa at the address in the front of the magazine. Oh, and if anyone is thinking of sending the equal opportunity people after me, you'll find that I am in the backroom of hubby's workshop, listening to *Desert Island Discs* and reading my *Woman's Weekly*.

A flexible LOPT tester design

Commercial LOPT testers cost about £90. This simple, easy-to-use tester, designed by Paul Coles, can be built for a fraction of that cost

The line output transformer tester described in this article was designed primarily to reduce diagnostic time with sets in which the line timebase is under the control of the microcontroller chip. In the event of a line output stage fault such sets will switch on for a second then revert to standby. Alternatively the power supply may go into the excess-current protection mode. This tester enables the transformer to be quickly eliminated as a possible cause. It has been in use in our workshop for over three years, with all sorts of TV sets, and has saved us a considerable amount of time.

The line output transformer is often suspected when the cause of the trouble is elsewhere, for example shorted line scan coils etc. The latter is a common fault with small portables that use Orion tubes. A check with the tester will avoid a faulty diagnosis in a situation like this. For example a Sony Model KV1410 was blowing fuses in the supply to the line output stage. This is usually caused by a faulty transformer. The tester cleared it, and further work revealed that the field output IC was the cause – it was short-circuit. A replacement chip cured the fault.

Design details

Fig. 1 shows the circuit diagram of the tester, which is based on the popular Signetics 555 timer chip (IC1). It's used as an astable oscillator to provide the LOPT being tested with drive at approximately 15·6kHz. The supply end of the LOPT's primary winding is fed with about 8·5V via a current-limiting resistor (R11, main PCB). As a result the line output stage runs at about 1/25th of the normal energy level. In this condition it will not be notably affected by shorted components, for example ICs etc., fed from a scan-derived supply.

The peak collector voltage in this condition can be checked with an oscilloscope. A good transformer should produce a pulse that peaks at about 50V. There will also be about 800V at the first anode connector. This can be checked with an oscilloscope or fed to a meter for a derived EHT reading. This checks for shorted diodes etc. across the secondary windings.

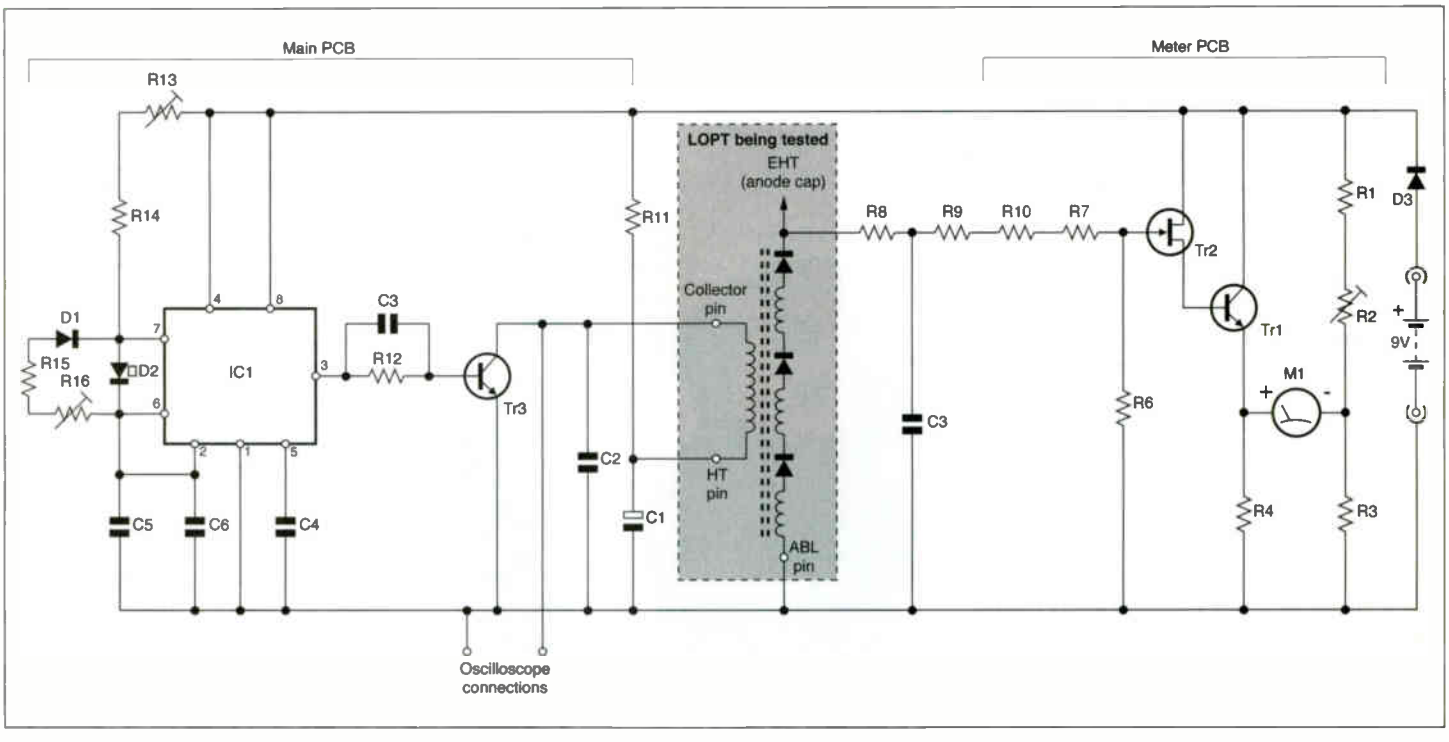


Fig. 1: Circuit diagram of the LOPT tester, which is built on two boards (main and meter).

The meter used was a ready-to-hand VU type from a scrap Philips cassette recorder. When checked it was found to read 300μA at full-scale deflection. As the EHT section of a good transformer will provide only 18-20μA when operated in this way, a FET amplifier circuit was designed to increase the meter sensitivity to 20μA at FSD. At switch on with no test leads connected the

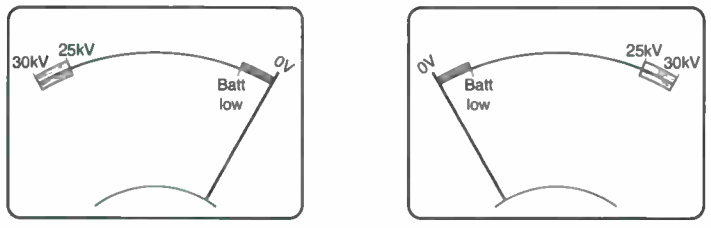


Fig. 2: Alternative meter scales. 25kV-30kV LOPT OK, otherwise LOPT faulty.

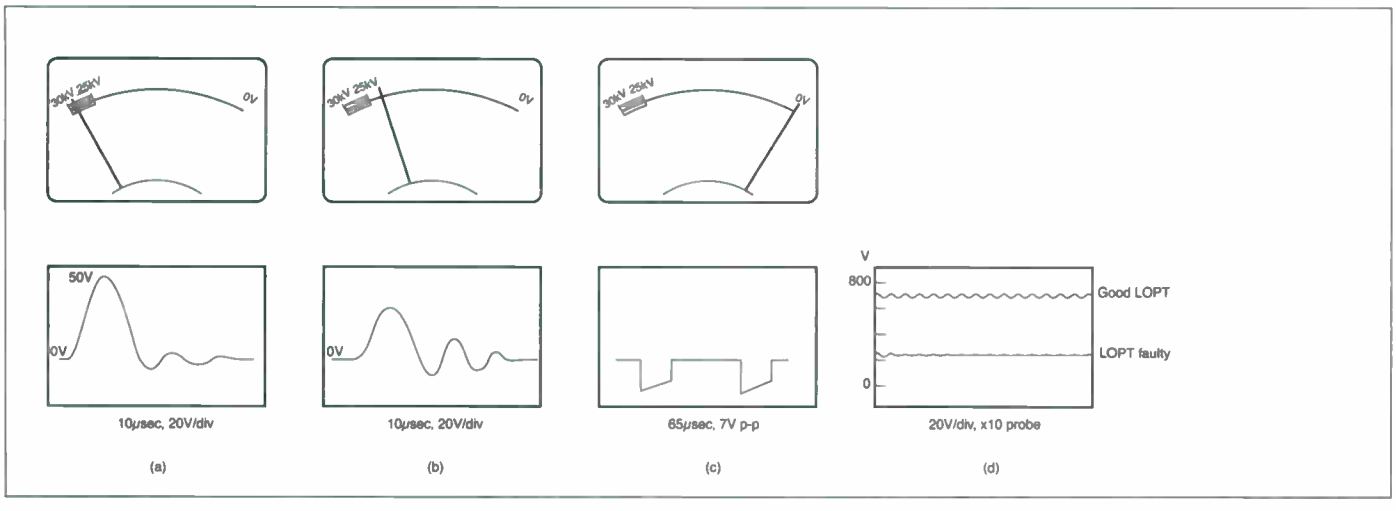


Fig. 3: (a) Meter reading and oscilloscope waveform with a good LOPT. (b) Meter reading and oscilloscope waveform with a faulty LOPT. (c) Meter reading and oscilloscope waveform with incorrect connection or an open-circuit winding. (d) Conditions at the anode connector with a good and a faulty LOPT, oscilloscope check.

voltmeter circuit will check the battery condition, as the needle will shift away from zero with decreasing battery voltage. Any 100-300μA meter can be used however – just decrease the value of R6 to reduce the sensitivity. Aim for FSD with 18μA through R7.

Construction

This is flexible. Different versions can be built depending on use. For example if the tester is to be used only in the workshop, the meter circuit can be omitted and, for ease of construction, a much larger case could be used, with the battery fitted internally and an on/off switch and flashing on LED indicator added. To use this version, connect the HT and collector leads to the transformer's primary winding after disconnecting its collector pin. Use an oscilloscope to monitor the peak waveform at the collector. 50V = OK. Then switch your oscilloscope to 20V/cm and check at the anode connector with a x10 probe. DC ripple at approximately 700V should be seen.

The version I built (see photograph) was made small enough to fit inside the ever-decreasing space in my toolbox. The only reason the meter was fitted was for use during service calls. The VU meter used was fitted from inside the case, with the scale protruding through the cutout.

Setting up

(1) Connect a new 9V battery.

(2) Adjust R2 on the meter PCB to zero the meter.
(3) Set R16 to mid-position. Connect an oscilloscope or frequency counter across Tr3 (oscilloscope connections). With no transformer connected, adjust R13 for a reading of 15·6kHz on the counter or pulses at 64μsec on the oscilloscope.

(4) Connect the collector and HT connectors to the primary winding of a known good LOPT. An oscilloscope should show a peak collector voltage of approximately 50V. If necessary, adjust R16 very slightly for minimum ringing at the bottom of the waveform.

(5) Connect the anode lead. The meter should show 25-30kV (derived).

Use

Remove the CRT's anode connector, then desolder the LOPT's collector pin. Connect the HT and collector pin leads of the tester. Connect the earth lead to focus earth or the LOPT's ABL pin.

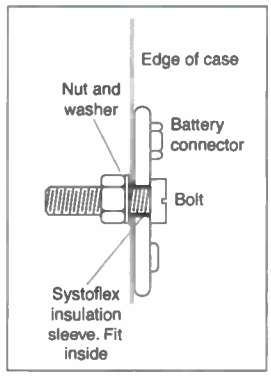
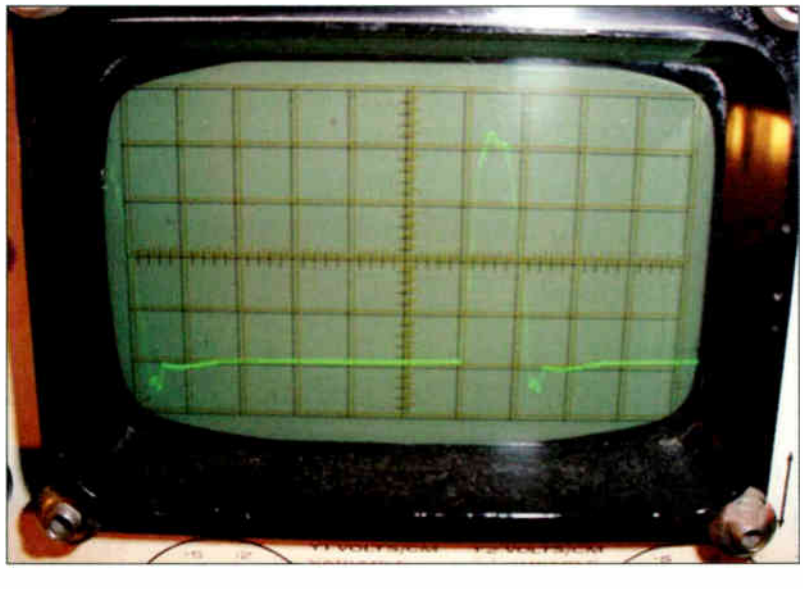


Fig. 4: Method of fitting the battery connector to the case.

Display with a good LOPT.



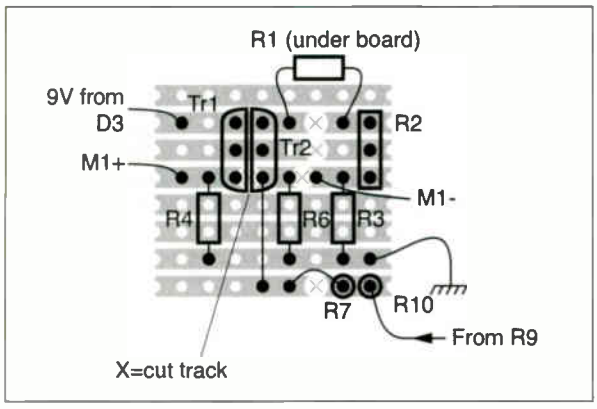


Fig. 5: Layout of the meter board. R8, R9 and C3 are connected in free space off the board.

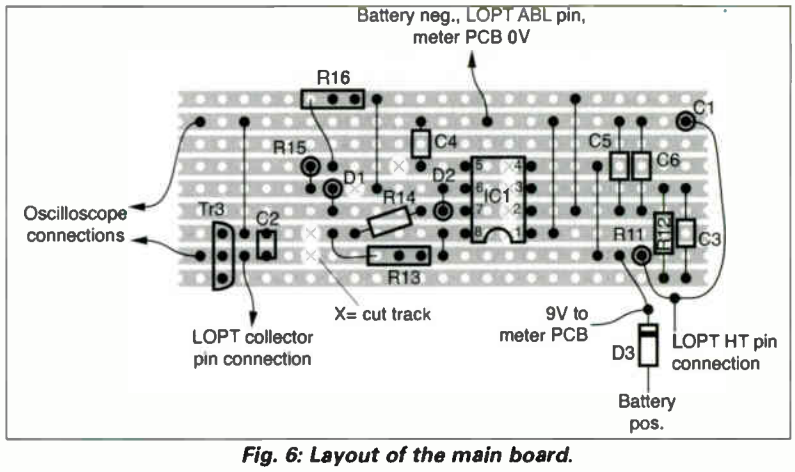


Fig. 6: Layout of the main board.

Connect the CRT anode test lead and battery. A25-30kV reading means that the LOPT is OK. A reading of three-quarter scale or less means a possible fault.

If the LOPT is suspect, disconnect the lead to the CRT's anode connector and use an oscilloscope to check the peak collector voltage. If this is 50V the LOPT is possibly OK, but there might be an incorrect earth connection or it may be a 32kHz, 100Hz type. A display of 30V or less with severe ringing means that the transformer is definitely useless.

As a last resort if you are in doubt, mark its connections and remove the LOPT. Connect the HT and collector clips only. If the connections are definitely correct and the display is less than about 50V peak, there is a 95 per cent probability that the transformer has shorted turns.

Usually a faulty transformer produces a peak collector voltage display of 25V or less with severe ringing at the bottom of the waveform, and the meter reading is approximately a quarter to three-quarters of full scale.

Components list

Fixed resistors are all 0·25W metal film

Meter circuit

R1	6·8kΩ	Tr1	BC546
R2	2·2kΩ miniature vertical preset	Tr2	BF245
R3	2·2kΩ	C3	2·2nF, 2kV disc
R4	10kΩ	D3	1N4007
R6	22kΩ (see text)	M1	300µA (see text)
R7/8/9/10	10MΩ		

Stripboard (22 x 22mm)

Main PCB

IC1	NE555, LM555 etc.	C1	47µF, 16V
R11	270Ω	C2	3·3nF, 200V ceramic disc
R12	220Ω	C3	22nF, 50V
R13	22kΩ miniature horizontal preset	C4	100nF, 50V ceramic disc
R14	1kΩ	C5/6	2·2nF, 50V
R15	1kΩ	D1/2	1N4148
R16	4·7kΩ sub-miniature horizontal preset	Tr3	2SC2482*

*300V, 0·1A, 0·9W video transistor

Stripboard (25 x 65mm)

Miscellaneous

Case for small version CPC order code ENT2B
Case for full-size workshop version CPC order code EN55028
9V battery
Four insulated crocodile clips
Rigid battery snap, CPC order code AR70314
Optional parts on/of switch SW1 CPC order code SW01613, flashing LED CPC order code SC00032

AUDIO FAULTS

Reports from
Geoff Darby
Chris Bowers
Andrew Benyon
Philip Rosbottom and
Martin McCluskey

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,
Nexus Media Communications,
Media House,
Azalea Drive, Swanley,
Kent BR8 8HU

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

Sony MZ-N710

The owner's complaint about this personal MiniDisc recorder was "not playing – keeps searching for disc". There were certainly sled search noises when I tried it but, other than this, not a lot happened. With the lid open I used a cotton bud for an experimental prod at the optical block. Instead of resisting, it moved freely from side to side. So there was clearly no connection between the laser and the worm drive.

