

Tips, guides and reports for people repairing televisions and electronic equipment

# TELEVISION

**AND HOME ELECTRONICS REPAIR**

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## CES Las Vegas report



### Replacing the Painter chip

### Vintage radio repairs

### Wireless broadband links



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# CONTENTS

April 2004

Vol. 54, No. 6

## 323 Comment

TV – the low-down.

## 324 Teletopics

Digital TV system for mobile phones. Analogue TV switch-off proposal. Pioneer joins Euro HDTV project. BoxClever to be sold off. Top-Up TV. Blue laser breakthrough.

## 326 CES Las Vegas 2004

Manufacturers worldwide use the annual International Consumer Electronics Show to announce or launch major new products and developments. George Cole reports on the highlights of the show.



## 331 Workshop equipment guide

Eugene Trundle takes a look at what's good and what's new in the world of test gear and aids for bench and field servicing. This second part concentrates on some of the more recent technology we have to deal with, some ways of cost saving, aids and tools.

## 345 Service casebook

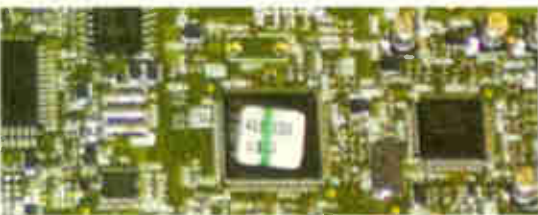
Michael Maurice on problems he's encountered in the field and the workshop.

## 346 Introduction to computer networking

In this concluding instalment of his latest series Fawzi Ibrahim describes the Domain Numbering Service.

## 348 Replacing the Painter chip

Philips refers to the main microcontroller IC in the A10E chassis as the Painter. It's a small, surface-mounted 100-pin device that can be the cause of many symptoms. Particular care is required when replacing it. Martin Cole explains how to carry out the repair.



## 350 Vintage repairs

Pete Roberts describes a couple of 'no-reception' faults with vintage radio equipment, a Radford FM tuner and a Motorola car radio.

## 352 Wireless broadband links

Steve Beeching on the advantages of having a wireless broadband link for internet connection.

## 354 DX and Satellite Reception

Terrestrial DX and satellite TV reception reports. Broadcast and satellite TV news. A channel-pass filter for Band I. Roger Bunney reports.

## 357 Monitors

Guidance on repairing monitors and related equipment.

## 358 Audio faults

## 359 Test Case 496

## 360 Extended fault reports

Reports on tricky or complex TV fault conditions that are too long for inclusion in our regular fault-finding section.

## 362 TV fault finding

## 365 VCR clinic

## 366 DVD faults

## 368 Letters

Picture and sound quality and an aerial mystery. Burn ups. The Philips L01 chassis.

## 369 Help wanted

## 370 Web service

Useful websites for TV professionals, technicians and enthusiasts.

## 372 Books to buy

The Television book service, with details of some of the titles you can order.

## 374 What a life!

I had the shop to myself for a while. Some faulty TVs and a dead VCR. Then a visit from the shop steward. Donald Bullock's servicing commentary.

## 376 Satellite notebook

Audio narrative setting. Digital channel update. Recording MPEG-2 signals on a DVD. Ku-band signals from Express 3A at 11°W. Digibox fault reports.

## 379 Next month in Television

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# TV – the low-down

**T**V has been a part of most people's daily lives for several generations. It's remarkable the strides that this medium has taken in a relatively short time span, from crude beginnings to its current predominance – to the extent that it now provides front-page stories day after day in the popular press. At the end of the nineteenth century TV was already being written about by some visionaries. The telephone and the telegraph had been invented, also the cathode-ray tube (though in a very simple form), so signals could be transmitted and there was the possibility of remote picture displays. Radio transmission was to follow shortly.

It seems that as early as 1907 Boris Rosing was able to demonstrate TV as a practical system at the St. Petersburg Technical Institute, using a CRT as the display device. In 1908 A.A. Cambell Swinton proposed a system that used electronic means both to produce the video signal and display it. Not much happened till the mid Twenties, when Baird became active in the UK and researchers in the US were developing practical electronic cameras. By the early Thirties there had been several major advances, including in particular RCA's demonstration of a fully-electronic TV system in 1933, with the transmitter atop the Empire State building. But the Depression has taken hold worldwide, making further advances difficult. Despite this the BBC started its TV service, the first in the world with regular scheduled transmissions, in 1936. In the pre-war period however transmissions were severely limited, and the number of sets that were sold in the UK was only some 10-20,000. It was hardly a mass medium. The US was not to get regular TV services until 1941.

World War II saw major strides in the development of electronics, though not for TV purposes of course. But radar has many similarities, and the work on this helped the development of TV in the immediate post-war era. Since then there has been one development after another, leading to the present situation where high-quality sets are available to all at knock-down prices and you can get your signals, with a wide variety of channels, off-air, via cable or from satellites. Or, for that matter, from tapes and discs. It's the predominant medium that affects everyone's life. But – there always has to be one, doesn't there – what is TV doing for human happiness? Is it a benign or malign influence? It can of course be either, depending on choice of material watched and who is doing the watching. There are overall effects however.

Happiness is not an easy thing to

## What is TV doing for human happiness? Is it a benign or a malign influence?

assess, especially on a mass scale. Nevertheless a certain amount of research has been done. The outcome seems to be that we are no happier now than we were a generation ago despite all the advances that have made life easier, in the developed countries at any rate. In fact it seems that in the US people are slightly less happy than they were in the Fifties. The situation appears to be much the same in the UK.

Various factors can be measured to determine general welfare: for example crime, the number of broken families, and any increase in depression, alcoholism and the use of drugs. These negative factors have become increasingly strong in recent years. What could be the cause? There are probably many, but Professor Richard Layard of the London School of Economics has done some very interesting work that points to TV as being a major negative influence. His conclusions are to be published later this year in a book. It's likely to create quite a stir.

The professor (he is now Lord Layard)

points out that watching TV alters the happiness of society in two ways: it makes people more violent, and it makes them less satisfied with what they have. There has been much investigation into the effect of TV on violence: how, for example, children become more aggressive the more time they spend watching TV. But there seems to have been no such effect back in the Fifties. Why? Because in those days TV mirrored the level of violence in society, whereas today it grossly inflates violence. It also shows much bad behaviour that people come to accept as normal. Then there is the wealth factor – TV presents a world that exaggerates wealth and thus feeds dissatisfaction. In all, TV can cause general unhappiness.

It's difficult, in fact virtually impossible, to see what could be done about the malign influence of TV. We can't ban TV. Even totalitarian regimes can't suppress it in this age of satellite signals (though you may have to hide the dish!). Censorship would hardly be acceptable in today's developed societies. It seems that guidance, to programme makers on what is acceptable, and to viewers on what to watch and how much, is the best that can be done. But it's hard to believe that this will achieve much. There is nevertheless a huge responsibility on all who run this predominant medium.

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# TELETOPICS

## Digital TV system for mobile phones

A European trial involving Nokia, Philips, Vodafone and Universal Studios of Germany is being run in Berlin to test the feasibility of broadcasting digital terrestrial TV channels to mobile phone handsets. The trial is part of a project called Broadcast Mobile Convergence (BMCO). It uses a new transmission standard known as DVB-H (Digital Video Broadcasting – Handsets). This is based on the DVB-T standard used for conventional DTT services, like Freeview in the UK, the main difference being the transmission of far less data. The chipsets used for reception require about a tenth of the power of those

in STBs and IDTV sets.

DVB-H uses a system called time-slicing: the digital receiver is turned on only when it is receiving a digital signal and is turned off when there is no signal, thus greatly reducing power consumption and extending battery life. To increase efficiency, encoding systems such as MPEG-4 are employed instead of the MPEG-2 system used for conventional DTT broadcasting. DVB-H channels can be transmitted alongside DVB-T services.

The trial, run by the BMCO project, is to run from April 2004 to next September. It involves about fifty people who will use

modified Nokia 7700 media handsets to receive the DVB-H transmissions. There are plans to run a large-scale trial involving about 1,000 people next year. If the trials are successful, the first DVB-H services could start in 2006.

Samsung launched a mobile phone with a built-in analogue tuner in Korea in June 2003. A month later NEC announced the first working prototype of a mobile phone that can receive DTT transmissions. NEC hopes to launch commercial products in Japan in 2005. Sanyo has also demonstrated a prototype mobile phone with digital TV reception capability.

## Pioneer joins Euro HDTV project

Pioneer has joined the Euro1080 Project, which started transmitting Europe's first HDTV service in January, via Astra at 19.2°E. Resolution of the HDTV transmissions is 1,920 x 1,080 lines, using a 50Hz interlaced format. The service consists of two channels, a Main Channel of live and recorded programmes that are broadcast on a carousel basis daily, and an Event Channel of items such as football matches and concerts. The footprint of the Main Channel covers over thirty European countries, extending from Norway to Greece.

Pioneer markets a range of PureVision HDTV-ready plasma TV sets that feature the company's Pure Drive technology. This provides advanced video signal processing and thus improved display quality whatever the source, including PC signals and compressed formats.

Pioneer has signed a memorandum of understanding to buy NEC's plasma screen business for some £205m. The deal will increase Pioneer's share of the world plasma display market to about 22 per cent. NEC will continue to market NEC-branded plasma displays supplied by Pioneer on an OEM basis. Pioneer expects the deal to enable it to increase production fairly quickly and also broaden its range.

## Labgear bought by Philex

Labgear Ltd., a well-known manufacturer of aerials and receiving equipment such as amplifiers and filters, has been bought by accessories specialist Philex PLC. Labgear has been designing and producing equipment at its Cambridgeshire location for over sixty years. Philex, which was established in 1982, has announced that it intends to develop Labgear's terrestrial and satellite aerial and signal distribution range.

## Analogue TV switch-off proposal

The Digital Television Group and broadcasters including the BBC, NTL and ITV have proposed a staggered analogue TV switch-off starting in 2007. The government had announced a switch off at some time during the period 2005-2010, as soon as 95 per cent of homes can receive digital transmissions. But the DTG and others consider that greater pressure would be put on the public to convert to DTT by means of a phased switch-off: BBC2 analogue transmissions would be switched off first, followed by BBC1 and Channel 4, leaving only digital transmissions.

The DTG estimates that it would take about five years to complete the analogue switch-off throughout the UK.

## Joint ODD venture

Toshiba and Samsung have announced a new joint venture, known as Toshiba Samsung Storage Technology Corporation, for optical disc drives (ODDs). Operation starts on April 1. The company will integrate business planning and ODD development, procurement and marketing, including CD-ROM and DVD-ROM drives. The headquarters will be in Japan, with a wholly-owned subsidiary in Korea. To start with there will be some 700 employees.

## BoxClever to be sold off

BoxClever is expected to be sold off to an investment company for some £350m. It was put into receivership late last year by its bankers, and had already made plans to close all its stores. The aim was to create a sustainable business then come out of receivership. This would involve improving the cash balance and reducing the customer termination rate. Endeava, which provides service backup (logistics, call-centre operation and servicing facilities), would remain part of the operation.

BoxClever was established in 2000 from the merger of the Radio Rentals and Granada rental businesses. At the time it had nearly 900 stores with a turnover of some £700m. By November 2001 the number of stores had fallen to 416, with increased use of call-centre facilities to deal with its 2.4m customers. The capacity of the call-centre facility at Bedford was being increased. By last November the number of stores had fallen to 180, with about 1.5m customers, a turnover for the year of £350m and a profit of £160m. There have been further store closures since then. It seems that the company is unable to service the loans its bankers have provided, including £748m from WestLB, a state-owned German bank.

The business is being continued on a call-centre (phone and internet) only basis. There are also plans to consolidate all head office and call-centre operations at Bedford.

## Digital TV report from Ofcom

The Office of Communications (Ofcom) has issued its first report on the digital TV market. This replaces the ITC Multi-channel TV report and covers the last quarter of 2003. It reveals that by the end of 2003 digital TV penetration was estimated to have reached 50.2 per cent of UK households, an increase from 48 per cent at the end of the previous quarter. Sky's subscribers in the UK and Ireland rose to some 7,208,000 by the end of the year, while the number of Freeview households is estimated to have grown to about 2,996,700. In addition the latest estimates suggest that about 211,000 households use free-to-air digital satellite reception: this figure has fallen following the BBC's

decision to end encryption and the withdrawal of the solus card scheme. More than 3.2m households now receive free-to-air digital signals.

The total number of cable TV subscribers is estimated to have remained stable at about 3.2m, of which some 2.3m receive digital services with more switching over.

An adjustment has been made to take into account the number of households that receive digital TV in more than one way. Ofcom estimates that during the last quarter of 2003 15 per cent of Freeview adaptors were bought by those who already had digital TV reception facilities of one sort or another.

## DAB news



Some 300,000 DAB radio sets were sold in the UK last year, an increase of 222 per cent. Dixons and Comet are both now selling more DAB than analogue radios. Bush and Philips have recently launched pocket DAB radio models. The Bush PSDAB2003 is expected to sell for about £99 and has the aerial concealed in its headphones. The Philips Model DA1000 (see accompanying photograph) weighs just 100g and also has FM band coverage. A signal-strength indicator is included for manual tuning, and up to twenty DAB and FM stations can be pre-set. The DA1000 has mains/battery operation: the two rechargeable AA batteries provide ten hours of operation after a charge.

## JVC launches wood-cone speaker



JVC's new micro component DVD audio/video system, Model EX-A1, features a loudspeaker system that uses a wooden cone (see accompanying photograph). The cone has long been a limiting factor in moving-coil loudspeaker design. The aims are stiffness with surround flexibility. In this respect wood is ideal, but has been difficult to use. JVC has solved the problem by using birch that's soaked in Japanese rice wine to enable it to be shaped and moulded without cracking.

## Manufacturing job losses

The manufacture of consumer electrical and electronic goods in the UK seems to be in steady decline. Samsung is to close its plant at Wynyard, Teeside with the loss of over 400 jobs. The plant was opened in 1995 and has been producing flat-screen monitors and microwave ovens. The company says that low international prices have made production in the UK uneconomic.

A similar problem has led Matsushita to review the future of the Panasonic plant at Pentwyn near Cardiff, where top-of-the-range TV sets, STBs and other products are assembled. It's likely that operations will be greatly reduced by the end of the year, with some 600 job losses. The plant was opened in 1997 and currently employs 1,700 people. Some operations, including R and D and laptop PC production, will continue. Others are likely to be transferred to Matsushita's plant at Pilzen in the Czech Republic.

## Blue laser breakthrough

There has been much reporting on the rival Blu-ray and HD DVD optical disc formats that could supersede the standard DVD system. They are based on the use of a blue- instead of a red-light laser. There is one big snag at present however: no one has discovered how to make blue lasers cheaply – at present sample blue lasers cost over £500 each.

Twenty or more companies around the world have been trying to use the molecular beam epitaxy (MBE) process used for CD and DVD lasers to produce blue lasers, so far without success. Current blue lasers are made using the much slower and more

expensive metal organic chemical vapour deposition process. Researchers working at Sharp's advanced optoelectronics laboratory at Oxford however claim to have achieved a breakthrough in adapting MBE technology for blue laser production. The process involves the evaporation of pure metals on to sapphire in a vacuum at rigidly controlled temperatures, with a whiff of ammonia as a catalyst. Obviously they are not saying more! Sharp is now making every effort to get the process to work on a mass-production scale.

Sharp set up the laboratory at Oxford ten years ago.

## Top-Up TV

Top-Up TV, the newly-announced pay-TV service designed for digital terrestrial TV, is in dispute with the BBC over the position of its channels in the Freeview electronic programme guide (EPG). The service aims to offer DTT viewers an extra ten channels for a monthly subscription of £7.99. These channels will be UK Gold, Turner Classic Movies (TCM), E4, Boomerang, Cartoon Network, Bloomberg, UK Style, Discovery Channel, Discovery Home and Leisure UK Food.

The service plans to use ex-ITV/ONDigital STBs, as these have a smart-card reader – Top-Up TV estimates that about 400,000 of them are still in circulation. It needs some 250,000 subscribers to break even.

The dispute with the BBC has been referred to the regulator Ofcom. It revolves around Top-Up TV's wish to have its programmes listed alongside the Freeview channels by genre. The BBC however believes that a mixture of free-to-view and pay-TV channels could confuse viewers and would prefer to list the Top-Up TV channels at the bottom of the EPG, next to the digital radio channels.





**Manufacturers worldwide use the annual Consumer Electronics Show to announce or launch major new products and developments. This year was noteworthy for increased participation by the IT industry. George Cole reports on the highlights of the show.**

**T**he International Consumer Electronics Show (CES) takes place each January in Las Vegas. This year's event attracted the major consumer electronics companies and computer giants such as Microsoft, Intel, Hewlett-Packard and Dell. Companies use CES to announce or launch major new products and developments: this year's event was no exception. It attracted some 129,000 visitors, and there were 2,400 or so exhibitors.

#### **TV developments**

No surprises that there were many TV developments on show, including combination TV sets with a built-in DVD recorder. Panasonic was showing combination TV sets with a built-in DVD recorder. Models PV-27DR84 and PV-DR2714 combine flat-screen TVs with a DVD-RAM/R recorder. The sets use Panasonic's PureFlat CRT technology, with 27in. screens, and include a front AV input socket plus audio output and optical



*Samsung's 80in. plasma TV with 1,920 x 1,080 resolution, capable of displaying high-definition images.*



digital output sockets at the rear. The TV/DVD recorders will also play CD-R/RW, MP3 and WMA discs. Model PV-DR2714 also incorporates a VCR that includes hi-fi audio, VCR Plus and Auto Clock Set, and in addition has a built-in FM radio, an alarm clock with a timer function and Tower Remote Control.

The Philips LCD range includes 17 and 26in. models that use a flash-memory card to enable users to store and play back video, music and images.

At every electronics show the Korean companies Samsung and LG seem to battle it out to show the largest flat-panel displays. This year Samsung had an 80in. plasma TV with 1,920 x 1,080 resolution, capable of displaying high-definition images. The company also showed a prototype 52in. LCD TV set with a contrast ratio of 1,000:1. LG showed a 60in. widescreen plasma integrated HDTV, Model DU-60PY10, which has connections for a PC as well as high-definition component, DVI (Digital Video Interface) and standard AV inputs. The 50in. Model DU-50PZ60 includes picture-in-picture and picture-outside-picture display modes. LG's LCD TV range includes 42, 30, 23 and 17in. models. The 23in. widescreen model RU-23LZ has WXGA resolution (1,280 x 768 pixels) with a contrast ratio of 400:1, built-in stereo speakers and an NTSC tuner. The 17in. model has the same display specification, a built-in DVD player and a PC connection.

LG also showed a 60in. LCD rear-projection HDTV, Model TU-60SZ31, which has a built-in hard disk able to store up to thirteen hours of HDTV material. It has WXGA resolution and an integrated ATSC/digital tuner. Model DU-52SZ60D uses DLP (a digital light processing chip) to produce a 52in. rear-projection display with WXGA resolution and is cable ready. There were also 48 and 42in. rear-projection models, the latter with 3:2 pull-down cinema correction.

Panasonic showed no fewer than six new rear-projection HDTV sets with either 53 or 47in. displays. They all feature Panasonic's P3 (Precision Picture Processing) technology, which includes auto-convergence, a 540p progressive-scan doubler, a new motion-adaptive 3D digital comb filter, an HDMI (High Definition and Multimedia Interface) input with HDCP (High-bandwidth Digital Content Protection), new digital noise reduction and new sharpness and contrast circuits. Model PT-53TW54 has two tuners to provide a picture-in-picture split screen with a freeze mode and 3:2 pull-down. There are four AV inputs, one at the front, three S-video inputs, one in front, and the set provides 60W total audio output via a six-speaker system. There's also a 3D menu system.

Panasonic's new Viera flat-panel range consists of ten high- and enhanced-definition models with screen sizes from 14 to

50in. There are five plasma and five LCD models. The high-definition plasma models have 50, 42 and 37in. screens with a 3,000:1 contrast ratio. They are equipped with an ATSC tuner, an SD memory-card slot and an HDMI input, and can provide picture-in-picture displays. In addition the 50 and 42in. models have a PCMCIA slot. The two enhanced-definition plasma models, with 37 and 42in. screens, have an ATSC tuner, 4,000:1 contrast ratio, an HDMI input, 3:2 pull-down, two-tuner picture-in-picture capability and an SD memory-card slot. There are three LCD models with 14, 17 and 20in. 4:3 screens plus two models with 26 and 32in. widescreen HD (WXGA) displays. All models include a three-line digital comb filter. The HD models include an HDMI input and PCMCIA and SD memory-card slots.

Philips was showcasing its Ambilight technology, which has been developed in conjunction with Philips' research and lighting divisions. It is based on the light that's reflected from the back of the set on to the wall. Sensors determine how much light there is in the room and control the TV output accordingly: in a dark room there will be reduced light output while in a bright room the light output will increase. The Matchline 32, 37 and 42in. LCD FlatTV models and 42 and 50in. plasma FlatTV models incorporate this technology. They are high-definition TV-monitors that feature Philips' PixelPlus 2 technology with Digital Natural Motion and Flat NXT speakers. According to Philips PixelPlus 2 improves the colour reproduction and increases resolution and picture depth by up to thirty per cent. It works with any input signal, including terrestrial, cable and satellite broadcast signals, interlaced- and progressive-scan DVD inputs, DVB/MHP digital TV signals and HD transmissions.

### CE/IT convergence

The move from analogue to digital technology in the consumer electronics field has resulted in growing convergence between the IT/computer and CE industries. Little wonder then that IT companies had lots to show at this year's CES. Microsoft already has its software in most PCs, and sees the home PC as an increasingly serious challenger to the domestic TV set. Last year Microsoft launched Windows XP Media Center, a super-set of its Windows XP operating system designed for reproducing music, images and video with a home PC. A Media Center PC can be operated with a remote-control handset as well as a mouse and keyboard. This year Microsoft chairman Bill Gates announced Media Center Extender Technology, which will enable content stored on a PC – such as video, images and music – to be seen and heard almost anywhere in the home regardless of where the PC is located. Microsoft expects its Media Center

Extender Technology to be built into various products including TV sets, games consoles and set-top boxes.

Microsoft and Matsushita/Panasonic also used CES to announce that a raft of companies support their HighMAT (High-performance Media Access Technology) standard. This is designed to improve interoperability for video, digital images and music between PCs and consumer devices that use storage systems such as CDs and DVDs. Panasonic plans to launch DVD players, DVD recorders, DVD Home Theatre systems and CD players that support the new standard.

Hewlett-Packard, Dell and Gateway showed flat-screen and high-definition TV sets, digital music players and cameras last year. A year after it launched a 42in. plasma TV set, Gateway has become one of the leading flat-screen brands in the US. Hewlett-Packard showed a 42in. plasma TV set and a 30in. LCD model, also a home-cinema projector. The TV sets are to be launched in the US this June. HP plans to introduce what it calls a Home Entertainment Hub, which serves as a central-storage server and access point for video, music and images. Dell had 23 and 30in. LCD sets on display. Both models include component video connections and are HDTV compatible.

'Intel Inside' usually refers to a micro-processor chip used in a PC. The semiconductor giant has now announced plans to produce chips that will provide flat-panel TV displays. It says that its technology will enable high-definition, large-screen TV sets, with clearer pictures than current systems, to be sold for less than the US equivalent of £1,600. The new rear-projection display system, code-named Cayley, is based on LCOS (Liquid Crystal on Silicon) technology. LCOS works by sandwiching a liquid-crystal layer between a glass cover and a highly-reflective, pixel-patterned mirror-like surface which sits on top of a silicon chip that provides digital modulation. Three such chips are required to modulate and reflect pure RGB light beams. Intel claims that its Cayley technology creates an extremely bright display. It plans to start delivering Cayley-based LCOS microdisplay devices during the second half of the year. A number of firms, including Chinese manufactures InFocus, TCL and Skyworth, and Primax PDC in Taiwan, are developing products based on prototype microdisplay devices from Intel.

One of the big differences between a TV set and a PC is that the latter takes some time to boot up, as drivers and files are loaded into the working memory from the hard disk. But InterVideo, a US company, has developed a software system that will turn on in an instant. The InstantON system uses a cut-down version of Linux called LinDVD, which is stored in a memory chip. Within ten seconds of switching on a PC the software is loaded and users

**The Philips Model HDRW770 is a combined hard-disk (80GB) and DVD+RW recorder that includes 5.1-channel Dolby Digital audio and a TV Guide Plus EPG.**



can access DVDs, TV programmes, MP3 files, photo images and more. LinDVD can also be used for web surfing, email, chat and video conferencing. If InstantON PC users want to access Windows applications such as Word or Excel however they have to use a remote-control handset to switch off LinDVD and reboot in the Windows mode. Sharp plans to launch a portable PC that uses InstantOn technology.

Instantec Philco's NetVision is an internet TV that includes the Windows XP operating system and Windows Media Player. Digital Fidelity showed a hard-disk based hi-fi system that uses Windows XP. The Fujitsu-Siemens Activity 300 set-top box also uses Windows XP.

Apple Computer had a success with the introduction of its iPod mini audio player, which has a 4GB hard drive capable of storing up to 1,000 music tracks. Apple has licensed its iPod technology to Hewlett-Packard, which will be selling players and will also install iTunes music software in its PCs. Apple uses AAC (Advanced Audio Coding) for audio compression.

### Blue-laser optical discs

The rival Blu-ray and HD DVD camps were out in force at CES. Blu-ray is a high-definition, blue-laser optical disc format that's backed by most major consumer electronics companies including Sony, Philips, JVC, Panasonic, Pioneer and Sharp. Discs have been developed with a capacity of up to 27GB. PC companies Dell and Hewlett-Packard are now supporting the format, while film company Columbia Tristar plans to launch pre-recorded Blu-ray discs in 2005/6. It believes that DVD sales will peak in 2005, after which the film and video industries will need a new format to maintain revenues.

The specification for the Blu-ray disc, called BD-ROM (Blu-ray Disc Read Only Memory), has been agreed. The specification for a write-only disc called BD-R is expected to be agreed this summer.

A Blu-ray rewritable disc (BD-RE) will come later. LG was one of a number of companies that showed Blu-ray hardware at CES: Model LGX8D420 combines a Blu-ray recorder with a hard-disk recorder – it's expected to go on sale in the US this autumn.

But Blu-ray is not an official format

approved by the DVD Forum which, instead, has given its approval to the HD DVD format developed by Toshiba and NEC. The two companies showed a prototype player that can play high-definition DVD discs and also standard DVD discs. The player has a single-lens optical head that integrates red and blue laser diodes, enabling it to read both types of disc. The HD DVD format is currently at version 0.9.

Toshiba maintains that an optical unit of this type provides the functionality, compactness and cost-effectiveness required for consumer HD DVD players, pointing out that it's more economical than a dual-lens head or dual optical heads. Toshiba has also developed an LSI chipset for HD DVD players. It consists of a servo controller, a data signal processor and an ATAPI interface (Attachment Packet Interface) – the latter enables a PC to control an optical disc drive.

A 12cm HD DVD disc can store over two hours of high-definition movie content. The dual-layer, single-sided read only version has a storage capacity of 30GB, while a single-layer, single-sided rewritable version has a 20GB capacity. A dual-layer, single-sided rewritable version with a capacity in excess of 32GB is under development.

Toshiba says that the HD DVD format has been designed to provide maximum compatibility with current DVD standards. It uses the same back-to-back bonding of two 0.6mm thick, 12cm diameter substrates. This enables manufacturers of current DVD discs to use existing production equipment for the new discs. Toshiba also adds that the format is PC-friendly, because the discs don't need a cartridge. It's very impressive technology, but many wonder whether the strength of current Blu-ray support means that HD DVD will fail to achieve general acceptance.

### DVD equipment

There was also plenty of standard DVD equipment on show,

including DVD recorders. The Philips Model HDRW770 is a combined hard-disk (80GB) and DVD+RW recorder that includes 5.1-channel Dolby Digital audio and a TV Guide Plus EPG. Sony's DVD recorders cater for both the DVD+RW and DVD-RW formats. The new Sony range includes the entry-level Model RDR-GX300 which features Precision Cinema Progressive. This proprietary technology consists of several elements including a timebase corrector and pre-frame noise reduction and pre-video equaliser systems. Other new features include simultaneous recording and playback in the DVD-RW VR (Video Recording) mode. It is to sell in the US at the equivalent of about £350.

Panasonic's new DVD players all include Windows Media Player compatibility as standard and JPEG playback. They also have progressive-scan output sockets. Model DVD-F86 has a five-disc changer and can play DVD-Audio discs while Model DVD-SA97 also has an HDMI interface (High-Definition Multimedia Interface). The entry-level Model DVD-S27 sells in the US for the equivalent of about £55!

Toshiba's DVD/VCR combi Model SD-V595 also has an HDMI interface – this combines audio and video in a single digital interface for connection to a suitably-equipped TV set or STB. The LG Model LST-341GA has a 120GB hard-disk drive that can store up to 12.5 hours of HDTV programming, 82.5 hours of standard-definition digital programmes or 120 hours of analogue TV programmes.