I stripped the unit and removed the PCB. This sounds drastic, but it takes only a few minutes. It was then obvious what had gone wrong. The pawl that engages with the sled drive worm is made from a thin piece of shaped phosphor bronze and is secured to the optical block by a single, tiny screw. The screw had become loose, and as a result the pawl twisted off to one side and lost its engagement with the worm.

I repositioned the piece and tightened its screw, adding a tiny amount of locking compound. This restored the normal mechanical coupling – and correct operation once the unit had been reassembled. **G.D.**

Sony HST-D307

This hi-fi unit's FM radio operation was very intermittent. You couldn't force it to go off: it just did so whenever it felt inclined. It sounded as if it was muting. Checks along the IF strip revealed a good level of 10·7MHz signal at the output from CF301 and, after amplification by Q303 and Q304, the signal arrived at CF303. The output from this ceramic filter was very variable however and, when reception cut out, there was quite a violent 'bounce' in the IF waveform at this point.

This effect was not present at the input side of CF303, which suggested that the problem was either in the filter itself or in something nearby and downstream from it. I decided to replace the filter as a first move. When I rummaged through the contents of my component drawer marked 'filters and xtals asst' I found a suitable replacement and fitted it. This provided a complete cure.

I assume that the output from this filter periodically fell below the demodulation threshold of the IF subsystem and demodulator chip IC301, which then muted. **G.D.**

Sony HCD-RX70

When I connected speakers to this one and powered it up I was greeted with a rasping buzz from both channels. Suspecting power supply trouble I headed for the smoothing capacitors, scope probe in hand. This quickly showed that C954 had massive ripple, with bursts of oscillation, across it.

When this 2,200μF, 16V capacitor was removed a slight bulge in its top could be seen. Once a replacement, more conservatively rated at 25V, had been fitted there was normal operation. A nice easy one for a change. **G.D.**

LG FFH-5670AD

Long ago, when I was a fresh-faced and enthusiastic youth, my workshop mentor taught me that I carried my best diagnostic equipment, superior to a meter, scope or anything else, around with me all the time. He was referring to my nose, ears, eyes and fingers of course. You can tell a lot about what's going on in a piece of equipment by careful observation of sounds and smells, sometimes component temperature, and just as often by spending a few minutes carefully looking. Causes of faults can often be found without having to resort to the use of any equipment or diagnostic procedures. This was a good example.

When the unit was powered it would start to come on but, after an initial burst of display and CD motor activity, it would simply 'freeze', usually with just 'nonsense' segments alight in the display and all the controls inoperative. There was a smell of warm transistor plastic, and a good look over the main PCB revealed crystallised joints at Q202. In addition the board was discoloured around the transistor's legs. It was a fairly small transistor, type 2SA1273. The A in the type number normally indicates a pnp device with standard Japanese nomenclature, so I hunted through my component drawers and soon came up with a somewhat beefier alternative. Once it had been fitted the unit sprang to life and worked normally.

I had no circuit diagram for the unit, and have no idea what the function of the transistor is. I would guess that it's a regulator or DC switch of some kind. But, with a little observation, the unit was repaired with no need for documentation or test equipment. **G.D.**

Sony MDS-JB920

The complaint with this unit was digital noise during playback. The cause of the trouble was on board BD, where the ATRAC decoding chip was faulty. Its part no. is 8-752-389-44. A replacement restored normal playback. **C.B.**

Sony STR-DE595

When this FM/AM receiver's volume level was at 62 the right-channel output for the headphones wouldn't increase as the level was turned up. The cause of the trouble

was a misfunctioning chip, IC1601, on the digital board. A new type has to be fitted, part no. 6-803-245-01. There was normal operation once this had been done. **C.B.**

Sony HCD-ED1

This unit wouldn't play CDs. It would spin clockwise then anticlockwise, as if trying to read the disc. Inspection of the top of the spindle motor revealed that the three ball bearings which hold the disc and stabiliser in place had broken off. As a result the disc was slipping. A new spindle motor, reference no. M101, part no. X-491-752-34, restored normal CD playback operation. **C.B.**

Sony HCD-SA30

AM reception was excessively noisy with this unit. I was told by Sony technical that a new vibrator crystal, X450, on the amplifier board would be needed – but only if the problem occurs when the set is tuned to one of the following stations, 765/770/774/1,539/1,540kHz, or the noise is audible with strong signals. It was. A replacement, part no. 1-813-122-11, restored normal AM reception. **C.B.**

Sharp CD-C421H

When three discs were loaded into this CD player it wouldn't recognise their presence. Inspection inside revealed the cause of the trouble: the optical pickup lens was covered with dust. Once the lens had been cleaned, using a lens cleaner, there was normal operation. **C.B.**

Sony HCD-XB500

When this unit was switched on immediately after plugging the AC power cord in it displayed "protect" – the protect message didn't appear when power was switched off and back on. Multimeter checks inside revealed that the microcontroller chip IC501 on the main board was malfunctioning. A replacement, part no. 8-759-639-96, restored normal operation. **C.B.**

Linn Kairn preamplifier

The reported fault was that the display came on and went off almost immediately. I quickly found that the –24V supply was missing. The power supply in this preamplifier is a separate switch-mode unit in a can known as the "Brilliant". When I removed the unit from its can I found that a surface-mounted tantalum capacitor, C20, is connected across the –24V output. It was short-circuit.

When this was replaced the power supply still started up only intermittently. Further testing with an ESR meter revealed that C2, C3, C4 and C7 were all faulty – most of them measured open-circuit. Replacements finally cured the fault. **A.B.**

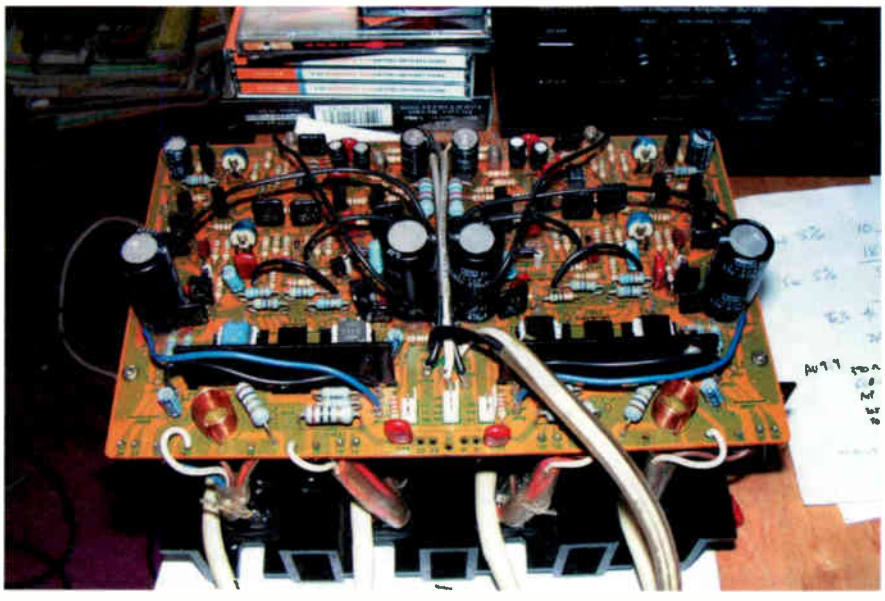


Photo 1: The Sansui AU919 power amplifier and heatsink removed from the case.

Kenwood A97 amplifier

A common fault with these amplifiers is no output because the speaker protection relay doesn't pull in. This is in turn because of a DC voltage at the output of one of the main front channels. The cause is not, as might be expected, faulty output transistors but the driver IC, type STK350-030. It's available from SEME. **A.B.**

Mission Cyrus One/Two amplifier

You sometimes find that one channel has a lower output than the other. The cause is usually one of the two non-polarised 470μF, 6·3V coupling capacitors beneath the ribbon cable that runs from the front to the back of the PCB. It's best to replace them both. Suitable capacitors are available from Farnell and RS Components. **A.B.**

Sansui AU919

This was Sansui's premier amplifier in 1978-9. It provides 100W output and weighs a ton. The problem was that the protection circuit was in operation all the time. I found a burnt-up 390Ω resistor on the power amplifier PCB: it feeds the Darlington-connected output transistors. There was also an open-circuit 560Ω resistor from a driver transistor's emitter to the output common rail. Further checks showed that one of the output transistors was short-circuit. These transistors have Sansui in-house numbers and direct equivalents are not obvious (MJ21193/4?). One of the TO126 transistors and a TO220 in the Darlington series were faulty, in the same channel.

I would not like to speculate on the cause of the failure. But the screws holding the TO220 transistors to the small heatsink were loose. They connect the collectors to the PCB. Or maybe the output transistor just gave up?

Photo 1 shows the amplifier board and heatsink removed from the case. **P.R.**

Ministry of Sound MOSMN008

This midi CD stereo system was dead with the 1·25A glass mains input fuse blown. The audio output circuitry uses a separate TDA7295S output IC for each channel, with +35V and –35V supply rails.

Both the output chips were short-circuit from the negative supply pin to chassis. So I fited a new pair of TDA7295S ICs and a new fuse, then switched on full of confidence. Three seconds later both new chips went up in a puff of smoke!

Thinking enviously of the repair-industry people who are near retirement age, I inspected the PCB a little more closely and found that the smoothing capacitors for the positive and negative rails, CE913 and CE914, had bulging tops. I fitted two 3,300μF, 50V replacements (the originals were rated at 35V), a pair of new TDA7295S output ICs and another fuse. This time when I switched on I was rewarded with the sound of sweet music. **M.McC.**

LETTERS

Send letters to "Television", Nexus Media Communications, Media House, Azalea Drive, Swanley, Kent, BR8 8HU or e-mail t.winford@nexusmedia.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.

Lead-free solder

I read with interest Geoff Darby's letter (August) on lead-free solder. In addition to doing repairs I spend one day a week working for a local coil-winding company. In this role I was asked to obtain information on the European directive that covers the use of lead in electronic equipment. Here are a few points that might be of interest.

"Article 2 Paragraph 3. This directive does not apply to spares for the repair, or to the reuse, of electrical and electronic equipment put on the market before 1 July 2006."

Under the list of exemptions, one of them states "lead in solders for networking infrastructure, equipment for switching, signalling, transmission, as well as network management for telecommunications."

The company I work for has also been told that components for military and medical equipment are exempt.

This seems to suggest that there is a known reliability problem with joints made using lead-free solder. It appears to be mainly the consumer market that is being forced to use lead-free solder.

To burn off the enamel, most of the coils made by the company I work for are dipped tinned in high-temperature solder pots. Surprisingly, these are also exempt from the directive as it states that any high melting-point solder containing over 85 per cent lead is exempt.

One of the reasons why lead is added is to reduce the tin content of solder, because whiskers start to grow from solder joints with a high percentage of tin. Some interesting photographs of this can be seen at the NASA website – go to http://www.nepp.nasa.gov/WHISKER/

Michael Bennett,
Romford, Essex.

Who invented the AVO?

It was interesting to read Conrad Edel's letter on Avometers in the July issue. He is incorrect however in suggesting that the first Avometer invented by Donald Macadie for the Post Office was an AC/DC instrument. I have a copy of an unpublished AVO document that shows the first Avometer made to "Macadie's patent". It looks at first like a cubic Model 7 prototype. The left-hand switch selects Amps, Volts or Ohms, but the instrument is strictly DC only. The right-hand "switch" controls a rheostat which is in series with the meter on the current ranges. I have yet to discover why the PO required this feature.

By chance, I have a "production" derivative of the 1923 original. It has a moulded front panel and a case with rounded corners – much like a Model 7. It has the odd 0-120 scaling of the original and retains the queer rheostat function with the right-hand knob. The voltage ranges are at 333Ω/V.

The 1923 instrument had three current ranges, three voltage ranges and two resistance ranges. Mine has four current ranges, five voltage ranges and two resistance ranges on the internal dry cell. It's still DC only.

I am trying to find an ancient telephone engineer who can remember why the instrument was produced with what appears to be a very odd specification.

Stan H. Falmouth,
Cornwall.

Same old stories

In the early 1980s I worked as a bench engineer at the local Comet service department. In those days people buying a new TV would take out an extra four-year warranty for £25. The majority of customers did this and in fact most of our repair work was covered by these extended warranties. Customers should have been happy, but they weren't – especially if a breakdown occurred just after the 'five-year guarantee' had expired. They would phone up, argue with the reception staff and think of all sorts of reasons why they should get a free repair. We would hear the same old stories over and over again. At the time I wrote down the best ones, assembled them as a 'Top 10' and pinned the list on the workshop notice board where it caused a lot of amusement. Twenty years on, I hope you find the list as entertaining as I do:

(1) It's the same fault as last time.
(2) We never called you out at all in five years and now it's gone wrong.
(3) It's never been right since the last engineer was here (three years ago).
(4) It shouldn't break down when it's only five years old.
(5) We've hardly ever used it.
(6) We had a black-and-white set for 20 years and it only ever needed one valve.
(7) My brother has exactly the same set and it's never gone wrong at all.
(8) I've just come out of hospital.
(9) We're pensioners.
(10) We were away on holiday when the guarantee ran out. My favourite!

Martin McCluskey,
Bishop Auckland, Durham.

Widescreen CRTs

The high failure rate of CRTs in widescreen sets has been a problem in recent times, leaving otherwise working sets beyond economic repair. Some suggestions on possible temporary or long-term cures have been made in these pages before, such as placing the set face down and tapping the neck of the CRT to clear debris from the gun assembly, or providing an isolated heater supply from a separate transformer or an experimental overwinding. These ideas are fine, and I've used them all. Recently however I've adopted another approach with two Philips chassis, the A8.0E and A10E, that were used in many models released over the last five or so years. The A10E is the one that has the now infamous 'painter' chip.

If you look at the circuit diagram for these chassis you will see that the heater winding on the line output transformer, between pins 11 and 12, is unusual in that ground pin 12 is not connected to any other winding internally. It's grounded externally however. The print layout from this pin goes two ways. One broad ground land is connected in a semicircle around the pin, while a finer print line goes off in parallel with the one from pin

11 – to the cable that's connected to the tube base PCB. In theory, if the print line between pin 12 and the ground land is cut the heater supply will be isolated.

I've done this on an experimental basis with three sets that had an intermittent heater-cathode short. It would possibly be wise to include some flashover protection – I have no way of knowing if other secondary windings are in close proximity to the heater winding and would suffer from a large DC presence close by. But I carried out the procedure over six months ago, and the three sets have all run faultlessly ever since – one in my own home, one at that of a colleague and the other in the workshop as a monitor.

I appreciate that heater-cathode leakage is only one form of tube failure, but in my experience it's the most common one. As with the other previously mentioned suggestions, this repair cannot be guaranteed. It's worth consideration however before condemning a set to the scrap heap.

Arthur Jackson,
Kilrea, Co. Derry.

Checking RC units

I see from various fault reports that repairers occasionally fail to detect problems with faulty remote-control units. There is an easy way to 'see' infra-red light: use the viewfinder of a camcorder. It works with my 1994 Samsung camera anyway.

Jon Talbot,
Tewkesbury, Glos.

Prospects

It is encouraging that Adrian Gardiner feels optimistic about the future of the electronics repair business (letters, September), but I feel that his is a minority view.

With most skilled trades – for example plumbing, joinery, decorating, bricklaying – the longer you have been doing the job the easier it becomes. The exact opposite applies with the electronics repair business. Many electronic products are now just too complicated for the ordinary engineer to repair. Who would be happy to try fault-finding to component level with LCD and plasma TV sets? As for panel-swapping etc., it would be sickening to pay £100 or more for a board then find that the cause of the fault lies elsewhere. If you were clever enough to be able to fix a DVD recorder, would Joe Public want to pay for the repair when supermarkets are selling these products for under £70?

Seventeen years ago I worked in the service department of a well-known electrical retailer. My annual salary at the time was £10,500. Some engineers I know who work in the repair trade are not earning much more than that in 2005.

Adrian derides the idea of getting a job stacking shelves in a supermarket. Right now, as I stand at the bench staring at the innards of a home-cinema system, this sounds like a nice, stress-free alternative.

Larry Brown,
Upminster, Essex.

A PlayStation repair

A Sony PlayStation 2 was recently brought to us for repair. The problem was no power because D003 (RM10A) was short-circuit, with the 2A fuse blown. I fitted an RM11C type, which proved to be a suitable replacement.

Bob Flynn,
Billericay, Essex.

J-Beam Aerials

In his DX and Satellite Reception column in the August issue Roger Bunney speculated on the origin of the name of J-Beam Aerials Ltd. As founder of the company and the writer of the booklet to which Roger refers, I can clarify the origin of the firm's name.

The first J-Beam aerial was a three-element, vertically-polarised beam with a J section for end-fed matching. When the company was formed, the question of its name arose. My wife suggested that as the aerial was a J-fed beam why not call the company J-Beam? As simple as that!

I have talked to R.V. Jones, of wartime fame, on the subject. Although I learnt my own aerial craft during the war, my work in radar had nothing to do with the German Knickebein system, which was unknown to me.

Bill Sykes,
Dorset.

Vintage matters

I enjoyed reading Chas Miller's comment (letters, June) on the value of the 1936 GEC radio/TV set I declined to accept some fifty years ago, because it was such a monster! I now think it had a 7in. rather than a 9in. CRT – 5in. tubes were more common in the Thirties. I agree that its value could now be high, but at the time I had a bedsit on the second floor of a house. Transport would have been very difficult, and where would I have put it? My wife was always critical of my activities, and this cupboard-sized TV would have strained our relationship to the limit!

The 1939 HMV Model 904 radio/TV

My son recently sent me a picture (see above) of a 1939 HMV Model 904 radio/TV set that had been restored to its original saleroom condition. This table model has 16 valves and was presumably just movable. The mains transformers used in those days were certainly heavy. I'm sure that many early TV sets were discarded because of lack of space and, of course, the carping of partners who usually lack our enthusiasms!

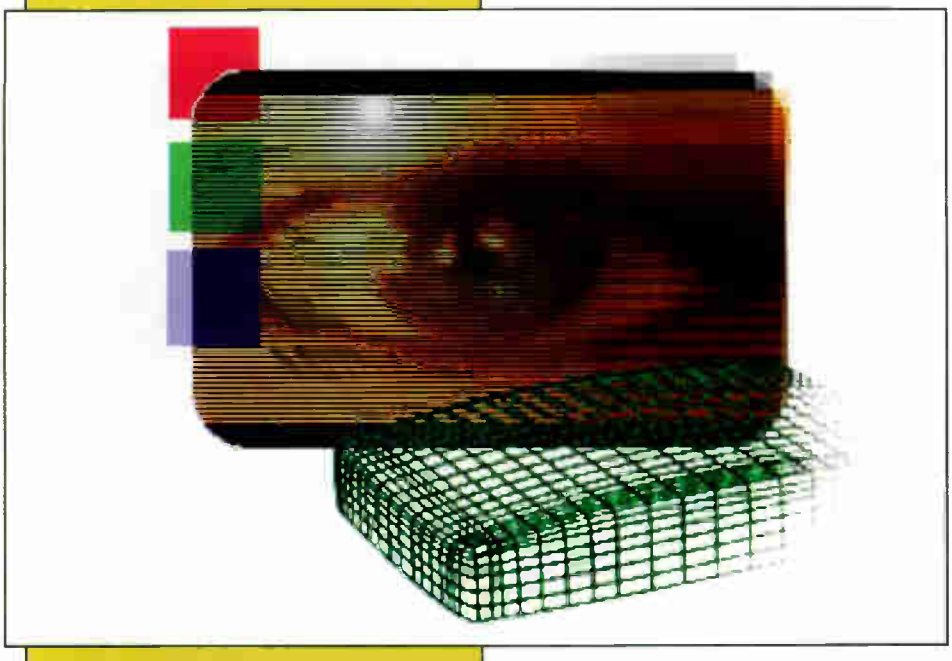
I have three interesting pieces of vintage equipment that reside in a cupboard: a 1944 home-made one-valve (1A7GT) headphone radio; a Labgear mains-operated UHF signal-strength meter (two valves); and a 1943 RAF 11V input, 230V AC output power supply – I've taken 300/400W from a car battery!

Digressing somewhat, post-war purchasers of brand-new cars discarded their old pre-war models for very little. Some of these fetch thousands of pounds today. I sadly recollect buying a second-hand 1921 Matchless motorcycle with sidecar (it originally sold for £256) and selling it for £20 because it was unreliable. It was a rare model as few were made. Estimates of its value now are around £20,000! No museum seems to have one, and possibly none of them exist any longer. If only I had it today!

Philip H. Bearman,
New Barnet, Herts.

Correction

A couple of editing errors occurred in Eugene Trundle's article on lead-free solder last month. See page 647. First, Sn96·5/Ag3//Cu0·5 solder is also known as SAC or TSC (not 7SC) alloy. Secondly the equipment shown in the bottom right-hand photograph is a solder-paste applicator, not a wave-soldering station. Our apologies for these mistakes.



TV FAULT FINDING

Reports from
Michael Dranfield
Philip Salkeld
Glyn Dickinson
Bob Flynn
Chris Bowers
Philip Laws and
Peter Graves

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,
Nexus Media Communications,
Media House,
Azalea Drive, Swanley,
Kent BR8 8HU

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

Bush 2877NTXSIL (11AK19 chassis)

The set was tripping, but this time the line output transistor was OK and there were no dry-joints in the EW modulator circuit, something from which nearly all these sets seem to suffer. The cause of the fault was found in the 15V LOPT-derived supply to the field output stage, where the BA159 rectifier diode D606 was short-circuit. **M.D.**

Amstrad CTV3021N

This set would go off when hot. I suspected dry-joints, but found none on this occasion. On test the set went off after about half an hour, and a scope check revealed that the line drive was missing. A common cause in this model is intermittent failure of the 2SC1573A line driver transistor, so I fitted a replacement. The fault remained however, and it transpired that the line driver transformer's primary winding was going open-circuit. The cause could have been at the leadouts, though they appeared to be well soldered. To be on the safe side I fitted a replacement from a scrap set. **M.D.**

Sharp 51GT25

This set was tripping. When I removed the back I saw that print in the area of the BU508DFI line output transistor was very discoloured. The transistor was short-circuit, and it looked as if it had been incorrectly driven for some time. The cause of the trouble was traced to capacitors C604 and C602 (both 220µF, 10V). They are connected in series and produce a negative supply to turn the line output transistor off quickly. One of them had fallen in value and the other was open-circuit. **M.D.**

Bush 2137TSIL (11AK30 chassis)

This set was dead with two of the mains bridge rectifier diodes short-circuit. In addition the 2·2Ω, 5W surge-limiter resistor R828 was open-circuit. The chopper FET was OK, so I assumed that the faulty diodes were the basic cause of the trouble. Not so. At switch on with replacements fitted C812 (470pF, 1kV), the blue capacitor in the snubber network, blew in half. The resistor and diodes also failed again. **M.D.**

Hitachi C2844S (11AK37 chassis)

A burst of EHT could be heard when this set was switched on. It would then trip and leave three coloured patches on the screen. The violent burst of EHT suggested a line flyback tuning problem or high HT. Further investigation revealed that R817 (100kΩ), which is in series with the earthy end of the set-HT control, had gone open-circuit. **M.D.**

Panasonic TH-42PE30B

This plasma set was dead with the LED flashing. There was also a burning smell. Although you could smell this burning, where it was coming from was a mystery. I decided to try to locate the source of the fault by unplugging panels. When I disconnected scan panel SD, which is on the left-hand side of the chassis, half a picture appeared. Inspection of the panel revealed that IC6408, one of four surface-mounted ICs, was badly burnt. A replacement panel, part no. TNPA2958AB, resulted in a full scan and a happy customer. It's not expensive. **P.S.**

Bush 2872NTX (11AK19B-1 chassis)

When these sets first started to come in for repair because of a dead power supply the cause was usually the BUZ91 chopper FET Q802 short-circuit because the MC44604 control/drive chip IC802 was faulty. Now when the sets come in with this symptom you are in for a rough ride. Two components that quite commonly fail are the 11V zener diode D819 which goes short-circuit, and the 22Ω, 0·5W resistor R835 which goes open-circuit.

When taking components from scrap boards, note that IC802 might be type TDA16846. It won't work in place of an

MC44604 – the result will be a completely dead set. **P.S.**

LG RZ-15LA32

There was a blanking fault with this small LCD set: the picture would appear momentarily then disappear. With little experience of this type of set, the best course seemed to be to phone LG technical. I was pleased to find that it's a known fault. The cure is to replace C51 and C55, which are both 220nF polyester capacitors, part no. OCF2241N5AA. When you take the back off you find a large screening can that has to be removed. You then remove the PCB to replace the capacitors. **P.S.**

JVC AV28GT1BJF (11AK45B5 chassis)

This set was dead with the 2·5A mains fuse blasted. The first thing to do was to check the chopper transistor Q102, where only two of the pins read short-circuit. Normally if the cause of the fault is Q102 the device is completely short-circuit. Further checks brought me to D111 (BY229) which was the short-circuit culprit. All that was necessary to get the set back working again was to replace D111 and fit a new anti-surge fuse. **P.S.**

Philips 32PW9544/05 (2.1E chassis)

This set was dead. When it was switched on the LED went red then changed to amber followed by green. The HT rose to 145V. The set would try to start up then closed down. A slight noise came from the line output transformer, and this was the clue. A replacement, part no. 4822 140 10559, brought this large set back to working order. I must say that the transformers from Philips are quite reasonably priced. **P.S.**

DeGraf 51KS

This old ex-rental Granada set came from a hotel. The instruction was to go ahead and repair it if this could be done cheaply. The fault with the set, which reminded me of some Sanyo models, was stuck in standby. I recalled disconnecting the field output chip IC431 to see if the set would then start up. My memory served me well. When I took this action the set came on with sound and field collapse. A new LA7832 field output IC restored normal operation. **P.S.**

SEG CT2802-S (11AK37 chassis)

The fault with this set was tripping. In this situation I normally start by measuring the resistance across the line output transistor, where I fully expect a short-circuit reading. I was not disappointed. Next I check the UF5407 HT rectifier diode D808, which I have found to be short-circuit on many occasions. But not this time. The short-circuit was still present when the diode was removed. A check from the collector of the line output transistor to chassis produced the fault reading, which cleared when the line output transformer was disconnected. A new transformer restored normal operation. **P.S.**

Toshiba 21T01B

This set was tripping because the line output transformer had failed. As it was just out of guarantee I decided to order the OEM part from Toshiba. Big mistake! The set is made by Samsung, and the transformer supplied by Toshiba produced a picture with top foldover because the –10V supply was low. The replacement transformer was the wrong type. I eventually obtained one from CHS, using the part number on the transformer itself, FSV14A004H – it's equivalent to the HR8628. **G.D.**

Matsui 20T10B

There was an odd fault with this Beko made set, several black dotted lines a few inches apart across the picture. When I eased the chassis out the fault cleared, but no dry-joints were obvious. I then found that the on-screen display was missing when the lines were present – in fact they consisted of the OSD without sync. This gave me something to go on, despite not having a service manual.

I found a sync pulse in the OSD circuit and traced it back to a transistor and integrator circuit. Touching the surface-mounted capacitor here, C410 (1nF), made the fault come and go. Resoldering it made the fault permanent! Once a new capacitor had been fitted the lines stayed away. **G.D.**

Philips 25PT632A (GR2.4 chassis)

There was a white raster with just a hint of a picture in the background and flyback lines. The sound was OK. The basic supplies to the tube's base panel were correct and, after running out of other ideas, I decided to try replacement of the tube's base socket. Bingo! **B.F.**

Toshiba 28N23B (11AK37 chassis)

"Went bang then dead" with these sets usually means a power supply rebuild. SEME can supply a kit, part no. RK351. In this case however C860 (1nF, 1kV) had split apart, blowing fuse F801. C860 and the other two capacitors, C803 and C804, associated with the bridge rectifier were all of the beige-coloured type that often causes problems. So I replaced all three with a better type – the ones in a nice blue colour. **B.F.**

Mitsubishi CT21A5STX (E14SF chassis)

With both the picture and teletext the contrast was very low. Adjustment from one end of the scale to the other had no effect, nor did the sub-contrast potentiometer. All other adjustments were OK. The cause of the fault was traced to R563 (150kΩ) in the beam-limiter circuit. **B.F.**

Toshiba 21N21B2

The 2SD2499 line output transistor Q401 was short-circuit because of a poor connection at the line driver transformer T401. In turn, the 2SK2651 chopper FET Q501 had gone short-circuit with D528 (18V zener diode) and R509 (0·22Ω, 1W) both open-circuit. Power was restored once these items had been replaced, but when selecting an untuned channel the power would try to collapse. The cause of this was R516 (1·2Ω), which had risen in value to 4·5Ω.

When talking to Techline about this fault it became apparent that there is another version of this set, using the same model number but different parts. **B.F.**

Hitachi C2886TN (A7 chassis)

Intermittently this set would start to change channels continuously or the menu would appear and the set would scroll down this continuously. The cause was eventually traced to a modification that had been added during manufacture. It consists of some diodes and a wire between IC953 and Q4000. The bare end of the wire soldered to Q4000 was shorting to some adjacent components. **B.F.**

Fidelity CTV3221 (PT11 chassis)

There was no sound apart from a rare brief reappearance. The cause was traced to a tiny break in the print to pin 1 of connector S901 on the sound module. **B.F.**

Grundig CUC2059 chassis

At switch on the power LED would go green then the set would make a grunting noise and revert to standby. There are always dry-joints in this chassis, but resoldering them made no difference. I then noticed that the set uses an EHT tripler – it was even green in colour, just like the older models. Once it had been disconnected from the line output transformer the set remained on. A replacement tripler from CPC restored normal

operation. The part no. is 29201-474-0101. **B.F.**

Sony KV-32FQ75U (AE5 chassis)

This set was dead. Checks on board D revealed that IC6604 and transistor Q6806 had failed, with the result that R6666 (0·1Ω, 0·5W) was open-circuit. Replacement of these items cured the power-up problem. The part numbers are R6666 1-202-933-61, IC6604 8-729-045-40 and Q6806 8-729-047-59. **C.B.**

Philips 32PW9586/05

There was no sound from this set's right-hand speaker. Checks in the audio output section revealed that IC7700 was short-circuit. Further checks showed that the right-hand speaker (2H52R) was open-circuit. Replacements restored normal operation. **C.B.**

Sony KV-28LS60U (AE6B chassis)

This set reverted to standby after powering on. A visual inspection of the power supply revealed poor wire crimping that connects to CN6004 on board G. A call to Sony Technical produced the recommendation to replace the "coil/choke" with the original type, part no. 1-424-855-11. This cured the problem. **C.B.**

Sony KD-28CL10B

There was a power supply problem with this set. When it was put into standby the 135V line remained high though the other voltages were switched off. As a result there was increased current via R5056, R5048 and R5068 and the reliability of the connections to these resistors was affected. If you come across this problem check the value of R6019 on board A. If it's 4·7kΩ, replacing it with a 1kΩ, 1/10W chip resistor, part no. 1-216-049-11, will help resolve the problem. **C.B.**

Toshiba 32ZP18Q

There was no sound or picture. Meter checks revealed that the 8V supply was low. The cause was the 2A fusible link Z890, which had gone high-resistance. A replacement restored the sound and picture. **C.B.**

Technosonic WCT2816T

The report with this set said that it flashed and went off. There was no sound or picture. When I advanced the setting of the A1 control on the line output transformer a picture appeared, but it was streaky with green bands and a ticking noise came from the CRT's base panel. Close inspection of the panel revealed that one leg of the A1 supply's decoupling capacitor was bent and arcing to an adjacent track. Cutting the leg and cleaning the print stopped the arcing but left a blank raster. A new STV5112 RGB output IC completed the repair. **P.L.**

Naiko N1003

This 15in. LCD/DVD combi set appeared to be dead apart from a blue light around the power button. When this was pressed you could toggle the blue light on and off. With the blue light on the DVD couldn't be ejected, but it could with the light off. This was in fact normal, as the blue light indicates the standby mode.

When switching between modes – DVD/AUX/PC/TV – a brief oscillation could be heard, and during this oscillation there was a glimmer of display. This led me to the converter PCB, which drives the fluorescent backlight. Close inspection revealed that there had been a lot of heat around the driver ICs. Reflowing the solder at the pins of these ICs and replacing the two 150μF, 30V electrolytic capacitors provided a lasting cure. **P.L.**

Samsung CI5070AN

There was no sound or picture when this set was brought out of standby and the power supply was buzzing. I didn't have a circuit diagram, but simple fault-finding was sufficient. There was 123V at the collector of the line output transistor. This fell to 40V when a dummy load was connected. A quick check at the primary side of the power supply produced a reading of only 260V across the mains bridge rectifier's reservoir capacitor C808, which was open-circuit. A new 150μF, 400V capacitor restored normal operation. **P.L.**

Bush 2874NTX (11AK19E3 chassis)

This set came in with the usual chirping power supply because of a short-circuit line output transistor (Q605). The usual dry-joints were dealt with – in this case the link that earths the emitter of Q605 was the cause of its failure. Then, after fitting a replacement, the set was stuck in standby.