### Storage media

Toshiba showed an 0.85in. hard-disk drive (HDD) that can store up to 4GB of data. The company has already developed a 1.8in. HDD that's used in devices such as palmtop computers, notebook PCs, hand-held GPS units and digital audio players. Although the new drive will be only a

**Sony had on show what it calls Location Free TV, a portable broadband LCD television system that can be carried and used virtually anywhere in the home.**





quarter the size of the 1.8in. one, it will have an initial storage capacity of 2-4GB. Toshiba expects the new drive to be used in a wide range of devices including mobile phones, digital camcorders and external storage units. It will be launched later this year.

Sony has developed Hi-MD (see Teletopics last month), which has five times (1GB) the storage capacity of a standard MiniDisc. Hi-MD technology enables users to record up to 45 hours of music compressed at 48kilobits/sec on one disc, with a transfer speed of up to a hundred times. Hi-MD Walkman recorders use a new codec (coder-decoder) called ATRAC3 plus, which provides music compression at 132, 105, 66, 64 or 48kilobits/sec. Hi-MD recorders can be connected to a PC via a USB cable for high-speed music transfer. When connected to a PC the Hi-MD recorder acts as an external drive, enabling users to transfer data files such as presentations, digital images and spreadsheets to the disc. Microsoft Word documents, PowerPoint presentations and JPEG images can be stored. The USB connection provides power, so there is no drain on the battery when the recorder is being used as a data-storage device. Hi-MD recorders include Models MZ-NH1, MZ-NH600D, MZ-NH900 and MZ-NH800 which includes a remote AM/FM/TV/Weather Band tuner. The discs are due to go on sale in the US this month (April) at the equivalent of about £5 each.

### Wireless developments

A growing number of homes have wireless data networks that use IEEE 802.11 technology (known as WiFi), and most of these homes have a high-speed broadband internet connection. PC companies are keen to exploit this development with products that enable digital content stored in a PC to be made available around the home. Sony and Philips have been at the forefront of consumer-electronics companies that are also keen to use these technologies in their products.

Sony had on show what it calls Location Free TV, a portable broadband LCD television system that can be carried and used virtually anywhere in the home. It consists of a 12.1in. wireless touch-screen LCD monitor and a base station that incorporates a dual-band wireless connection and high-speed Ethernet port for transmitting data. The system provides access to TV, video, web pages, streamed video, email and digital photos with no need for a PC. Sony says that it can also be used to control most major-brand AV products in the home. Location Free TV is compatible with the IEEE 802.11a/b/g standards (b has a maximum data rate of 11Mbps/sec while the others run at up to 54Mbps/sec). The screen has SVGA resolution (800 x 600) and includes 3D Y/C



**Sony's Hi-MD system has five times (1GB) the storage capacity of a standard MiniDisc.**

separation circuitry for improved picture quality. Viewers can freeze and save a TV scene by using the monitor's capture button.

Wireless connection to the base station gives access to the web via a dedicated internet browser. By using an on-screen keyboard, users can use email, shop online and watch streamed media such as music videos and internet radio. By using built-in memory or Memory Stick cards, the device can display digital images as well as MPEG-1 files. The Location Free TV can be connected to a printer via the base station's USB port. A printer connected in this way can also accept print commands from a PC. The base station houses an NTSC tuner and a 56k modem, and has an Ethernet port and S-Video, USB and IR ports. The LCD monitor weighs less than 3kg and includes Ethernet and USB ports, a Memory Stick slot, a headphone jack, a keyboard port and an AV input for camcorder connection. Location Free TV is to go on sale later this year.

Sony also announced its wireless DVD Dream system, Model DAV-FR10W, which includes Sony's new DIAT (Digital Infrared Audio Transmission) technology. This transfers digital audio signals without compression, and transmits multi-channel digital audio throughout a local area using infrared light as the carrier. It eliminates the need for wires to connect rear speakers. The new system includes a five-disc DVD/CD/SACD changer, and comes with four floor-standing speakers, a centre subwoofer, a six-channel digital amplifier and a tuner unit. It will be available in the US from September, at the equivalent of about £700.

Philips' Streamium Flat TV, Model 23PF99766, uses a WiFi wireless link and a wired Ethernet connection and can display content from a PC or via a broadband internet connection. The 23in. screen has WXGA (1,280 x 768) resolution. It


can display streamed video in the MPEG-1 and MPEG-4 formats, can show JPEG images and play MP3 music files. It will go on sale in Europe this summer – no price details have been released.



Panasonic has adopted an alternative wireless system that operates in conjunction with Power Line Communication (PLC) technology. It provides broadband connectivity to every room in a house via

existing power lines, using adapters about the size of an audiocassette. Each adapter contains a power plug, a LAN connector and an LSI chipset that converts broadband data signals into signals that can travel via a power line. The adapters connect a broadband internet link to the power lines in the house.

Panasonic points out that while existing home networking technologies have their advantages some, like coaxial cable and Ethernet, may require installing new cables. With some wireless LANs it can be difficult to communicate between rooms, and security may be a problem. Panasonic's HD-PLC (high-definition ready high-speed PLC) technology is designed to overcome these problems. It is also resistant to interference from other signals, such as amateur radio. Panasonic has combined OFDM (Orthogonal Frequency Division Multiplexing) with Wavelet compression technology to reduce the noise caused by interference to a fifth of typical levels. Panasonic has also developed a new TDMA (Time Division Multiple Access) specification that provides efficient data transfer. By using TDMA technology, Panasonic says that HD-PLC enables devices connected to the adapters to exchange data, such as high-definition video content, PC files and audio data, at speeds up to 190Mbps/sec. Panasonic expects to launch PLC adapters for consumer and office use by the end of the year.



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# LIBERTY

Dishes, Cams, LNBs, and other satellite related equipment also available.



# WORKSHOP EQUIPMENT GUIDE

Eugene Trundle takes a look at what's good and what's new in the world of test gear and aids for bench and field servicing. Part 2 concentrates on some of the more recent technology we have to deal with, some ways of cost saving, aids and tools, and concludes with a 'contacts list' for the various items that have been mentioned.

2004  
PART 2

Part 1 last month covered most of the basic workshop equipment, such as multimeters, oscilloscopes and component testers, also equipment for recep-

tion testing and setting up, safety testing, and equipment specific to TV and VCR needs. We'll kick off this month with soldering and rework equipment.

## SOLDERING AND REWORK

The increasing use of lead-free solder, the proliferation of surface-mounted assemblies and the ever-shrinking size of components, PCBs and modules has necessitated a rethink of soldering operations in the consumer-electronics workshop. The old soldering gun or heavy-metal, hand-held job no longer cuts the mustard with the processor-based, sub-millimetre spaced assemblies we so often encounter in 2004!

But we still have to deal with power circuitry, where most problems arise, and much can be done with a good temperature-controlled soldering iron. They start from as little as £30, with the new N78AR type from Maplin: it's adjustable



The Leister Hot Jet from Welwyn Tools.

over the range 350-480°F, and a three-pack of assorted bits is available to go with it. Several good temperature-adjustable irons are available at about the £85 mark. The Antex 660-TC for example is presettable from 65-450°C and can take a wide range of bits in the Antex 1100 range.

You generally have to go to about £200 for digital readout of the tip temperature. The Antex 50W SMT Rework kit is an excellent package that includes a range of bits – some shaped, branding-iron style, to suit various IC packages. I've got one, and it works well for me. Weller digitally-controlled irons start at just under £200 with Model WSD81, which has a 50-450°C range, 80W capability and automatic tool recognition. Precision Model WSL comes at about the same price, with a lightweight handpiece, fast thermal recovery and a hot-tip change facility. For heavy soldering work there's Model WSD151, a 150W job. Industry rivals JBC and Pace have similar equipment at similar prices throughout the range. The Pace Model ST45-PS90 at £115 has digital readout and SensaTemp control. X-tronic is a new company in this field, with a range of value-for-money soldering irons, stations and tweezers, all available from CPC.

Soldering irons and tweezers are not enough when you regularly work with high-density, surface-mounted processor circuitry, typically in digiboxes and camcorders. For this you need a rework station that deals with all the pins of a complex chip at once. Several rival systems that use different techniques are available. The X-tronic 626 outfit is relatively inexpensive at £700: it uses hot air, with temperature and airflow controls, and comes with a single general-purpose nozzle –



other nozzles are available at prices from £30 to £130 however. Welwyn's Leister Hot Jet S at £260 also blasts out hot air, from a hand-held blower: this company has a range of products for SMD rework. Generally these workstations are priced at over £1,000. The JBC JT7000, which uses hot air and heat-shielding dishes, is £1,250; the Pace MBT2500 system, which uses iron bits and vacuum extraction, comes at £1,350. These are both well-established systems that have been reviewed in past issues of *Television*.

The ERSA rework station, which uses infra-red heating that can cope with the new BGA (ball-grid array) chips as well as conventional surface-mounted devices, is a relative newcomer. Critical-temperature under-board heating is required for BGA ICs. The ERSA IR500A combines this with surface heating, laser-positioning and vacuum device removal. It's an excellent tool for the professional but is not cheap at £3,950, £4,650 with extras. It received a very favourable review in our October 2003 issue.

You have to be very committed to invest in these sorts of rework stations, and require a repair throughput that will provide a reasonable return on the investment. Not every service GP can justify such expense. But, with care, much can be done using more modest equipment, though some repairs may need to be farmed out – like replacement of the Painter chip in certain Philips TV models. For more on that, see the Help! section later.

## MONITOR AND PCWORK

PC monitors are generally much more than just a TV shorn of its tuner and fitted with a higher-definition tube, as the reports in our Monitors pages make clear. Their service and repair is largely a specialist business, which has to contend with the difficulty of getting service information and spares, also the economic problems of a market awash with good second-hand monitors and in the process of changeover to flat LCD screens.

Test-pattern generators for use with PC monitors are available from Ozan, which supplies the Teletest PC at £170. It's a hand-held, battery-operated type that provides colour bars, greyscale, cross-hatch and other patterns to VGA and SVGA specifications. There's a home-brewed alternative here, in the form of construction kits – see the DIY section later. We've already mentioned the special monitor LOPT tester from HR. This is available from SEME at £73, the order code being EQU488.

Computer servicing involves two areas, software and hardware. In the software field Norton has a new version of SystemWorks at about £50. It has four components: a Go Back system to restore normality after a software crash; AntiVirus, a 'policing' system that works in the background continually to detect and eliminate bugs and worms; Utilities, which has the ability to detect and repair problems within the Windows operating system, including hard-drive problems; and CleanSweep, for backing up and restoring files and removing unwanted clutter downloaded from internet sites.

When problems arise in a PC's power supply there's nothing for it but the meter and an oscilloscope. Readers of *Television*, steeped in this sort of troubleshooting, should be able to cope with faults of this type without too much trouble. Hardware problems elsewhere in a PC can often be dealt with using a software-based diagnostic approach. Ultra-X has a range of tools and utilities under the generic name Quicktech. They are designed to track down faults in any IBM-compatible PC that's fitted with a processor from the 386 to the Pentium IV, and use 'friendly' drop-down menus, working when necessary from a self-booting program. There are four packages in the Ultra-X range, ranging in price from £134 through £280 and £311 to the top kit at £940. The latter includes a diagnostic



*Above: the ERSA IR500A – the ultimate rework station?*

*Left: A PC used as a virtual oscilloscope. This one is by Grundig.*

*Below: A PC interface for 'virtual' measurement.*



card, loopback plugs and other accessories.

Some horrible faults can assail a networked PC's external wiring and links. To deal with these Belkin supplies twisted-pair and coaxial cable testers at £60-£80, while Peak is now making a new type of network cable tester that sells at £100. CPC's product range includes several LAN and Ethernet network testers in hand-held form, ranging from £68 to £308 for the comprehensive Fluke MicroScanner Pro with length measurement and LCD readout.



## SOFTWARE AND PC-BASED DIAGNOSTICS

Problems with other equipment can often be traced, and maybe fixed, using a PC and specialised peripheral equipment. There has been much progress recently in the field of 'virtual' instruments, basically precision A-D converters with software that makes possible the display, mapping, analysis and storage of 'real' quantities like waveforms, voltage and current levels, etc.

The PC Multi Instrument, new from Tecstar, combines the functions of an oscilloscope, a spectrum analyser, RMS voltmeter, transient recorder and waveform generator. These functions can be used individually or in concert with the others. The PC screen display, simulating an oscilloscope screen with quantitative captions, can be expanded to full size for

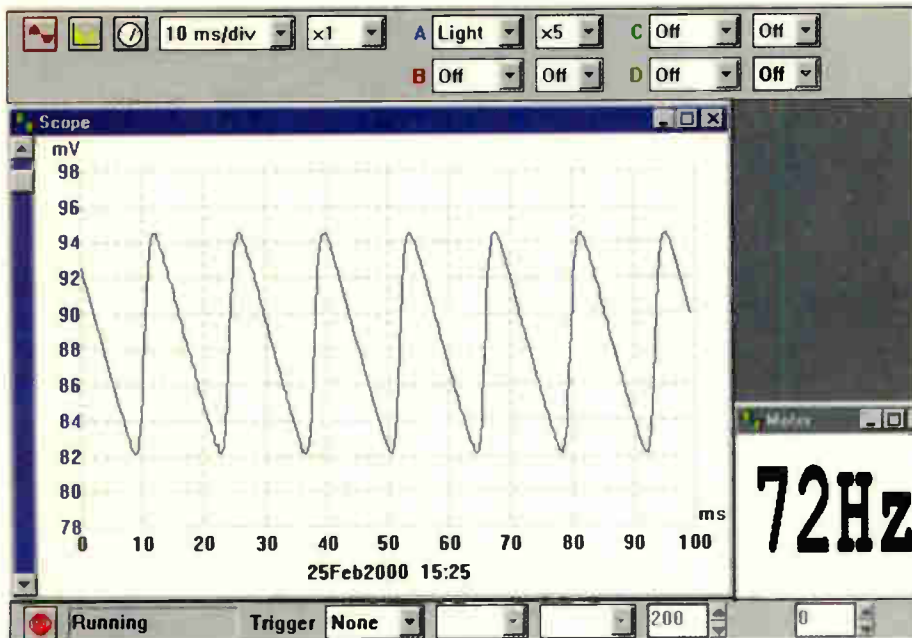
clear readout, and there's a full-colour printout facility. The hardware consists of a USB-linked box which is powered from the PC and has three BNC input sockets: two switched probes are provided. The data-acquisition system has sampling rates of 5, 25 or 50MHz, at £340, £570 and £620 respectively. These primarily govern the bandwidth of the dual-trace oscilloscope function, whose other features are 0.1-80V full height, 256k word memory, comprehensive (including TV) trigger modes, maximum 655ksec/div timebase and 50 times X magnification.

Pico has been in the virtual instrument business for many years and makes a wide range of products, none of which sports knobs, dials or buttons! The simplest, at about £70 and £90 respectively, are









Field-scan waveform displayed on a PC.

The Pico ADC-100 simulates a high-resolution, dual channel oscilloscope plus spectrum analyser and DMM when used with a PC.

Models ADC-40 and ADC-42. They come with operating software on disk and plug into a PC's parallel port.

Model ADC-100, at £215, simulates a high-resolution, dual-channel oscilloscope plus spectrum analyser and multimeter, with 12-bit sampling at 100ksamples/sec. The more sophisticated ADC200/212/216 sell at £290 to £450. At the top of the range there's Model ADC212/100 at £600, with a bandwidth of 50MHz, sampling at 5Gsamples/sec, 12-bit resolution and 1 per cent accuracy: the buffer size is 128k, capturing good signal detail.

Bus-diagnosis and chip-programming software like Sony's Trace system is very useful and time-saving but obviously brand-exclusive. If only there could be a 'universal' system of this type, suitable for all makes and models, with common software and operating protocols! Such a thing would require industry-wide co-operation, perhaps with the backing of Intellect and the IC manufacturers. One day, perhaps...

## DIY KITS

On several occasions in this guide I've mentioned build-it-yourself test equipment as an alternative way of obtaining what you need. Service technicians are certainly well qualified to undertake such projects: the skills, expertise, materials and tools required are all right there to hand! There



was a time when self-assembled test gear was available commercially – many will no doubt remember Heathkit.

Now the field is mainly confined to simple projects from the likes of Velleman: IR remote-control testers, fixed-tone signal generators and so on – more for the hobbyist than the service technician.

But parts kits for pattern generators have recently become available from CRH Electronics Design, and there have been many excellent constructional articles in past issues of *Television*: expertly designed, easy to understand and construct, and cheap at first cost. CRH's greatest triumph, for me anyway, is the brilliant D-GEN TV pattern and test-card generator which I reviewed in the February issue: £75 plus maybe four hours' enjoyable work gives you a full-blown, highly-featured instrument! CRH also provides kits for computer monitor testers, and simpler pattern generators, at £30 and £58 respectively. I'm sure that they are as good as the D-GEN I have here.

Regarding *Television* magazine projects, the best one I've come across is Alan Willcox's capacitor ESR meter design published in the March and April 1999 issues. We've built two of them in the workshop and they see more use, and save us more time and money, than any other gadget we possess. The June 2003 issue included details of a good and effective PAT tester that can be built for about £50. There have been many others over the years, ranging from LOPT and remote-zapper testers to an FM stereo-signal generator. For more details of publication

dates and, if required, reprints, refer to the SoftCopy Ltd. Index and Directory panel on page 379 of this issue.

## SECOND-USER EQUIPMENT

Another possibility for cash-strapped service technicians is used equipment, often discarded by government departments and other public-sector or public-funded organisations or, more sadly, being disposed of by businesses that are being disbanded – there have been several for-sale advertisements relating to this in *Television* over the past couple of years.

I know of three suppliers of surplus test and diagnostic equipment, in many cases little used, at prices way below 'list': you may well have helped to pay for it at initial acquisition, so you should certainly not hesitate to snap it up second-hand!

Anchor Supplies, with premises in Nottingham, has a regularly-changing selection of test equipment and tools. As I write, though the situation may have changed by the time you read this, the company has LCD DMMs at £6.50, ones with a transistor test facility and leads at £10, the Beckman H110 type at £30, and Thandar bench models at £25.

Metrohm PAT testers are going for £60, and Megger 500V insulation testers for £35. Signal generators start at £35, oscilloscopes at £95. Amongst the scopes are the Tektronix modular storage types 7623A and 7623B at £500 and £550 respectively. Switchable x10/x100 100MHz probes are available at £10, and temperature-controllable soldering irons with digital readout at just £38.



A laptop PC doubling as an oscilloscope



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£91.91 + vat = £108.00

Board cameras all with 512x582 pixels 8.5mm 1/3 inch sensor and composite video out. All need to be housed in your own enclosure and have fragile exposed surface mount parts. They all require a power supply of between 10 and 12v DC 150mA.

47MIR size 60x36x27mm with 6 infra red LEDs (gives the same illumination as a small torch but is not visible to the human eye)..... £37.00 + vat = £43.48

30MP size 32x32x14mm spy camera with a fixed focus pin hole lens for hiding behind a very small hole..... £35.00 + vat = £41.13

40MC size 39x38x27mm camera for 'C' mount lens these give a much sharper image than with the smaller lenses..... £32.00 + vat = £37.60

Economy C mount lenses all fixed focus & fixed iris

VSL1220F 12mm F1.6 12x15 degrees viewing angle..... £15.97 + vat = £18.76

VSL4022F 4mm F1.22 63x47 degrees viewing angle..... £17.65 + vat = £20.74

VSL6022F 6mm F1.22 42x32 degrees viewing angle..... £19.05 + vat = £22.38

VSL8020F 8mm F1.22 32x24 degrees viewing angle..... £19.90 + vat = £23.38

Better quality C Mount lenses

VSL1614F 16mm F1.6 30x24 degrees viewing angle..... £26.43 + vat = £31.06

VWL813M 8mm F1.3 with iris 56x42 degrees viewing angle..... £77.45 + vat = £91.00

1206 surface mount resistors E12 values 10 ohm to 1M ohm 100 of 1 value £1.00 + vat

1000 of 1 value £5.00 + vat

866 battery pack originally intended to be used with an orbitel mobile telephone it contains 10 1.6Ah sub C batteries (42x22dia the size usually used in cordless screwdrivers etc.) the pack is new and unused and can be broken open quite easily..... £7.46 + vat = £8.77



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**0845 6441628 (LOCAL RATE)**  
**Email: info@digirepairs.co.uk**

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Stewart of Reading is very fond of oscilloscopes and, at the time of writing, has the Farnell DTV12-14 types, dual-trace with 12MHz bandwidth, at £75 and the Tektronix 2445, a 150MHz, four-channel model, at £425. Another £100 will buy you a Tektronix dual-trace digital storage Model 2232, with a bandwidth of 100MHz. In the bench power supply department the Farnell HPS3010 0-30V, 0-10A type is available at £140, and a 500VA mains-isolating transformer is going for a mere £40. Kenwood wow/flutter meters are for sale at £50, and high-quality Fluke true-RMS 4½-digit DMMs for £95 used or £150 in as-new condition.

For audio technicians – and those tracking down the cause of rattles and resonances in TV cabinets! – there's the Farnell sine/squarewave oscillator covering 10Hz-1MHz at a bargain £75. And so on. But stock keeps changing – a check at the company's website is recommended.

Test Equipment Solutions operates at the high end of the second-user market. Bench power units starting at £85 and Philips 120MHz frequency timer/counter Models PM6670 and PM6673, at £350 and £395 respectively, may be of interest to the repair and service engineer. As with the other test-equipment firms mentioned here, TES has a wide and changing range of products on offer. Contact details are in the accompanying panel.

## SERVICE AIDS AND TOOLS

The test equipment we've looked at so far will, hopefully, get you a diagnosis. The next step is repair and component replacement. For this you need a range of tools, jigs and 'consumables'. Before a large TV set gets as far as the bench however transport is necessary. This can be done safely, often single-handed, with the Liftmate, a two-wheel trolley with fork-lift or suction cups to support the set and a hand-winch to raise and lower it. The Dixon Telelift is similar. See the contacts panel for agents' phone numbers.

The range of service aids available today is so vast that a whole issue of *Television* could be filled with them. So I'll confine myself here to stuff that's new, things associated with the equipment described above, and others that I think you ought to know about! Chemtronics makes micro-tip applicators – plastic sticks with tiny lint-free buds – for cleaning CD and DVD optical-unit lenses and small, closely-spaced contacts in relays and leaf-switches. They cost £16.50 for fifty. Maplin's new PCB cleaner, code N64AN, at £2 for a 200ml can is another good cleansing agent.

Various service aids are required for soldering activities, and I can endorse Steve



*The Dixon Telelift in action.*

Beeching's recommendation of the ChipQuick SMD removal kit (page 454, June 2003 issue), at a cost no less than is justified. I've found that Multicore 99C is a good type of lead-free solder for use on SM PCBs. It comes in 1.22 and 0.79mm diameters on 250 and 500g reels. Even in these small diameters it contains five cores of flux. There's now an ultra-skinny desoldering braid, with 0.65mm width, in the Servisol Solda-Mop range, for removing solder bridges at IC pins. I find that soldering flux spray dispensers are a bit too liberal for me and do best with a little bottle and brush: AID2067 from SEME contains 6ml in runny-liquid form and costs £4.

Still on the subject of surface-mounted components and their manipulation, Pro'sKit makes some excellent tweezers for use on tiny PCBs. There's a stainless-steel set of four (bent, straight, flat and reverse-acting) for £4, and a pair with built-in magnifying glass (on a hinged arm) at about £7. A pair of 80mm tweezers from CPC (code TLO1209) at only £2 also incorporates a magnifying glass, this time a 3.5x one mounted at the back end.

Good illumination with built-in magnification is essential for servicing today's electronic equipment. The price of magnifying bench lamps has come down with the introduction by CPC of a new model, code

LAO1331. It has a 22W circular fluorescent lamp, a spring-balanced articulated arm and a 3x dioptre lens – all for £30. In the higher price range CPC stocks a new range of Luxo illuminated magnifier lamps at prices from £110 to a whopping £332 for Model WAVE ESD, the last word in static-dissipative, specially made for the electronics industry, high-tech lamps with two 7W fluorescent light sources.

Kamasa makes a very good little multi-angle table vice with a ball-swivel head. It's ideal for holding tuners and other small subassemblies, even PCBs, while they are being worked on. It is not expensive at £8, and does as well for me as similar clamps that cost three times as much or more.

CPC has a large, new range of battery-operated drills that are suitable for those who mount dishes or terrestrial aerials on walls and chimney stacks. Drilling into brick and concrete calls for a lot of torque, staying power, as light weight as possible and a hammer action. These drills are not cheap, but there's no point in skimping when you do a lot of this work.

Suitable types are the Bosch 24V GBH24V and GBH24VRE at £349 and £299 respectively and the De Walt DW004K at £350. Prices are of course very much less for those who are prepared to drag a mains cable up the ladder.





## HELP!

An SMD-reflow facility at MCES in Manchester

Difficult jobs are no less likely to come along because you are not prepared for them! The economics of a smaller workshop mean that it's simply not possible to purchase all the expensive tools and jigs that may be required, especially when they are unlikely to see much use.

Although companies such as Test Equipment Solutions rent out their wares at so much a week, this is seldom relevant for the domestic-electronics repair technician. Sony agents are lucky in that they can take advantage of the company's free jig and tool loan scheme to facilitate the repair and alignment of equipment. mainly electro-mechanical, it has made.

That well-known service company MCES of Manchester can help with surface-mounted ICs, for example the troublesome Philips Painter chip. It will fit ICs such as this for a labour charge of £22, which includes return carriage, but responsibility for the diagnosis and selection of the appropriate replacement chip remains, of course, with their customer. *Television* readers will be aware of the presence of surface-mounted and ball-grid array chips in digiboxes: advertisers in *Television* can take care of digibox fault-diagnosis and repair, but the plummeting price of Freeview adaptors is, I fear, threatening the viability of all but the simplest repairs.

## Who's got the golden probe?

My Golden Probe award this year goes jointly to CRH Electronics Design of Stoke-on-Trent for those magical little self-build, value-for-money pattern generators; and to distributor CPC for the sheer volume and variety of test gear, tools and service aids it can supply.

There were no nominations for the booby prize this time. So my bag of duff components and weeping, smelly electrolytic capacitors will stay here for the present.



CRH Electronic Design, 43 Jonathan Road,  
Trentham, Stoke-on-Tent, Staffs ST4 8LP.