A check at pin 41 (standby) of the microcontroller IC used in this version of the chassis revealed that it was trying to switch on. The voltage here rose from 0V to 2·5V, which seemed low. Checks were then carried out around Q805 and Q806 in the power supply standby-switching circuit where I discovered two extra transistors, Q833 and Q834, that are not shown in my circuit diagram.

The loading on the standby-switching line seemed to be related to Q833. A long time was spent drawing out the circuitry associated with these two transistors. I discovered that Q833 monitors the output from the 8V regulator. A check from its output to chassis produced a reading of 52Ω. The cause of the trouble was IC401 (TDA8843). A replacement completed this lengthy repair. **P.L.**

Hitachi C28WD2TN (A7 chassis)

This set would trip intermittently, sometimes at switch on sometimes not. To cut a nightmare story short, R950 (68kΩ) in the power supply was going high in value intermittently. It's in series with the HT preset VR950. Note that ZD950 (BZV10) in this circuit is a 6·2V voltage-reference diode, which measures high-resistance naturally. Make sure you use the correct type. I replaced it as well, to great acclaim.

Two weeks later the tube shorted! **P.G.**

Alba CTV3409

The owner of this set reported that it went dead at the same time that the fish-tank pump blew up! There appeared to be a short-circuit chopper transistor, but the short remained when it had been removed. The short was actually in the small chopper transformer, part no. PTX6074. A replacement plus a new fuse got things going again.

This was not quite the end of the story however, as some channels had 'locked up' and some had changed their programme numbers. About half of all programmes, about forty of them as I recall, had to be unlocked manually via the menu before retuning the main five. I was then allowed home!

No fish were harmed in the process. **P.G.**

Beko 14272TD8 (12.7 chassis)

About fifteen black horizontal lines approximately 3mm thick were superimposed on this portable's otherwise normal picture. The lines were quite solid, and had steps in them. Where to start? Phone someone who knows! I was told to check C410, a 1nF capacitor that's almost exactly in the centre of the PCB. Spot on. A replacement cured the fault.

Incidentally like most of us I always resolder the line output and power stages regardless of the reported fault. Note in this respect that with partial field collapse you will find a short reading across R508, which is a surface-mounted resistor in the line output stage area. The cure is to remove the solder blob across R508! **P.G.**

DVD

Fault reports from Geoff Darby and Andrew Benyon

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, Nexus Media Communications, Media House, Azalea Drive, Swanley, Kent BR8 8HU

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

Panasonic DVD-LS50

When a disc was inserted in this personal DVD player it displayed 'H03' and refused to play. The error code indicates a traverse servo error. When I opened the unit up I saw that the laser wasn't fully home, which backed up the faulty traverse message. I next tried to rotate the drive worm by rolling a finger across it, but it wouldn't move. In fact the whole assembly was quite tight. So I stripped, cleaned and relubricated it, then repeated the finger-roll test. This time the worm rotated freely and smoothly with only very slight pressure applied.

Once the unit had been reassembled the laser homed and the disc was spun up and played correctly. **G.D.**

Yamaha DVD-S830

This job was interesting not so much because of what was wrong with the unit but for why it didn't work at first when I had fixed it. The reported fault was 'H02 error being displayed'. As we all know, when you see this with a Panasonic machine you go straight to the spindle motor. This was a Yamaha model however, but perhaps it meant the same thing. When I opened the unit it was obviously a badged Panasonic, and in fact it didn't spin the disc until 'helped'. So, with more than a little confidence, I ordered a replacement deck assembly from Yamaha. When you get the deck from Panasonic it comes with both motors fitted but without the laser and a couple of gears in the sled/tray drive train. These have to be transferred from the previous deck. It seemed that this was the action required when the replacement from Yamaha turned up.

There was one very slight difference. The original deck had an extra little PCB mounted on a pillar, just under the edge of the turntable. It had a reflective opto on it, just like you find under many VCR reel tables. I'd never seen this on the Panasonic version. I swapped it over, along with the laser and gears, then fitted the deck back in the machine and loaded a disc. Although these decks have to be aligned for tilt when fitted, they are always near enough at least to play. So I was surprised when the disc span up to a very high speed, then came to a stop with H02 showing again. This was puzzling, as the original deck had played discs all right once its spindle motor had been helped to start up. Why was the motor spinning up apparently out of control? The extra little board with the opto on it was probably involved. It presumably has something to do with sensing the speed of the turntable.

When I checked under the turntable in the original deck I saw that it had the standard ring of silver and black tape, again like you would find under a VCR reel table. So I removed the new deck again and checked under its turntable. Nothing! I measured the turntable height carefully, then fitted the old one in its place. The turntable was then under control again, with normal play.

What I can't understand is why, when the deck was supplied as a genuine Yamaha part and was obtained direct from Yamaha, it appeared to be an unmodified Panasonic part. Turntable height is a critical factor for correct operation of a DVD player, which is why replacement motors normally come as part of a pre-aligned skeleton deck and why you would not normally have to swap turntables between motors.

That said, when I invoked the built-in jitter meter, using the front-panel pause plus open plus remote 5 as with many Panasonic models, I was able to achieve a very respectable figure of 7·8 per cent (display J 078 xxxxx) by adjusting the three tilt-set Allen screws. **G.D.**

JVC DRM1SLB

This DVD recorder powered up for a second or so and displayed the word 'loading'. It then shut down and showed no further signs of life. When the unit was unplugged from the mains supply and reconnected the sequence was repeated.

At first I thought that there might be an overload on one of the supply lines, but no shorts were readily measurable. I then discovered that the reservoir capacitor remained fully charged several minutes after disconnection from the mains supply. This suggested a start-up problem, but the unit did start up. I decided that a replacement chopper chip (STR-G6653-F9) would be a good move. This turned out to be the case, all being well once it has been fitted.

No heatsink compound had been used during manufacture, so I applied some when fitting the replacement. The IC runs very hot despite a fan being fitted just behind the heatsink. **A.B.**

TELEVISION BOOKS
AND HOME ELECTRONICS REPAIR

The Television Book Service offers access to our team of specialist publishing experts. We can order any book or CD-ROM currently in print from *War And Peace* to the *Newnes Guide to Television and Video Technology*. All books are delivered free of charge within the UK unless otherwise stated. Contact us at the numbers below:

Telephone: **01737 812727** or **01737 812676**
Fax: 01737 813526
Email: salesteam@boffinbooks.demon.co.uk

CLOSED CIRCUIT TELEVISION: CCTV INSTALLATION, MAINTENANCE AND OPERATION

Joe Cieszynski

CCTV surveillance is one of the fastest growing areas in the security industry, and this is a thorough guide to the technical side of CCTV – including installation, maintenance, video recording, cameras and monitors. The second edition is fully dual-standard for PAL and NTSC systems.

2nd edition ▲ Sept 2003 ▲ 256 pages
Glossary ▲ Index ▲ PB ▲ Published in UK
Code 0-7506-5728-6 **£24.99**

DICTIONARY OF VIDEO AND TELEVISION TECHNOLOGY

Jack Tsatsoulin

This work provides comprehensive and contemporary information on the essential concepts and terms in video and television, including coverage of test and measurement procedures. The CD accompanying the text includes an electronic version of the book.

Sept 2002 ▲ 365 pages & CD-Rom
Published in UK
Code 1-878707-99-X **£29.99**

DVD PLAYERS AND DRIVES

K F Ibrahim (College of North West London)

This text is based on hands-on experience and acts as a guide to DVD technology and its application, with a special focus on design issues. The principles of the subject are introduced from the basics, and DVD applications are illustrated by genuine technical information.

Aug 2003 ▲ 256 pages ▲ Glossary ▲ Index
PB ▲ Published in UK
Code 0-7506-5736-7 **£24.99**

ELECTRONIC CLASSICS: COLLECTING, RESTORATION AND REPAIR

Andrew Emmerson

This text encompasses all aspects of buying, collecting, restoring, repairing, sourcing parts, professional services, clubs and societies. The first part covers technical aspects of restoration and details where components can be found; the second presents useful information for collectors.

Aug 1998 ▲ 256 pages ▲ Index
10 halftones ▲ 50 line illustrations ▲ PB
Published in UK
Code 0-7506-3788-9 **£21.99**

INTRODUCTION TO DIGITAL SYSTEMS

John Crisp

This self-study text introduces digital electronics from first principles, before going on to cover all the main areas of knowledge and expertise. It covers the practicalities of designing and building circuits, including fault-finding and the use of test equipment.

Feb 2000 ▲ 302 pages ▲ Glossary ▲ Index
PB ▲ Published in UK
Code 0-7506-4583-0 **£18.99**

NEWNES DICTIONARY OF ELECTRONICS

S W Amos; R S Amos

Aimed at engineers, technicians and students working in the field of electronics, this dictionary provides clear and concise definitions, including TV, radio and computing terms, with illustrations and circuit diagrams.

4th edition ▲ Mar 2002 ▲ 394 pages
100 illustrations ▲ PB ▲ Published in UK
Code 0-7506-5642-5 **£12.99**

NEWNES GUIDE TO TELEVISION & VIDEO TECHNOLOGY

Eugene Trundle

An exploration of television and video technology. It covers the fundamentals of digital television (satellite, cable and terrestrial) and digital video, as well as providing a grounding in analogue systems.

3rd edition ▲ Feb 2001 ▲ 432 pages ▲ Index
PB ▲ Published in UK
Code 0-7506-4810-4 **£17.99**

NEWNES GUIDE TO DIGITAL TV

Richard Brice

Covering all aspects of digital television, this text encompasses the electronics of the equipment, data compression, television production, servicing and the different transition methods - terrestrial, satellite and cable. The text has been updated with developments since the 2000 edition.

2nd edition ▲ Oct 2002 ▲ 304 pages ▲ Index
45 illustrations ▲ 15 photographs ▲ HB
Published in UK
Code 0-7506-5721-9 **£24.99**

PRACTICAL ELECTRONIC FAULT FINDING AND TROUBLESHOOTING

Robin Pain (Design Engineer, Cotag International Ltd)

A text using simple circuit examples to illustrate principles and concepts fundamental to the process of analog and digital fault finding. It aims to help the reader tackle any job, from fixing a TV to improving the sound of a hi-fi. A digital multimeter and oscilloscope are needed for these jobs.

Apr 1996 ▲ 284 pages ▲ Index
50 line illustrations ▲ PB ▲ Published in UK
Code 0-7506-2461-2 **£21.99**

PRACTICAL ELECTRONICS HANDBOOK

Ian Sinclair

A collection of all the key data, facts, practical guidance and circuit design basics needed by a spectrum of students, electronics enthusiasts, technicians and circuit designers. It provides explanations and practical guidance, and includes new sections on SHF techniques and intruder alarms.

5th edition ▲ Feb 2000 ▲ 571 pages
Illustrations ▲ PB ▲ Published in UK
Code 0-7506-4585-7 **£16.99**

RSGB RADIO & ELECTRONICS COOKBOOK

Radio Society of Great Britain

Only a basic knowledge of electronics is assumed for this collection of electronics projects, and it is ideal for all electronics and DIY enthusiasts and experimenters. Designed by the RSGB, the UK radio amateurs federation, the projects are clearly explained step by step.

Nov 2000 ▲ 336 pages ▲ PB ▲ Illustrations
Published in UK
Code 0-7506-5214-4 **£17.99**

REFERENCE DATA FOR ENGINEERS: RADIO, ELECTRONICS, COMPUTERS AND COMMUNICATIONS

Mac E Van Valkenburg; Edited by Wendy Middleton

Written by professionals for professionals, this is a complete reference for engineers. As well as addressing radio technology data, it covers digital electronics, computers and communications.

9th edition ▲ Aug 2001
1568 pages & CD-Rom ▲ 1385 line illustrations
HB ▲ Published in UK
Code 0-7506-7291-9 **£90.00**

SERVICE ENGINEER'S POCKET BOOK

Lewis & Sinclair

This title aims to provide the service engineer with all the necessary information to carry out work on domestic electronics equipment. The coverage ranges from satellite reception to NICAM. Both analogue and digital equipment are covered, and there are chapters on common problems.

Jan 1998 ▲ 238 pages ▲ HB
Code BUTO-7506-3448-0 **£14.99**

SERVICING TV, SATELLITE & VIDEO EQUIPMENT

Eugene Trundle

A practical hands-on guide for service engineers, installation technicians and servicing students, this text emphasises the practical business of fault diagnosis and repair of TV, satellite and video equipment.

Revised 2nd edition ▲ Nov 2001 ▲ 336 pages
Symptom index ▲ PB ▲ Published in UK
Code 0-7506-5507-0 **£21.99**

TELEVISION MICROPROCESSOR IC DATA FILES

J Edwards

Microprocessor ICs are the most complicated port of TV equipment and present special problems to the engineer. This text covers the most popular microprocessor ICs. Each device is presented graphically with the relevant data information given against each pin.

Mar 1997 ▲ 240 pages ▲ 200 line drawings
PB ▲ Published in UK
Code 0-7506-3335-7 **£19.99**

TELEVISION IC DATA FILES

J Edwards

A compendium of data on all the most common integrated circuits used in televisions. Each device is illustrated with a pin-out diagram, and all the measurements and signal data in the book were taken under actual working conditions. This second edition contains over 70 new ICs.

2nd edition ▲ Jan 2000 ▲ 245 pages
PB ▲ Published in UK
Code 0-7506-4381-4 **£18.99**

TV FAULT-FINDING GUIDE

Edited by Peter Marlow

A distillation of the most-used fault reports from 11 years of *Television* magazine. Arranged by make and model, it features over 200 reports on over 300 models of television, including diagnosis and repair advice.

Mar 2000 ▲ 387 pages ▲ Illustrations
PB ▲ Published in UK
Code 0-7506-4623-0 **£20.99**

VALVE AMPLIFIERS

Morgan Jones

The author's straightforward approach, using as little maths as possible, should be of use to those with only a limited knowledge of the field as well as being the standard reference for experts in valve audio. Design principles and construction techniques are also provided.

3rd edition ▲ Aug 2003 ▲ 624 pages ▲ Index
PB ▲ Published in UK
Code 0-7506-5099-8 **£29.99**

VCR FAULT-FINDING GUIDE

Edited by Peter Marlow

A distillation of the most-used fault reports from 11 years of *Television* magazine. Arranged by make and model, it features over 2000 reports on over 200 models of VCR, including diagnosis and repair advice.

Mar 2000 ▲ 447 pages ▲ Illustrations ▲ PB
Published in UK
Code 0-7506-4634-9 **£20.99**

VCR IC DATA FILES

J Edwards

This text aims to provide the workshop technician and the field engineer with a convenient method of fault-finding without the need to consult workshop manuals. The most popular ICs used in video recorders are covered. Each device is presented graphically with data given against each pin.

Jul 1998 ▲ 448 pages ▲ 200 line illustrations
PB ▲ Published in UK
Code 0-7506-3993-8 **£20.99**

VIDEO AND CAMCORDER SERVICING AND TECHNOLOGY

Steve Beeching

A comprehensive guide to domestic VCR technology and repair techniques. This edition brings the information fully-up-to-date, with expanded coverage of camcorders, sections on DVD equipment and the latest VCR technology.

5th edition ▲ Apr 2001 ▲ 323 pages
Illustrations ▲ PB ▲ Published in UK
Code 0-7506-5039-7 **£20.99**

VIDEO DEMYSTIFIED

Keith Jack

This edition has been updated to include information on digital television, datacasting, interactive video, digital camcorders and VCRs, and video interfacing. Coverage is international, including European, Asian and North/South American video standards, methods and techniques.

3rd edition ▲ Jul 2001 ▲ 784 pages & CD-Rom
References ▲ Glossary ▲ Index ▲ PB
Published in UK
Code 1-878707-56-6 **£50.00**

THE DIGITAL SATELLITE TV HANDBOOK

Mark E Long

A handbook and CD-ROM pack an digital satellite television. It provides an overview of all the digital TV platforms in use world-wide. It includes satellite coverage maps and transmission parameters that readers will need to receive digital TV services from any location in the world.

Sept 1999 ▲ 207 pages & CD-Rom ▲ PB
Code BUTT 0-7506-7171-8 **£41.99**

NEWNES GUIDE TO RADIO AND COMMUNICATIONS TECHNOLOGY

Ian Poole

This is a guide to the technology and applications of modern radio and communications equipment. The author's approach provides a useful foundation for college students and technicians seeking an update on the latest technology.