Website: [www.videocomer.co.uk](http://www.videocomer.co.uk)

## LOG OFF

*The prices quoted in this guide have been rounded off and do not include VAT or carriage. Prices vary from one supplier/distributor to another.*

*Those I've quoted are typical, taken from catalogues and advertisements.*

# CONTACTS

<b>ABI</b>	Available from CPC	<b>HAMEG INSTRUMENTS LTD</b>	<b>01234 856 345</b>	<b>PRO'SKIT</b>	Available from CPC and Farnell
<b>ALBAN ELECTRONICS LTD</b>	<b>01727 832 266</b>	Also available from CPC, SEME and Willow Vale Electronics		<b>PROMAX</b>	Available from Alban Electronics
<b>ANCHOR SUPPLIES</b>	<b>0115 986 4902</b>			<b>ROBIN</b>	Available from CPC and Maplin
<b>ANTEX</b>	Available from Maplin	<b>HORIZON</b>	<b>020 8281 3777</b>	<b>SEAWARD</b>	Available from CPC, SEME and Willow Vale Electronics
<b>AVO/MEGGER</b>	<b>01304 502 100</b>	<b>HR</b>	Available from SEME	<b>SEME LTD</b>	<b>01664 484 000</b>
<b>BELKIN</b>	Available from CPC	<b>INSTEK</b>	Available from CPC and Maplin	<b>SERVISOL</b>	Available from CPC and SEME
<b>BMR</b>	Available from SEME	<b>JBC</b>	Available from Willow Vale Electronics	<b>STEWART OF READING</b>	<b>01189 268 041</b>
<b>BOSCH</b>	Available from CPC	<b>KASAMA</b>	Available from CPC	<b>SWIRES RESEARCH</b>	<b>01268 417 584</b>
<b>BUROSCH</b>	Available from CPC	<b>KENWOOD</b>	Available from CPC SEME and Vann Draper	<b>TECSTAR</b>	Available from CPC
<b>CALTEK</b>	Available from CPC	<b>LACUNA</b>	Available from Coastal Aerial Supplies	<b>TEKTRONIX</b>	Available from CPC
<b>CELTEK</b>	Available from CPC and SEME	<b>LEDU</b>	Available from CPC and SEME	<b>TELETEST</b>	<b>FRECALL 0500 009 070</b>
<b>CHEMTRONICS</b>	Available from CPC and SEME	<b>LEISTER</b>	Available from CPC and Welwyn	<b>TELEVÉS</b>	<b>01633 875 821</b>
<b>CHIPQUICK</b>	Available from CPC	<b>LEVELMETER</b>	Available from CPC	<b>TENMA</b>	Available from CPC
<b>COASTAL AERIAL SUPPLIES</b>	<b>01903 723 726</b>	<b>LIFTMATE</b>	<b>01778 345 365</b>	<b>TEST EQUIPMENT SOLUTIONS</b>	<b>01753 596 000</b>
Distributor for Sadelta and Perifelec		<b>LUXO</b>	Available from CPC	<b>THANDAR/THURLBY</b>	Available from CPC and Willow Vale Electronics
<b>CPC PLC</b>	<b>08701 202 530</b>	<b>MAPLIN ELECTRONICS</b>	<b>0870 429 6000</b>	<b>ULTRA X</b>	<b>WWW.UXD.COM/</b> Available from CPC
<b>CRH</b>	CRH Electronic Design, 43 Jonathan Road, Trentham, Stoke-on-Tent, Staffs ST4 8LP	<b>MCES</b>	<b>0161 746 8037</b>	<b>VANN DRAPER ELECTRONICS</b>	<b>01283 704 706</b>
Website: <a href="http://www.videocorner.co.uk">www.videocorner.co.uk</a>		<b>MEGGER</b>	Available from CPC and Farnell	<b>VELLEMAN</b>	Available from CPC and Maplin
<b>DE WALT</b>	Available from CPC	<b>METEX</b>	Available from CPC and SEME	<b>WELLER</b>	Available from CPC Farnell and SEME
<b>DIGISAT</b>	Available from Myersat <b>020 8520 7277</b>	<b>MULTICORE</b>	Available from CPC and SEME	<b>WELWYN TOOL COMPANY LTD</b>	<b>01707 331 111</b>
<b>DIXON TELELIFT</b>	<b>08700 114 326</b>	<b>NORTON</b>	Available from CPC	<b>WILLOW VALE ELECTRONICS LTD</b>	<b>0870 600 0271</b>
<b>ELECTRONICS DESIGN SPECIALISTS</b>	Available from CPC	<b>OZAN</b>	<b>FRECALL 0500 009 070</b>	<b>X-TRONIC</b>	Available from CPC
<b>ERSA</b>	Available from Blundell <b>0247 647 3003</b>	<b>PACE</b>	Available from CPC		
<b>FARNELL ELECTRONIC COMPONENTS</b>	<b>0870 1200 200</b>	<b>PEAK</b>	<b>01298 70 012</b>		
<b>FLUKE</b>	Available from Willow Vale Electronics, Farnell	<b>PERIFELEC</b>	Available from Coastal Aerial Supplies		
<b>GRUNDIG</b>	Available from Vann Draper Electronics	<b>PICO TECHNOLOGY LTD</b>	<b>01480 396 395</b>		
			Available from CPC		



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<b>ALBA</b>			<b>GOODMANS..continued</b>			<b>mitsubishi..continued</b>			<b>SAMSUNG</b>		
1452T	PSU	ONWAKIT	F16	PSU	GOODKIT1	CT25A4STX	TDA 8178S	MITSKIT1	CI5944	FRAME	SAMKIT2
1427T	PSU	ONWAKIT	F16	VIDEO	GOODKIT1	CT25A6STX	TDA 8178S	MITSKIT1	CI6844	FRAME	SAMKIT2
1402	PSU	ONWAKIT	<b>GRUNDIG</b>			CT25AV1B	PSU	MITSKIT3	VIK310	PSU	SAMSUNGKIT
1455T	PSU	ONWAKIT	CUC 2050	PSU	MODKIT48	CT25AV1BS	PSU	MITSKIT3	VIK320	PSU	SAMSUNGKIT
1456T	PSU	ONWAKIT	CUC 2051	PSU	MODKIT48	CT25AV1BD	PSU	MITSKIT3	VIK350	PSU	SAMSUNGKIT
1458T	PSU	ONWAKIT	CUC 2058	PSU	MODKIT48	CT25AV1BDS	PSU	MITSKIT3	VI375	PSU	SAMSUNGKIT
1459T	PSU	ONWAKIT	CUC 2059	PSU	MODKIT48	CT28AV1B	PSU	MITSKIT3	VI395	PSU	SAMSUNGKIT
1499Y	STANDBY	MODKIT37	CUC 2080	PSU	MODKIT48	CT28AX1BD	PSU	MITSKIT3	WINNER 1	PSU	SAMSUNGKIT
14SLTX	STANDBY	MODKIT37	CUC 7350	GRUNDIGKIT1		CT28AV1BDS	PSU	MITSKIT3	<b>SHARP</b>		
1799Y	STANDBY	MODKIT37	CUC 7301/3	(BUZ90)	PSU	GRUNDIGKIT2	CT29A51	TDA 8178S	51CS03H	PSU	SHARPKIT1
2002	PSU	ONWAKIT	CUC 7301/3	CUC 7301/3	(MJF18004)	PSU	GRUNDIGKIT3	CT29A4	51CS05H	PSU	SHARPKIT1
2009B	PSU	ONWAKIT	<b>HINARI</b>			HIT14RC	PSU	ONWAKIT	56FW53H	PSU & DOLBY	MODKIT45
2052T	PSU	ONWAKIT	<b>JVC</b>			<b>NEINIKKAI</b>			59CS03H	PSU	SHARPKIT2
2152T	PSU	ONWAKIT	AV29SX1EK	FIELD O/P	JVCKIT1	CE25 CHASSIS	PSU	NIKKAIKIT1	59CS05H	PSU	SHARPKIT2
2099TX	STANDBY	MODKIT37	AV29SX1EN	FIELD O/P	JVCKIT1	C289FTXN	PSU	NIKKAIKIT1	59CS08H	PSU	SHARPKIT2
BTV17	STANDBY	MODKIT37	AV29SX1EN1	FIELD O/P	JVCKIT1	C28F41FXN	PSU	NIKKAIKIT1	59DS03H	PSU	SHARPKIT2
CTV501	PSU	ONWAKIT	AV29SX1PF	FIELD O/P	JVCKIT1	<b>PANASONIC</b>			59FW53H	PSU & EW	MODKIT49
CTV701	PSU	ONWAKIT	AV29TS1E1	FIELD O/P	JVCKIT1	IC561	TDA 8175	PANKIT1	66CS03H	PSU	SHARPKIT2
CTV840	PSU	ONWAKIT	C14E1EK	PSU	ONWAKIT	TX25XD60	VERT OUTPUT	PANKIT2	66CS05H	PSU	SHARPKIT2
CTV841	PSU	ONWAKIT	C14T1EK	PSU	ONWAKIT	TC28XD60	VERT OUTPUT	PANKIT2	66CS08H	PSU	SHARPKIT2
CTV485	PSU	ONWAKIT	C21ET1EK	PSU	ONWAKIT	TX28XD70	VERT OUTPUT	PANKIT2	66FW53H	PSU & DOLBY	MODKIT45
<b>AKAI</b>			CS21M3EK	PSU	ONWAKIT	TX29XD70	VERT OUTPUT	PANKIT2	66FW54H	PSU & DOLBY	MODKIT45
CT1417	PSU	ONWAKIT	<b>MATSUJI</b>			TX-W26D3	VERT OUTPUT	PANKIT2	66FW54H	PSU & EW	MODKIT49
CT2159U	PSU	ONWAKIT	1455	PSU	ONWAKIT	<b>PHILIPS</b>			76FW53H	PSU & DOLBY	MODKIT45
CT2162UNT	PSU	ONWAKIT	1496RT (H3N90)	PSU	MODKIT43	310.10708		PHILKIT3	76FW54H	PSU & EW	MODKIT49
CT2863UNT	PSU	ONWAKIT	1496RT (BUZ90)	PSU	MODKIT44	310.20491		PHILKIT2	76FW53H	PSU & EW	MODKIT45
<b>DECCA/TATUNG</b>			1498	PSU	ONWAKIT	310.20496		PHILKIT10	76FW54H	PSU & EW	MODKIT49
F SERIES	PSU	MODKIT30	2086	PSU	ONWAKIT	310.31994		PHILKIT6	76FW53H	PSU & DOLBY	MODKIT45
TVC563	STANDBY	MODKIT37	2096RT (H3N90)	PSU	MODKIT43	310.32252		PHILKIT5	76FW54H	PSU & EW	MODKIT49
<b>GOLDSTAR</b>			2096RT (BUZ90)	PSU	MODKIT44	310.32253		PHILKIT4	76FW53H	PSU & DOLBY	MODKIT45
CF25A50F	FRAME	MODKIT36	2098	PSU	ONWAKIT	310.32254		PHILKIT9	76FW54H	PSU & EW	MODKIT49
CF25C22C	FRAME	MODKIT35	21V1N (BUZ90)	PSU	GRUNDIGKIT2	310.32255		PHILKIT7	76FW53H	PSU & EW	MODKIT45
CF28A50F	FRAME	MODKIT36	21V1T (MJF18004)	PSU	GRUNDIGKIT3	310.32262		PHILKIT8	76FW54H	PSU & DOLBY	MODKIT45
CF28C22F	FRAME	MODKIT35	TVR180R/208	STANDBY	MODKIT37	310.62264		PHILKIT1	DA-100 CHASSIS	PSU & EW	MODKIT49
CF28C28F	FRAME	MODKIT36	TVR185T	STANDBY	MODKIT39	<b>SONY</b>			SLV715HB	VCR - PSU	MODKIT40
CF29C42F	FRAME	MODKIT35	<b>MITSUBISHI</b>			<b>THOMSON</b>			SLV777UB	VCR - PSU	MODKIT40
<b>GOODMANS</b>			AV1 SERIES	PSU	MITSKIT3	35029400		THOMKIT2	<b>SONY</b>		
147TT	PSU	ONWAKIT	CT1M5B	PSU	MITSKIT3	35065920		THORNKIT1	<b>SONY</b>		
149T	PSU	ONWAKIT	CT21M5BT	PSU	MITSKIT3	FV70	PSU	THORNKIT1	<b>SONY</b>		
1430RA	PSU	ONWAKIT	CT25M5BT	PSU	MITSKIT3	ICC7 CHASSIS	TDA 8178FS	THOMKIT1	<b>SONY</b>		
1430RS	PSU	ONWAKIT	CT21AX1B	PSU	MITSKIT3	ICC8 CHASSIS	TDA 8178FS	THOMKIT1	<b>SONY</b>		
1430RW	PSU	ONWAKIT	CT21A3STX	TDA 8178S	MITSKIT1	ICC9 CHASSIS	FRAME	THOMKIT3	<b>SONY</b>		
1450T	PSU	ONWAKIT	CT21AV1BS	PSU	MITSKIT3	ICC8 CHASSIS	FRAME	THOMKIT3	<b>SONY</b>		
1455TS	PSU	ONWAKIT	CT25A2STX	TDA 8178S	MITSKIT1	ICC9 CHASSIS	EASTWEST	THOMKIT4	<b>SONY</b>		
2019R	PSU	ONWAKIT	CT25A3STX	TDA 8178S	MITSKIT1	ICC17 CHASSIS	PSU	MODKIT141	<b>SONY</b>		
2029T	PSU	ONWAKIT	<b>MITSUBISHI</b>			ISS20 (TV-DVD)	PSU	MODKIT146	<b>SONY</b>		
2029TA	PSU	ONWAKIT	AV1 SERIES	PSU	MITSKIT3	R3000	PSU	THOMKIT2	<b>SONY</b>		
COMPACT 11	PSU	MODKIT47	CT1M5B	PSU	MITSKIT3	R4000	PSU	THOMKIT2	<b>SONY</b>		
F16 CHASSIS	FRAME	GOODKIT1	CT21M5BT	PSU	MITSKIT3	TX92F CHASSIS	EASTWEST	THOMKIT4	<b>SONY</b>		
F16 CHASSIS	LINE	GOODKIT1	CT25M5BT	PSU	MITSKIT3	<b>THOMSON</b>			<b>SONY</b>		
<b>ORDER CODE PRICE</b>			<b>ORDER CODE PRICE</b>			<b>ORDER CODE PRICE</b>			<b>ORDER CODE PRICE</b>		
GOODKIT1	£ 11.00	MODKIT35	£ 9.50	MODKIT46	£ 12.00	PHILKIT2	£ 2.50	SAMKIT2	£ 8.00	<b>SONY</b>	
GRUNDIGKIT1	£ 10.50	MODKIT36	£ 5.00	MODKIT47	£ 15.50	PHILKIT3	£ 4.00	SAMSUNGKIT	£ 16.00	<b>SONY</b>	
GRUNDIGKIT2	£ 10.50	MODKIT37	£ 6.50	MODKIT48	£ 8.00	PHILKIT4	£ 4.25	SHARPKIT1	£ 11.00	<b>SONY</b>	
GRUNDIGKIT3	£ 10.50	MODKIT39	£ 8.50	MODKIT49	£ 13.00	PHILKIT5	£ 5.75	SHARPKIT2	£ 11.00	<b>SONY</b>	
JVCKIT1	£ 11.00	MODKIT40	£ 6.00	NIKKAIKIT1	£ 12.00	PHILKIT6	£ 5.50	SHARPKIT3	£ 9.00	<b>SONY</b>	
MITSKIT1	£ 3.00	MODKIT41	£ 6.00	ONWAKIT	£ 12.00	PHILKIT7	£ 7.60	THOMKIT1	£ 7.00	<b>SONY</b>	
MITSKIT2	£ 15.00	MODKIT43	£ 7.00	PANKIT1	£ 15.00	PHILKIT8	£ 4.25	THOMKIT2	£ 12.00	<b>SONY</b>	
MITSKIT3	£ 6.00	MODKIT44	£ 7.00	PANKIT2	£ 9.00	PHILKIT9	£ 7.50	THOMKIT3	£ 9.00	<b>SONY</b>	
MODKIT30	£ 10.00	MODKIT45	£ 4.00	PHILKIT1	£ 10.00	PHILKIT10	£ 8.50	THOMKIT4	£ 4.00	<b>SONY</b>	

### New Arrival !!

#### Philips L01.1E Chassis PSU Repair Kit

Fits the following models :

28PT4457/05 , 28PW5407/05 , 28PW6006/05

Order Code : MODKIT50

Price : £ 18.00 + vat

### New Arrival !!

#### Vestel 11AK31 Chassis PSU Repair Kit

Fits the following brands :

Bush , Goodman , Hitachi , Toshiba  
Models BD2851S , BD2951S , BD2581S , BD3251S

Order Code : MODKIT51

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

## Digital Satellite Accessories

### Sky™ Digital Remote & TV Link Eye Combination



**Order Code : SKYPACK1**

**Price : £ 16.00 + vat each**

**5 +**

**£ 14.50 + vat each**

**Carriage Charged at £ 5.00 + vat**

### Sky™ Digital Remote Controls



**Order Code : RCSKY**

**Price £ 7.95 + vat**

**5 or more £ 7.45 + vat each**

**10 + £ 6.95 + vat each**

**Carriage Charged at £ 5.00 + vat**

### Sky™ Digital Remote & SLx Link Eye Combination



**Order Code : SKYPACK2**

**Price £ 13.00 + vat each**

**5 + £ 11.50 + vat each**

**Carriage Charged at £ 5.00 + vat**

### SLx Link Eye

Allows control of Sky™ Digibox via the signal feed for second TV



**Order Code**

**27833R**

**£ 5.80 + vat each**

**10 or more**

**£ 4.80 + vat each**

### Sky™ Digital TV Link Eye

**Order Code : TVLINKEYE**

**Price**  
**£ 10.00 + vat**

**5 +**

**£ 7.99 + vat**

**each**



### SLx Amp By Pass Kit

For use with aerial amplifiers and Sky™ Digibox

Allows for operation of Link Eye in conjunction with a distribution amplifier



**Order Code 27829R**

**Price: £ 5.00 + vat**

## Satellite Repair / Mod Kits

### Amstrad DRX100

Tuner Repair Kit

**Order Code**  
**SATKIT35**

**Price**  
**£ 1.40 + vat**

### Amstrad DRX100

PSU Reliability Kit

**Order Code**  
**SATKIT36**

**Price**  
**£ 12.00 + vat**

### Amstrad DRX100

PSU Repair Kit

**Order Code**  
**SATKIT37**

**Price**  
**£ 13.50 + vat**

### Grundig GDS200

Digital Satellite Receiver Repair Kit

Early psu  
MODEL : DSO - 0385 REV C

**Order Code**  
**SATKIT34A**  
**Price : £ 10.00 + vat**

### Grundig GDS200 / GDS300

Digital Satellite Receiver Repair Kit

LATER psu TYPE REV 03  
DSO - 0375 REV A DSO - 0385 REV 5

**Order Code**  
**SATKIT34B**  
**Price : £ 10.00 + vat**

### Digital Satellite Receivers Fan Kit

Suitable for

Amstrad DRX100 , DRX200  
Grundig GDR200 , GDS200  
Pace Digibox

plus many more analogue makes and models

**Order Code : FANKIT1**

**Price : £ 10.00 + vat**

### Panasonic Digital Satellite Receiver Fan Kit

Suitable for Panasonic TU-DSB20/30 , TU-DSB31/35

**Order Code : FANKIT2**

**Price : £ 15.00 + vat**

### Grundig Digital Satellite Receivers Reliability Kit

These kits contain capacitors that are generally of higher specification than those fitted by the manufacturers.

#### GDS200

Early PSU  
DSO0385 Rev C

Kit Contains 9 capacitors

**Code : RELKIT34A**

**Price: £ 4.00 + vat**

#### GDS200 / GDS300

Later PSU  
DSO0375 Rev A  
DSO0385 Rev F

Kit Contains 11 capacitors

**Code : RELKIT34B**

**Price: £ 4.00 + vat**

#### GDS200 / GDS300

Later PSU  
Rev 03

Kit Contains 13 capacitors

**Code : RELKIT34C**

**Price: £ 4.00 + vat**

#### GDS200 / GDS300

Samsung PSU  
PSSH370601B

Kit Contains 12 capacitors

**Code : RELKIT34D Price: £ 4.00 + vat**

#### GDS300

Samsung PSU  
PSSH370603B

Kit Contains 13 capacitors

**Code : RELKIT34E Price: £ 4.00 + vat**



# Grandata Ltd

distributor of electronic components

## 105°C Electrolytic Capacitors

VALUE CODE PRICE PER PACK	VALUE CODE PRICE PER PACK	VALUE CODE PRICE PER PACK	VALUE CODE PRICE PER PACK	VALUE CODE PRICE PER PACK
<b>6.3 Volts</b>				
220uF .CAP163 .£0.70.....10				
470uF .CAP164 .£0.80.....10				
<b>10 Volts</b>				
100uF .CAP118 .£0.45.....10				
220uF .CAP165 .£1.00.....10				
470uF .CAP29 .£1.20.....10				
680uF .CAP166 .£1.20.....10				
1000uF .CAP119 .£1.50.....10				
2200uF .CAP120 .£2.10.....10				
3300uF .CAP167 .£1.60.....5				
<b>16 Volts</b>				
22uF .CAP121 .£0.35.....10				
33uF .CAP122 .£0.35.....10				
47uF .CAP123 .£0.35.....10				
100uF .CAP124 .£0.60.....10				
150uF .CAP168 .£0.65.....5				
220uF .CAP125 .£0.80.....10				
330uF .CAP30 .£1.75.....10				
470uF .CAP31 .£1.75.....10				
680uF .CAP32 .£2.10.....5				
1000uF .CAP33 .£2.10.....10				
1200uF .CAP169 .£1.50.....5				
1500uF .CAP170 .£1.50.....5				
2200uF .CAP34 .£5.25.....10				
3300uF .CAP35 .£5.00.....5				
4700uF .CAP36 .£6.10.....10				
6800uF .CAP171 .£4.50.....5				
<b>25 Volts</b>				
10uF .CAP37 .£0.45.....10				
15uF .CAP172 .£0.45.....10				
22uF .CAP38 .£0.45.....10				
33uF .CAP126 .£0.40.....10				
47uF .CAP39 .£0.48.....5				
68uF .CAP127 .£0.55.....10				
100uF .CAP40 .£0.70.....10				
120uF .CAP128 .£0.85.....10				
150uF .CAP41 .£0.95.....5				
220uF .CAP42 .£1.20.....10				
330uF .CAP43 .£1.40.....5				
470uF .CAP44 .£1.90.....10				
680uF .CAP45 .£3.15.....5				
<b>25 Volts...continued</b>				
1000uF .CAP46 .£3.65.....10				
1500uF .CAP47 .£3.90.....5				
2200uF .CAP48 .£2.00.....2				
3300uF .CAP49 .£2.20.....2				
4700uF .CAP50 .£3.65.....5				
6800uF .CAP51 .£3.90.....2				
<b>36 Volts</b>				
1uF .CAP130 .£0.40.....10				
3.3uF .CAP131 .£0.40.....10				
4.7uF .CAP132 .£0.45.....10				
10uF .CAP52 .£0.50.....10				
22uF .CAP53 .£0.45.....10				
33uF .CAP54 .£0.50.....5				
47uF .CAP55 .£0.85.....10				
68uF .CAP133 .£0.55.....10				
100uF .CAP56 .£0.85.....10				
150uF .CAP57 .£0.95.....5				
220uF .CAP58 .£1.45.....5				
330uF .CAP134 .£1.60.....10				
470uF .CAP135 .£1.75.....10				
680uF .CAP59 .£6.50.....10				
1000uF .CAP60 .£4.35.....10				
1500uF .CAP173 .£4.00.....5				
2200uF .CAP61 .£2.45.....2				
3300uF .CAP62 .£10.00.....5				
4700uF .CAP136 .£3.50.....2				
<b>40 Volts</b>				
2200uF .CAP174 .£1.80.....2				
2200uF .CAP175 .£2.00.....1				
<b>50 Volts</b>				
0.47uF .CAP176 .£0.35.....10				
1uF .CAP137 .£0.35.....10				
2.2uF .CAP138 .£0.35.....10				
3.3uF .CAP139 .£0.35.....10				
4.7uF .CAP140 .£0.35.....10				
6.8uF .CAP177 .£0.45.....10				
10uF .CAP63 .£0.50.....10				
22uF .CAP64 .£0.70.....10				
33uF .CAP141 .£0.85.....10				
47uF .CAP65 .£0.85.....10				
68uF .CAP142 .£0.90.....10				
<b>50 Volts...continued</b>				
100uF .CAP66 .£0.85.....10				
220uF .CAP67 .£1.75.....10				
330uF .CAP68 .£2.45.....10				
470uF .CAP69 .£4.35.....10				
680uF .CAP70 .£4.90.....5				
1000uF .CAP71 .£5.25.....10				
1500uF .CAP143 .£4.50.....5				
2200uF .CAP72 .£3.25.....2				
3300uF .CAP144 .£3.25.....2				
<b>63 Volts</b>				
0.22uF .CAP145 .£0.45.....10				
0.33uF .CAP178 .£0.35.....10				
0.47uF .CAP73 .£0.35.....10				
1uF .CAP74 .£0.35.....10				
1.5uF .CAP179 .£0.35.....10				
2.2uF .CAP75 .£0.35.....10				
3.3uF .CAP76 .£0.50.....10				
4.7uF .CAP77 .£0.35.....10				
6.8uF .CAP180 .£0.50.....10				
10uF .CAP78 .£0.50.....10				
15uF .CAP79 .£0.95.....5				
22uF .CAP80 .£0.75.....10				
33uF .CAP81 .£0.85.....10				
47uF .CAP82 .£0.95.....10				
56uF .CAP181 .£1.10.....10				
68uF .CAP83 .£1.30.....5				
100uF .CAP84 .£1.20.....10				
150uF .CAP85 .£2.80.....5				
220uF .CAP86 .£2.80.....10				
330uF .CAP87 .£4.00.....10				
470uF .CAP88 .£5.25.....10				
680uF .CAP89 .£5.00.....10				
1000uF .CAP90 .£5.40.....5				
2200uF .CAP182 .£2.20.....1				
4700uF .CAP183 .£4.00.....1				
<b>100 Volts</b>				
0.1uF .CAP184 .£0.80.....10				
0.22uF .CAP185 .£0.80.....10				
0.33uF .CAP186 .£0.80.....10				
0.47uF .CAP91 .£0.50.....5				
1uF .CAP92 .£0.85.....10				
1.5uF .CAP93 .£0.70.....5				
<b>100 Volts...continued</b>				
2.2uF .CAP94 .£0.50.....5				
3.3uF .CAP95 .£0.50.....5				
4.7uF .CAP96 .£0.50.....5				
6.8uF .CAP187 .£0.80.....10				
10uF .CAP97 .£0.95.....10				
22uF .CAP98 .£1.05.....10				
33uF .CAP99 .£1.55.....5				
47uF .CAP100 .£1.75.....10				
68uF .CAP188 .£1.30.....5				
100uF .CAP101 .£2.10.....10				
220uF .CAP102 .£6.00.....5				
330uF .CAP189 .£3.00.....2				
470uF .CAP103 .£6.00.....5				
680uF .CAP190 .£3.00.....2				
1000uF .CAP191 .£3.00.....1				
<b>160 Volts</b>				
0.47uF .CAP192 .£0.45.....10				
1uF .CAP193 .£0.45.....10				
2.2uF .CAP146 .£0.45.....10				
3.3uF .CAP194 .£1.00.....10				
4.7uF .CAP195 .£1.00.....10				
10uF .CAP147 .£1.40.....10				
22uF .CAP148 .£1.80.....10				
33uF .CAP149 .£2.30.....10				
47uF .CAP196 .£2.20.....5				
100uF .CAP150 .£3.25.....5				
220uF .CAP197 .£3.00.....2				
470uF .CAP198 .£3.25.....1				
<b>200 Volts</b>				
22uF .CAP199 .£1.60.....5				
100uF .CAP151 .£3.25.....5				
220uF .CAP200 .£2.50.....1				
330uF .CAP201 .£2.50.....1				
<b>250 Volts</b>				
0.47uF .CAP202 .£0.60.....10				
1uF .CAP152 .£0.60.....10				
2.2uF .CAP203 .£1.30.....10				
3.3uF .CAP104 .£1.75.....10				
4.7uF .CAP204 .£2.00.....10				
10uF .CAP105 .£2.60.....10				
22uF .CAP153 .£2.30.....10				
<b>250 Volts...continued</b>				
33uF .CAP205 .£0.50.....5				
47uF .CAP106 .£4.35.....10				
100uF .CAP154 .£4.50.....5				
220uF .CAP155 .£2.00.....2				
330uF .CAP206 .£2.50.....1				
<b>360 Volts</b>				
1uF .CAP156 .£0.70.....10				
2.2uF .CAP207 .£1.20.....10				
3.3uF .CAP157 .£1.50.....10				
4.7uF .CAP208 .£1.10.....5				
10uF .CAP158 .£2.25.....10				
22uF .CAP159 .£3.40.....10				
33uF .CAP209 .£2.60.....5				
47uF .CAP210 .£1.50.....2				
100uF .CAP211 .£3.00.....2				
330uF .CAP212 .£5.00.....1				
<b>400 Volts</b>				
0.47uF .CAP213 .£0.60.....10				
1uF .CAP107 .£2.15.....5				
2.2uF .CAP108 .£2.25.....5				
3.3uF .CAP214 .£2.25.....5				
4.7uF .CAP109 .£3.15.....5				
10uF .CAP110 .£4.00.....5				
22uF .CAP111 .£2.50.....2				
33uF .CAP215 .£2.50.....2				
47uF .CAP112 .£3.50.....2				
68uF .CAP216 .£3.50.....2				
100uF .CAP160 .£4.00.....2				
150uF .CAP217 .£3.20.....1				
220uF .CAP161 .£7.00.....2				
560uF .CAP162 .£4.00.....1				
<b>450 Volts</b>				
1uF .CAP113 .£2.80.....5				
2.2uF .CAP114 .£3.20.....5				
3.3uF .CAP218 .£3.20.....5				
4.7uF .CAP115 .£4.95.....5				
10uF .CAP116 .£5.50.....5				
22uF .CAP117 .£4.15.....2				
33uF .CAP219 .£3.00.....2				
47uF .CAP220 .£2.00.....1				
100uF .CAP221 .£3.00.....1				

## Aerial & Satellite Installation Accessories

### SLx Aerial Amplifiers

Now with built in Digital ByPass Operates with Sky™ DigiEye

Class leading noise figure of 4dB or less

6dB signal amplification on all models



Integrated Digital By Pass

Description	Order Code	Price
<b>2 Way - No Bypass</b>	<b>SLX2</b>	<b>£ 8.00 + vat</b>
<b>2 Way - With Bypass</b>	<b>SLX2B</b>	<b>£ 9.25 + vat</b>
<b>4 Way - No Bypass</b>	<b>SLX4</b>	<b>£ 13.00 + vat</b>
<b>4 Way - With Bypass</b>	<b>SLX4B</b>	<b>£ 14.00 + vat</b>
<b>6 Way - No Bypass</b>	<b>SLX6</b>	<b>£ 18.00 + vat</b>
<b>6 Way - With Bypass</b>	<b>SLX6B</b>	<b>£ 19.00 + vat</b>
<b>8 Way - No Bypass</b>	<b>SLX8</b>	<b>£ 18.50 + vat</b>
<b>8 Way - With Bypass</b>	<b>SLX8B</b>	<b>£ 20.00 + vat</b>

### SLx Masthead Amplifiers

UHF TV antenna pre amplifier designed for the professional aerial installer

15dB gain masthead amplifier ideal for majority of domestic installations

26dB gain masthead amplifier for longer cable runs (loss of more than 3dB) or if connected to passive splitters

Requires 12V DC power supply via downlead either via dedicated power supply unit or from a distribution amplifier with line powering

**15dB Amp Order Code : 27830R**  
**Price : £ 4.30 + vat**

**26dB Amp Order Code : 27831R**  
**Price : £ 4.50 + vat**

**SLx Masthead Amp PSU**  
**Order Code : 27832R**  
**Price : £ 5.00 + vat**

**Postage for 2+ £ 5.00 + 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



# Grandata Ltd

distributor of electronic components

## Konig Replacement Remote Controls

Part No.	Code	Part No.	Code	Part No.	Code	Part No.	Code	Part No.	Code	Part No.	Code	Part No.	Code
<b>AKAI</b>		<b>FERGUSON...continued</b>		<b>HITACHI...continued</b>		<b>NOKIA</b>		<b>PHILIPS...continued</b>		<b>SHARP...continued</b>		<b>TOSHIBA...continued</b>	
CT2582E	IR9700	68LS2	IR9639	C24WS511T	IR9983	3126	IR9157	RC9020	IR9434	RRMCG0662PESA	IR9487	1480RBW	IR9953
CT2585	IR9700	A10R	IR9259	C2514	IR9476	3126F	IR9157	RC9030	IR9434	RRMCG0739BMSA	IR9711	1480TBT	IR9953
CT2885	IR9700	A14R	IR9259	C2546	IR9677	C1	IR9161	RC9050	IR9556	RRMCG0777PESA	IR9487	1480TBW	IR9953
CT2885E	IR9700	A36R	IR9259	C2546TN	IR9677	C2	IR9161	RC9057	IR9710	RRMCG0833PESA	IR9487	1480TBT	IR9953
IR16	IR9700	B51F	IR9639	C2547TN	IR9677	C3	IR9161	RC9060	IR9556	RRMCG1048BMSA	IR9711	1480TBZ	IR9953
RC556	IR9397	B51NX	IR9639	C2556TN	IR9983	C4	IR9161	RC9070	IR9434	RRMCG1023BMSA	IR9711	1510RBT	IR9962
RC57	IR9700	B59F	IR9639	C2566TN	IR9677	CM 1	IR9181	RC9133	IR9710	RRMCG1031BMSA	IR9788	1510RDT	IR9962
<b>AMSTRAD</b>		B59N	IR9639	C2567TN	IR9983	D1	IR9161	<b>SAMSUNG</b>		RRMCG1036BMSA	IR9711	1510RT	IR9962
SRD550	IR9386	B59NX	IR9639	C2567TN2	IR9983	D2	IR9161	CX5312W	IR9432	RRMCG1046BMSA	IR9788	155R9B	IR9962
SRX510	IR9386	B68F	IR9639	C2568TN	IR9983	E1	IR9161	CX5325W	IR9432	RRMCG1048BMSA	IR9788	155R9BT	IR9962
AE6001	IR9352	C59NX	IR9639	C2569TN	IR9983	E2	IR9161	CX532WT	IR9432	RRMCG1050BMSA	IR9788	155R9BW	IR9962
<b>B&amp;O</b>		C68NX	IR9639	C2611	IR9142	EM2	IR9700	CX534WT	IR9432	RRMCG2799CESA	IR9487	155R9Z	IR9962
Beolink 100	IR9843	D51ND	IR9639	C2646TN	IR9677	ES5	IR9701	RM104	IR9432	SV2044G	IR9487	156R9B	IR9962
<b>BEKO</b>		D59F	IR9639	C2847TN	IR9677	FS10	IR9573	SV2045G	IR9487	SV2145S	IR9487	156R9BG	IR9962
RC51321	IR9398	D59N	IR9639	C2856TN	IR9983	FS11	IR9573	SV2145S	IR9487	SV2145S	IR9487	156R9B	IR9962
RC51331	IR9398	D68N	IR9639	C2866TN	IR9677	FS4/1	IR9573	SV2145S	IR9487	SV2145S	IR9487	156R9B	IR9962
RC51331	IR9398	D78N	IR9639	C2866TN	IR9983	FS4/2	IR9573	SV2145S	IR9487	SV2145S	IR9487	156R9B	IR9962
<b>BLAUPUNKT</b>		E51N	IR9639	C2866TN	IR9983	FS5	IR9573	SV2145S	IR9487	SV2145S	IR9487	156R9B	IR9962
8669493	IR9188	E59R8	IR9639	C28W410TN	IR9983	FS5/1	IR9573	SV2145S	IR9487	SV2145S	IR9487	156R9B	IR9962
1532	IR9188	RCU1734	IR9584	C28W510TN	IR9983	FS9	IR9573	SV2145S	IR9487	SV2145S	IR9487	156R9B	IR9962
1570-46	IR9516	RCU1742	IR9584	CBP1476R	IR9142	FS9	IR9573	SV2145S	IR9487	SV2145S	IR9487	156R9B	IR9962
8627 105 463	IR9188	RCU1789	IR9584	CBP1646R	IR9142	IR1	IR9157	SV2145S	IR9487	SV2145S	IR9487	156R9B	IR9962
8688913000	IR9516	RCU1785	IR9584	CBP2067	IR9142	IR2	IR9157	SV2145S	IR9487	SV2145S	IR9487	156R9B	IR9962
1555-46	IR9516	RH880	IR9584	CBP2216	IR9142	IR3	IR9157	SV2145S	IR9487	SV2145S	IR9487	156R9B	IR9962
1563-46	IR9516	RH885	IR9584	CBP222	IR9142	IR4	IR9157	SV2145S	IR9487	SV2145S	IR9487	156R9B	IR9962
IB16	IR9504	RHT01	IR9325	CBP226	IR9142	IR5	IR9157	SV2145S	IR9487	SV2145S	IR9487	156R9B	IR9962
IC16	IR9504	RHT10	IR9325	CBP260	IR9142	IR6	IR9157	SV2145S	IR9487	SV2145S	IR9487	156R9B	IR9962
ID32	IR9503	RHT30	IR9325	CL2156TAN	IR9983	IR7	IR9157	SV2145S	IR9487	SV2145S	IR9487	156R9B	IR9962
IL32	IR9503	RHT30	IR9325	CL24W1TAN	IR9983	IR8	IR9157	SV2145S	IR9487	SV2145S	IR9487	156R9B	IR9962
IM32	IR9503	T49F	IR9639	CL2556TAN	IR9983	IR9	IR9157	SV2145S	IR9487	SV2145S	IR9487	156R9B	IR9962
IM55-16	IR9516	T49N	IR9639	CL2566TAN	IR9983	IR10	IR9157	SV2145S	IR9487	SV2145S	IR9487	156R9B	IR9962
IM63-16	IR9516	T51F	IR9639	CL2566TAN	IR9983	IR11	IR9157	SV2145S	IR9487	SV2145S	IR9487	156R9B	IR9962
IM70-16	IR9516	T51N	IR9639	CL2886TAN	IR9983	IR12	IR9157	SV2145S	IR9487	SV2145S	IR9487	156R9B	IR9962
IP32	IR9503	T59F	IR9639	CL28W1TAN	IR9983	IR13	IR9157	SV2145S	IR9487	SV2145S	IR9487	156R9B	IR9962
IQ16	IR9504	T59N	IR9639	CL28W2TAN	IR9983	IR14	IR9157	SV2145S	IR9487	SV2145S	IR9487	156R9B	IR9962
IR32	IR9504	T68N	IR9639	CL32WD2TAN	IR9983	IR15	IR9157	SV2145S	IR9487	SV2145S	IR9487	156R9B	IR9962
TC106	IR9406	T742	IR9584	CL32WD2TAN	IR9983	IR16	IR9157	SV2145S	IR9487	SV2145S	IR9487	156R9B	IR9962
TC110 PIP	IR9248	T752	IR9584	CL32WD2TAN	IR9983	IR17	IR9157	SV2145S	IR9487	SV2145S	IR9487	156R9B	IR9962
TC143	IR9406	T758	IR9584	CL32WD2TAN	IR9983	IR18	IR9157	SV2145S	IR9487	SV2145S	IR9487	156R9B	IR9962
TC144	IR9406	T789	IR9584	CL32WD2TAN	IR9983	IR19	IR9157	SV2145S	IR9487	SV2145S	IR9487	156R9B	IR9962
TC190	IR9529	T789DPL	IR9639	CL32WD2TAN	IR9983	IR20	IR9157	SV2145S	IR9487	SV2145S	IR9487	156R9B	IR9962
TC192	IR9529	<b>GOLDSTAR</b>		CL32WD2TAN	IR9983	IR21	IR9157	SV2145S	IR9487	SV2145S	IR9487	156R9B	IR9962
TC194	IR9529	105-068	IR9403	CL32WD2TAN	IR9983	IR22	IR9157	SV2145S	IR9487	SV2145S	IR9487	156R9B	IR9962
<b>CROWN</b>		105-209B	IR9662	CL32WD2TAN	IR9983	IR23	IR9157	SV2145S	IR9487	SV2145S	IR9487	156R9B	IR9962
RC51331	IR9398	105-210A	IR9662	CL32WD2TAN	IR9983	IR24	IR9157	SV2145S	IR9487	SV2145S	IR9487	156R9B	IR9962
RC61331	IR9398	105-219J	IR9662	CL32WD2TAN	IR9983	IR25	IR9157	SV2145S	IR9487	SV2145S	IR9487	156R9B	IR9962
2190T	IR9397	105-224V	IR9662	CL32WD2TAN	IR9983	IR26	IR9157	SV2145S	IR9487	SV2145S	IR9487	156R9B	IR9962
<b>DAEWOO</b>		105-229H	IR9662	CL32WD2TAN	IR9983	IR27	IR9157	SV2145S	IR9487	SV2145S	IR9487	156R9B	IR9962
DMQ1414	IR9397	105-230A	IR9662	CL32WD2TAN	IR9983	IR28	IR9157	SV2145S	IR9487	SV2145S	IR9487	156R9B	IR9962
DMQ14A 1	IR9840	105-230C	IR9662	CL32WD2TAN	IR9983	IR29	IR9157	SV2145S	IR9487	SV2145S	IR9487	156R9B	IR9962
DMQ20A 1	IR9840	105-230C	IR9662	CL32WD2TAN	IR9983	IR30	IR9157	SV2145S	IR9487	SV2145S	IR9487	156R9B	IR9962
DMQ2195	IR9840	105-230C	IR9662	CL32WD2TAN	IR9983	IR31	IR9157	SV2145S	IR9487	SV2145S	IR9487	156R9B	IR9962
DMQ2595	IR9840	105-230C	IR9662	CL32WD2TAN	IR9983	IR32	IR9157	SV2145S	IR9487	SV2145S	IR9487	156R9B	IR9962
DMQ2895	IR9840	105-230C	IR9662	CL32WD2TAN	IR9983	IR33	IR9157	SV2145S	IR9487	SV2145S	IR9487	156R9B	IR9962
<b>FERGUSON</b>		105-230C	IR9662	CL32WD2TAN	IR9983	IR34	IR9157	SV2145S	IR9487	SV2145S	IR9487	156R9B	IR9962
20H3	IR9594	105-230C	IR9662	CL32WD2TAN	IR9983	IR35	IR9157	SV2145S	IR9487	SV2145S	IR9487	156R9B	IR9962
22B5	IR9584	105-230C	IR9662	CL32WD2TAN	IR9983	IR36	IR9157	SV2145S	IR9487	SV2145S	IR9487	156R9B	IR9962
22H3	IR9584	105-230C	IR9662	CL32WD2TAN	IR9983	IR37	IR9157	SV2145S	IR9487	SV2145S	IR9487	156R9B	IR9962
2415	IR9584	105-230C	IR9662	CL32WD2TAN	IR9983	IR38	IR9157	SV2145S	IR9487	SV2145S	IR9487	156R9B	IR9962
2422	IR9584	105-230C	IR9662	CL32WD2TAN	IR9983	IR39	IR9157	SV2145S	IR9487	SV2145S	IR9487	156R9B	IR9962
2423	IR9584	105-230C	IR9662	CL32WD2TAN	IR9983	IR40	IR9157	SV2145S	IR9487	SV2145S	IR9487	156R9B	IR9962
2433	IR9584	105-230C	IR9662	CL32WD2TAN	IR9983	IR41	IR9157	SV2145S	IR9487	SV2145S	IR9487	156R9B	IR9962
2445	IR9584	105-230C	IR9662	CL32WD2TAN	IR9983	IR42	IR9157	SV2145S	IR9487	SV2145S	IR9487	156R9B	IR9962
2452	IR9584	105-230C	IR9662	CL32WD2TAN	IR9983	IR43	IR9157	SV2145S	IR9487	SV2145S	IR9487	156R9B	IR9962
2453	IR9584	105-230C	IR9662	CL32WD2TAN	IR9983	IR44	IR9157	SV2145S	IR9487	SV2145S	IR9487	156R9B	IR9962
2463	IR9584	105-230C	IR9662	CL32WD2TAN	IR9983	IR45	IR9157	SV2145S	IR9487	SV2145S	IR9487	156R9B	IR9962
2475	IR9584	105-230C	IR9662	CL32WD2TAN	IR9983	IR46	IR9157	SV2145S	IR9487	SV2145S	IR9487	156R9B	IR9962
26H3	IR9594	105-230C	IR9662	CL32WD2TAN	IR9983	IR47	IR9157	SV2145S	IR9487	SV2145S	IR9487	156R9B	IR9962
29132	IR9584	105-230C	IR9662	CL32WD2TAN	IR9983	IR48	IR9157	SV2145S	IR9487	SV2145S	IR9487	156R9B	IR9962
36K2	IR9584	105-230C	IR9662	CL32WD2TAN	IR9983	IR49	IR9157	SV2145S	IR9487	SV2145S	IR9487	156R9B	IR9962
41H3	IR9584	105-230C	IR9662	CL32WD2TAN	IR9983	IR50	IR9157	SV2145S	IR9487	SV2145S	IR9487	156R9B	IR9962
4233	IR9584	105-230C	IR9662	CL32WD2TAN	IR9983	IR51	IR9157	SV2145S	IR9487	SV2145S	IR9487	156R9B	IR9962
4414	IR9584	105-230C	IR9662	CL32WD2TAN	IR9983	IR52	IR9157	SV2145S	IR9487	SV2145S	IR9487	156R9B	IR9962
4415	IR9584	105-230C	IR9662	CL32WD2TAN	IR9983	IR53							



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## Transistors / Linear IC's

Part No.	Price	Part No.	Price	Part No.	Price	Part No.	Price	Part No.	Price	Part No.	Price	Part No.	Price	Part No.	Price		
BU208A	£0.75	IRF5450	£5.00	MJE350	£0.80	STK4191	£9.00	STK5464	£3.00	STR371	£4.00	TDA2450-3	£10.00	TDA4665	£2.50	TDA8138	£2.00
BU2508DF	£0.90	IRF5740	£3.00	MJF		STK4191 X	£14.00	STK5466	£5.00	STR380	£3.50	TDA2460-2	£0.70	TDA4670	£4.75	TDA8138A	£1.30
BU2508DX	£1.00	IRF5840	£3.00	MJF 16206	£4.50	STK419-130	£15.00	STK5467	£4.00	STR381	£3.90	TDA2501	£3.00	TDA4671	£5.00	TDA8138B	£2.00
BU2508A	£1.00	IRF610	£0.80	MJF 18004	£1.75	STK419-140	£16.00	STK5468	£3.00	STR383	£4.10	TDA2506T	£8.00	TDA4680	£3.50	TDA8139	£2.00
BU2508AF	£1.10	IRF611	£1.20	MJF 18006	£2.00	STK4192	£7.00	STK5471	£9.00	STR384	£3.50	TDA2507	£4.50	TDA4681	£4.50	TDA8140	£2.00
BU2508AX	£1.30	IRF620	£1.00	MJF 18008	£1.75	STK4192 II	£9.50	STK5472	£3.75	STR40090	£3.50	TDA2510	£4.50	TDA4686	£2.75	TDA8143	£1.60
BU2508D	£1.30	IRF630	£0.75	MJF 18204	£2.50	STK4199 II	£10.50	STK5473	£4.80	STR40115	£6.00	TDA2514A	£5.00	TDA4686	£5.00	TDA8145	£1.20
BU2508DF	£1.20	IRF634	£1.25	STK0025	£4.20	STK4199II	£10.50	STK5474	£5.00	STR4090A	£6.50	TDA2515	£4.50	TDA4687	£5.00	TDA8146	£2.00
BU2508DX	£1.50	IRF640	£1.50	STK0039	£6.00	STK420	£4.00	STK5476	£3.50	STR41090	£3.30	TDA2520-1	£9.00	TDA4700A	£7.50	TDA8153	£10.00
BU2520AF	£1.70	IRF640F	£2.00	STK086	£10.00	STK4204 II	£10.50	STK5477	£4.50	STR4142	£4.50	TDA2521	£8.00	TDA4710H	£7.00	TDA8150	£1.70
BU2520AX	£1.40	IRF630S	£2.00	STK1039	£4.60	STK4204II	£10.50	STK5478	£2.50	STR4211	£3.15	TDA2522	£12.00	TDA4714C	£3.50	TDA8171	£2.30
BU2520DF	£2.25	IRF642	£2.00	STK1040	£6.40	STK4211 II	£10.00	STK5479	£3.00	STR4311I	£9.50	TDA2523	£8.50	TDA4716C	£4.50	TDA8172	£2.00
BU2520DX	£2.00	IRF644	£2.00	STK1049	£7.00	STK4211 V	£8.00	STK5481	£4.70	STR440	£8.00	TDA2525	£4.50	TDA4720	£6.60	TDA8173	£1.75
BU2522AX	£1.50	IRF650	£2.00	STK1050	£6.50	STK4221 II	£12.00	STK5482	£2.85	STR441	£9.50	TDA2530	£3.00	TDA4725	£7.50	TDA8174	£2.00
BU2525A	£3.25	IRF710	£1.50	STK1060	£7.00	STK4231 II	£10.50	STK5483	£4.40	STR44115	£4.75	TDA2548	£2.00	TDA4780	£6.00	TDA8175	£7.00
BU2525AF	£2.20	IRF720	£0.85	STK2025	£6.20	STK4231 V	£14.00	STK5484	£4.50	STR442	£18.00	TDA2549	£3.00	TDA4800	£3.00	TDA8177	£3.00
BU2525AX	£1.90	IRF730	£1.25	STK2028	£5.00	STK4241	£10.50	STK5487	£5.25	STR450A	£7.00	TDA2558	£4.00	TDA4810	£5.00	TDA8177F	£3.50
BU2525D	£2.40	IRF740	£0.90	STK2029	£6.00	STK4241 V	£12.50	STK5488	£4.80	STR451	£8.00	TDA2560C	£7.00	TDA4850	£4.75	TDA8179S	£7.50
BU2525DF	£1.75	IRF740F	£3.00	STK2030	£10.00	STK4272	£5.00	STK5490	£4.50	STR45111	£5.50	TDA2560-3	£14.00	TDA4851	£3.25	TDA8180	£12.50
BU2527AF	£4.00	IRF820	£0.90	STK2038	£7.00	STK4273	£5.50	STK5491	£4.00	STR4512	£4.00	TDA2576A	£3.50	TDA4852	£3.25	TDA8205	£1.50
BU2527AX	£2.50	IRF830	£0.85	STK2048	£9.50	STK4274	£5.00	STK5492	£4.15	STR452	£4.75	TDA2576B	£9.00	TDA4854	£5.00	TDA8212	£3.50
BU2527DF	£2.00	IRF830F	£1.60	STK2058 IV	£16.00	STK4274	£5.00	STK5632	£3.00	STR453	£5.00	TDA2577A	£2.00	TDA4855	£6.00	TDA8214B	£10.50
BU2527DX	£2.00	IRF840	£0.85	STK2101	£10.50	STK430	£5.00	STK5720	£4.00	STR454	£13.00	TDA2578A	£7.00	TDA4856	£5.00	TDA8215H	£3.00
BU2532AL	£3.25	IRF840F	£1.75	STK2110	£5.50	STK4301	£5.00	STK5725	£3.50	STR455	£5.50	TDA2579A	£2.10	TDA4858	£3.50	TDA8217	£2.25
BU2708AF	£2.00	IRF9140	£10.00	STK2139	£6.75	STK4311	£6.50	STK5730	£3.00	STR456	£4.70	TDA2579B	£3.25	TDA4860	£2.00	TDA8303	£2.50
BU2708AX	£2.00	IRF9300	£4.00	STK2155	£9.00	STK433	£4.00	STK583	£4.00	STR457	£6.00	TDA2652	£48.00	TDA4861	£3.50	TDA8304	£4.00
BU2708DF	£2.00	IRF9510	£1.50	STK2230	£4.70	STK4332	£3.65	STK6316	£3.00	STR470	£3.00	TDA2653A	£4.50	TDA4866	£2.75	TDA8305	£5.00
BU2708DX	£2.00	IRF9511	£1.50	STK3102 II	£5.30	STK435	£3.75	STK6324B	£5.00	STR50020	£3.50	TDA2710-1	£4.00	TDA4880	£2.50	TDA8305A	£5.00
BU2720AX	£2.00	IRF9520	£1.50	STK3106	£25.00	STK4352	£5.00	STK6327	£12.00	STR50092	£5.50	TDA2820M	£1.00	TDA4918A	£17.00	TDA8310	£6.00
BU2720DF	£2.00	IRF9530	£1.25	STK3122 III	£7.25	STK436	£4.30	STK6328A	£4.00	STR50103A	£2.60	TDA2822M	£0.60	TDA4930	£5.00	TDA83500	£2.75
BU2720DX	£2.00	IRF9531	£2.00	STK3152 II	£9.00	STK4362	£4.50	STK6431	£6.00	STR50112A	£6.50	TDA3190	£2.00	TDA4935	£3.00	TDA8351	£2.00
BU2722AF	£3.30	IRF9540	£1.75	STK3156	£5.00	STK437	£6.00	STK6607	£4.00	STR50113	£5.00	TDA3301B	£16.00	TDA4940	£2.00	TDA8354Q	£6.75
BU2725AF	£2.00	IRF9541	£2.00	STK350-030	£7.00	STK4372	£4.90	STK6712BIV	£5.50	STR50115	£5.00	TDA3303	£7.00	TDA4941	£2.80	TDA8356	£2.00
BU2725DF	£2.00	IRF9810	£0.95	STK392-040	£12.00	STK439	£5.00	STK6722	£6.50	STR50213	£4.00	TDA3501	£3.00	TDA4942	£2.00	TDA8360N3	£8.00
BU2725DF	£2.00	IRF9820	£0.85	STK401-050	£8.00	STK4392	£5.00	STK6832	£10.00	STR50330	£5.00	TDA3502	£3.60	TDA4950	£1.00	TDA8361AN3	£8.00
BU2727AF	£2.00	IRF9622	£2.00	STK401-080	£9.00	STK441	£7.50	STK6822	£7.50	STR51041	£5.75	TDA3504	£3.00	TDA4951	£4.00	TDA8361AN3	£9.00
BU2727A	£2.00	IRF9630	£1.30	STK401-120	£10.00	STK4412	£4.50	STK6875	£6.50	STR51213	£5.00	TDA3507	£4.50	TDA5010	£3.00	TDA8362AN3	£12.00
BU2727AF	£2.00	IRF9640	£2.30	STK401-140	£12.00	STK443	£7.00	STK6922	£10.00	STR5142A	£7.00	TDA3521	£7.50	TDA5000	£6.00	TDA8362AN3	£7.50
BU506DF	£1.00	IRFBC20	£1.10	STK4017	£4.00	STK4432	£8.00	STK6932	£4.50	STR53041	£4.00	TDA3560	£6.00	TDA5000	£9.00	TDA8362BN3	£8.00
BU508AF	£0.60	IRFBC30	£1.20	STK4019	£4.80	STK457	£2.70	STK6962	£2.75	STR5404A	£3.20	TDA3561	£3.00	TDA5000	£4.50	TDA8362BN3	£12.00
BU508APH	£0.60	IRFBC40	£2.10	STK402-040	£7.00	STK459	£5.60	STK6972	£3.00	STR5412	£2.80	TDA3561A	£3.00	TDA5010-2	£7.50	TDA8362N5	£12.00
BU508AX1	£0.60	IRFBE30	£2.25	STK402-070	£7.00	STK460	£6.60	STK6981B	£5.00	STR55041	£4.50	TDA3562A	£2.60	TDA5620	£4.50	TDA8366N3	£15.00
BU508D	£0.75	IRFD120	£1.00	STK402-070	£7.00	STK461	£6.00	STK6982	£6.00	STR56041	£5.50	TDA3563	£3.50	TDA5702	£11.00	TDA8366N3	£11.50
BU508DF	£0.85	IRFD9120	£1.20	STK402-071	£7.00	STK463	£9.50	STK6982H	£6.00	STR58041	£2.50	TDA3563A	£4.00	TDA5830-2	£11.00	TDA8370	£1.50
BU508DR	£1.30	IRFD9220	£1.00	STK402-090	£8.00	STK465	£9.00	STK7216	£4.20	STR59041	£3.00	TDA3564	£3.25	TDA6100Q	£1.50	TDA8370	£1.50
BUH1015	£4.25	IRFF120	£3.00	STK4021	£3.80	STK473	£8.20	STK7217	£2.50	STR60001	£5.25	TDA3565	£2.20	TDA6101Q	£1.20	TDA8372A	£16.50
BUH1215	£4.50	IRFIB40C	£1.00	STK402-100	£9.00	STK4793	£8.00	STK7225	£5.00	STR6002X	£5.75	TDA3566	£2.80	TDA6103C	£2.25	TDA8374	£10.00
BUH515	£2.00	IRFIB40G	£2.00	STK402-100	£9.00	STK4803	£10.00	STK7226	£17.00	STR6028	£2.70	TDA3566A	£3.00	TDA6106Q	£1.25	TDA8375A	£15.00
BUH515D	£2.50	IRFP054	£4.00	STK402-120	£9.00	STK4813	£8.00	STK7231	£7.00	STR61001	£4.75	TDA3567	£3.50	TDA6107Q	£3.00	TDA8376	£12.50
BUH517	£2.75	IRFP064	£5.00	STK4024 I	£5.50	STK4833	£8.50	STK7253	£5.00	STR7001	£6.00	TDA3569	£3.00	TDA6108F	£3.00	TDA8376	£15.00
BUH517D	£1.75	IRFP140	£2.50	STK4025	£4.50	STK4843	£7.20	STK7253	£6.50	STR80145	£4.75	TDA3570	£3.75	TDA6111Q	£2.25	TDA8380	£2.00
BUH715	£4.25	IRFP150	£2.40	STK4026	£6.80	STK4853	£17.00	STK7300-060	£6.50	STR81145	£3.75	TDA3576B	£7.00	TDA6120C	£5.50	TDA8424	£4.00
BU180	£1.25	IRFP240	£3.00	STK4026H	£4.80	STK4863	£7.00	STK7300-080	£6.00	STR81159	£4.00	TDA3650	£6.75	TDA6160-2S	£4.75	TDA8425	£5.50
BU181	£1.50	IRFP250	£2.80	STK4028V	£5.00	STK4873	£11.00	STK7308	£7.00	STR8124	£10.00	TDA3651	£2.00	TDA6160-2K	£2.50	TDA8433	£6.00
BU181D	£1.25	IRFP340	£2.50	STK4028	£5.50	STK4880-010	£8.00	STK7309	£4.00	STR83145	£5.00	TDA3651A	£3.50	TDA7052	£1.20	TDA8440	£3.00
BU111A	£0.35	IRFP350	£3.25	STK4032 II	£5.10	STK4880-050	£8.00	STK7310	£3.20	STR83159	£7.00	TDA3652	£5.00	TDA7056	£2.00	TDA8443	£3.50
BU111AF	£0.35	IRFP360	£8.00	STK4034 X	£9.25	STK4893	£10.00	STK73405 II	£5.50	TDA1420	£8.00	TDA3652XT10	£8.00	TDA7262	£3.25	TDA8451	£3.25
BU111AX	£0.50	IRFP450	£2.70	STK4036	£4.70	STK4913	£9.00	STK73410	£3.50	TDA1470	£12.00	TDA3653B	£0.80	TDA7263	£3.60	TDA8453	£3.50
BU12	£0.80	IRFP460	£4.00	STK4036V	£8.00	STK501	£5.50	STK73410 II	£5.00	TDA1514A	£3.25	TDA3653C	£0.85	TDA7263M	£4.00	TDA8461	£9.50
BU12A	£0.80	IRFP9140	£14.50	STK4038	£6.80	STK50322	£3.50	STK7348	£4.00	TDA1540	£4.20	TDA3654	£0.80	TDA7264	£5.00	TDA8461	£3.75
BU12AF	£0.90	IRFP9240	£3.00	STK4040 II	£6.50	STK5314	£4.75	STK7356	£4.25	TDA1541	£5.00	TDA3654Q	£0.85	TDA7265	£5.00	TDA8501	£3.75
BU18	£0.80	IRFP240	£3.00	STK4042 II	£8.00	STK5315	£5.00	STK7358	£4.40	TDA1541A	£4.00	TDA3724	£3.00	TDA7265	£5.00	TDA8505	£11.00
BU18A	£0.80	IRFP250	£4.50	STK4046	£9.50	STK5323	£6.00	STK7359	£4.25	TDA1546T	£1						