Jul 2003 ▲ 352 pages ▲ Index ▲ PB
Published in UK
Code 0-7506-5612-3 **£16.99**

VALVE RADIO & AUDIO REPAIR HANDBOOK

Charles Miller

A practical manual for collectors, dealers and service engineers of valve audio and radio equipment. This edition includes new material on restoration and valve amplifiers.

2nd edition ▲ Apr 2000 ▲ 280 pages
▲ 10 halftones ▲ 50 line illustrations ▲ PB
Published in UK
Code 0-7506-3995-4 **£20.99**

NEWNES TV & VIDEO ENGINEER'S POCKET BOOK

Eugene Trundle

This updated text provides a pocket tool for service engineers. It presents a range of essential information in a compact form, covering television reception, satellite and cable television, video recorders, colour camera technology, teletext and fault-finding.

3rd edition ▲ Oct 1999 ▲ 512 pages ▲ HB
Code BUTT 0-7506-4194-0 **£17.99**

TELEVISION ORDER FORM

Please order or search the following:

Code	Description	Qty	Price

POSTAGE & PACKING **FREE** IN THE UK* TOTAL

Name ..... Daytime Tel .....

Address .....

Postcode .....

I enclose a cheque/postal order value £ ..... payable to 'Boffin Books Ltd'

Please debit my Access/Visa/Switch/Delta card (delete as applicable) Issue number (Switch only) .....

Card Number ..... Expiry Date .....

Signed .....

*Postage charges outside the UK available upon request or email: salesteam@boffinbooks.demon.co.uk

Post to: **Boffin Books Ltd, 24 Walton Street, Walton-on-the-Hill, Tadworth, Surrey KT20 7RT, UK**

If you are ordering by credit card, need further information, or would like to use our search facilities, call

01737 812727 Fax 01737 813526

The order/helpline is open from 9am to 5pm, or leave your order on our out-of-hours answerline or email us at salesteam@boffinbooks.dv.mon.co.uk

When placing orders please quote ● Name ● Address (home & delivery) ● Daytime telephone number ● Debit/Credit card number ● Expiry date ● Details of order. Please note that prices may change, but are correct at time of going to press.

Extended Fault Reports

Reports on complex or tricky TV fault conditions are sometimes too long for inclusion in our basic fault-finding section. We've put a few of them together in this extended fault report feature

Reports from
Michael Dranfield
Bob Longhurst
Arthur Jackson
Bob Flynn and
John Tennant

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,
Nexus Media Communications,
Media House,
Azalea Drive, Swanley,
Kent BR8 8HU

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

Naiko N1003

This 15in. LCD set incorporates a DVD player. At switch on the screen would light up momentarily, with the word 'AUX' visible for a split second in the corner. The set would then trip out. I couldn't get hold of a service manual and, as a result, had to play it by ear, wasting much time chasing a red herring. At the outset I assumed that the inverter was OK, as the screen lit momentarily. This was my first mistake.

With so little time to look for the cause of the fault, as the set powered up for only a split second, this was going to be a challenge. I eventually discovered a 27MHz crystal that wasn't oscillating. It was connected to a logic chip, forming an oscillator that didn't work because its supply voltage was missing. I traced the source back to a switched 5V regulator, 1Q7. Its input was OK, but there was no output. The chip wasn't faulty however: pin 5 must be held high for there to be an output. I traced back from pin 5 to a little switching transistor that had 0·7V at its base and was thus turning the regulator off. I decided to earth its base and see what happened. The 5V supply then appeared and the 27MHz clock oscillator ran, but the fault was still present.

While scoping around, I discovered a very large switching pulse on the 12V supply from the mains adapter. It occurred only as the screen lit up, just before the set tripped out. But it didn't come from the mains adapter. More careful scope checks revealed that it came from the inverter panel. I then found that the two supply decoupling capacitors on the panel, C1 and C2 (both 150μF, 30V), were very low in value. The fault was cured by replacing these capacitors. I used very high-quality, low-ESR Panasonic capacitors.

As for the 27MHz clock oscillator that didn't run, it turned out that this is used for the DVD player and is active only during DVD operation. **M.D.**

Bush WS7673SIL (11AK19 chassis)

I had repaired this set a few weeks previously, when the fault had been loss of all video with just a blank raster when the first anode voltage was increased. Replacement of the TDA6108JF RGB output IC on the CRT PCB/socket assembly had restored normal pictures. It was now back with the same fault.

I decided to contact Bush technical, where the ever-helpful Victor is always ready to solve fault problems. He said that the PCB itself is the cause of the problem – it's a very small rectangular board with one corner cut off diagonally. Because the spacing between the base socket pins is very close, inter-pin capacitance can cause a discharge effect, damaging the IC. An improved PCB/socket assembly is available.

I was able to obtain this very cheaply from Charles Hyde, the order code being ALB1614. In addition to being larger, the new PCB has slots drilled between all the CRT socket's pins to prevent flashovers etc. There are sockets that have to be removed to accommodate the hard-wiring to the main PCB. The only wires that have to be swapped over are those in the four-wire ribbon cable – these carry the 200V, heater etc. supplies. The six-way ribbon cable can be soldered in place of the removed socket, with the wires in the same order.

This modification is well worth carrying out if the TDA6108JF IC has failed. **B.L.**

Philips 32PW9534/05 (MD2.25 chassis)

The initial fault with this set was that it would revert to standby after about two hours' use. If it was left to cool down it would work again. I was called in when, one day, it went off and stayed off! The line output transistor had been destroyed because of dry-joints at the pins of the driver transformer. Fairly straightforward I thought.

At switch on however all that happened was that the red LED flashed – the set refused to come out of standby. To deal with this second fault I had to locate the 'service socket' S89, which is near the microcontroller chip. You short across pins 1 and 2 of this socket to enter the service mode – an explanatory diagram is printed on the PCB itself. Once this had been done the set switched on normally and worked perfectly! At this point, while the set is working, change the short so that it's across pins 2 and 3. In this mode error codes are displayed.

In my case error codes 44 and 47 were

shown, among other numbers. This indicates that the FET, circuit reference 7470, has expired. It's type IRF620F1. Fortunately a replacement FET cured this little problem. Phew! You have to empty the current fault codes from the 'error buffer' once the repair has been completed. **B.L.**

Philips 36PW9525 (MG3.1 chassis)

This 36in. model is heavy and access for servicing is difficult. Fortunately it has proved to be very reliable. This one had a problem with starting up however. Sometimes it would refuse to start up fully. It would attempt to come out of standby, then make a screeching sound and click off again. This would be repeated several times. If it did come on fully a normal picture would appear and the set would run for a short time. Then an unusual screeching sound would occur and the set would cycle on/off to and from standby. I think the symptom got worse with picture content that produced a high beam current.

I wanted to enter the service mode to read any recorded errors, but couldn't get the set to run long enough for this to be done. Eventually I discovered that if the tube's heaters were disconnected the set would continue to run, giving me enough time to enter the service mode via the remote-control procedure (0 6 2 5 9 6 – OSD). I then reconnected the heaters while the set was running and was able to read out errors 067 and 068 before the set tripped out again.

These errors suggest a power supply fault. As I now had something to go on, I decided to check the Philips on-line symptom/cure service and was delighted to find that the problem is a known one and is detailed there. The faulty component is C2204 (680pF, part no. 5322 121 51214), which is connected to pins 1 and 2 of the power control chip IC7205. These pins are connected to an internal oscillator, which explained the unusual screeching sound when the set shut down. A genuine replacement was obtained from Philips and, when fitted, the fault symptoms had gone. **A.J.**

Thomson TEKNO2 (Eurocombo 2 chassis)

The fault with this modern TV/VCR combi unit was no teletext or on-screen display for menus etc. It had apparently been this way for some months and became a problem only when the customer wanted to tune in an extra channel but couldn't because no menu could be displayed. Our general service manual for the chassis doesn't provide any information on the type of text or microcontroller chip in the set – they are on a separate PCB that's mounted on plastic supports on top of the VCR screening can.

When I contacted Thomson I found that a supplement sheet is available (part no. 351-313-10) and was advised to replace the microcontroller chip IR001 (part no. 10663550) and the EEPROM IR003 (part no. 20977300). These items were obtained and the ICs were fitted – but the fault remained!

At least I now had a circuit diagram. The cause of the trouble was quickly traced to absence of the horizontal sync pulse at pin 49 of IR001. Checking back, I found that there was a pulse at pin 15 of connector BR001 (input to the subpanel) and up to the base of transistor TR022. It should be passed from the collector of TR022 to IR001 via RR126, but was absent here because TR022 had no supply. The faulty component was the surface-mounted collector load resistor RR026 (6·8kΩ), which was open-circuit. In fact it was cracked across its body – slight pressure restored the supply to TR022 and cleared the problem. All that was required was a suitable replacement resistor. **A.J.**

Philips 28PW6332 (MD1.2E chassis)

The fault note with this set said that it was dead. When I carried out tests it seemed to be in some sort of protection mode. At switch on the red LED appeared then, as normal, briefly turned amber and after that green. The sound should then appear followed, a few seconds later, by a picture. But in this case after four seconds the green LED went red again. The red-amber-green-red cycle continued, but no sound or picture appeared.

Checks in the power supply revealed that the standby protection line at the input to transistor Tr7593 rose and fell as the set tried to start up. Tracing back to the line output stage I found that the beam-current monitoring and the EW circuit are connected to this line. Cold checks then revealed that the MTP3055EF EW drive FET (part no. 4822 130 63726) was very leaky – 100Ω source to drain. The reason for its failure was a dry/arcing connection to the EW balance coil L5424.

A replacement FET and resoldering of the coil restored excellent reception. As these sets are now ageing, this may become a common fault. **A.J.**

Daewoo DWF2881GB (CP885/WP895 chassis)

I had been to the house previously to install a Freeview unit and noticed that this set's picture displayed trapezium and field distortion. The customer thought that it was under guarantee, so I left. A couple of weeks later she phoned to say that it wasn't under guarantee and that the picture was now upside down!

It was indeed upside down, and inside out with all sorts of geometry problems. Several things have been reported with these sets, so I started by improving the connection between the line output transformer and transistor as it didn't look too good. I also replaced D403 (BY228) and IC301 (TDA8358J). None of this made any difference.

The next most common problem is EEPROM corruption, possibly triggered by the poor connection to the line output transformer. I entered the service mode by selecting channel 91, adjusted the sharpness to minimum, exited the menus then quickly pressed red, green and menu in that order. The set went into the service mode, but I couldn't see the adjustments properly because of the distortion.

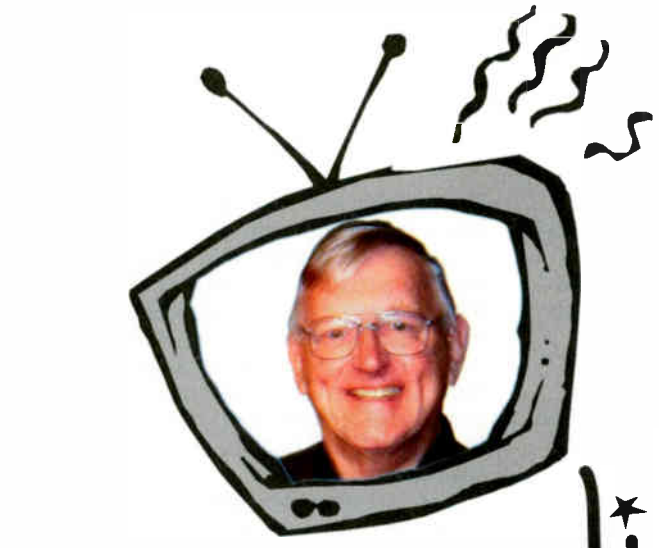
The EEPROM would have to be replaced, so I phoned SEME who didn't have one listed for this model. I quoted the type, 24LC16B, and was told that it had been replaced by the BR24C16F. When it arrived it turned out to be a surface-mounted type that couldn't be fitted. I found that I had a BR24C16 which had been removed from a scrap Panasonic TX24DX1 (Euro-4 chassis). Once this had been fitted and a few minor adjustments had been carried out in the service mode the set was OK. **B.F.**

Toshiba 285T8B

There was a fearful howl from the speakers when this set was switched on from cold. After a couple of minutes the noise would subside and the standby LED would come on. The set resisted all attempts to start it up however. If it was left for a few minutes the LED would begin to pulsate, as if the power supply was tripping.

Suspecting capacitor trouble, I decided to replace the four electrolytics on the primary side of the power supply, C845 (22μF), C814 (47μF), C820 (100μF) and C819 (1μF). Unfortunately the symptoms remained exactly the same, so I decided to study the circuit diagram.

This chassis has two power supplies. One produces the main 147V HT supply, with an optocoupler that provides standby switching. The second power supply produces an always-present 5V supply for the microcontroller chip and the standby switching circuit. The cause of the problem was revealed when I checked for 5V at regulator Q805 in this second power supply – the output at pin 5 was low at only 3V. The input to the regulator, at pin 1, was also low at 4·5V. The 330μF, 25V reservoir capacitor C842 turned out to be open-circuit. A replacement restored normal operation. **J.T.**



What a life!

Donald Bullock's servicing commentary

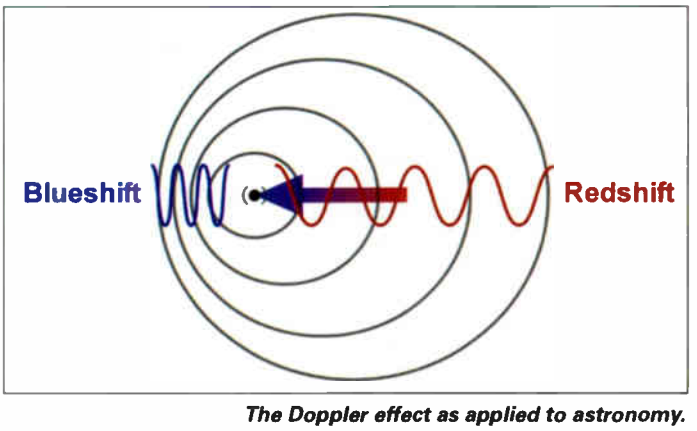
Professor George Isaak and the Doppler effect ▸▸ Troubles with recent CRTs ▸▸ Recollections on the Coronation Twin ▸▸ Correspondence

I wonder how many of you noticed the death in June of Professor George Isaak, an eminent scientist who studied the Doppler effect and expanded its principle to provide further knowledge of the stars and the planets?

Everyone reading this will know that when an electric bell rings at a fixed, constant pitch we hear it like that. Unless, that is, the bell starts to move towards or away from us or we start to move towards or away from it. When we get closer we hear the pitch rising and, as the bell passes us and travels on, we hear the pitch of its ringing fall. Christian Doppler (1803-53) discovered that the effect is caused by a shift in the frequency and of course the wavelength of the sound waves that reach our ears. He also discovered that by measuring the rate-of-change of the pitch he could deduce the speed at which the sound source was travelling.

Professor Isaak took this further, applying the principle to light and electromagnetic waves in his studies of the movements of the stars and planets. In testing this technique on the sun he discovered that its outer layer heaves in and out at roughly five-minute intervals, and that the sound waves involved penetrate to the sun's inner core. He published details of this research in 1979 and, since then, the measurement of these pulsations has enabled researchers to learn a lot about the temperature and internal composition of the sun.

When the light source travels towards the observer the emitted radiation frequency is progressively squeezed towards the blue end of the spectrum. The radiation is said to be blue-shifted – see the accompanying diagram. When the light source is receding, its radiation is stretched towards the red end and is said to be red-shifted. By applying these findings to the study of the movement of the stars and the planets, he was able to detect and analyse planets that would otherwise have been unknown.



The Doppler effect as applied to astronomy.

In the 1970s he used this knowledge to test Einstein's theory of relativity. The experiment proved that the velocity of light is constant and independent of the earth's movements – in fact it's the only constant in this field. By extension, the Doppler effect could be used to measure the movements of objects in outer space. In 1987 he said that with sufficient data on a particular star it would be possible to tell how many planets it has, their masses and how far each of them is from the star. From that it would be easy to work out which ones are likely to habitable.

A friendly and modest man, Professor Isaak was awarded the Max Born Medal and Prize in 1985, the Hughes Royal Society Medal in 1993 and the Herschel Medal of the Royal Astronomical Society in 1996. He was the author of over 150 papers on solar and stellar cosmology published during his lifetime.

CRT problems

Son James Quentin mentions that he has been having trouble repairing someone's Philips 32PW6006/1 set, which is fitted with the L01.1E chassis. The symptom is that the raster disappears after a few seconds. Having suggested that an oscilloscope would be helpful to check the line oscillator and line drive waveforms I referred the matter to Steven, who feels that the cause could be to do with the setting of the first-anode control on the line output transformer. This can be tricky. During manufacture the adjustment hole is covered with a small, sticky patch. While some sets that come into the workshop have the patch intact, others don't. Steven thinks that the latter have had to be reset manually after displaying the symptoms James mentions.