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## Line Output Transformers

Part No	Code	Price	Part No	Code	Price	Part No	Code	Price	Part No	Code	Price			
<b>ALBA</b>			<b>HITACHI..continued</b>			<b>PANASONIC..continued</b>			<b>PHILIPS..continued</b>			<b>THOMSON..continued</b>		
3714002	LOT02	£12.00	2433453	LOT82	£12.50	TLF 14568 F	LOT40	£15.00	AT 2079 / 21	LOT395	£12.00	10588080.P2	LOT1505	£19.00
043714002J	LOT02	£12.00	2433751	LOT01	£13.00	TLF 14584 F	LOT41	£17.00	AT 2079 / 24	LOT392	£15.00	151128140	LOT1505	£19.00
43700000	LOT02	£12.00	2433752	LOT01	£13.00	TLF 14586 F	LOT42	£17.00	AT 2079 / 40	LOT73	£11.50	1512814	LOT1505	£19.00
<b>AMSTRAD</b>			2433891	LOT23	£12.50	<b>PHILIPS</b>			AT 2079 / 99	LOT276	£14.00	15128140	LOT1505	£19.00
1810951	LOT55	£14.00	2433892	LOT84	£14.50	3119 108 31260	LOT90	£12.50	AT 2079/30 01	LOT106	£12.50	1531446	LOT1505	£19.00
3714002	LOT02	£12.00	2433893	LOT23	£12.50	3119 108 31290	LOT73	£11.50	AT 2079/30102	LOT106	£12.50	15314460	LOT1505	£19.00
043714002J	LOT02	£12.00	2433952	LOT33	£10.00	3119 108 31440	LOT433	£16.00	<b>SAISHO</b>			1531447 A	LOT1505	£19.00
43700000	LOT02	£12.00	2434002	LOT226	£14.50	3119 108 31441	LOT433	£16.00	3714002	LOT02	£12.00	1532873 A	LOT1505	£19.00
AM152591	LOT55	£14.00	2434141	LOT33	£10.00	3119 108 31442	LOT433	£16.00	043714002J	LOT02	£12.00	3233500	LOT244	£14.50
<b>FERCUSON</b>			2434274	LOT44	£10.50	3119 198 62930	LOT57	£11.00	43700000	LOT02	£12.00	3233900	LOT244	£14.50
00 D-3-508-002	LOT381	£15.50	2434393	LOT405	£22.50	3122 108 10246	LOT111	£15.00	7140021	LOT02	£12.00	40011200	LOT244	£14.50
06 D-3-083-001	LOT82	£12.50	2434593	LOT44	£10.50	3122 138 36070	LOT111	£15.00	<b>SHARP</b>			40148300	LOT244	£14.50
06 D-3-083-002	LOT82	£12.50	2435006	LOT401	£17.00	3122 138 36072	LOT111	£15.00	RTRNF 1220 CEZZLOT39	£18.50	<b>TOSHIBA</b>			
06 D-3-084-001	LOT23	£12.50	2435131	LOT251	£14.50	3122 138 36920	LOT57	£11.00	RTRNF 2001 CEZZLOT338	£17.50	1810951	LOT55	£14.00	
06 D-3-087-001	LOT23	£12.50	2436201	LOT90	£12.50	3122 138 36922	LOT57	£11.00	RTRNF 2006 CEZZLOT308	£13.50	2433751	LOT01	£13.00	
06 D-3-088-001	LOT84	£14.50	23236465	LOT392	£15.00	3122 138 36923	LOT57	£11.00	RTRNF 2023 CEZZLOT310	£15.00	23236098	LOT288	£14.00	
06 D-3-093-001	LOT204	£16.00	2433891H	LOT23	£12.50	3122 138 37050	LOT132	£15.00	<b>SONY</b>			23236198	LOT288	£14.00
06 D-3-508-003	LOT276	£14.00	45150504	LOT362	£16.00	3122 138 37620	LOT90	£12.50	1-439-286-00	LOT46	£13.00	23236245	LOT395	£12.00
06 D-3-512-001	LOT204	£16.00	<b>MATSUI</b>			3122 138 37771	LOT129	£14.00	1-439-286-11	LOT46	£13.00	23236255	LOT289	£15.00
29201-022-01	LOT63	£17.00	20070	LOT438	£16.00	3122 138 37992	LOT1116	£19.00	1-439-286-12	LOT46	£13.00	23236255	LOT289	£15.00
473197	LOT304	£15.50	20071	LOT438	£16.00	3122 138 38040	LOT73	£11.50	1-439-286-13	LOT46	£13.00	23236255	LOT289	£15.00
D 059 / 37	LOT200	£14.00	20072	LOT438	£16.00	3122 138 38123	LOT395	£12.00	1-439-286-21	LOT46	£13.00	23236255	LOT289	£15.00
<b>GOODMANS</b>			20073	LOT438	£16.00	3128 138 20201	LOT433	£16.00	1-439-332-41	LOT100	£15.00	TFB 4090 AD	LOT395	£12.00
1142.5057	LOT1164	£15.00	20074	LOT438	£16.00	3128 138 20202	LOT433	£16.00	1-439-332-42	LOT101	£14.50	TFB 4*24 AE	LOT392	£15.00
1142.5077	LOT1164	£15.00	20075	LOT438	£16.00	3138 108 30100	LOT106	£12.50	1-439-332-52	LOT100	£15.00	TFB 4*24 AP	LOT392	£15.00
1142.5079	LOT1164	£15.00	3714002	LOT02	£12.00	3138 108 30101	LOT106	£12.50	1-439-363-11	LOT268	£14.00	<b>We are stockist of both</b>		
1142.5081	LOT1164	£15.00	043221088P	LOT438	£16.00	3138 108 30103	LOT106	£12.50	1-439-363-21	LOT268	£14.00	<b>Konig</b>		
1152-5016	LOT1934	£19.00	43700000	LOT02	£12.00	3139 128 30400	LOT90	£12.50	1-439-387-11	LOT311	£14.50	<b>and</b>		
1179.0387	LOT1147	£16.00	7140021	LOT02	£12.00	40348-08	LOT1577	£18.00	1-439-387-21	LOT311	£14.50	<b>HR Diemen</b>		
1192.0527	LOT1147	£16.00	<b>mitsubishi</b>			40348A-09	LOT1577	£18.00	1-439-416-11	LOT255	£16.00	<b>LOPT's</b>		
1352.5008	LOT1167	£15.00	731003	LOT51	£15.50	4812 140 10246	LOT111	£15.00	1-439-416-12	LOT255	£16.00	<b>This is just a selection</b>		
1352.5008E	LOT1167	£16.00	334 P 18506	LOT51	£15.50	4812 140 10349	LOT106	£12.50	1-439-416-21	LOT255	£16.00	<b>of the LOPT's that we</b>		
1352.5016	LOR1934	£19.00	<b>ORECA</b>			4812 140 10369	LOT90	£12.50	1-439-416-23	LOT255	£16.00	<b>stock....Please call on</b>		
1352.5027	LOT1270	£16.00	40153201	LOT349	£17.50	4812 140 10421	LOT90	£12.50	1-439-416-51	LOT255	£16.00	<b>020 8900 2329 for copy</b>		
1352.5033	LOT1270	£16.00	<b>ORION</b>			4822 140 10246	LOT111	£15.00	<b>THOMSON</b>			<b>of our LOPT catalogue</b>		
<b>HINARI</b>			3714002	LOT02	£12.00	4822 140 10306	LOT57	£11.00	105009.8	LOT1505	£19.00			
3714002	LOT02	£12.00	043714002J	LOT02	£12.00	4822 140 10349	LOT106	£12.50	10500980	LOT1505	£19.00			
43700000	LOT02	£12.00	043714002J	LOT02	£12.00	4822 140 10381	LOT128	£13.00	10500980.P1	LOT1505	£19.00			
CF 124 B	LOT67	£14.50	43700000	LOT02	£12.00	4822 140 10384	LOT127	£15.50	10531460	LOT1505	£19.00			
CF 124 E	LOT67	£14.50	<b>PANASONIC</b>			4822 140 10406	LOT73	£11.50	105660.6	LOT1505	£19.00			
<b>HITACHI</b>			TLF 14512 F	LOT39	£18.50	4822 140 10544	LOT433	£16.00	105660060	LOT1505	£19.00			
2424593	LOT44	£10.50	TLF 14520 F	LOT40	£15.00	4822 140 10566	LOT433	£16.00	105660060	LOT1505	£19.00			
2432461	LOT169	£15.00	TLF 14521 F	LOT39	£18.50	AT 2076 / 10	LOT57	£11.00	10566060.P2	LOT1505	£19.00			
2432761	LOT169	£15.00	TLF 14567 F	LOT39	£18.50	AT 2077 / 81	LOT121	£15.00	105880.8	LOT1505	£19.00			
						AT 2078 / 21	LOT395	£12.00	10588080	LOT1505	£19.00			
						AT 2079 / 15	LOT129	£14.00						

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KSS 210A Replacement	£9.50	KSS 240 A	£30.00	RCTRTH8147 Mech	£ 10.00
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E & OE





# Service Casebook

Michael Maurice

## **Tatung TYN9801P (B series chassis)**

This set had failed during a thunderstorm. Checks in the power supply revealed that there was a short-circuit across the supply to the chopper control chip. So a new UC3844N chip was fitted. When I switched the set on it remained dead though the HT was now at 58V. Many fruitless checks were carried out, then I eventually tried replacing all three BY399 diodes in the chopper FET's snubber circuit. Although the diodes all read OK when cold, the power supply – and the rest of the set – then worked.

## **LG WE32Q10IP**

This set's relay kept clicking on and off and there was no picture. The cause of the problem was the microcontroller chip IC01. I was told by LG technical that an updated version, part no. 0ISO770011A, should be fitted. As I don't have an account with LG I ordered the chip from SEME. When it arrived I fitted it along with a new EEPROM, part no. 0IAL241600B. After switching the set on however all I got was EHT with no picture and no on-screen menus. A few phone calls and faxes to LG brought the response that the microcontroller chip should be obtained from LG direct. There is apparently a difference between the version sourced from LG Europe and the UK version, though the part numbers are the same . . .

I obtained the UK version through an LG dealer and fitted it. There was now snow on the screen, which would blank when you changed channels, but there were no on-screen menus and I couldn't get into the service mode. More faxes, phone calls and emails brought the suggestion that I must be doing something wrong. But eventually LG technical sent me another chip from an older batch. When I fitted it, with a new EEPROM, the set worked.

I've lost count of the number of phone calls and faxes involved and the amount of time I had to spend on the job. But credit where credit is due: LG technical was very helpful and provided support even though I'm not an account holder. Most other manufacturers would leave you high and dry.

## **Sony KVX2162U (AE2 chassis)**

This set had died during a thunderstorm. Checks showed that the chopper FET Q601 was short-circuit, so I fitted a new BUZ91A and also replaced the TDA4605-3 control/driver chip IC601. When I switched the set on these two items failed again. I also found that the HT rectifier D611 (D5L60), which had been OK when I first checked the power supply, was now short-

circuit. When I replaced all three items the set worked, to my relief.

It would appear that a short-circuit on the secondary side of a power supply of this type can kill the chopper FET and its control IC.

## **Panasonic TX25T2 (Alpha 2W chassis)**

The complaint with this set was white fly-back lines. This time the flyback boost capacitor C455 (100 $\mu$ F, 50V) in the field output stage wasn't the culprit. The AN5521 output chip (IC451) was the cause.

## **Hitachi C2514T**

The sound was poor and muffled, as if one of the transistors in the audio output stage had failed. The cause was the loudspeaker however, though there was no physical damage. A replacement proved the point.

## **Sanyo CB5949**

This set was intermittently dead. Resoldering dry-joints on the secondary side of the power supply put that right, but the set wouldn't respond to the front-panel controls – remote-control operation was OK. Checks showed that the switches worked, and that the correct pulses reached the microcontroller IC. The 5V supply was also present and correct. So it seemed that the microcontroller IC was faulty. A replacement proved the point, restoring front-button operation.

## **Toshiba 2512DB**

This set had died during a thunderstorm. Only a faint ticking came from the power supply. Checks revealed that several of the BC547B transistors in the standby power supply circuit were faulty, but replacing them made no difference. The set worked when I replaced the two TLP621 optocouplers D814 and D830 and the SE140N voltage-error detector/optocoupler driver IC833.

## **Finlandia C59JZ5 (Nokia Eurostereo 2 chassis)**

This set would cut out intermittently. Checks showed that the set tripped when it cut out, there being no standby or any other output from the power supply. There was 300V across the mains bridge rectifier's reservoir capacitor however. The clue to the cause of the fault was that the set would run happily for hours when the contrast was turned down to about mid-way and, conversely, tripped more frequently when the contrast was set at maximum. So attention was turned to the beam-limiter circuit, where I found that C858 (1.5 $\mu$ F) had a 1.5k $\Omega$  leak. A replacement restored reliable operation, even at maximum contrast

# Introduction to computer networking

In this concluding instalment Fawzi Ibrahim\* describes the Domain Naming Service, which enables host computers belonging to one company/organisation but located in a number of cities, countries or continents to be grouped together by a single domain name

So far we have considered two ways in which a host PC/workstation on a network can be identified: by its MAC or physical address, and by its IP address. In addition, it's desirable that a host has a unique domain name that corresponds with its IP address. This enables host computers that belong to an organisation, for example BA or ICI, which operates in a number of cities, countries or continents to be linked together by a single 'domain' name known as an FQDN (Fully Qualified Domain Name).

An FQDN specifies the position of a host in the internet DNS (Domain Naming Service) tree. The internet is organised in an hierarchical structure with a root at the top beneath which there is a layer of top-level or primary domains that are divided into sub-domains that in turn can be divided into further sub-domains and so on. See Fig. 1.

At the end of any branch there's a host or node. The host FQDN has the dotted format

Host\_name.Sub\_domain.Sub\_domain.Top\_domain.

In the example shown in Fig. 2, the FQDN of host server 1 is

server1.animalcare.org.uk

server 1 is the host name, animalcare is the lowest sub-domain, org the highest sub-domain and uk the top domain.

Basically an FQDN has two parts, the host name and a suffix. In the above example the host name is server1 and the suffix animalcare.org.uk. A suffix can be added to the computer name manually or dynamically, by DHCP. With Windows 2000, a suffix can be added manually as follows: starting at the desk top > right click my computer > properties > network identification > more > enter suffix.

For the TCP/IP suit the DNS name, i.e. FQDN, of a host is the responsibility of the presentation/application layer, while the IP and MAC addresses are the responsibilities of the internet and the physical layers respectively.

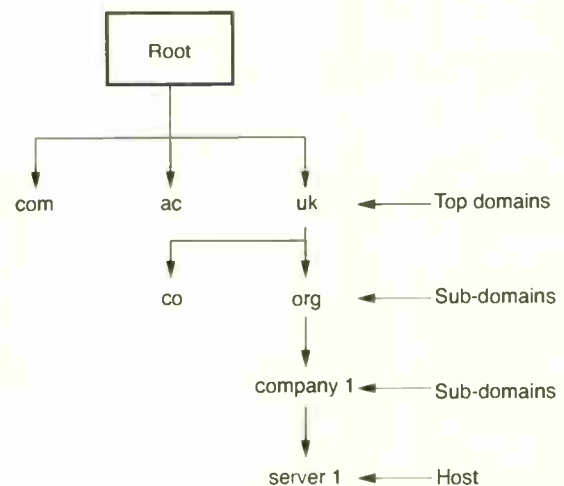


Fig. 1: The hierarchical structure of the internet.

In the same way that a host IP address has to be resolved into its MAC address and vice versa, FQDN host names have to be resolved into their respective IP addresses. This is carried out by the DNS server, which builds up a database of FQDNs and their IP addresses in a lookup table.

When a host requires a DNS name resolution it sends its request to a DNS server which will check its database and, if the host name is present, will send it back to the enquiring computer. For this reason the TCP/IP configuration of a host computer contains a field for the IP address of the DNS server.

In the case of the simple network shown in Fig. 2, the DNS server for workstations 1 and 2 (Wks1 and Wks2) has the IP address 10.0.0.10. This IP address must be entered when configuring the TCP/IP of each workstation.

The DNS server holds a list of fully qualified domain names and their IP addresses. This list can be constructed manually or dynamically. For the network shown in Fig. 2, the list will be as follows:

```
SERV1.animalcare.org.uk 10.0.0.10
Wks1.animalcare.org.uk 10.0.0.12
Wks2.animalcare.org.uk 10.0.0.11
```

\*Fawzi Ibrahim is senior lecturer at the College of North West London and is the author of several books, including *PC Operation and Repair*.



Once a DNS server is known, a host can be contacted by using its DNS name rather than its IP address. For example, if you are sitting at Wks1, you can ping Wks2 by entering the following command at the command line:

```
ping wks2.animalcare.org.uk
```

When this command is carried out, Wks1 looks at its TCP/IP configuration to ascertain the DNS server. If a DNS server is entered, a request for a resolution is sent to that server which, for the network shown in Fig. 2, means sending the request to IP address 10.0.0.10. The DNS server then checks its lookup table to find the address of Wks2, i.e. 10.0.0.11, and sends this back to Wks1 which then stores it in a temporary memory (cache). Wks2 proceeds to send the ping command to 10.0.0.10 and awaits a reply.

The IP address for Wks2 remains in memory at Wks1 for a specified period of time so that, if a subsequent attempt is made to contact Wks2, it doesn't need to go to the DNS to find the IP address. This is the reason why the first attempt to contact a remote host takes longer than the first attempt. Stored DNS name resolutions are however wiped out following a reboot.

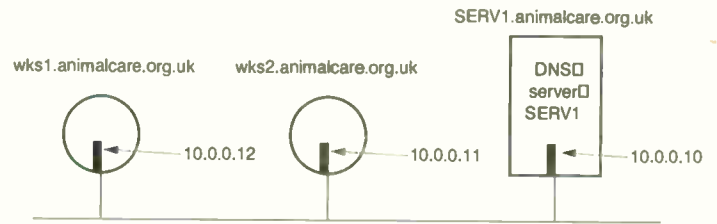


Fig. 2: Practical network example.

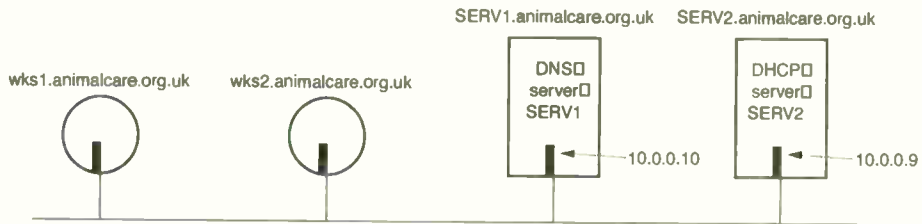


Fig. 3: Simple network with a DNS and a DHCP server.

### Dynamic configuration

Manual TCP/IP configuration of each host for DNS server and the suffix is time-consuming and in most cases impractical. Instead, dynamic configuration with a DHCP is used. This is done by setting the appropriate options of the scope or server list. The relevant options are

06 DNS and . . . suffix options.

Thus when a host computer requests an IP address from the DHCP server it will be allocated an IP address from the pool of addresses and will also be informed of the DNS server for the name resolution and given a fully qualified domain name.

Fig. 3 shows a simple network with a DNS and a DHCP server. In small networks, where the traffic is light, one server may be used as both the DNS and the DHCP.

Fig. 4 shows a typical host TCP/IP configuration listed by the command IPCONFIG/ALL.



Fig. 4: A typical host TCP/IP configuration listed by the command IPCONFIG/ALL.

### Secondary DNS servers

A single DNS server may be used to service a network. With a large network that contains hundreds of computers however the DNS's workload may be so large that the network is slowed down. Furthermore if only one DNS server is available in a multi-segment network requests for name resolution may have to go across routers, which will slow the network even more. For this reason secondary DNS servers are used.

Secondary DNS servers contain an uneditable (i.e. read only) copy of the primary database constructed by the primary DNS server. Typically a secondary DNS server will be attached to each segment of a network as shown in Fig. 5.

In very large networks more than one secondary DNS server

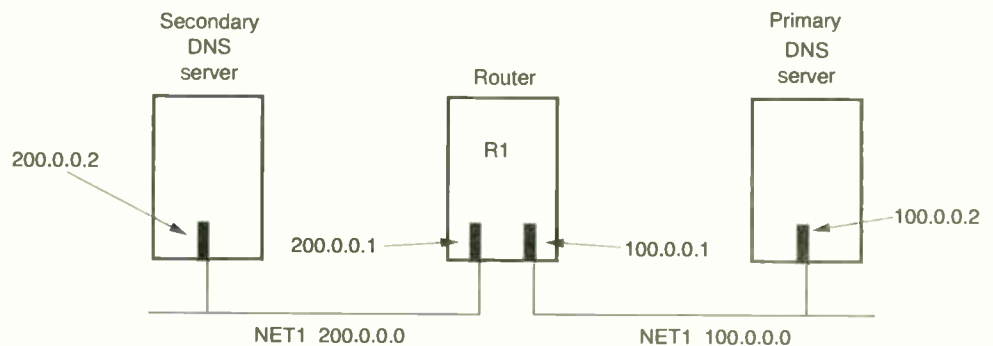


Fig. 5: A network with primary and secondary DNS servers.

may be attached to the same segment. Hosts are then allocated to one of the DNS servers to share out the work. Normally hosts are configured with more than one DNS server: if one server fails, the host switches over to the next in the list and so on.



# Replacing the Painter chip

**Philips refers to the main microcontroller IC in the A10E chassis as the Painter. It's a small, surface-mounted 100-pin device that can be the cause of many symptoms. Particular care is required when replacing it. Martin Cole explains how to carry out the repair.**

**T**he Philips A10E 50Hz chassis was introduced in 2000. It's very reliable except for one component, the Painter IC, a small surface-mounted device with 100 pins. Painter is a Philips colloquialism for the main microcontroller chip in this chassis, IC7064. It's mounted on the small-signals board (SSB), a computer-type PCB that slots into a SIMM-type socket on the main board, and can be the cause of all sorts of symptoms. These include no remote-control operation, no sound, Ext 1 switching on automatically, failure to come on, cutting out to standby and many more.

## Versions

There are several versions of the chip, the three main types being ET, EP and ED. Before you tackle faults it's best to check the IC version fitted. To do this, enter the customer-service mode by pressing the remote-control handset's mute button and any button on the set's keypad for five seconds. The top line will then tell you the version number, for example A10EP1-1.3. Press any button to exit the customer service mode.

If the fault is no remote-control operation you can't use this method. You have to look at the IC itself to read the version type. EP is the most common version, with the part number 3111 250 54501. It has recently been recoded 9352 710 77557. The latest version is A10EP1-2.0.

## Preliminary action

To replace the IC you ideally require the Philips Computer Aided Repair system (COMPAIR) to enable you to enter different settings in the EEPROM (NVM) chip. But in my

experience this is very rarely required. A comprehensive instruction leaflet comes with the new IC: it should be followed very carefully. You also require a hot-air surface-mounted device IC removal tool. You cannot do the job with a 25W soldering iron and solder wick. If you don't have the right equipment, *do not* attempt the repair.

Before you start it's best, if the remote-control functions are OK, to enter the service-alignment mode (SAM) and note all the options. This will make it much easier to set up the picture after the replacement. You can enter the SAM by pressing the 'align' button on the Philips Dealer Service Tool (RC7150) or numbers 062596 followed by the OSD button with the standard remote-control unit – the OSD button is the teletext i (index page) one. The SAM menu will then appear on the screen. Before starting I always make a note, for service records, of the hours counter.

Use the remote-control unit's cursor buttons to go down to options, and select with the right cursor. Then use the cursor buttons to go down the list (not all items can be displayed at once, just keep pressing the down cursor to reveal the next item), making a note of each line, until you get to the option numbers OB1-OB8. These are the options that should be the same as the codes on the sticker on the back of the CRT. Do the same for the white-tone, geometry, Super-wide geometry and Smart settings. You don't need to bother with the tuner or sound.

You will probably find error code 13 in the error buffer. This is an IC tuner error, but the tuner will be OK. If you want to cure this problem, change the value of

R3267 and R3268 to 10Ω. The cause of the problem is an incorrect logic level at the relevant input to the microcontroller chip.

When you are satisfied that you have all the details, you can remove the SSB and proceed with the replacement.

## Carrying out the replacement

I allow two days for the repair as I use Chemtronics Chemask, which is best left overnight to cure, to isolate the surrounding components thermally before using a Leister Hot Jet S tool. Other equipment with shields and suction to remove surface-mounted devices is available, but is unfortunately very expensive – beyond the budget possibilities for many engineers.

Use gentle heating to remove the chip, with tweezers to flick it away from the solder lands. Then clean up the PCB with flux and solder wick, using a standard soldering iron.

When soldering the replacement IC in place, take the usual static precautions and line up all the pins very carefully. I use a bench magnifying lamp and two more magnifying glasses to see the pins. Extra care at this stage pays off, as poorly aligned pins will cause problems later.

Tack two corner pins to hold the IC in place before full soldering. There are different schools of thought on how to go about soldering the hundred pins. I use a Pace Mini-Wave tip, which holds a reservoir of solder and can solder them all in seconds. Some flood the whole lot with solder, then wick off the excess. Others use a solder paste or solder each pin individually with a fine-point soldering tip.



To perfect my preferred method, I practised with old scrap VCR panels.

When the soldering has been completed, clean the board with isopropyl alcohol and inspect it. If the soldering at any pin appears to be suspect, try moving the pin gently with a fine point. Resolder if necessary. It is most important that every pin is correctly soldered. More on this later.

### Testing

Once the IC has been fitted, it's time to try it out. After replacing about fifty Painter ICs I still find this the most heart-stopping moment – when you fit the SSB and switch on. First make sure that the mains socket switch and the set's mains switch are both in the off position. If you plug the SSB into a set that's already powered up you will have to buy another IC and do it all again! This is important: the new IC has to download to the EEPROM chip and vice versa, and you get loads of problems if this process is interrupted. If there are other engineers working on equipment in the workshop and you have sensitive mains safety trips, ask them to stop work while you switch on. Someone causing the workshop supply to go or using a Philips remote-control unit can cause trouble.

Plug an aerial in before you switch the set on. When you switch on nothing seems to happen for what seems to be ages, then you hear the degaussing and the set comes on with no picture. Be patient. The picture will appear and the set will start the auto-tuning search. Leave it alone until it has finished and the sound appears.

### Setting up

If all this happens you have been successful. All you need to do is to go into the SAM and check the option numbers, then re-enter the geometry and white-tone settings. Pay particular attention to the cathode-drive settings. They are always too high with a new IC.

To change the option numbers OB1-OB8 as per the numbers on the CRT sticker, go to Options and, using the cursor buttons, work your way down to the end of the list until you get to OB1. If it is incorrect, enter the right number. You have to enter a three-digit number so, if any number has only two digits, enter a zero first, e.g. 023 for 23. Do this for OB2, OB3 etc. Option numbers OB5-OB8 are usu-

ally zeros. The option numbers vary with model, screen size and CRT type. With the Smart settings, use those you noted previously or follow the instruction sheet supplied with the IC. To store your settings, press the menu key until you get the main menu, right cursor to brightness, down cursor to 'store' and store. Press menu twice to return to the SAM menu and press standby.

### When things go wrong

What if things go wrong? The most likely outcome is that the set doesn't come on. Remove the SSB and check your soldering again. If you find a poor connection, it is possible that the download didn't go to plan. This is the worst possible situation.

As I understand it, during the download the Painter talks to the EEPROM and the EEPROM talks to the Painter. The Painter is then 'write-protected', and whatever you try from then on will not get the set going again. The instruction sheet refers to changing the EEPROM IC on the other side of the PCB, but it won't help in this situation. Even using COMPAIR to wipe the EEPROM clean, then downloading from a floppy disk a known-good EEPROM file for the exact model being repaired will not provide a cure. The only cure is to replace the Painter again, an expensive outcome!

Philips technical engineers have given me conflicting advice on what actually happens during the download, suggesting that the Painter is write-protected all the time. But if this is the case why can't a suspect IC be used on another panel?

Other faults I've had are incorrect menu colours and text colours. Again the cause was the relevant IC pin not being correctly soldered. At one stage Philips had a faulty batch of 'blank' ICs – the set would not come on – but supplies of these should have been exhausted by now.

### An alternative approach

If you feel that you cannot carry out this repair, there are repairers who will change the Painter IC for you if you send them the PCB. I have known cases where an engineer simply puts the repaired panel back in the set and does nothing about setting it up.

This means that the set operates with incorrect option codes, awful geometry and excessive cathode drive!

I hope that you will find this

article of use and, after reading it, will feel able to replace the Painter IC. If you are still unsure however it's probably best not to try, as damage to the SSB is terminal and I don't think it is available any longer. If you use a third-party repairer, always set up the options and geometry etc. before returning the set to the customer. These sets produce excellent pictures, especially when they are fitted with a Philips CRT.

### Costs

It seems to me that engineers in this trade are expected to carry out very difficult repairs, to component level, for little reward. If this was a PC instead of a TV set, the SSB panel would probably cost about £40 and be a throwaway item. When it was available, I believe it cost in the region of £220 plus VAT!

An estimate for the replacement of this IC is always met with much resentment. After all, the ICs started to fail when the sets were just out of guarantee, and people were not pleased at the prospect of having to pay nearly £130 to repair a set that was just over a year old. The sets, up to three years old, are still coming in.

Customers tend to think that they are being ripped off, and don't appreciate the cost of the equipment needed to carry out such repairs. As mentioned earlier, desoldering stations are expensive – quite often in excess of £1,000. The COMPAIR system with all the software costs nearly £300, and annual software updates have to be purchased. Our charge also includes two people to collect and return the set. I have had two cases where the customer has written off the set and bought a supermarket model for £199.

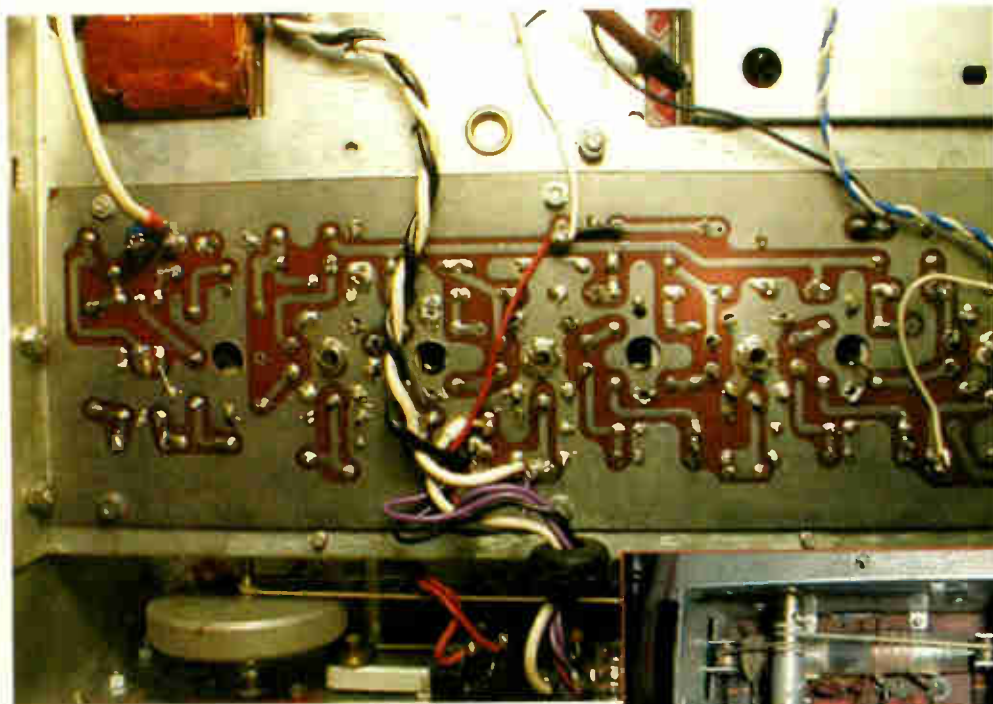
If you require an A10E service manual, the part number is 3122 785 10430. There are several errors in it – a separate sheet is available with all the corrections.

*The SSB in the Philips A10E chassis slots into a Simm-type socket on the main PCB. The Painter IC is towards the centre.*



# Vintage repairs

**Pete Roberts describes a couple of 'no-reception' faults with vintage radio equipment, a Radford FM tuner and a Motorola car radio.**



**M**y latest vintage equipment servicing efforts involved two nice items, a Radford hybrid FM tuner, Model FMT1, and a Motorola 124 car radio. The latter was typical of dozens I repaired as a callow youth about thirty years ago. The problem with both was said to be "no reception".

## The FM tuner

The Radford tuner matches in appearance the firm's contemporary preamplifier/control unit and power amplifier. That is, it's housed in a strong battleship-grey metal cabinet and weighs as much as a light destroyer. Going by the date codes on the electrolytic capacitors, I assume that this particular example hailed from the mid-Sixties. The valve line-up is as follows: an ECC85 RF amplifier/mixer-oscillator; three EF89 vari-mu IF amplifiers; an EF80 limiter; and an EM87 tuning indicator. Two germanium diodes are used for demodulation, which is followed by a two-transistor audio amplifier that uses

an odd Texas Instruments device with an unreadable number and an AC128. The IF strip and audio amplifier are both built on PCBs that are mounted on cut-puts in the metal chassis. The RF amplifier and self-oscillating mixer stages are contained in a screened, permeability-tuned tuner head.

After checking for any obvious faults I applied power and switched on. The heaters all came up to normal brightness, but the magic-eye's display was very dim and showed no movement as I spun the dial across the band. I'd already checked that the permeability tuner's cores were free and moving. Then I saw it, balefully staring at me from the centre of the chassis: a

Sen-Ter-Cel selenium bridge-rectifier block. So out came the meter, which showed that the HT supply was less than 90V – with an input from the mains transformer of about 250V AC! Knowing these things from long ago, I discharged the HT reservoir and smoothing capacitors (3 x 16+16 $\mu$ F, 350V wkg, 450V surge, with each having both sections wired in parallel) and measured their capacitances. 32 $\mu$ F in each case – not bad for 35-year old capacitors!

Suspicious confirmed, out came the selenium rectifier block: old hands may recall that meter checks on this type of rectifier could never be relied upon. I just happened to have a fairly substantial 1kV, 8A silicon bridge in stock. So in it went, with a 1,000pF, 250V AC class Y ceramic capacitor wired across the AC input to protect it from transients – always advisable when using silicon rectifiers with a transformer-derived high-voltage supply. OK, so 8A is a bit over the top, but it saved having to use tagstrip to mount a 1A part. After fitting it I was rewarded with success. With the valves heated the HT was now at about 270V, confirmed by a nice, bright magic-eye.

Better still, the display flickered when I spun the tuning knob. As the magic-eye's control voltage is derived from the ratio-detector circuit, audio should have been present. But there was still silence.

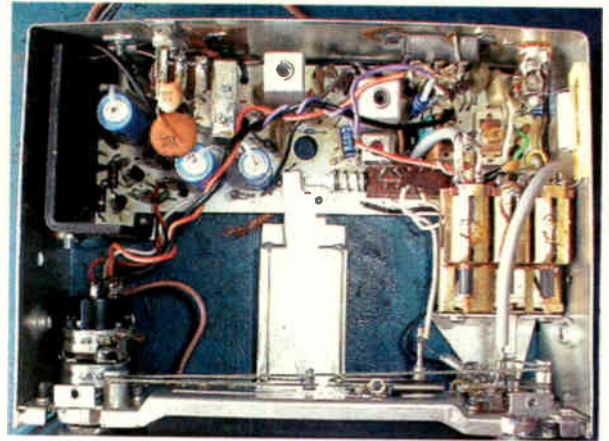
## Audio section

This tuner's audio section is odd to say the least. The post-detector transistor audio amplifier's output goes to a 5-pin DIN socket which is mounted on the rear panel. The twin-gang front-panel volume control is connected to the same socket, via a pair of screened leads. Another pair of screened leads connects a set of phono sockets, again mounted at the rear, to the wipers of the ganged volume-control potentiometers. My customer told

*The IF strip in the Radford FM tuner.*

*Inset: the tuner head in the Radford Model FMT1.*





me that he took the mono signal from the DIN socket, which is obviously there to connect an external stereo decoder – bearing in mind that this tuner was built a couple of years before stereo transmissions started in the UK. Needless to say the volume control has no effect when the output is taken in this way.

The loss of audio was caused by a broken transistor lead. After repairing this I was able to tune across an FM band solid with signals. The audio amplifier is powered from the main HT line via a 2W carbon resistor that was rather cooked. When measured, the amplifier's supply was found to be 34V. As the AC128 transistor has a maximum Vce of 32V, I decided that this was not a good idea! I don't have a circuit diagram, and couldn't make out the original value of the dropper resistor (it measured 27kΩ). So I replaced it with a 33kΩ, 3W flameproof metal-film resistor mounted well off the preamplifier's little PCB. The audio amplifier's supply then measured 28V. With the replacement resistor running just comfortably warm and the audio quality unaffected, I decided to leave it at that. Reasonable longevity should be assured. I wonder why Radford didn't stabilise the preamplifier's supply with a zener diode?

Quite a few soldered joints on the IF amplifier PCB looked a bit past their best, so I did a blanket resoldering job, taking particular care to make good the joints that secure the valveholders. The unit was soak tested for a fortnight, then parcelled up for its journey home to the north of Scotland.

### The Motorola

The Motorola 124 car radio was in excellent cosmetic condition for its age. It was one of the later all-silicon models made during the very late Sixties, with an output stage

that features those odd little Motorola 'liquorice allsort' power transistors that have a distinctive, gold-plated heatsink tab. There's an RF amplifier stage prior to the mixer/oscillator stage, both being permeability tuned to provide full LW and MW coverage. The IF is 470kHz, and the single IF amplifier stage has two double-tuned IF transformers.

The reported fault was "no reception", but when I connected a speaker and my 13.8V bench power supply there was the usual MW noise – though not very much. After a few minutes even this disappeared, but wiggling the aerial plug in its socket would bring the set back to life. No need to 'hunt the fault' here: the symptoms were those of a duff detector diode. A new OA90 diode restored reception.

But the sound was thin and the volume a bit low. Turning up the wick produced obvious clipping at a still modest level. The output stage is of the familiar complementary-symmetry 'totem-pole' type, with capacitive coupling to the speaker. The 1,000μF, 25V coupling capacitor was the cause of the trouble, being almost open-circuit.

The electrolytic capacitors were all those nice golden and usually very reliable German Frako types. But the radio had no doubt been regularly toasted during its thirty odd summers, so I thought it prudent to replace them all. When refurbishing old radios I find that modern radial electrolytics aren't right from the appearance point of view. So I use those awfully nice blue BC Components axial capacitors which, though smaller, otherwise look just like their Sixties Philips predecessors. To many vintage radio enthusiasts the appearance of "the works" is as important as that of the case.

Dry-joints are a common fault with these radios. The PCBs appear

to be flow-soldered and, sometimes, there are just minimal amounts of solder with the component leads clearly visible. So I undertook a blanket resoldering. This is particularly important as car radios are subject to vibration, which can also shift cores. Because of this I checked the alignment – a tweak of the IF cores provided a useful increase in gain.

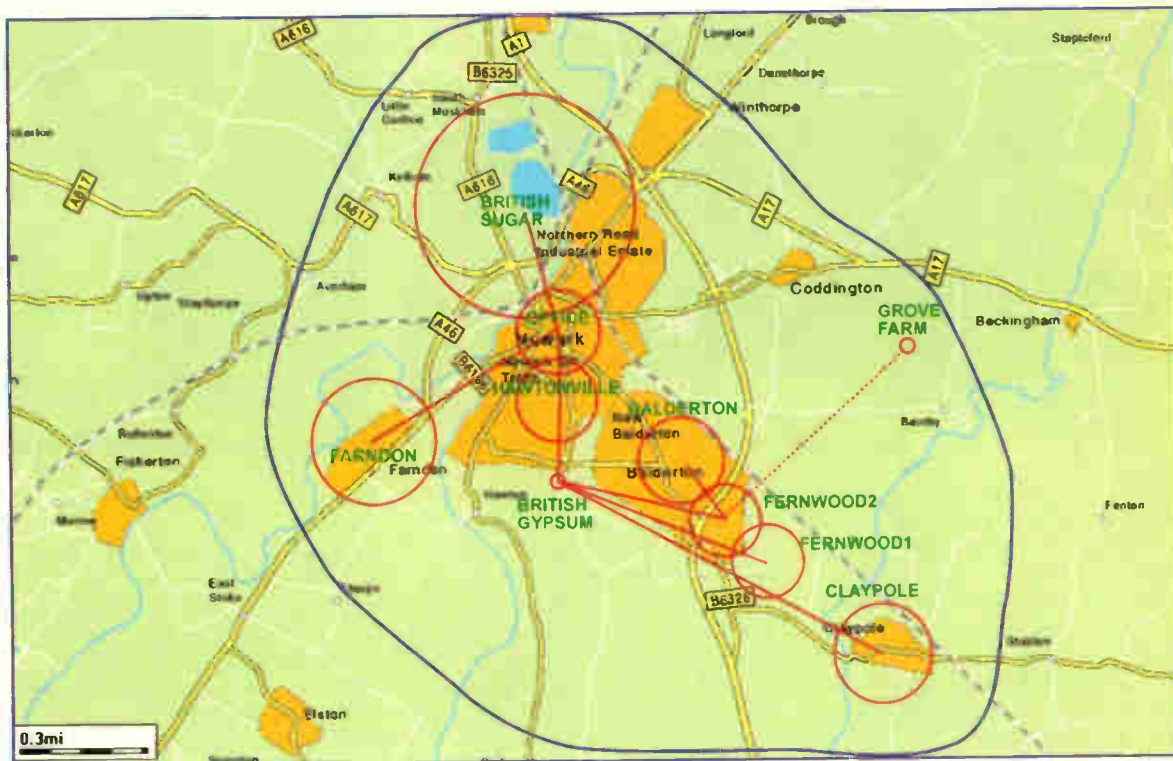
Finally, never forget to check the voltage and polarity before applying power when repairing a vintage car radio: 6V radios weren't all that rare, and most Sixties models will be set for positive earth. The polarity setting is usually indicated by the position of a switch, but Radiomobile models use soldered links on the PCB – the position of these will need to be checked. Always ensure that the polarity is set as originally. It might be a good idea to note the polarity on the customer's invoice. Impress on the owner the need to fit a suitably-rated fuse in the supply lead. A 3A rating is adequate for most radios of the period.

**Top left:**  
The Motorola car radio Model 124.

**Top right:**  
Internal view of the Motorola Model 124.

**Below:**  
Electrolytics in the Motorola 124.





Coverage of the Newark Network.

# Wireless broadband links

Steve Beeching on the advantages of having a wireless broadband link for internet connection

I live at a rural location and run a business from my home, Grove Farm. It was still a working farm back in the Fifties and Sixties, and thus had the outbuildings that go with such an enterprise. These were in fact what attracted me to the farm when, in the mid-Eighties, I decided to concentrate on repairing the then revolutionary camcorders for a major manufacturer. It provided sufficient workshop accommodation and storage and there were five telephone lines. So there was no need to move to an industrial estate. I suppose that, in 1986, I would have been a pioneer in the trend to non-agricultural business location in a rural setting.

In the early days, around 1990, I started to use PCs for drawing and writing, in order to update technical publications including my book

*Domestic Video Recorders – a Servicing Guide*. Since then the PC has also become a tool for adjusting the high-tech products that come my way. I've had to upgrade many times, which is not a problem when one can build a PC for a specific purpose.

### Use of the internet

During the mid-Nineties the internet became a normal part of business, for communications, web sites, publishing and downloading product data files and service software. As the files became larger, the communication periods became longer, tying up the PC and phone lines for hours on end.

So broadband was to be the next step – and that was where progress came to a halt for a while.

When I asked BT about ADSL (broadband) I discovered that there were two stumbling blocks. The local exchange, somewhere in a field, would not be upgraded to ADSL. And I was too far from it – more than 2km. The distance from the exchange has increased to 6km, and there is also the problem that the 1km 5-pair cable along the driveway to Grove Farm has quite a few knots in it. These would impede BT's high-frequency carriers. The local NTL cable network comes nowhere near the local village, and again there would be the long driveway to cable. So no chance there.

Then a local entrepreneur and his small IT and computer company decided that, for social and financial (in the longer term) reasons, it would be a good idea to





*Left: Steve's chimney-mounted data link.*

equipment, in turn lowering costs. The link is connected to the workshop PC's network port. This will make possible future expansion with other PCs, using a smaller internal WiFi network. The roof-mounted data-link unit is more sensitive and efficient than a passive aerial. I get 70 per cent signal data quality over a distance of two and a half miles to an access point at Fernwood 2 (see map, Fig. 1). This is a temporary arrangement – an adjacent water tower is likely to become available in the future. There will be no need to reposition the 'aerial' as it has a beam width of 32°.

### Newark Network development

JHCS had a favourable response from local organisations to requests for access to tall buildings to site equipment – access points and bridges. These consume very little power, an access point 100mW, a bridge 24mW. A lot less than a 10W light bulb!

The first experimental link provided an access point at the Fernwood 1 site, just outside the BT broadband (ADSL) range. To achieve this two data bridges were installed, at Hawtonville and Balderton. They were subsequently upgraded to access points. The link to Farndon, along the A46, followed soon after. There were signal problems at Fernwood 1: help was provided by British Gypsum, which allowed a bridge to be installed on a high construction. This gave better signals to Fernwood 1 and 2 – the latter is isolated from Fernwood 1 by trees – and made a link to the village of Claypool possible. A recent addition to the network is an access point on a high tower at the British Sugar factory to the north of Newark. The full extent of this coverage has still to be assessed. A total area of about 100 square miles is now covered, within the blue line in Fig. 1, with the possibility of reaching some 90,000 subscribers.

### Costs

Some local schools have access to the internet via cable at a cost of up to £250,000 per school. A wireless link with a 1:1 connection, at a speed of 2Mbits/sec, would cost virtually nothing in comparison. There would be no need for digging and laying expensive cable.



*An external broadband data-link aerial for domestic use.*

have a wireless communications system in Newark-on-Trent. John Harris, of JHCS Computers, gave a short presentation about his idea for a Newark Network to members of the Newark Business Club. John already had a 'pipe' connection to the internet world, and hosted sites as an ISP. I was very interested, but again there was a stumbling block: I am five miles from Newark.

But over the past year the network has grown and progressed and, as newer and more efficient communications equipment has become available, its range has increased. This has been achieved by technical advances in weak-signal recovery and error-correction techniques rather than increased transmission power. The network equipment is being continually upgraded as newer and better transceivers become available, increasing the coverage.

### Broadband at Grove Farm

I am now on broadband, with full 512 kbits/sec access for 24 hours seven days a week, at a very reasonable cost, without changing ISP, email or web addresses – except for outgoing emails, but even here there is no change to the source address.

My 'aerial', see Photo 1, is a data-communications link that works at the standard WiFi frequency of 2.4GHz. This frequency was chosen because it is widely used for networks, thus making possible the use of a wide range of

The cost of a wireless broadband link is very reasonable. The initial installation cost of £400 can be offset by a grant application to [rabbit-broadband.org.uk](http://rabbit-broadband.org.uk), leaving the subscription charge of £29.99 plus VAT per month. This charge increases to £49.99 a month for network connection via a router. Because of the modest cost and the advantage of continuous 24/7 internet access, local businesses are changing from their current providers to Newark Network. Domestic users have a small WiFi card fitted to their PCs. The card is connected to an external aerial (see Photo 2) and the cost is much lower – £55 for the card, plus installation and a monthly subscription charge of £19.99 plus VAT.

### In conclusion

JHCS plans to introduce smaller access points around the town for laptops. There are also plans to introduce VOIP for voice communication, providing local phone calls via the Newark Network.

Newark Network is a great advantage to me and to farms and businesses around Newark at locations where a broadband connection was, a year ago, inconceivable – and the main telecommunications provider was just not interested.

Anyone interested in a similar project can contact John Harris at [info@jhcs.com](mailto:info@jhcs.com), or call 01636 682 244.



# DX and Satellite Reception

**Terrestrial DX and satellite TV reception reports. Broadcast, satellite and digital TV news. Could Bluetooth be an interference problem? The early days of ITV. Roger Bunney reports**



*Firework display as the Queen Mary-2 leaves Southampton on her maiden voyage. Picture from BT TES-9, downlinked via Telecom 2D.*

**R**eception conditions have been poor at best so far this year, perhaps reflecting the dreadful weather up to the time of writing (end January). We can however look back on a reasonable year for DXing in 2003, with the bonus that propagation tended to be on a north-south axis, bringing in plenty of Band I signals from TVE (Spain).

Unfortunately at least one Band I TVE transmitter (ch. E4) closed down last July, and there are indications that the rest will follow before long. While on holiday in the Canary Is Garry Smith noted that Izana ch. E3 closed down on 10 December: it was there one morning at 0300 but not the next! Strange, as I had a report of reception on the 11th, while Hugh Cocks in Portugal reported on 5 January that Madrid ch. E2 and Izana ch. E3 were still on air. In an email on 28 January Hugh said he could not confirm Izana but that a steady video buzz could be heard in ch. E2 from the direction of Madrid, which suggests that Madrid was transmitting a caption rather than programmes. I'll probably have further news next time.

Digital terrestrial TV is to start in France within the next twelve months. By the end of 2005 it's expected that 60 per cent of the population will be covered, then increasing to an eventual 85 per cent.

Clearly there will be analogue TV closing dates in many countries across Europe over the next few years. Even the local RSL station Solent TV, on the Isle of Wight, tried to get included in a digital multiplex from Rowridge. Access was refused on the grounds that "there's no room". The multiplexes seem to have plenty of space to me!

## Satellite sightings

First, an easy one. Check out EPG no. 238 via Astra at 28.2°E. You'll probably find a channel called BEN, a curious selection of entertainment items. But, late at night, AFT (African Independent Television) appears. It consists of various items from African TV stations, including Nigeria and the SABC. Try after 2300 hours GMT.

Not such good news over at NSS-7 (21.5°W), where the CNN Newsource feeder has been telling subscribers to contact CNN for information on upgrading their receivers. It seems that from April the Atlantic CNN feed will be encrypted, using Scientific Atlanta scrambling, possibly PowerVu. A pity, as this frequency carried unique live relays of breaking news from affiliates across North America.

An Algerian multiplex appeared in mid-January via NSS-7, with Arabic- and French-language programming. There were four video channels (one unused) that had material from Algerian stations across the country, plus twenty or so radio channels. By late January the multiplex had disappeared, but may return. Check at 12.736GHz H (symbol rate 16.625, FEC 3/4). The uplink service was provided by Telediffusion d'Algerie. An Iranian TV channel popped up on Eutelsat W1 (10°E) at 11.155GHz V (5.632, 3/4), signing as TVBN 2 with a website (ertebatm@IRANNTV.com). The program cut abruptly at 2200 hours.

A scan over NSS-7 on the 17th revealed a couple of feeds with a religious theme. A presentation for the New Apostolic Church, L.A. California, as part of the NAC TV Network, appeared to be live from the Los Angeles Central Church, Pasadena. It was uplinked by DSNG3 AMLX (identification with colours bars) at 11.659GHz H (5.632, 3/4). The other presentation, at 11.668GHz H (6.617, 3/4), was called Cap sur Jesus. This French-language programme started at 1750 and ended, including part repeats, at 1851.

There was a lot of evening sports from Germany in the middle of the month. A check at 10°E on a couple of evenings provided a rich variety for those feeling athletic. For example Friedrichafen v. Tours VB was a hard-fought volleyball match, uplinked by INTEAX 62/LBR at 11.016GHz H (6.109, 3/4), while ice-hockey action on an adjacent frequency (not logged!) appeared courtesy of AKK-TV UE6. Volleyball appears to be a popular sport in mid-Europe. On the 14th the Poland v. Holland match was downlinked via Eutelsat W2 (16°E) at 12.654GHz H (5.632, 3/4) by VTM DSNG 5 EN. For several nights German TV ran, also via W2, its version of a jungle celebrity challenge, Ich-bin-ein-B. This was at 12.548GHz H (5.632, 3/4).



On 10 January there was local interest in the maiden voyage from Southampton of the Queen Mary-2. It was bad luck for Meridian Tonight, which broadcasts at 1800-1830 hours, that the QM-2 delayed its cast off. This could be seen live via the local BBC South programme, which is transmitted at 1830-1900! The BT sat truck Meridian 8MBI delayed its departure however, recording pictures from Hythe (opposite Southampton Docks) of the spectacular fireworks as the QM-2 slowly cruised into the night. These were downlinked, as usual, via Telecon 2B (8°W) at 12.592GHz H (5,632, 3/4).

Bomb outrages in Iraq continue. Reuters Baghdad has been using Europe\*Star-1 (45° E) for its intermittent feeds. A German-language VT package on troops' welfare was transmitted in the clear. A few days later there was a live feed for BBC2 Newsnight using MPEG 4:2:2. Check at 12.688GHz V (5,632, 3/4). The usually slumbering Sesat (36°E) was rudely awakened for Reuters Baghdad Flyway at 11.598GHz V with the unusual characteristics (for news feeds) of SR 27,500 and FEC 5/6. For its Iraqi news hookups APTN Baghdad continues to use Eutelsat W1, at 10.961GHz V (4,167, 5/6). CBS New York, entrenched at the Rimal Hotel, prefers to use W2, usually at 12.525GHz H (5,632, 3/4) or an adjacent frequency – its current service ident is simply 523209.

I rarely check Intelsat 707/Thor (1°W), but the capsized freighter tragedy in a Norwegian fjord in late January initiated a scan. What I found, at 11.659GHz H (5,632, 3/4), was the Baghdad output from ABC Scopus feeding NTSC to NY, possibly direct. It seems to be present much of the time. Roy Carman subsequently told me that there was a live feed from the fjord at 11.485GHz H (6,111, 3/4).

The BBC produced dramatic, live pictures via a videophone of the destruction caused by the earthquake at Bam, Iran at the end of December. It was a considerable improvement on the results seen during the invasion of Iraq last spring. The flyaway terminal UKI-511 Coder was quickly in operation on 1 January, showing live rescue operations. This was via W1 at 11.108GHz V (6,109, 5/6). There was an 'Iran Bam Default' at 10.980GHz V (6,109, 3/4) with live updates.

Live broadcasters were kept guessing for a few evenings as to when Flight BA223 would actually leave Heathrow for Washington. The BT TES-10 truck was present during the time, providing live reports for Sky News via W2 at 11.127GHz H (5,632, 3/4).

The usual coverage of the Paris-Dakar rally was missing this year, but Roy Carman found a couple of live broadcasts via PanAmSat-1R (45°W), at 11.575 and 11.583GHz H (6,111, 3/4). He also drew my attention to increased activity via Intelsat 901 (18°W): there are German channels Bundestag at 11.586GHz, IVBB-BPK at 11.593GHz, IVBB-BPA at 11.598GHz and IVBB-Bundesra at 11.603GHz (all H with 3,906 and 3/4); also Prima TV, a Romanian channel, at 10.982GHz H (4,199, 3/4).

Intermittent news for INA News/www.ina.tv/UKI-801 is being carried by Hellas-Sat (39°E). Check at 11.082GHz V (5,632, 3/4) and 12.633GHz V (6,111, 3/4). There are also soft-porn offerings at 12.689GHz H (27,500, 3/4)!

Curious results were seen at 33°E, the E-Bird satellite. When I stopped my dish here on 15 January the 'spectroscope' display revealed several downlinks, but there was a cyclic movement of signal levels from normal to zero then up again. This was repeated over and over.

Our best wishes to correspondent Alan Richards who had to move from his mobile home near Nottingham when the site owner sold out to a property developer. He has relocated to Lincolnshire, and I hope to receive fresh reports from him soon.

## Broadcast news

**Malaya:** The national TV network RTM-1 intends to start operating on a 24-hour basis by the middle of the year and plans to broadcast via satellite to Asia, Australia, the Middle East and Eastern Europe. For cost reasons downlinking will be via Chinese satellite capacity instead of Malaya's Mesat bird. The 8TV terrestrial channel started broadcasting in



*Is this a caption or a test card? Seen via Europe\*Star-1, from the news agency IHA in Afghanistan.*

early January, with coverage along the heavily populated west coast, offering entertainment, music and news in Chinese and English. This is the fourth commercial TV service to open in Malaya.

**France:** Several DTT launch dates have been announced previously. The latest is December 2004 to March 2005.

**South Korea:** The country is to continue to use US analogue and digital TV standards. Tests of the US and European DTT systems have been going on for five years. The latter seems to have been rejected on cost grounds.

**Finland:** YLE has authorised the expansion of DTT across the country. 95 per cent of the population should be covered by this autumn, and most populated areas by late 2005 – low-power transmitters will be used for small settlements.

**Nigeria:** Channels Television, which is based at Abuja, has started to transmit from its studio site. This is unusual, as you can get interference problems when a transmitter is close to the studio.

The station expects to be available shortly across Africa in digital satellite form. It opened nine years ago and specialises in news and current affairs.