The tubes used in this and many other Philips models have turned out to be quite troublesome. If the first-anode

voltage is slightly off, which seems to happen when the tubes wear and the beam current increases, the protection system senses the beam current increase and shuts the set down. It's possible, by constantly resetting the channel selector, to fool the protection system by depriving it of enough uninterrupted time to be able to monitor the beam current. The monitoring system needs up to five seconds, and a further second or so is required for the shutdown. During channel change, the field circuit blanks the screen. Thus if the set fails some six seconds or so after switch on, this condition is usually the cause of the fault.

Alternatively the cause could be a short-circuit, perhaps intermittent, in one of the guns. To check on this tap the CRT's neck to see if the gun sparks and the set shuts down. Steven says that the 32in. tubes are the worst offenders, 25in. ones being affected less. According to Steven several sets that suffer from the fault are brought in each week. The Philips tubes are also used in Panasonic sets, but in this case a Panasonic label is usually placed over the Philips one. The problem arises mainly with sets that are fitted with the Philips A10 chassis and Panasonic DK1 and DK2 series sets built two-four years ago. At present Steven mentions that a Philips 28PW6515 and two Panasonic TX32DK1 sets are in the workship with short-circuit Philips tubes, also a Toshiba Model 28W8DB.

The tubes and the painter chip problems must have cost Philips dearly, as many of the failures have been during the warranty period. Philips has also subsidised the cost of replacement tubes for some customers whose sets have been over four years old. Recompensing other setmakers who have used the tubes has added to the problem.

I have also discussed the problem of James's faulty set with Alan J. Roberts, who has contributed servicing articles to *Television* in the past, mainly on Philips models. While settling down to talk to me he sat on his cat, which had crept into the armchair. That made my day! Apparently it bounced around the walls like a shell as we spoke, illustrating the Doppler effect in ongoing waves that put my description of it to shame. Alan has been an expert on Philips sets for many years and, after discussing the set's fault condition with James, came to the conclusion that the tube was indeed the cause of the trouble. I daresay we shall know more in time for the next column!

The Ultra Coronation Twin

Malcolm Burrell's vintage repair article last month struck a chord, as such articles often do. It was on the Ultra Coronation Twin battery/mains portable radio, and reminded me of one we had in for repair in the early Fifties.

The customer was a high-ranking and starchy ex-colonial governor who, after a lifetime's government service in remote parts, had retired to Cheltenham. He had brought his cook, batman and maid to look after him there. They had bought him the set from the large, central furniture shop where I worked at the time.

During the first few months the set had given him trouble, and a little fur had flown. First the selenium rectifier had failed, filling his house with the obnoxious smell this fault produces. Then the DK96 frequency-changer valve had gone soft. Following this one of the mains dropper sections had gone open-circuit. The set had then failed again. This time George, the service manager, had carefully repaired the set himself. He then spoke to the governor on the phone. Now soothed, the governor decided to call in forthwith to collect it.

We had a young fellow, Rob, working as an apprentice. "Rob, here, clean up the cabinet – make it look like new! Let's see if we can bring a smile to his face after the trouble he's had with it" George had said.

Rob found a bit of clear bench and got busy with a duster. Just as he had got it looking like new, he spotted a tiny mark on the top of the plastic. So he reached for the spout-can of switch-cleaner, sprinkled the contents liberally on the cabinet top, and started to rub with his duster. Horror of horrors! The duster seized up, and was now firmly attached to the cabinet top!

When George saw it his face went white and he began to gibber. The showroom salesman downstairs then came on the internal phone to tell us that the governor had arrived. George added a dance to his act and snatched the phone. "For God's sake, walk him around the outside windows for five minutes!" he screamed.

George shot through the door and down the stairs. Rob and I followed him discreetly. We reached the showroom just in time to see the mystified salesman almost frog-marching the erect and protesting governor out through the door as, at the far end of the showroom, George crouched and darted around the radio display area like a burglar. He found a new and identical Ultra Coronation Twin, grabbed it and, rubbing it with his hanky as he went, walked to the front of the shop. He arrived with perfect timing to meet the bemused governor on his return.

We watched as George smiled, shook the governor's hand, made a little speech and handed him the new radio.

The governor was delighted and thanked the salesman for showing him round the extensive window displays. "Jolly good of you to explain how and where all the furniture is made, upholstered and varnished" he said, "if I ever need any furniture I'll give you a call, what?" He then departed, with the new radio under his arm.

Back in the workshop, George looked at Rob mournfully. "Don't clean any more Ultra Twin radios with switch-cleaner, there's a good chap" he said.

As I mentioned to Rob later, mistakes are easy to make. I recalled one wet Saturday morning when the shop where I had been working was full. A chap came in for a demonstration of a quality valve amplifier that Pye had been promoting in a series of lively advertisements. I was given the job of connecting it up. After placing it on a table, I plugged the mains lead into its two-pin 5A socket and the other end into the mains socket. There followed an almighty bang, and all the shop lights went out. A curling cloud of blue smoke climbed from the amplifier's output transformer.

Pye, in its wisdom, had arranged that identical 5A sockets were used for the mains input and the speaker output. I recall the customer tactfully suggesting that he should call again in a week's time...

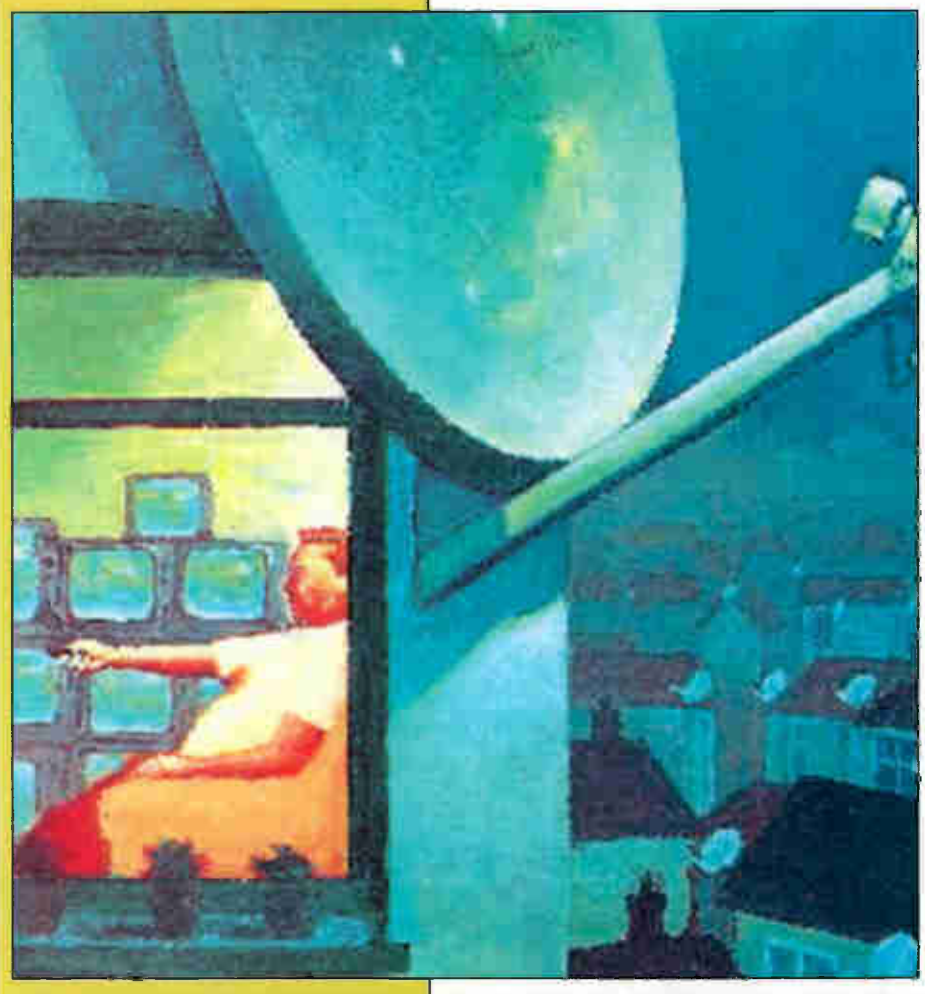
Correspondence

Chris Drew of Essex tells me that he has had a call from A. Boyle in Cheshire acknowledging safe receipt of and thanking him for the Grundig TK830 tape recorder. We would be interested to hear how the renovation goes.

John Woodgate of Rayleigh, Essex, an audio consultant, has sent me an email following my comments on hearing aids last month. "I used to be involved in the design and manufacture of deaf aids" he says, "but until I became deaf myself I had no idea that the major factor in their use is correct volume-control setting. Turn the volume right down, then increase it carefully until you can just hear Greeneyes' dulcet tones in your ear. You will then have set the control too high! Carefully turn the control back until her voice is no longer 'in your ear'. Although it will now seem that the aid is not doing anything, it is in fact amplifying only the previously lost sibilants, or consonants with hissing sounds. It's the loss of these that makes speech indistinct, and only they need amplification."

Well I tried it, John, and it works. My thanks. Go to the top of the class!

Alick Cowan wants to know who handles spares for Aiwa products. I understand that they are now stocked by Sony, KSA Wholesale Components, CPC and SEME.



SATELLITE NOTEBOOK

Reports from Christopher Holland Pete Haylor and Michael Dranfield

HDTV cont

HDTV test transmissions with H.264 compression have started via Astra 3A (23·5°E) at 12·032GHz H. The symbol rate is 27.500, with 3/4 FEC. An Astra caption is transmitted in standard-definition (MPEG-2) format, the H.264 HDTV content consisting of a tape loop showing part of a football match.

I've come across an interesting computer program, called Tsreader, for use with a PC-card satellite receiver. It analyses the incoming signal multiplex, displays thumbnail images of the video contents (both MPEG-2 and H.264), and provides a mass of information about the received signal. A free version, called Tsreaderlite, can be downloaded from www.coolstf.com/tsreader. The full version costs US $99: the lite version has most of the features of the full one, including being able to display H.264 images.

Photo 1 is an off-screen shot of the program receiving an Astra 3A HDTV test transmission, with thumbnail images of the standard-definition Astra caption and an HDTV picture. Photo 2 shows reception from one of the BBC's Astra 2D transponders – thumbnail images from other channels via this transponder can be seen by scrolling below the first three.

More on this program and installing it in a PC next month. **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 ITV sub-regions listed will appear as EPG no. 103 with viewing cards that are registered at addresses within the region concerned. For out-of-region reception the channels can be added manually via the digibox's extra-channels menu.

Three unused Astra 2A and 2B transponders have been switched on again. These are transponder 1 (11·720GHz H), transponder 5 (11·798GHz H) and transponder 33 (12·344GHz H). The first two were used by the BBC before it moved to Astra 2D a couple of years ago. So far I've not seen any signals via these transponders. They may be used for future HDTV services. **C.H.**

A Sky RC extender problem

Problems with Sky remote-control exten-

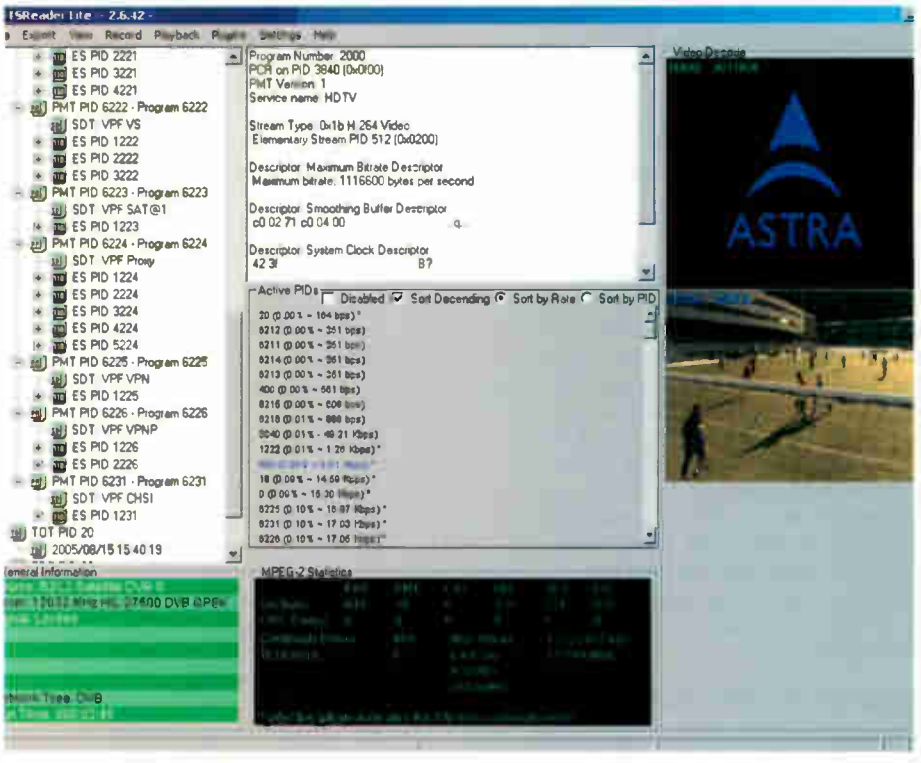


Photo 1: Off-screen shot of the Tsreader program being used to receive an HDTV transmission via Astra 3A (23·5°E).

der systems were discussed here in the August issue (see page 631). Since then I have come across an unusual problem that I've not encountered before. The digibox was installed in a large house, with several RC pickup eyes (they are also known as mice) that were coupled to a distribution amplifier. The amplifier passed the RC signals back to the digibox in the main room as well as amplifying the UHF output signals (terrestrial plus digibox UHF modulator) fed to each of the other rooms. The digibox's RF2 output socket provided 9V to power the amplifier and the eyes, via the coaxial signal cable.

The system had worked well for about a year. Then, suddenly, channel changing in all the rooms with remote-control eyes became intermittent, though remote-control operation in the main room remained normal. The symptoms were similar to what you might experience with a malfunctioning remote-control unit: stepping up and down through the channels worked most of the time, though entering numbers or trying to access the TV guide was almost impossible.

After some experimentation and testing the cause of the problem was found to be one of the pickup mice connected to the amplifier. Disconnecting it and installing a replacement restored normal operation. The faulty mouse wasn't drawing excessive current, so it wasn't loading down the 9V supply. Unfortunately I didn't get to the bottom of why the mouse was causing the whole system to misbehave. **C.H.**

Rain fade

It's well known that rain attenuates satellite signals in the 11-12GHz band. Very heavy rain in the vicinity of a receiving dish can even cause loss of signal, usually for only a short time. If the receiving dish is not correctly aligned with the satellite, resulting in marginal signal strength to start with, even a small amount of rain can cause signal loss. Signals in the 4GHz band are affected by rain much less.

It is less well known that heavy rain in the vicinity of a Ku-band uplink can cause the same signal-fade problem. Recently I noticed that the signals from all the BBC transponders at 28·2°E became much weaker and eventually failed for a few minutes. The Sky and ITV signals, transmitted from different sites, remained strong. To get round the problem with OBs, a second uplink some distance away is sometimes used as a back-up, being switched in if heavy rain affects the main site. I don't know how the link between the venue and the back-up site is made – it wouldn't be via satellite! **C.H.**

Eutelsat W2 (16°E)

This month we take a look at the signals available via this satellite. It has a very wide footprint, and there are so many signals that I'll list only those in the 12·5-12·75GHz spectrum this month.

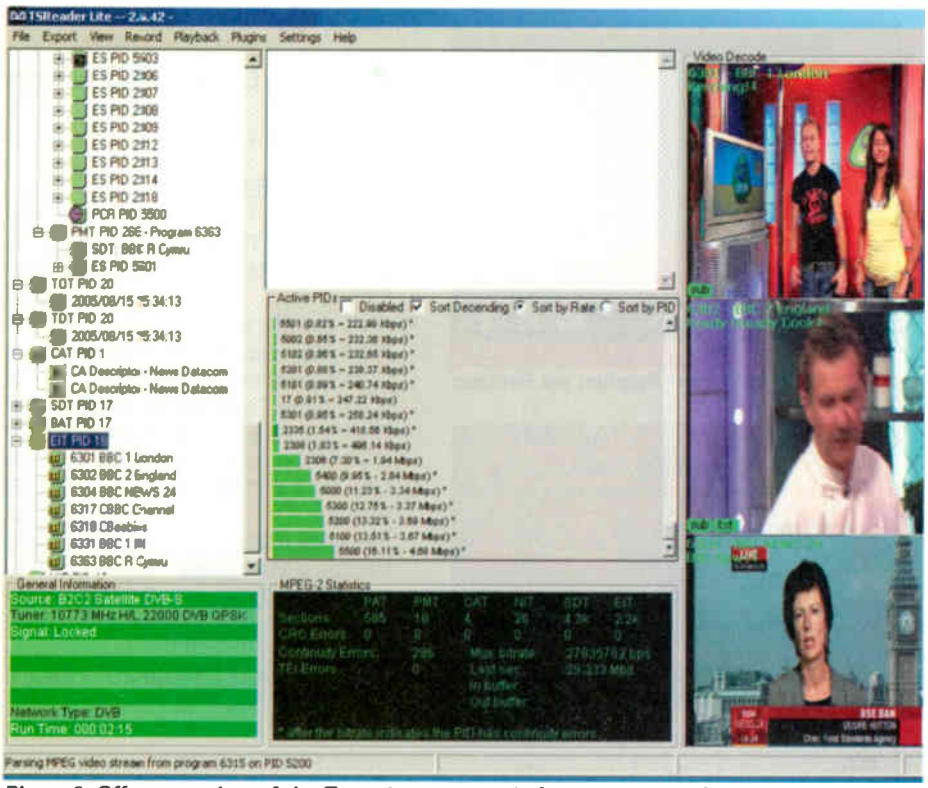


Photo 2: Off-screen shot of the Tsreader program being used to receive one of the BBC's Astra 2D transponders.