**New Zealand:** The Maori Television Service is due to start in mid-March in the North Island, the intention being to increase knowledge of and interest in Maori culture. It's a non-commercial, public-funded channel.

**Iraq:** After much delay the contract to operate the Iraqi Media Network for the next twelve months has been awarded to the Harris Corporation (US). Two national TV channels, two radio services and a national newspaper are to be set up. Transmitters will be located in Baghdad and at thirty other locations across the country.

**UK:** A new RSL TV station has opened in York, using ch. 54. More information can be obtained from York TV on 01904 700 464 or by emailing info@york.tv  
RSL service Solent TV has installed a new transmitter at Rowridge, increasing the output to 2kW ERP. Nicam stereo sound was introduced at the same time.

**Iran/Azerbaijan:** The Iranian TV channel Sahar-2 has resumed transmissions across the border to Azerbaijan, in retaliation for claims that Azerbaijan TV has been transmitting anti-Iranian material across the border to Iran. Late last year the two countries had signed an agreement to terminate the Sahar-2 transmissions to Azerbaijan. Sahar-2 also broadcasts across the Middle East via satellite.

## Satellite news

Amos-2, the new Israeli satellite, was successfully launched on 28 December from Baikonur, Kazakhstan. The orbital slot is 4°W, where the footprint will cover Europe, the Middle East, North Africa and across into the Canadian Eastern Seaboard. It has 22 Ku-band transponders.

The new Telstar-14 at 63°W is just above the horizon in the UK for those with a flat take-off to the SW. This 41 Ku-band transponder satellite will be used mainly for coverage of Brazil, with additional capacity for North America and "the North Atlantic". In the latter region it will provide live connection to aircraft, on behalf of Boeing, for internet services. The launch was on 11 January from a platform in the Pacific, but once in orbit it was found to have deployed its northern solar panel only partially. Efforts are being made to correct this. If these fail, the effect will be a shortened life span.

The new Saudi news channel Al-Ikhbariya was launched on 11 January, initially with twelve hours a day of Arabic transmissions but with its output to be expanded to 24 hours a day, including English-language programming. The 'rolling news' format has been lacking with Saudi terrestrial channels and it is hoped that this will attract viewers. One aim is to provide an alternative to the mainstream channel Al-Jazeera, which most people in the region watch for breaking news. Al-Jazeera plans to open an English-language news channel later this year, from a studio at Doha in Qatar. It has high credibility in the region as a news source but operates on a tight budget, with funds derived from programme and advertising sales and the Qatar government.

The Hong-Kong based Star News channel has been given 'landing rights' for the sub-continent and permission to open a news base and uplink centre in India. The Indian government had for some years refused to allow Star access to ground-based operations in the country.

Satellite enthusiasts in Shanghai, China are being offered cheap dish systems despite it being illegal since 1993 to own and operate a satellite receiving terminal. Typical receiver prices range from \$US360 to \$US420. Odd that most domestic satellite receivers are now produced in China and incorporate the latest technology, such as the blind-search feature used in more complex models.

## Band 1 filters

I've received a letter from Ian Moody, a well-established TV-DXer, on the subject of Band 1 filtering. He has made several channel-pass filters for ch. E2, E3 or E4, using typically three pairs of tuned circuits. During the 2003 SpE season he found that local 49MHz interference was blocking out ch. E2. He was able to clear the interference with the filter design shown in Fig. 1, using the six trimmers C1-6 to peak the three pairs of tuned circuits in sequence. The filter was incorporated after the preamplifier to overcome, in part, the throughput losses. The design is straightforward and is inexpensive to make, but ensure that it is built in a metal, preferably diecast, case.

A previous wideband VHF amplifier design by Ian (select the required band with different inductors) has been further modified to reduce breakthrough problems – if you live next door to a main transmitter! A one input, two output version for DXing is being developed. Hopefully Ian will publish his design in these pages.

Ian draws attention to the following websites which are of general DX interest: <http://www.g4fbz.freemove.co.uk>  
<http://perso.libertysurf.co.uk/ade/knott/buttons.htm>

The former is run by William F. Kitching, G4FBZ, the latter by Adrian Knott, G6KSN.

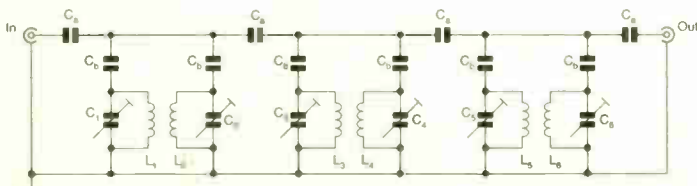
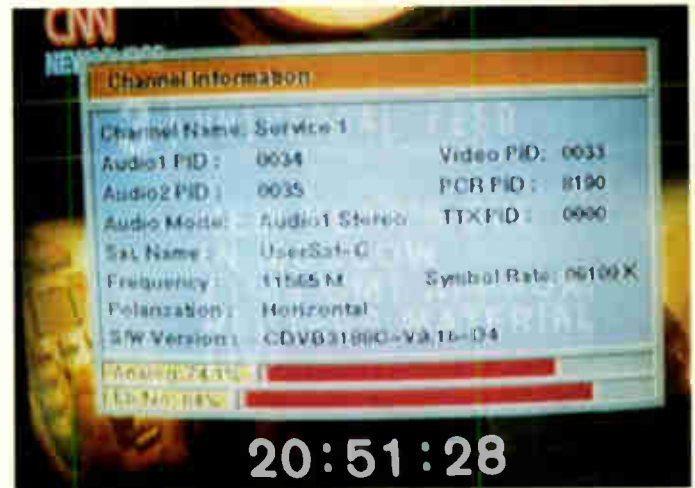


Fig. 1: Ian Moody's channel-pass filter for ch. E2. The value for  $C_a$  is 4.7nF and for  $C_b$  is 18pF. C1-C6 are 2-10pF dielectric trimmers. L1-6 consist of 13 turns of 24 SWG EC wire, 5/32in. in diameter, close spaced.



Channel information display provided by the Coship blind-search satellite receiver.

## Humpty Dumpty had a great fall

Here's a serious warning for those who ascend ladders to install aerials etc. For the past 35 years I've been rigging aerials, also a few dishes, have scaled roofs, chimneys and lattice masts, and have even replaced a few tiles. So, on 27 December, Mr Confidence is outdoors in the darkness on the platform of a 4ft high, three-rung domestic stepladder, completing a minor aerial task. I'm only about 8ft above ground. Then I reach across for the grease, and the ladder topples over complete with me. When I come round on a tarmac drive and roll away from the wreckage, I think that all bones and a hip have been broken. This is real pain. I eventually manage to stagger indoors.

A few days later I am still in pain and a large haematoma (caused by internal bleeding from ruptured blood vessels) has grown on my back and is enormous. The doctor says it will disperse in a few weeks. But it's very painful, and I may have to be 'referred'. Fortunately it does go down, but the pain in my legs, arm and back continued. The moral is obvious: never be over-confident on a ladder!

Bill of Wright's Aerials comments that most aerial-rigging accidents involve stepladders and low heights. When you think there can't be an accident, there may well be one. Bill says that the main dangers associated with aerial rigging have in his experience been stepladders, loft-access hatches, bad lifting technique, Yorkshire Terriers, traffic when working with the van on a busy road, rotten roof timbers – and too many others to recall.

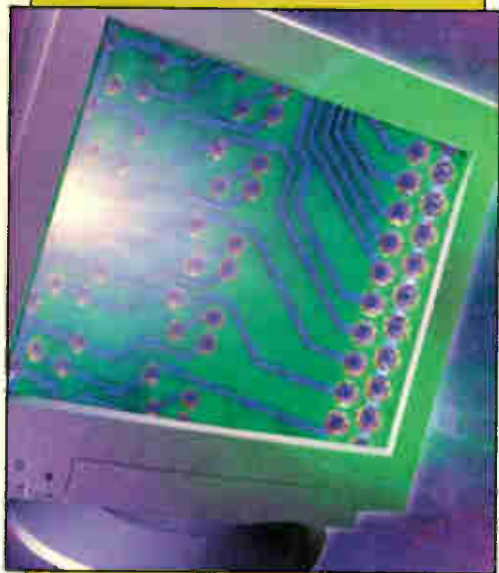
I've not drawn attention to aerial-rigging dangers before in this column. It has taken an accident after 35 years to make me appreciate that even a short-distance fall can cause severe physical damage and pain. So think safety!

## IN MEMORIAM

An old friend and DXer, George North, has passed away in Quito, Ecuador. He suffered a massive heart attack at the relatively young age of 48. In earlier years he had lived at Walton-on-Thames, then travelled across the Americas where he was able to obtain employment.

Grant Dixon, one of the pioneers of Amateur Television and a stalwart of the British Amateur TV Club (BATC), died on 20 December. He was born in 1916 and grew up with radio and television, building his first radio in 1927 and then, in the early Thirties, a 30-line spinning-disc televisor. He even introduced some improvements to John Logie Baird's mechanical colour system. In the post-war period he built 405-line sets for reception from Holme Moss and Alexandra Palace then, when amateur TV took off in the early Fifties, he joined the BATC. In 1955 he was first to start amateur TV colour transmission. Slow-scan TV was another of his interests. Grant's involvement with the BATC continued until 'retirement' in 1981. He continued to support the club for some years after that.





# MONITORS

Fault reports from  
**Gerry Mumford**  
**Ian Field**  
and  
**Bob Bradley**

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Television Magazine Fault Reports,  
Highbury Business,  
Media House,  
Azalea Drive, Swanley,  
Kent BR8 8HU

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

## **SAM M1766-10**

This quite old 17in. monitor appeared to be completely dead. But when the cover was removed a very slow and quiet ticking noise was just audible. A short-circuit was quickly found across the 75V output from the power supply. This feed goes to the CRT base board, where the video amplifiers live. Removal of the connector cleared the short. The cause was eventually found to be C258 (100nF, 100V), which is one of the many ceramic decoupling capacitors for this supply, mounted around the edge of the board. Once a replacement had been fitted the monitor powered up correctly and produced a perfect display. **G.M.**

## **Panasonic E50i (TX5F71)**

The fault symptom with this monitor was flickering colours: either red, blue or green would be missing from the display randomly. Visual inspection of the CRT base board revealed big dry-joints on the CRT socket. These were resoldered, then the monitor was given a soak test. After a few hours the colours started to fade away randomly – it was quite unlike the previous abrupt flickering. Application of heat and freezer showed that the cause was the 2SC945 transistors Q301, Q321 and Q341. The display was reliable once these had been replaced. **G.M.**

## **Escom KT90-7134TL**

The complaint with this Acer-made monitor (F8T version) was starts sometimes, more often the power LED flashes then no-go. Once or twice it stayed on long enough for a display to appear. I should have realised that it couldn't be the start-up resistors R603/4 (33k $\Omega$ , 2W) as, once they start the monitor, a supply from the chopper transformer takes over. In fact the cause was the on/off switch.

There were no obvious signs of any failing low-value, high-voltage electrolytics. These seem to be grouped in a cluster next to the line output stage heatsink, by the EW driver transistor. Had the repair not been so simple. I would eventually have investigated the TO126-packaged transistors just forward of the cluster of electrolytics on the secondary side of the chopper power supply.

Instead of using a continuously-variable B+ PWM regulator, many Acer chassis use a selection of secondary tapings that are switched in as appropriate for the video mode in use. There is always one more voltage selection than the number of switching transistors, as the lowest voltage required is taken directly from the relevant rectifier. Switching to any higher voltage reverse-biases this 'default' diode. The

lower-voltage selections are used for the slower scan rates, where the line output transistor is on for a longer time. If operated at too high a voltage the result would be excessive EHT or, in an extreme case, core saturation with the line output transistor having a short-circuit collector-base junction and the base-emitter junction torn open.

Failure of any of the B+ switching transistors can result in over-voltage protection shutdown. Since some of the chopper-supply rectifiers also act as switches (turned off by a higher voltage being switched on to the B+ rail), failure of almost any of them could have produced the observed symptoms. **I.F.**

## **Dell D1428LS**

This monitor was dead because the power supply failed to start. It uses a '3842 type control chip (Samsung KA3882). The start-up resistors were OK, and pin 7 had the required start-up voltage (16V), but there was no Vref supply at pin 8. There are several ways in which the chip can be shut down, and a lot of time was spent checking possible components. As every item I checked was found to be OK, in desperation I replaced the reservoir capacitor connected to pin 7, C616 (47 $\mu$ F, 25V). When I switched the monitor on again the power supply sprang to life! C616 read off the scale when checked with an ESR meter.

I subsequently had the same fault with another of these monitors. They both needed CRT reactivation to obtain a reasonable display. **I.F.**

## **IBM G74**

This 17in. monitor failed to produce a display. But the green LED was on constantly after power was applied, with a somewhat disconcerting random flash. I didn't hear the EHT rustle up at switch on, so out came the EHT probe to confirm whether there was voltage at the CRT's anode cap. There wasn't. Some scope checks showed that the line drive was missing, while voltage checks showed that the outputs from the power supply all seemed to be correct. So I replaced the TDA4859 deflection processor IC. Unfortunately this didn't cure the fault.

I was beginning to suspect that the line output transformer (FBQ-17A001) might be faulty, but didn't have one available for a substitution test. So I decided to carry out a closer check on the power supply. This revealed that the 13V output was on the low side. I then removed various capacitors to check them individually and found that C622 (1,000 $\mu$ F, 25V) produced a poor ESR reading. A replacement capacitor cleared the fault. **B.B.**



# AUDIO FAULTS

Reports from  
**Eugene Trundle**  
**Roy Blaber**  
**David I Scott**  
**Keith Wevill**  
**Philip Rosbottom and**  
**Geoff Darby**

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## Sony TA-VE100

This is a surround-sound 'multi-amplifier'. The problem with it was intermittent crackling and cutting out – probably because the overload-protection circuit was coming into operation. On investigation I found that there were dry-joints at the leadouts of two of the four power-amplifier chips, and at the legs of the two 12V regulator chips IC402 and IC403. The leadout wires of these warm-running devices should be double-kinked to take thermal expansion into account: this would remove the stress from the soldered joints. **E.T.**

## Denon DRA265R

No sound was the problem with this amplifier. Checks around the sound output transistors revealed that TR323 (2SA1633) was short-circuit collector-to-emitter while TR317 (2SD667) had been getting very hot. In addition R329 (330Ω), R331 and R333 (both 0.22Ω) were either open-circuit or burnt. Normal operation was restored by replacing these components and attending to various dry-joints, which I think were the initial cause of the failures. **R.B.**

## Peavy Studio Pro 112

"Loud buzzing without any other sound" said the report that accompanied this Chinese-made guitar amplifier. The point was proved when it was plugged in, the very loud hum confirming that there was at least a power-supply fault.

Construction differs from most audio equipment. The pre- and power amplifiers, control circuitry and power supply are built into a chassis that's housed at the top of the unit. A separate unit for reverberation etc. is mounted at the bottom of the cabinet, with the heavy-duty speaker front-mounted. At the rear there are sockets for special effects, remote operation and an external loudspeaker. Clearly the cause of the problem lay in the main chassis, which had to be removed (several screws plus leads to the lower chassis and the speaker) before diagnosis could begin.

Once this had been done I was surprised to find that the bridge rectifier had overheated to the extent that its case was being melted. I replaced it and the associated reservoir capacitors but the fault was still present. Attention was turned to the output section, where I found that some 40V DC with a high ripple content was present at the output terminal of the LM3886T power-amplifier IC. As this was directly coupled to the loudspeaker it was evident why such a loud hum was present!

A replacement LM3886T chip cured the fault but left me wondering what had caused the failure in the first place. It was likely that a short-circuit external speaker cable had damaged the power amplifier IC.

overloaded the positive and negative power supplies and led to failure of the bridge rectifier.

The power-supply design is interesting, being based on a transformer with a centre-tapped secondary winding. The centre tap is used in conjunction with the bridge rectifier, which is fed from the ends of the secondary winding and provides separate positive and negative supplies. **D.I.S.**

## Marantz CD73

Having seen how much these 20-year old CD players are being sold for on the internet I decided to retrieve mine from the back of the cupboard and power it up. There was no illumination from one of the track-indicator LEDs and hum in both channels. When a CD was played there was considerable distortion in both channels. Several years earlier I had cured a similar distortion fault by replacing the LM317T 5V regulator and ensuring that there was thermal grease between this IC and the heatsink. This time I replaced all the electrolytics, using 105°C capacitors. This cured the hum, the distortion and the lack of light from the track indicator LED.

These capacitors lead a hard life, as they are next to a heatsink that runs hot – the player consumes 45W. Incidentally the service manual shows that the decoder is fitted with Philips ICs, but in my CD73 a Sony decoder board is fitted.

Now that it's fixed, what am I bid?!  
**K.W.**

## Technics SU8055

One of this 50W amplifier's channels had failed. Replacing the encapsulated output transistor restored normal operation – they are similar to the STK module package. **P.R.**

## Yamaha CR1000

This classic tuner-amplifier from the Seventies didn't produce any output. You first have to remove the chassis from the wooden sleeve. Make sure that the tuning cursor is towards the left-hand side of the scale, or a bracket will rip the wires from the pointer bulb. Remove the screws at the left- and right-hand sides of the front, and two screws just behind the tuner PCB. The whole of the front then pivots upwards, revealing the power supply PCB. The front two transistors are +/- regulators for the supplies to the driver stages in the power amplifier. The right-hand one (+50V) dies because of an inadequate heatsink.

Another of these units had low output with distortion. At the back of the power-supply board there's a mute signal (MU) that swings from about 0V to -15V at switch on. Two wires are connected to this. One goes to a PCB that swings up with the



chassis, to mute the preamplifier output. I never did find out where the other one goes to, but there's a similarly coloured wire on the tuner PCB. This second wire produced a low-resistance reading to chassis. Leaving it disconnected cured the fault and didn't cause any problems. **P.R.**

### **Akai GX912**

This is a semi-pro cassette deck that dates from the late Eighties. During eject the left-hand pinch wheel fouled the cassette holder. The grease on the pivot had solidified, which prevented the mechanism from returning to the rest position. Stripping and cleaning provided a cure. **P.R.**

### **Sony TA88**

This mini-amplifier dates from 1975. The right-hand channel produced terrible noises. I found that the two input transistors on the power amplifier PCB had horrid dry-joints. Blanket resoldering gave the unit a new lease of life. **P.R.**

### **Sony MZ-R501**

When this personal MD recorder came in the season for 'sand in the works' had just ended. I don't know in which part of the world the MiniDisc sand-burying championships take place, but wherever it is the grains are microscopic and exactly the right size to fit in all the gear teeth. . . . This one had been rejected elsewhere as

being beyond economic repair. Over the years I've repaired many of these recorders because of the sand problem, and have never found one to be uneconomic to repair. What is needed is a fair amount of patience and, if your eyes are anything like mine, appropriate optical assistance.

It's not a particularly lengthy job if you strip the unit properly. You will need to remove the lid from the upper chassis, the bottom cover, the PCB and the main chassis from the sub-chassis. When the main chassis has been separated, remove the laser unit and its drive gears. All this should take no longer than fifteen minutes.

You now need to employ a strong light source and a bench or head-band magnifier, a soft brush, and a scalpel tip to remove the sand grains from everywhere they have lodged. You must, at this stage, make your best effort to find every last grain and get it out. If you leave as much as one stray grain in the unit, I guarantee that it will find its way into a gear tooth two days before your repair warranty runs out.

Check wherever there is grease very carefully, particularly behind the door-catch slide. Check gear teeth in minute detail. The tiniest obstruction here will cause trouble as the motors, being so small, are only just powerful enough to do their job.

Once you've removed every grain that

you can see, I recommend that you take a coffee break and let your eyes settle for a few minutes. When you return to the bench, check all the components again. You will inevitably find a couple of grains that you missed the first time round. The clean-up procedure normally takes 20-30 minutes, including coffee.

Finally, rebuild the unit in the reverse order, reapplying grease wherever you've cleaned it off. When the deck has had the laser refitted, check that the optical block runs smoothly up and down its track. Also check that the overwrite head up/down drive and motor run smoothly.

Once the unit has been fully reassembled, run the auto-diagnostic/set-up program. This should be done after any repair to a personal MD player, particularly after a major mechanical rebuild. This will ensure that correction is applied for all deck and electronic tolerances. Note however that the program can be run successfully only by using the official Sony test discs. While other discs may appear to work for some tests, the results can be unreliable.

If you've worked on the job steadily, the grand total of time taken should be about an hour. I've found that the owners of these recorders are prepared to pay well for a repair. A replacement is expensive, and your repair bill is likely to be less than the excess on their insurance policy. **G.D.**

## **Test Case 496**

The fault descriptions provided by some customers can be very wide of the mark. As an example, a recent patient in the workshop, a Tatung Model T25TE61 (E-series chassis), had with it a note saying "negative picture". Cathode Ray, who had been assigned to this repair, concluded that the receiver was set up for the wrong TV transmission standard, even before it arrived at his bench – in fact he had the service manual open at the software-option bytes page by the time it got there. When he switched the set on however it produced a bright pink picture, with bad streaking in red from all picture highlights. He suspected the tube itself, and plugged in his trusty tube tester – after discharging the residual EHT voltage held by the bowl's coatings of course. The tester proclaimed that the tube was OK, though with somewhat tired emission. So it seemed that the cause of the fault had to be elsewhere.

To be certain about this, Ray interchanged the red and blue cathode drives at the tube base panel. Sure enough the picture now came up with excessive blue on the screen. This exonerated the tube and pointed to the red video drive circuit as the cause of the trouble. The original connections were then restored, so that Ray could start to look for clues. He began by playing with the customer controls, and found that with zero colour and very low brightness and contrast settings a picture with almost normal overall hue could be obtained. As the control settings were advanced, the red flared up again. An oscilloscope connected to the tube's red cathode told a similar story: the black-level volt-

age was about the same as with the G and B drives, but the signal amplitude (drive) in the red channel was much greater. To confirm that the fault was on the tube base panel, Ray next checked at the signal inputs to the panel. At pin 3 of PL902 the R-signal amplitude, with a monochrome input, was identical to the G- and B-signal amplitudes at pins 1 and 2. So the fault was proved to be on the tube base panel, but where? There are over twenty components in each channel here, with a cascode driver stage and a complementary-symmetry output stage in each one.

Ray vaguely recalled trouble with the load resistors in the driver stages. There are three series-connected 6.8k $\Omega$  resistors in each channel. He started by checking those in the red driver stage, R907/8/9. They were all OK. He then disconnected two legs of each of the four transistors in the red channel, and again carried out checks with his ohmmeter. The transistors produced normal readings. The four 1N4148 diodes in the circuit were next given the same treatment, which proved correct conduction and no leakage. Was this 'blind' passive component testing the right way to tackle the problem? It seems that it was as far as Cathode Ray was concerned: he eventually found the culprit, with the aid of Television Ted. It was not conduction in the PCB itself, as he was beginning to suspect! By the time a normal picture had been restored, Ray had spent over two hours on his diagnosis. A more experienced (or more thoughtful?) technician might have spent fifteen minutes or maybe less.

So where did the problem lie, and could it have been sussed out with less physical activity? For the solution, turn to page 379.



# Extended Reports Fault

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

Reports from  
**Martin J. Abbott**  
and  
**David I. Scott**

**Hitachi C2186TN (A7 chassis, 3D stereo)**  
There were no off-air signals with this set: the screen remained blank and the volume control had no effect. Sound and picture were normal with an AV input. I replaced the ST24W16-1 EEPROM chip IC005, which had been corrupted – the replacement was obtained from Chas Hyde.  
Before you start on the process of setting up it's worth noting that this is a multi-system capable set and that, peculiar

to modern Hitachi TV sets, an external AV input can be assigned to any channel by programming the manual-tuning menu. All service-mode adjustments produce bar-graph displays. I found it helpful to measure the bar lengths with a tape measure and keep a record of these before taking out the old memory chip. It also saved time to take a note of the customised naming and frequencies on the manual-tuning menu. These can be re-entered – it saves having to do this in the customer's home.  
The far-right box on the manual-tuning menu has to be set to system I. If it is set to DK or BG the sound will be poor. If you are pre-setting all the frequencies manually, it's easy to go down each box, setting the correct system letter. Likewise the second box from the right has to be set to the correct input. When the new EEPROM was fitted this box had 'mon' in it. For tuner input selection, leave this box blank.  
Under the tuner adjustment heading in the service mode no system box should be ticked except I (for the UK). There's a list of 34 models under options. You have to select the correct one.  
If you decide to reset the bar indicators by measurement, the horizontal adjustments must be carried out first. **M.J.A.**

**Mitsubishi CT25A5STX (Euro 14SF chassis)**  
"Faultless for ten years" this set's owner said. There was certainly plenty of dust inside. The set was now dead apart from the initial degaussing action. My first step was to disconnect the HT feed to the line output stage and fit a dummy load (60W bulb) with a voltmeter across it. When I switched on again the bulb glowed dimly and, surprisingly, the HT was correct at 145V. So the basic problem was excessive loading on the power supply. It didn't take

long to find the cause: the 2SD1555 line output transistor (Q551) was very leaky.  
The dilemma I then faced was what had caused the transistor's failure? Excessive HT is the usual culprit, but didn't seem to be the cause this time. But as a precaution I replaced the usual two suspect capacitors, C905 (470µF) and C914 (47µF), and carried out a blanket resoldering in the line driver/output stages. A check on the HT after doing this showed that it was still steady at 145V.  
All was revealed when the HT feed to the line output stage was reconnected and power was applied. The set burst into life, accompanied by sparking from the S-correction capacitor C567, whose rivet connection had burnt away from the PCB. This hadn't been obvious before, because the joint is hidden by a red wire strap that's glued on top of it. A PCB clean up, followed fresh solder, completely cured the problem – and I had the satisfaction of knowing what the original fault mechanism had been. **D.I.S.**

**Sharp 66FW-53H (DA100 chassis)**  
The fault originally reported with this set was that the picture was displaced upwards, i.e. the top inch or so of the picture/text was missing, though the field linearity was apparently correct. Before I had a chance to look at it however a more serious problem had arisen: the set was stuck in standby.  
Investigation showed that the power supply had shut down because of a virtually full short-circuit across the 150V HT supply. There was severe leakage in the BUH515 line output transistor Q601. As I couldn't see anything else wrong, I assumed that an excessively high HT supply had killed the transistor. So I replaced Q601 and, in addition, the MOC8106 regulation feedback optocoupler IC705.  
When I switched the set on everything seemed to be working and I could see the original offset picture symptom. But I then noticed random picture-width variations, which could be instigated by tapping the PCB. Careful examination of the PCB revealed several poor joints, the most serious being at R613 where one end barely penetrated the board and C613 which was completely dry-jointed at the end connected to the line scan coils. In addition C611 and R624, whose leads were oxidised, hadn't been soldered properly. Once these connections had been remade the line scanning was rock steady, and I concluded that the dry-joints, not high HT voltage, had been the cause of Q601's failure.  
All that was needed to complete the repair was to enter the service mode, adjust the vertical centring and store the new setting. After that I gave the set a lengthy soak test. **D.I.S.**



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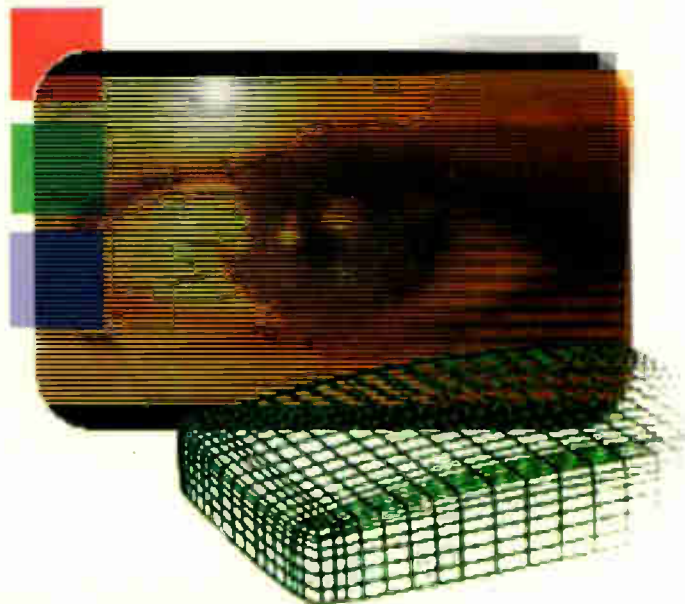
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**Philip Laws**  
**Dave Packham**  
**James Grant**  
**David Kerrod**  
**Les Mainstone**  
**Bob Flynn and**  
**Martyn S. Davis**

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### Goodmans GTV34T6SIL (Vestel 11AK36 chassis)

I have had this fault several times with sets that are fitted with the 11AK36 chassis – various brands use it. The symptom is EHT brushing lines on the picture, i.e. a horizontal ripple that changes with beam current. In days gone by it could, with the Philips G11 chassis, be cured by replacing the EHT lead assembly – assuming that the cap had not fallen off and got stuck in the line output transformer. The first time I came across the problem with the 11AK36 chassis I assumed that a new line output transformer would be required, but this is not so.