Photo 3: Reception of the Italian Horseracing Channel via Eutelsat W2.

Photo 4: Sky News via Eutelsat W2.

Photo 5: Sky News via Eutelsat W2.

Photo 6: A feed from Belgium via Eutelsat W2.

Photo 7: A feed from Belgium via Eutelsat W2.

Photo 8: An RTL (Luxembourg) feed via Eutelsat W2.

Photo 9: Russian NTV beaming back a report from London via Eutelsat W2.

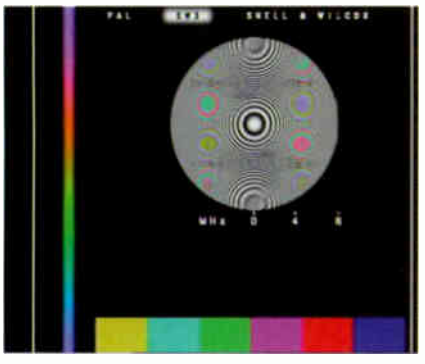


Photo 10: A Snell and Willcox test pattern prior to a feed going live via Eutelsat W2.

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

Channel and EPG no.	*Sat*	*TP*	*Frequency/pol*
Aasha TV (828)	EB	C4	11·307GHz/V
ABC1	2D	51	10·862GHz/H
Choices UKTV (697)	EB	C4	11·307GHz/V
Discovery Real Time Extra	EB	C2	11·224GHz/H
FX + 2	2D	52	10·877GHz/V
ITV1 Anglia South (103)	2D	41	10·714GHz/H
ITV1 Meridian North (103)	2D	53	10·891GHz/H
ITV1 Meridian South (103)	2D	53	10·891GHz/H
ITV1 Tyne Tees South (103)	2D	41	10·714GHz/H
ITV1 Yorkshire East (103)	2D	53	10·891GHz/H
ITV1 Yorkshire West (103)	2D	53	10·891GHz/H
Life TV + 2 (161)	EB	C1	11·264GHz/H
Passion TV	EB	C2	11·260GHz/V
Set Max (826)	2B	14	11·973GHz/V
Vectone Mall (696)	EB	C2	11·222GHz/H
You TV 2 (179)	EB	C2	11·260GHz/V
You TV 3	EB	C2	11·260GHz/V

2B, 2D = Astra 2B and 2D EB = Eurobird

Table 2 lists the free TV channels available. Note that Armenia TV requires the video and audio PIDs (packet identifiers) to be entered manually – they are normally found and entered in the satellite receiver channel data automatically when the receiver scans the channel. Photo 3 shows reception of the Italian Horseracing Channel.

After doing a normal scan the result will probably say that two TV channels are available, with the video and audio PID data given as 0. Enter the video PID 7681, the audio PID 7697 and the Programme Clock Reference PID (PCR PID) 7681.

The feeds available in this spectrum are as follows. The European News Exchange (ENEX) is very busy with feeds via this satellite. ENEX involves several broadcasters including Sky, RTL, NTV (Turkey), Antena 1 (Greece), VTM Belgium, SIC (Portugal) and some others. Frequencies used are 12·509GHz, 12·517GHz, 12·524GHz, 12·532GHz, 12·541GHz, 12·550GHz, 12·559GHz, 12·642GHz and 12·650GHz, all with horizontal polarisation. The most common symbol rate is 5,632, with 3/4 FEC. The lowest frequency (12·509GHz) is usually encrypted, but all other frequencies used are normally in the clear. The MPEG format is 4:2:0 or, more likely now, 4:2:2.

Sky News seems to be the most active user, generally at 12·517GHz or 12·524GHz (see Photos 4 and 5).

Other symbol rates may be used. I've seen Newsforce using 12·507GHz and 12·521GHz with the low rate of 2,816 and RTL using 12·543GHz and 12·559GHz with 11,264, both with the same 3/4 FEC. Incidentally these symbol rates are exactly half and double to 5,632 rate.

I've seen TVN Poland using 12·702GHz with SR 5,632 and 3/4 FEC – this isn't part of the ENEX group.

Photos 6 and 7 show feeds from Belgium, Photo 8 a feed from RTL (Luxembourg) and Photo 9 Russian NTV beaming back a report from London.

Photo 10 shows a Snell and Willcox test pattern prior to a feed going live. Photo 11 is from RTL prior to Formula 1 racing coverage at 12·543GHz, using the wide symbol rate (see above). **C.H.**

An LNB problem

"My Sky box isn't working" the voice at the other end of the phone said, "it's saying 'no satellite signal is being received'".

I asked about the digibox make and was told that it was a Grundig one. When I called I checked the input from the dish at the receiver end and found that there was a good signal. So I dismantled the receiver and replaced the power supply – because of the usual capacitor problem. At switch on the receiver was working, so I wrapped up the job and went on my way.

Two weeks later the customer called back to say that the receiver had apparently failed again, but would work for several days if it was switched off then on.

I returned armed with a spare receiver and LNBs. On arrival everything was working, so I decided to replace the LNB and was surprised to find that it was a twin Cambridge one – the type that gave us so many problems a few years ago. I installed a current quad type and after that everything worked correctly. So I told the customer to run the system for several days and, if no further problems occurred, pay the difference between the cost of a PSU and a quad LNB. So far so good...**P.H.**

Cable trouble

"Hello, do you remember me?" the voice said, "you did my satellite about two years ago." It was the second-hand shop owner down the road. "Can you come and mend my satellite, and how much?"

"The callout is £35" I said.

"But you only live down the road, and I'm an old customer."

In the end I reduced the callout, much against my better judgement, to £30.

"Will you repair it for that?"

I went through the possible causes and costs, e.g. LNBs and receivers.

"Sky guarantees to repair for a fixed price" he commented.

I wondered why he hadn't used them. The fault was the usual 'no signal being received', but it appeared on different channels at different times. I checked the on-screen signal indication and saw that the strength was about 10 per cent, the quality 90 per cent. The dish was on the flat roof and when a Horizon meter was connected here the readings were strength 202 and quality 96. Dish alignment was checked and found to be spot-on. A replacement LNB was tried, as I have had LNBs that cause this type of fault, but the situation remained the same. A new receiver made no difference either.

The only thing left was the cable, so I advised the customer on the cost of rewiring the feed. He agreed for me to test it. If it was the cause, he would pay for the cable and install it at his leisure. This suited me, as he had a conservatory across the whole of the rear yard and access was nigh on impossible.

The fault was cured when the cable was dropped down to the room and connected, and I happily took the cash. I wondered if Sky would have done this and gone on to the roof for the fixed price he quoted – £65. **P.H.**

Problems with a motorised system and Sky

I was called to attend to a motorised system because the dish wouldn't move. When I arrived I was told that the Sky system was also faulty. The cause of the trouble was traced to a loose F connector at the LNB. Everything was OK once this had been tightened.

The motorised system was an old one with a 1·2m prime-focus dish and a jack arm. Even when checked with my home-made tester at the dish end it wouldn't move. It turned out that the customer had fitted a second-hand jack that was faulty. Fortunately the old jack was found in the garage and was installed. With this one fitted the dish turned when driven at the dish itself but not when driven at the house. The cause was traced to a faulty cable under the lawn. The customer is to replace this in the future!

Table 2: Free TV channels available via Eutelsat W2

Frequency/pol	*SR*	*FEC*	*Services*
12·568GHz/H	2,894	3/4	SIC International (Portugal)
12·608GHz/H	27,500	2/3	Rete Capri (Italy) plus other channels, some encrypted
12·630GHz/H	6,111	3/4	MTV Italy, La 7 Italy
12·633GHz/V	4,883	1/2	RTK Albania and two Albanian radio stations
12·656GHz/V	4,883	1/2	TV Shqiptar Albania and Radio Tirana
12·657GHz/H	4,000	2/3	Italian Horseracing Channel
12·675GHz/V	4,444	1/2	Radio B92 Serbia plus encrypted TV B92
12·683GHz/H	2,894	3/4	TV7 Tunisia plus two radio stations
12·692GHz/V	3,798	1/2	BNTV Serbia plus two radio stations
12·725GHz/V	3,418	2/3	Armenia TV (see text)

Where someone had joined the motor-feed cables and wrapped the joint with self-amalgamating tape the latter had worked perfectly: it held the water inside the joint and wouldn't let any out! The result, of course, was a corroded fitting and fractured cables. **P.H.**

Panasonic TUDSB30

A whistling noise came from the chopper transformer in this dead digibox. The cause was traced to a leaky diode in the snubber network on the primary side of the transformer, D806 (PC9D). As I couldn't find any information on this diode or on a suitable replacement I had to make a guess. I decided to fit a BA159, which seemed happy enough.

Incidentally while looking through the data in the serial EEPROM from a Sky digibox I found that from software version 1.2S4BQ onwards it includes the subscriber's post code. In previous versions this location in the EEPROM was blank. **M.D.**

Pace BSkyB 1000 Mini box

The reported fault with this unit was that it displayed "no satellite signal being received". It worked all right while on test for several days, with no fault. So when the customer eventually phoned I said that it seemed to be fine and that there could be a fault with the LNB. I told her I would return the box with only a postage charge. But before packing it up I decided to try the box once more. Guess what? The fault was present!

The box did indeed say "no satellite signal being received", but it was also making a loud squealing noise. A scope check showed that the LNB supply had a 700kHz waveform superimposed on it, and a check inside the box revealed that a small inductor, L7200, was screaming. It's part of the circuit that generates the 12V supply. I don't have the service manual for this model, but in most digiboxes the supply voltages are generated by a chopper-type power supply. It

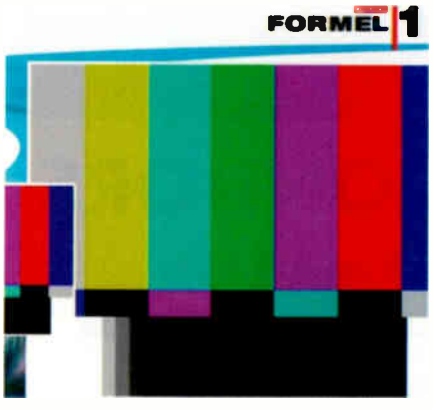
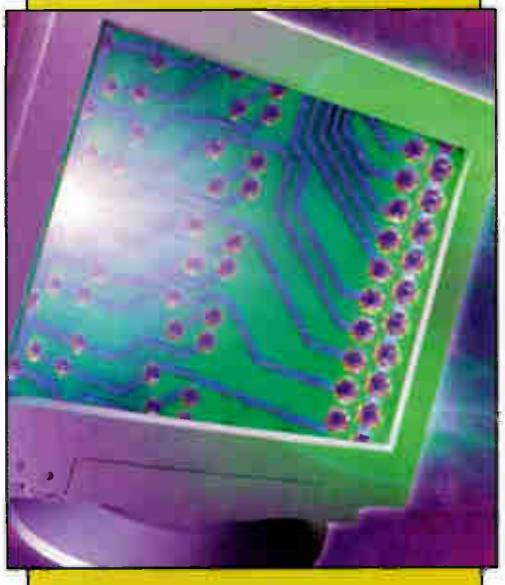


Photo 11: RTL prior to Formula 1 racing, at 12·543GHz via Eutelsat W2.

sounded as if the chopper was working at the wrong frequency.

Investigation underneath the PCB revealed that L7200 is connected to pin 8 of a surface-mounted 10358 op-amp chip. A finger placed near the chip cured the fault. So I assumed that a resistor or capacitor that sets the free-running frequency was faulty. While looking around the IC I saw an *RC* combination that's connected to one of the pins. Next to the capacitor there were two empty pads. Nothing unusual about that. But in the middle there was a small spot of red adhesive, which suggested that a component should have been fitted here.

Fortunately I had a scrap, lightning-damaged box, which I stripped down. After doing so I found that the missing component was a surface-mounted ceramic capacitor. Transplanting it from the scrap box to the faulty one cured the problem. I think the reason why the faulty box had worked OK on test was the current drawn by the LNB. When I tried it first it had been on the soak test bench, with a quad LNB. When I tried it again before sending it back it was on the repair bench, which has only a single LNB. **M.D.**



MONITORS

Fault reports from Alun Rawson-Williams and Bob Bradley

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,
Nexus Media Communications,
Media House,
Azalea Drive, Swanley,
Kent BR8 8HU

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

Tagra TM4269-2

This monitor was at the customer's site about 45 miles away and it was already late afternoon. I didn't relish the thought of a 90-mile round trip to fix it! When I got there and opened it up I found that the monitor had a distinctive LG look about it, though I had not come across this model before. The fault symptom was that the display was in lime green only, though the OSD showed up in blue when it was selected.

I hate these jobs. In most cases they involve removal of the metal screening from the CRT base PCB and the numerous earthing connections between the PCB and the main board, the metal chassis and the CRT. The situation was the same here, with the added complication that the screening was box-like, completely surrounding the CRT base panel, and the seams were soldered up.

Then the penny dropped. Why was I contemplating taking the CRT panel apart? If the OSD had blue content, the problem was probably to do with the LM1281N colour-amplifier chip IC401 on the main PCB or the signals lead to the CRT panel. Continuity tests showed that the lead was OK, so attention was turned to the IC and its peripheral circuitry. When you don't have the circuit diagram for a monitor I've found, over the years, that reference to chip manufacturers' data is invaluable. It often includes a practical circuit for use with the device concerned. One of the best websites for such data is www.alldatasheet.co.kr

When I had downloaded the data for the LM1281N IC to my laptop I found that the circuit was remarkably similar to the one in the faulty monitor. Voltage checks on the IC in the monitor showed that the blue input (pin 11) was at 12V, the supply voltage, while the red (pin 5) and green (pin 8) inputs were at 2·7V. It seemed likely that the IC was faulty, and a new LM1281N cured the problem. **A.R-W.**

Digital PCXCV-DW

This 14in. monitor is the same as the **LG Electronics Model CS456** (CA-47 chassis). When it was connected to a running PC the screen was completely blank, but when the signals' lead was disconnected the CRT produced, in repeat order, pure flooded red, green and blue rasters. The front mode LEDs changed along with the screen colour changes. The CRT's cathodes are driven by separate transistor output stages (Q341, Q351 and Q361). When the MC13281BP video processor chip IC901 had been replaced the monitor produced an excellent display considering that it is now about eight years old. **A.R-W.**

Philips 109B40

The owner of this 19in. monitor complained about field cramping/foldover at the bottom of the display. Stripping down the monitor to gain access is straightforward, but note that a number of earth straps have to be disconnected, also the usual scan-coil plug, display rotation plug, degaussing plug, a connector from the front control panel and the EHT lead. After this the chassis tray can be slid out from the monitor's casing together with the CRT base assembly. To withdraw the chassis from the tray, remove a few screws and washers and a plastic retaining clip at the left-hand side of the chassis.

The cause of the fault was C2157 (470μF, 16V), which is the reservoir capacitor for the TDA8172 (IC7404) field output chip's 12V supply. A new capacitor followed by a good soak test after reassembly confirmed the cure. **B.B.**

Panasonic Panaflat LC40

This TFT monitor came into the workshop because it was dead. A check on the AC adapter revealed that there was no output – there should have been 14V at 4A.

For safety reasons many AC adapters are sealed and impossible to open. But this one had a screw hidden underneath the product label and could be dismantled. Very often an AC adapter's cable cracks internally with use, either near the gland where it comes out of the adapter or at the plug end that connects with the monitor. In this case however the cable wasn't damaged. The cause of the trouble was the start-up capacitor C7 (47μF, 50V). A replacement cured the fault and the monitor tested OK with the repaired adapter. **B.B.**

Taxan RX174

The complaint with this 17in. Crystal Vision 780 TFT monitor was streaking on green when cold. The customer said that as the monitor warmed up with use the streaking became less noticeable until, after an hour or so, the symptom had almost disappeared. This indicated a thermal fault.

Stripping down the monitor to gain access turned out to be reasonably straightforward and presented no problems. Once the main board was visible I saw three electrolytic capacitors in the vicinity of the M52743BSP video preamplifier IC. When one of these capacitors was subjected to freezing the green streaked very badly, while heating it reduced the problem. The capacitor is an electrolytic, C67 (1μF, 50V), which provides signal coupling. A replacement proved that it had been the cause of the fault. **B.B.**

Solution to Test Case 514

– see page 732 –

Many faults in Hitachi TV chassis have well-known causes making them, in most cases, easy for the initiated to repair. The fault on this occasion was not a common one however. It was probably brought on by old age. Some would say the same about Ted, now a sexagenarian, but that's not true of course! It was he who found the cause of the fault, and he who added another note on the circuit diagram – perhaps the last that will go there.

Using an oscilloscope, Ted found that at switch on all worked well for a split second, during which the line output stage sprang to life. Then the power supply shut down. Now one of the protection systems in this set is based on three parallel-connected resistors, R945/6/7, through which the current in three of the chopper transformer's secondary windings, including the HT one, flows. If the voltage across these resistors exceeds a certain level two different protection arrangements come into operation, one activated by transistor Q951 and the other by transistor Q950. The resistors, which should be 1Ω (1W), 0·5Ω (2W) and 0·5Ω (2W) respectively, produced readings of 5·8Ω, 0·58Ω and 1·1Ω – varying! – when checked. They looked very grey, old and distressed (we'll draw no more parallels with Ted), obviously having overheated as their resistances increased.

Replacements brought the set back to life, and made both Ted and Mrs Harris very happy. The lady had in fact been unable to master her loan set . . .

NEXT MONTH IN TELEVISION

At the IFA Show

The Internationale Funkausstellung (IFA), which is held in Berlin every two years, is the world's largest consumer electronics show. George Cole has been there to report for us. Highlights this year included digital recording, high-definition TV, mobile TV and broadband-delivered entertainment including digital music. The Blu-ray and HD-DVD discs both had a high profile, with each determined to show why it should become the de facto standard for the next generation of CE optical discs.

The problem of older sets

Many people write off older sets when they go wrong, though they are often better built than more recent offerings. Large numbers of sets can be given an extra lease of life with a little effort. Michael Maurice confronts the problem and describes a number of examples of successful repair/restoration.

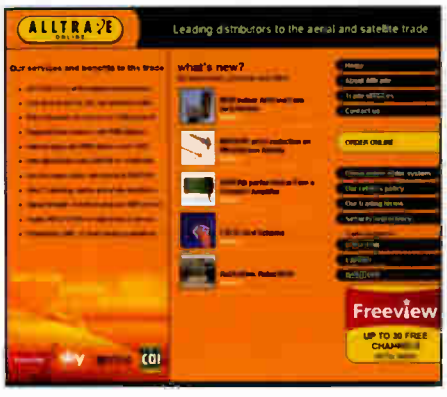
Review: the Humax LGB32TPVR

Here's a TV set that was designed with the future in view – 32in. LCD screen, HD-TV capability, a built-in personal video recorder and other advanced features. Roger Thomas bought one and reports on his experiences with it.

Published on the third Wednesday of each month by Nexus Media Communications, Media House, Azalea Drive, Swanley, Kent, BR8 8HU. Nexus Media Communications is a trading name of Nexus Holdings Ltd. Registered in the UK, number 5346404. Registered office Hanover House, Hanover Square, London W1S 1HP. **Filmsetting** by Impress Repro, Unit 2, Parkway, Southgate Way, Orton Southgate, Peterborough PE2 6YN. **Printed** in England by William Gibbons Ltd, 26 Planetary Road, Willenhall, West Midlands, WV13 3XT **Distributed** by Seymour Distribution Ltd, 86 Newman St, London, W1T 3EX. **Sole Agents** for Australia and New Zealand, Gordon and Gotch (Asia) Ltd.: South Africa, Central News Agency Ltd. ***Television*** is sold subject to the following conditions, namely that it shall not, without the written consent of the Publishers first having been given, be lent, resold, hired out or otherwise disposed by way of Trade at more than the recommended selling price shown on the cover, excluding Eire where the selling price is subject to currency exchange fluctuations and VAT, and that it shall not be lent, resold, hired or otherwise disposed of in a mutilated condition or in any unauthorised cover by way of Trade or affixed to or as part of any publication or advertising, literary or pictorial matter whatsoever.

WEB SERVICE

To reserve your web site space telephone
Tel: 01322 611261 Fax: 01322 616339
E-MAILS r.gurunlian@highburybiz.com



Alltrade Aerial & Satellite Ltd

www.alltrade.co.uk

Leading distributor to the trade.
Full e-commerce site with over 1500 products with in-stock quantities!! We supply everything associated with Digital/Analogue Terrestrial & DTH/Motorised Satellite reception. All Antennas. All Brackets. All Cables. All Connectors. All Amplifiers. We provide a free MATV/SMATV planning service as well.
Trade Counters @ Brighton, Cardiff, Dartford and Watford
Phone 0845 075 0751
Fax 0870 770 9151

Charles Hyde & Son Ltd

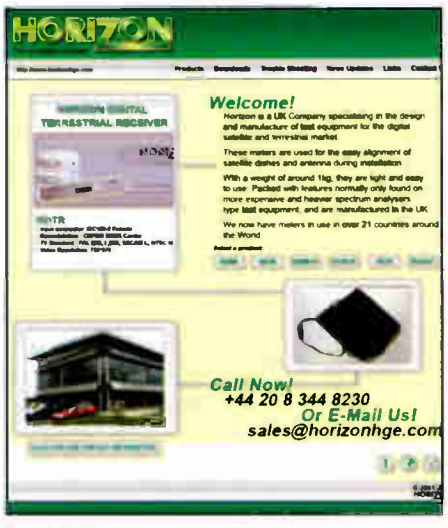
www.charleshyde.co.uk

Search for both original and copy spare parts in our extensive database covering Akai, Alba, Bush, Ferguson, Goldstar, Hitachi, LG, Matsui, Nokia, Saisho, Sanyo, Sony, Sharp, Thomson, Panasonic, Philips, Samsung, Tascam, Teac, Toshibo, Yamaha and many more. In addition huge ranges of Lasers, Lopts, Remote controls and Semiconductors may be accessed.

Amtel Electronics

www.amtel.co.uk

Amtel Electronics provide service manuals and service sheets for most major brands of TV, video, Satellite, Audio equipment etc. OEM service information is available for most european, USA and Far Eastern makes and models.
Amtel electronics is one of the leading service information suppliers. Please contact us with your requirements via our contact page or telephone 01955 611313.



Horizon

www.horizonhge.com

Horizon is a UK company specialising in the design and manufacture of test equipment for the digital satellite and terrestrial market. the meters are used for the easy alignment of satellite dishes and antenna during installation. At around 1kg they are light and easy to use, packed with features normally found on expensive and heavier spectrum analysers. Manufactured in the UK we have meters used in over 21 countries.

IRWIN ELECTRONICS

www.irwinelectronics.co.uk

As classic distributors we compliment our existing mail and trade counter business with our website. You can order parts on-line quickly and easily. We intend to explore alternative ways of assisting engineers to run their business successfully.

Swires Research

www.swires.com

Swires Research produce high quality instruments for the television industry, including portable signal level meters and spectrum analysers for digital and analogue RF signal measurements.

Wizard Distributors

www.wizard-distributors.co.uk

Main distributor for major brands. Search by make/model for LOPTX; switches; remotes etc. Find ICs; semicons; service kits; lasers; capacitors; resistors and a huge range of service aids, tools and other products.

Service Link

TELEPHONE 01322 611261 FAX 01322 616376

CLASSIFIED TEL: 01322 611254

FOR SALE

"The television engineer's wholesaler"

ICC17 LOPTX Kit
Ferguson W7023U etc.
Thomson 24WK23U etc
Pt no. 10608670P1 £24.95

GRUNDIG EHT TRAY
BG1899022644 £18.95

www.IrwinElectronics.co.uk
Telephone 0114 273 9622

SERVICE DATA

NEED HELP NOW?
Then ring the
★ **ELECTRON TECHNICAL HELPLINE** ★
Genuine help available to all repairers of
T.V. - V.C.R - SAT - AUDIO
(Inc Valves)
Over 30 years experience
and vast data base
9 Chapel Street, Donisthorpe, Derbyshire DE12 7PS
0906 470 1706
Calls cost 60p per minute

RECRUITMENT

Authorised Service Centre
STARTEC Services

Require
Field/Workshop Engineer - Brown Goods
Combined Field/Workshop for TV/VCR/DVD & AUDIO
Based in beautiful East Sussex covering 2-3 days field service remainder in workshop the applicant must be fit and hold relevant qualifications and experience, however training will be given on advance technologies including PLASMA & LCD.
Recent qualifications in electronics with little or no experience? we could be interested.
Excellent performance related salary bonuses and benefits.
Please Contact Paul on 01323 412012 or email info@startec.tv

LINEAGE

PRIVATE RETAILER has excellent part exchange colour televisions and videos to clear. Tel: 01494 814317.

SERVICE DATA

SERVICE MANUALS
and Service Sheets for
TV - VIDEO - AUDIO
Prices start at

CTV	s/sheet	5.00
VCR	s/sheet	7.00
CTV	s/man	10.00
VCR	s/man	13.00

No p/p or VAT
- Other items POA -
AMTEL
Huna,
Caithness KW1 4YL
01955 611313
www.amtel.co.uk

SERVICE DATA

OPEN 6 DAYS
TV/VCR CIRCUITS (WE DO NOT STOCK AUDIO OR MONITOR INFORMATION)
A.T.V. on
0114 285 4254
CTV Circuits..... from £5.00
VCR Circuits ..... from £7.00
CTV Manuals..... from £10.50
VCR Manuals.....from £14.50
(P/P add £2.50 to each order)
419 LANGSETT ROAD
SHEFFIELD S6 2LL
www.atvcircuitsandservicemanuals.co.uk
MANUAL COLLECTIONS PURCHASED.
(POST 2000)

WANTED

WANTED Surplus or Obsolete Electronic Components
Turn your excess stock into instant cash!
SEND OR FAX YOUR LIST IN STRICTEST CONFIDENCE
Will collect anywhere in the UK

Mushroom COMPONENTS

28 College Street, Kempston, Bedfordshire, MK42 8LU
Tel: 01234 363611 Fax: 01234 326611
E-mail: sales@mushroom.co.uk
Internet: www.mushroom.co.uk

BEST CASH PRICES PAID
FOR VALVES KT88, PX4 AND MOST AUDIO/OTHER TYPES.
Tel: 01403 784961
Billington Export Ltd
Sussex RH14 9EZ
Fax 01403 783519
Email: sales@bel-tubes.co.uk
Visitors by appointment

For a FREE consultation on how best to market your products/services to a professional audience contact REUBEN on 01322 611261

Finally, your search for FREEVIEW replacement remote controls is over...

Look no further than Classic for your Freeview remote controls. We already cover a vast range of models and more are being added all the time.

If you have a requirement for a Freeview remote control not listed, give us a call on 01635 278678 and we may be able to add it to our development programme.

Brand	Model	IRC No	Brand	Model	IRC No
Alba	STB1X1	IRC83079	Nokia	121T	IRC83078
Alba	STBX3	IRC83106	Nokia	221T	IRC83078
Black Diamond	BD65DSF	IRC83079	Panasonic	TUCT20	IRC83088
Black Diamond	BD68STB	IRC83079	Panasonic	TUCT30	IRC83088
Bush	DFTA 1X1	IRC83079	Philips	DTR100	IRC83101
Bush	DFTA1	IRC83079	Philips	DTR1500	IRC83083
Daewoo	DS608P	IRC83082	Philips	DTR500	IRC83083
Digifusion	FRT100	IRC83108	Philips	DTX6370	IRC83087
Digifusion	FRT101	IRC83108	Philips	DTX6371	IRC83087
Digifusion	FVRT100	IRC83107	Philips	DTX6372	IRC83087
Digifusion	FVRT150	IRC83107	Sagem	ITD58	IRC83105
Dijam	32VU DVB-T	IRC83082	Sagem	ITD59	IRC83105
Ferguson	FDT2000	IRC83077	Sagem	ITD60	IRC83105
Ferguson	FDT500	IRC83077	Sagem	ITD601	IRC83105
Fusion	FRT100	IRC83108	Sagem	ITD602	IRC83105
Fusion	FRT101	IRC83108	Sagem	ITD61	IRC83105
Fusion	FVRT100	IRC83107	Sagem	ITD611	IRC83105
Fusion	FVRT150	IRC83107	Sagem	ITD62	IRC83105
Goodmans	GDB1	IRC83079	Sagem	ITD64	IRC83105
Goodmans	GDB2	IRC83079	Sagem	ITD66	IRC83105
Goodmans	GDB3	IRC83079	Sagem	ITD68	IRC83105
Goodmans	GDB4	IRC83079	Sagem	ITD72	IRC83105
Goodmans	GDB5	IRC83104	Tatung	TFR100G	IRC83108
Grundig	GDT1000	IRC83081	Techwood	TWDFV1	IRC83079
Grundig	GDT1500	IRC83081	Thomson	DHD4000	IRC83086
Grundig	GDT2000	IRC83077	Thomson	DTI1000	IRC83080
Hitachi	HDB60	IRC83079	Thomson	DTI1002	IRC83080
Labgear	DTT100	IRC83082	Thomson	DTI2300	IRC83086
Matsui	DTAR10	IRC83104	Thomson	DTI2305	IRC83086
Matsui	DTR 1	IRC83079	Thomson	DTI550	IRC83080
Matsui	DTR 2	IRC83079	Triax	DVB2000T	IRC83082

And, if you're after the latest Panasonic or Philips replacement remotes... We've got these as well!

Our already comprehensive range has grown still further and now covers even more of the latest models including IDTV, LCD, Plasma and TV/DVD combies. Visit www.classic-serviceparts.com and click on the 'NEWS' link to see the recent additions to the range.

All products listed are available from your usual Classic distributor. For more information on the complete Classic range visit www.classic-serviceparts.com, phone us on 01635 278678 or email us at uksales@classic-serviceparts.com

classic

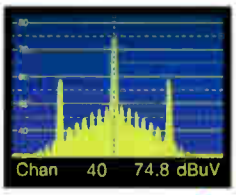
Technical helpline 01635 278678

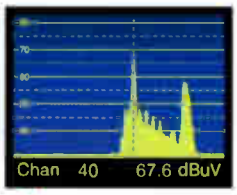
TELEVISION TEST PATTERN GENERATORS

The new GV 998 is a digital pattern generator offering more advanced features at again a realistic price. Those features include :

- MPEG-2 format Transport Stream generation
- Video and audio included in the TS
- Video and audio inputs
- Generation of a variable frequency sound carrier for decoding verification
- Multistandard and multisystem analogue TV signal generation
- Possibility to edit different fields of the TS database to present the name of the service provider
- Remote control via a personal computer
- Moving video patterns to check MPEG-2 decoders

PROMAX





IDEAL FOR PLASMA DISPLAYS

IDEAL FOR WIDE SCREEN

PROMAX GV SERIES

- Choice of 12 instruments
- NICAM and Teletext
- 4:3 and 16:9 Formats
- Full field and VITS
- Computer Controlled
- Front panel memories
- Own Company Logo
- Computer Monitor testers
- Hand Held Models
- Multi Standard, PAL, NTSC, SECAM
- High Quality Construction
- Attractive Price Levels
- Full After Sales Service
- Available from Stock

FOR TELEVISION PATTERN GENERATORS, THERE'S NO WIDER CHOICE THAN WITH PROMAX

PROMAX

SELECTED ITEMS FROM THE PROMAX RANGE OF TEST EQUIPMENT

MS 250

Analogue and Digital Satellite Detector.

PRODIG 1+

Satellite Dish Installer's Meter
Does more than just BSkyB

PRODIG 2

Analogue & Digital Aerial Meter
Measures digital channel power and C/N

MC 577

Analogue & Digital, Satellite & Terrestrial
Measures channel power and C/N

PROLINK 3 + 4 *PREMIUM*

Satellite & Terrestrial, Analogue & Digital,
Spectrum Analyser with BER (optional on P3)

PROMAX

AA 930
AUDIO ANALYSER

TA 903B
CRT
REJUVENATOR

Alban

ALBAN ELECTRONICS LIMITED

THE PROMAX SERVICE CENTRE

6 Caxton Centre, Porters Wood,
St. Albans, Hertfordshire, AL3 6XT.

TEL: 01727 832266 FAX: 01727 810546

WEB : www.albanelectronics.co.uk
EMAIL : info@albanelectronics.co.uk

SALES + SERVICE + CALIBRATION