If you peel the rubber seal back from the base of the EHT lead you can prise out the EHT wire. In all the sets I've come across with this problem there has been green corrosion on the wire. It must have been there from new, as none of the sets showed any other signs of dampness – and the rubber seal appears to be watertight. Clean off the corrosion and everything should be OK. M.D.

### Matsui 28DW01

This set, which has a built-in digital decoder, was tripping. The customer said that smoke had come from the back. I told him that the cause could be a faulty line output transformer, which would be expensive. The line output transistor was OK however, and there was no burning

apparent on the transformer. I then noticed that a hole had been burnt in the front of the TA8427K field output chip. A check on the associated flyback boost capacitor C421 (100µF, 35V) showed that it was open-circuit. So this is why the IC had failed.

When I had replaced these two items the set continued to trip. I found that the 27V supply rectifier D411 was short-circuit. It's marked G6, but a BYW36 works well in this position. M.D.

### Akura AB280W-S

This set was tripping. In between trips it displayed a blank white screen. A check revealed that the HT voltage was low and contained HF hash. The cause was the smoothing capacitor C627 (100µF, 200V), which was open-circuit. Once it had been replaced the set came on normally but with very low contrast.

This cannot be adjusted without the remote-control unit, so I phoned the customer and told him that there may or may not be another fault but I needed the remote-control unit in order to check on this. He then told me that over the past few months he had been lowering the contrast as this kept the set running for longer. Funny that he failed to mention that when he brought the set in. M.D.

### Sharp 56FW-53H (DA100 chassis)

If the set is dead and R613 (3.3kΩ, 3W) in the line output stage is getting red hot, check the line scan coupling capacitor C613 (560nF, 250V). R613 is part of a network that shunts C613. You might also find that the 2SD2391 EW modulator driver transistor Q506 has been damaged. M.D.

### Hitachi C2156TN-311

There was a colour purity problem with this set, so I replaced the posistor in the degaussing circuit. The replacement made no difference, and the coils tested OK. What next? I then spotted a 2AT glass fuse, F902, near the degaussing posistor. It was open-circuit. It's the first time I have come across a separate fuse for the degaussing circuit. M.D.

### Toshiba 32WD98B (C95S chassis)

At switch on this widescreen set produced an HT supply of 60V for a second then shut down, with zero HT and no light from the standby LED. When I carried out a random check on the components in the power supply I found that the two 22V zener diodes D810 and D818 on the primary side were short-circuit. I replaced them and confidently restored power. There was full HT (125V), a burst of



EHT, then the HT voltage dropped to 60V with, this time, the standby LED remaining alight.

The power supply operation is similar to that in the C5SS chassis, so I looked at the article on this chassis in the April 2003 issue. It suggested that the symptom can be caused by an excessive load on the line-output stage derived 27V supply. This is used by the LA7846N field output chip, so I fitted a replacement. At switch on the set worked normally – but why had the two zener diodes in the power supply failed? **D.H.**

### **Bush WS6673 (11AK19 chassis)**

When this just out of guarantee set was powered the LED glowed red as normal. It should turn to green when the set is brought out of standby. Instead it went out then came back in red. The BUZ90AF chopper transistor was overheating, so I decided to carry out some cold checks. This brought me to D807 (MR852), which was short-circuit – it's in the snubber network. A replacement restored normal operation. I've not seen these symptoms before with the 11AK19 chassis. **P.S.**

### **Beko NR21231ND**

This set was dead. A check on the HT voltage produced a low reading of 30V, though no short-circuits were apparent. I decided to remove the BU808DF1 line output transistor T552 and try again. This time the HT voltage was correct. Resistance checks between the pins of the transistor produced lowish readings, and when I looked at the PCB I noticed a dry-joint at C555 (7.5nF). A quick resolder and a new line output transistor restored normal operation. The transistor is available from SEME at a very reasonable price. **P.S.**

### **Sharp 66FW-53H (DA50W chassis)**

A number of these sets have come in recently with excessive width and EW distortion. The important thing is to establish in which part of the circuit the fault lies. The control signal comes from pin 32 of the video/deflection processor chip IC801, where a parabolic waveform should be present. Enter the service mode, select EW width and adjust it (use the volume minus and plus buttons). If the waveform varies horizontally, you know that the IC801 is OK. So the cause of the fault will be in the drive or output circuitry. The possibilities here are Q506, L603, L604, D502, D503, D504, D516 and C528. Provided Q506 (2SD2391, part no. RH-TX0151BMZZ) is OK, the most like-

ly offender is L603 (part no. RCLIP0286BMZZ) which develops shorted turns. **P.S.**

### **LG WF32A12T (MC52C chassis)**

This set was totally dead. On inspection I found that C810 (470 $\mu$ F, 16V) was swollen and IC801 (STR-S6709) had blown in half. The set was OK once these two items had been replaced. IC801's part no. is 01SK670900A. **P.S.**

### **Beko NR28128NX**

I've not previously had the no-sound symptom with this model. On investigation I found that R417 (0.1 $\Omega$ , 0.5W) in the LT feed to the TDA1521 audio output chip IC601 was open-circuit. It seemed likely that IC601 was faulty and had been the cause of R417's failure. All was well once these two items had been replaced. **P.S.**

### **Tatung T14RF71 (F series chassis)**

This portable was stuck in standby. Voltage and resistance checks produced no clues as to the cause. So the hairdryer and freezer were brought into action, paying particular attention to the power supply. This restored normal working. Time and patience brought me to zener diode D409, which was the actual cause of the fault. Its part no. is 6615016730. **P.S.**

### **Samsung WS28W6NG**

This set was tripping, with the relay chattering. The power supply ran normally when the feed to the line output stage was disconnected, but the symptom returned when a dummy load was connected. The HT reservoir capacitor (330 $\mu$ F, 200V) was open-circuit. **P.L.**

### **Sanyo 25DN2**

This set reverted to standby after a few seconds, with the LED flashing. Pin 45 of IC801 seemed to be a good place to start, as it's labelled protection. Sure enough the voltage here was low at 1V instead of 4.7V. A long drawn-out process followed, while I checked the various protection lines. They are mostly connected via diodes, and are thus easy to check. I found that D445 was conducting. It seems to monitor the CRT heaters! When I disconnected D445 and switched the set on again it worked, with the picture intermittently fading. The cause of the problem was simply a dry-joint at R451 in the heater feed line. **P.L.**

### **Samsung CI5079T**

The original fault with this set had been a dead power supply. I obtained and fitted

the repair kit, then found that the HT output was only 75V. The line output stage worked to the extent that it was producing outputs, though these were not correct. When the feed to the line output transformer was disconnected the HT rose to approximately 150V.

I have to thank Samsung technical for help with this one. Make sure that you have removed the mica washer from IC801 and cleaned the compound from the heat sync. **D.P.**

### **Thomson 28DG24U (ICC17 chassis)**

The standby light flashed twice then seven times – error code 27. This usually means a faulty line output transformer or field output IC, or the supply to it, but not this time. I disabled the protection circuit by connecting the collector of transistor TL71 to chassis, but the set still flashed error code 27. I then tried disconnecting the inputs to TL71, DL72, DL73 and DL74. Still no change.

A check on the HT line (Usys), using a scope with DC input, produced a reading of about 170V for the brief moment during which the EHT rustled up. With this 4:3 set (A66EHJ43X15 CRT) it should have been 132V. Cold checks in the HT sensing network revealed that RP63 (432k $\Omega$ ) had risen in value to 570k $\Omega$ . A replacement cured the problem.

This sort of fault used to be quite common with many makes of sets. I hate these ones! **J.G.**

### **Panasonic TX24DX1**

For the first half an hour there was no teletext, only the header page number. The cause, proved by a squirt of freezer, was the microcontroller chip IC1101 (type SDA5450C59). **D.K.**

### **Panasonic TX28PL1 (Euro-4 chassis)**

If there's no picture, with very low-contrast text and graphics and the sound OK, replace the EEPROM chip IC1103 (X240RZ-01GA). Do a self-check after replacing it, by pressing the status button on the remote-control unit and the V- button on the set then switching off with the mains switch. Switch on again, retune and run the set for about 45 minutes to allow for auto grey-scaling. **D.K.**

### **Hitachi C2164TN**

This set was dead. When I dismantled it I found that it was in very poor condition, with dry-joints all round the power supply. These were attended to, and all the electrolytics on the primary side were replaced at this stage. Some proved to be leaky, but they weren't the cause of the

problem. The start-up resistor R901 (82k $\Omega$ , 1W) was faulty. L.M.

### **Panasonic TX25MD3/TX28LD1 (Euro-2 chassis)**

These two sets arrived within a day or two of each other. One had a good picture and sound for a short time, then the picture gradually faded out. At first I thought that the CRT's heater voltage was dropping. The second set produced a reasonable picture except that there were faded vertical yellow bars down the left-hand side, in a band about six inches wide. In both sets the cause of the trouble was eventually traced to the VDP3108-PP-A1 chip IC601. Sadly, because of the price of the chip, only one estimate was accepted. L.M.

### **Hitachi C2858TN (GQ8 chassis)**

This set was dead. Checks in the power supply revealed that zener diode ZD901 was short-circuit. So there was no supply to the UC3844 chopper-control chip IC901. I replaced these two items, and the two series-connected chopper transistors Q901 and Q902. When I switched the set on again the HT at the secondary side of the chopper circuit was almost normal but was pulsing, with the twin front indicators flashing. Checks in the line output stage showed that the S2000AF output transistor Q702 was leaky.

A new S2000AF produced an EHT rustle for a few seconds each time the set was switched on. Attention was then turned to the LT supplies and, after much delving, the 12V regulator IC932 (7812) was found to be leaky. The smoothing capacitor at its output, C937 (1 $\mu$ F, 50V), read only 0.5 $\mu$ F. These two items were replaced, along with C933 (2,200 $\mu$ F, 25V). The set then remained on, but the sides of the picture were bowed in. The cause was the TEA2031A EW control/driver chip IC651. Fortunately a fairly high estimate had been accepted by the customer. L.M.

### **Sony KV32FX20U (BE3E chassis)**

This heavy monster sat on my bench ticking loudly. When I isolated the power supply it ran normally, so attention was turned to the line output stage where I found that the 2SC5251 output transistor was short-circuit. A replacement was obtained and fitted, then the set was powered via a variac. At 160V input the line output transistor died a horrible death, emitting a loud crack in the process.

My home-made line output transformer tester, coupled to my scope, told me that the transformer was OK. But it seemed the most likely cause of the trouble. The

expensive replacement, along with another transistor, finally restored normal operation. L.M.

### **Proline CTV28N1-T**

At switch on this fairly new set produced a bright white screen with flyback lines. A check on the 200V supply at the CRT base panel showed that it was missing. The relevant rectifier is D28 (BA157), which was short-circuit. Naturally the 4-7 $\Omega$  safety resistor R174 was open-circuit. Replacement of these two items cured the fault. L.M.

### **Alba CTV3419 (11AK36 chassis)**

When this set was first turned on there was no sign of life. There would then be a crackle on the sound, after which a picture would appear with tearing and interference that gradually cleared. The item to replace is C822 (470 $\mu$ F, 16V), which gets slowly cooked by a nearby regulator. Use a high-temperature capacitor. B.F.

### **Philips 14PV162**

The 4A input fuse in this combi unit had blown, but no short-circuits could be found. At switch on with a new fuse fitted a cloud of smoke appeared from the degaussing resistor and the fuse blew again. The resistor was a black one with the marking T209-9716 on its case. The more usual type 96209 was fitted in another of these units, so I used this type as the replacement. B.F.

### **Sharp C3703H (7PS chassis)**

Power would be lost intermittently. The fault could be instigated by pressure on the board, but no obvious dry-joints could be found. Investigation with a magnifying glass however revealed a problem connection at D502. Resoldering this cured the fault. B.F.

### **Matsui 2890**

The sound was OK but the screen was blacked out because of field collapse. Voltages are marked on the main PCB, and I found that the 28V supply was missing. It comes from the power supply panel, where R515 (3.3 $\Omega$ , 1W) was open-circuit. No reason could be found for its failure, but a lot of poor joints in the field and line stages were in need of attention. B.F.

### **Sharp 59DS-03H (CA10 chassis)**

The line output transistor was short-circuit because of a faulty capacitor, C613 (680nF, 250V). After replacing these two items there was field collapse with a smell of burning. Q501 (IRFR9020) and Q502 (IRFR010TM) had failed, and as a result

F601 and F602 (both 1.5A) were open-circuit. You can obtain the necessary parts from Charles Hyde – a BUH515 transistor (order no. SH1054), a 680nF, 250V capacitor (order no. SH2094) an IRFR9020 transistor (order no. SH919) and an IRFR010TM transistor (order no. SH920). B.F.

### **Proline 28N1 (F19 chassis)**

D25 (BA157) had burnt to a cinder. I dealt with some poor connections and fitted a new diode. When I switched on there was an oversized picture with bowed sides. The cure was to replace C69 (22nF, 400V). B.F.

### **Philips L6.1 chassis**

After a while the picture would collapse to a line down the centre of the screen (line collapse). This was cured by replacing C2422 (560nF, 250V). When the set was working again most channels would constantly flick off tune then back on again; any station that remained on looked off-tune. Coil L5100 in the IF circuit was found to be intermittent. B.F.

### **Bush 1438 (11AK20S chassis)**

The height was reduced to about an inch. Before it became permanent the fault had been intermittent. The cause was D702 (1N4007) which was breaking down intermittently. B.F.

### **Sanyo 24WN4**

There was no red in the picture. Scope checks seemed to show that the TDA6103Q RGB output chip IC701 on the tube base panel was faulty, but a replacement failed to restore the red picture content. To prove that the red gun in the CRT was OK, I carefully desoldered and wired the blue and then green drives to the red cathode. This cleared the tube of suspicion and I subsequently found that R706 (100k $\Omega$ ) was open-circuit. It biases the red input to IC701, and had probably died with the chip. The TDA6103Q is part no. 4094688403. M.S.D.

### **Sanyo 28WN4**

There was no red in the picture. This set came in at the same time as the 24WN4 (see above) in which the cause of the trouble was on the tube base panel. In this case however there was an open-circuit gun within the 28in. tube. I used the same technique to prove exactly where the fault was: careful desoldering/soldering to link the green/blue drives to the red cathode (no picture) and the red drive to the blue/green cathodes (this did produce a picture). This was quite an unusual fault, as in my experience tube guns tend to go short-circuit. A new tube provided a full cure. M.S.D.





## VCR CLINIC

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### Wharfedale NV6

There was a very elusive intermittent fault with this machine, which was barely a year old. When selecting or changing a deck mode it would sometimes shut down with an ERROR caption in its display. The cause is the grease used in the rotary mode switch. The cure is to dismantle and degrease the switch, clean the stator and rotor fingers with a fibre pen, retension the fingers then reassemble it with a whiff of switch cleaner. My thanks to Key Electronics for this tip.

Incidentally this is the first VCR I've come across with no cassette LED and no end sensors. It's got a very clever microcontroller instead. **E.T.**

### Hitachi VT-M610EUK

With an RF output the E-E and playback sound were spasmodic, sometimes drowned by a vision-type buzz. Sound from the scart socket was consistently good. I found that the symptom could be made to come and go by wiggling the aerial input plug and socket. There was a dry-joint inside the tuner/modulator assembly, at one of the earthing lugs between the sockets and the first IC.

This VCR is similar inside to many Philips models. **E.T.**

### Toshiba V632

The complaint with this VCR was that the picture rolled when it played back its own recordings. There were also obvious head-switching problems with prerecorded tapes. The cure is to play back a test tape, wait for the machine to finish auto-tracking, press SW703 then the SP/LP button on the remote-control unit. Switch off to store. SW703 is hidden behind the front of the machine. **R.B.**

### Sanyo VHR3100

This old machine had lines across the screen in the E-E mode, similar to co-channel interference. Checks in the power supply led me to C11 (1 $\mu$ F) which was the cause. **R.B.**

### Hitachi VTFX860

The front display was OK in standby but went out when the machine was turned on. This seemed odd until I realised that the machine uses an LC display. Three LEDs are used to light the display dimly in standby. Conventional lamps are used when the machine is brought out of standby. All three were open-circuit. Old cassette lamps proved to be OK. **R.B.**

### Ferguson FV33H

This old Nicam machine wouldn't restart after a power cut. I used my ESR meter to carry out some checks on the primary side of the power supply and found that C13

(180 $\mu$ F) and C14 (1 $\mu$ F) were virtually open-circuit. As 180 $\mu$ F is an unusual value I fitted a 220 $\mu$ F capacitor in this position. **R.B.**

### Sharp VCM27HM

There was no playback colour. The cause was dry-joints at crystal X501 on the main PCB. **D.R.**

### Panasonic NVHV60

This VCR was completely dead. I found that the start-up feed resistor R1150 (1M $\Omega$ ) was open-circuit. **D.K.**

### Akai VSJ719EK-N

For no functions, no display and the standby light flashing, try replacing C116 (1,000 $\mu$ F, 16V) in the power supply. I fitted a capacitor rated at 25V to be on the safe side. **M.L.**

### Panasonic NVSJ220B-S

The tape would be ejected immediately after loading. It's becoming a common symptom with various different machines nowadays. In this case the fault was cured by replacing the capstan motor. The problems didn't end there however. The machine subsequently came back with a report that said "erratic play". It would sometimes unlace then lace up again, sometimes fast rewind wouldn't operate properly, and sometimes the machine would just shut down. These problems were eventually cleared by replacing the two take-up sensors IC1501 and IC1502 on the main PCB.

How can a machine develop two different, genuine faults at the same time, such as a duff capstan motor and faulty sensors as in this case? I'll just file it under 'one of those things', where most stuff seems to end up nowadays! **M.L.**

### Sony SLVSE720

This machine is made by Samsung and is fitted with the Scorpio II chassis. The silk-screen printing is incorrect in one position and because of this C701 (470 $\mu$ F, 16V) in the AL5V supply is inserted the wrong way round. Sony seems to think that fitting a new capacitor the right way round will prevent corruption of the EEPROM – typical symptoms are display not lit, no video playback picture, incorrect head switching or incorrect front-panel button operation. This is not the case however. If you simply replace C701 and reprogram the EEPROM the machine will fail again later. The true cause is the surface-mounted microcontroller chip.

You may, depending on how corrupt the EEPROM has become, have difficulty using the hidden switch to enter the service mode. In this case press any button on the front panel. This will provide access to the EEPROM map. **M.D.**



# DVD

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## **Sony DVP-NS705V**

This DVD player was dead, i.e. there was no power up. Multimeter checks on the power board showed that IC101 was short-circuit. As a result, D103 had gone open-circuit. A check with Sony revealed that IC101 has to be replaced with a new, improved device, part no. 9-885-030-35. I managed to obtain a replacement diode from a spare board in the workshop. This was fortunate, as the diode is not available from Sony as a separate part: a full power-board block has to be ordered. Replacement of the two items restored normal operation.

Note that power boards with part nos. 1-468-648-12 and 1-468-651-13 are already fitted with the new IC. **C.B.**

## **Sony HT-BE1**

At power up this unit produced a load chirp from all the speakers. The cause of the problem was C914 (47µF, 50V). Simply replace it to restore the normal power-up sound. **C.B.**

## **Aiwa HT-DV90HK**

The job ticket said that this home-cinema unit "went bang". In view of this suggestion of violent behaviour I removed the top before applying power. As visual inspection of the chopper power supply didn't reveal any major problems and the mains fuse was intact, I plugged in. The power supply remained dead.

I then checked with an ohmmeter between each pin of the mains plug and each pin of the power supply's mains input connector, and found that there was continuity between the live pin of the 13A plugtop and the blue wire going to the power supply and between the neutral pin and the brown wire. Oh dear!

The 13A plugtop is actually an adaptor that links the moulded-on 2-pin Europlug (non-polarised) and a standard UK plug, enabling the manufacturer to use the same mains lead throughout the EU. The top of this adaptor hinges open when the screw

is undone, the 2-pin Europlug sitting inside the space with its pin tips connected to a pair of brass hooks that are connected to the 13A pins. I've never been happy with this arrangement, as the Europlug can be reversed within the body of the adaptor. This probably isn't a problem with transformer-isolated equipment, but could be with a chopper power supply – depending on the front-end design. Whether the adaptor had come from the factory like it or whether the owner had undone it and inadvertently reversed the Europlug is hard to say. If he was looking for a fuse, the one concerned is readily and clearly accessible from outside the adaptor. In my opinion the screw that secures the adaptor should at least be a tamperproof type, not a regular Phillips-head type.

Having fitted the Europlug the right way round and confirmed that the live pin was now connected to the brown wire, I removed the power supply from the unit. There's a plastic cover under the 'hot' end of the PCB. Through this two added components could be seen, with large amounts of black glue around them and stuck to the cover. There was a nice blast mark between them.

I finally managed to unstick the cover and clean up around these components, then saw that about 1cm of print between them had been vaporised. They appeared to be resistors which were soldered to tracks that came directly from the vicinity of the mains bridge rectifier. The bodies of these resistors had been sleeved but, unbelievably, the legs had been left as bare wire. Where one of these was pressed right down to the PCB it had shorted to an adjacent track and blown it out.

When you consider the onus that is placed on us as engineers to carry out reliable and, above all, electrically safe repairs, it beggars belief that manufacturers can get away with such poorly-executed modifications, which are at best going to be unreliable and at worst downright dangerous.

Once the positions of the resistors had been redressed and the exposed legs had been sleeved I repaired the blown-out printed track. After that the unit came to life and worked normally.

As a final point with this repair, two very thin flexiprints connect the front panel to the main PCB. They pass over the power supply, lying against a heatsink that runs too hot to touch. There was just enough slack to pull them to one side and Tywrap them to the power supply's output harness. I also noticed that every hotspot in the power supply has an electrolytic capacitor sited by it, and that there are no cabinet ventilation slots over the power supply. So the units should be good earners in the not too distant future, when these capacitors start to fail. **G.D.**



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# LETTERS

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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. Please send ONLY text intended for the letters page. Correspondence relating to subscriptions and other matters must be sent to the office address given above.



## The Philips L01 chassis

Thank you Brian Storm for an excellent article on this chassis (March issue). The protection circuitry in the line output stage is quite elaborate, so it may be helpful to show this. I've sketched it out in Fig. 1. Brian Storm explained the basic action of the circuits connected to pin 7 of the line output transformer in his article. The beam current is also monitored for protection (and limiting) purposes. This is done at pin 10 of the line output transformer, i.e. the earthy end of the EHT system. There's a connection between this and pin 11 of the UOC chip IC7200. When the voltage at pin 11 of this IC exceeds 6V the line drive at pin 30 is switched off. The voltage at pin 11 then falls and line drive is restored after the slow-start procedure. There is also a link between the beam current monitoring line and the circuitry shown in Fig. 1. via R3247.

Cuthbert Merryweather,  
London W4.

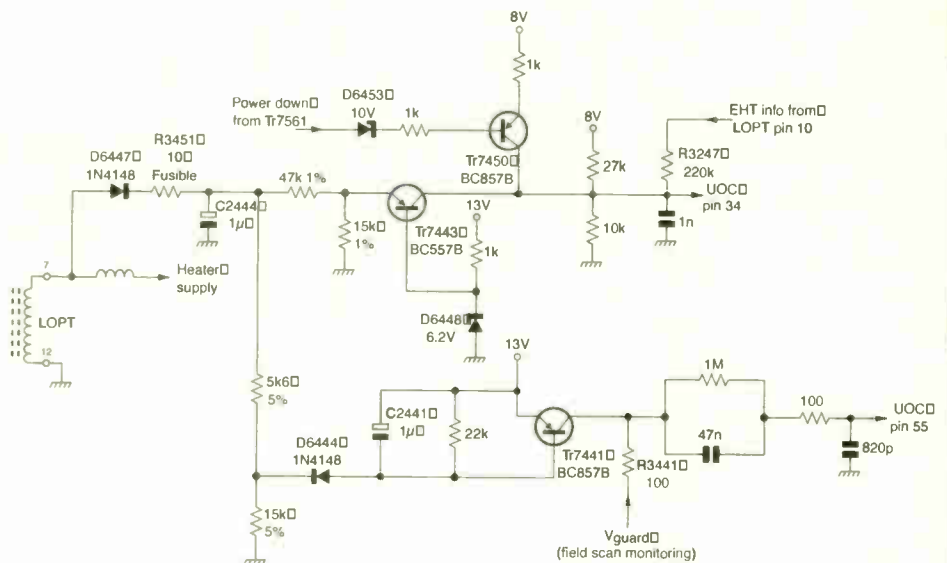


Fig. 1: Protection circuitry in the line output stage, Philips L01 chassis.

## Picture quality and an aerial mystery

I would like to support the view expressed by Martin McCluskey in his letter last month. With the current trend to larger screens, picture quality matters more. I have installed Freeview for my elderly parents, and find that the results via the RGB scart connection look decidedly soft. When I change the digibox to video, then use the sharpness control on the nine-months old TV set, the picture is almost as good as with an analogue signal.

I certainly agree with the comments about the Philips G8 chassis. I am still using one as my main TV set, though the tube was changed about 18 years

ago. I have two others in working condition, with their original tubes.

I wonder if anyone could clear up a mystery? In the late Sixties my parents had a combined Band I/III aerial installed. It was of the H type, with five Band III elements in front of the Band I dipole. After two-three years the Band I elements all fell off. This seemed to happen with lots of similar types of aerial, though others have remained intact. A few weeks ago my parents had the guttering replaced, and the missing elements were found there. I was amazed to discover that they were filled with coaxial cable. This explained why they had snapped off so

quickly, because of the weight in them. But what was the coaxial cable in the elements for? Do any older aerial riggers know the answer? Could it have been to shorten the aerial life deliberately?

Steve Ball,  
Peterborough.

I agree with Martin McCluskey's comments in the March issue about digital picture quality, but would like to go further – what about the sound quality? It's a fact that with digital terrestrial transmissions the dynamic sound range is much narrower in comparison with analogue terrestrial transmis-



sions. So the public misses out on two fronts, poor picture and poor sound. Why? As always, the simple answer is money. Why transmit one very good-quality channel when, by lowering the data transmission rate, you can transmit two channels in the same bandwidth?

More channels introduces another problem, one that's even more significant than lower-quality pictures and lower-quality sound: more programmes are needed to fill the gaps between the adverts! Hence reality and lifestyle TV. Fills lots of airtime at minimum cost.

So, in its current format, digital offers the public lower picture quality, lower sound quality and poorer programme content – now at a lower retail price of £60. Yet another winner for our trade then!

*John Halstead.  
Sent by email.*

### Burn ups

Several letters and articles in past issues have commented on fire hazards with TV set PCBs. In computer monitors the small, resin-covered high-voltage ceramic disc capacitors tend to burn up. They don't seem to be able to cope with high-frequency, high-voltage stresses.

The small ceramic capacitors in Acer monitor line output stages often burn up. So do the ones used on the inverter board in LCD flat-screen monitors made by NEC. The customer complains of smoke from the monitor, and you find that the inverter PCB is a blackened, charred mess, the cause being a 22pF, 3kV capacitor that goes short-circuit and burns the board. I wonder if these capacitors were designed for lower-frequency operation?

*Mark Garton,  
Bromsgrove.*

### Scam messages

Further to the letters on this subject in the January and February issues, I thought I had better mention another scam that's going about. I've had it in the form of a text message that says "you have won £1,000 cash or a £2,000 prize". To claim you are told to phone an 087 number, then you are asked to ring an 09 number from a land line. This number costs £1.50 a minute, and the call can last about ten minutes. As soon as I was told that I had to ring 09### I saw three lemons whizzing before my eyes, as if on a one-armed bandit. I simply said this sounds like a scam and not to ring again. Two days later this scam was reported on, I think, ITV News 24. It was said to come from abroad.

Nothing to do with TV servicing, but it's best to be warned.

*David Smith,  
Leigh, Lancs.*

# HELP WANTED

The help wanted column is intended to assist readers who require a part, circuit etc not generally available. Requests are published at the discretion of the editor.

Send them to the editorial department or email to [winford@highburybiz.com](mailto:winford@highburybiz.com)

**Wanted/for sale:** I need a uPD552C-045 microcontroller chip, or a used display driver card, for the Ferguson VCR Model 3V23 (or JVC HR7700). Have for sale the following parts from a brand new, unused but damaged current Decca Model 21N21B2: CRT (A51LMV10X16), LOPT, tuner, remote-control unit, chopper transformer, all ICs, speaker etc. – but no case or PCB. £25 the lot. Phone David Scott on 01564 779 003 (evenings) or email [david@scott6692.freereserve.co.uk](mailto:david@scott6692.freereserve.co.uk)

**Wanted:** IC type M5840H-84 for the Philips Model 16CT2216 (CTX-E chassis). Laurie Jones, 56 Southridge Rise, Crowborough, E. Sussex, TN6 1LQ. Phone 01892 654 867.

**Wanted:** Circuit diagram for the Goodmans Compact 210 TV set (sold by Comet). Photocopy OK. Any help appreciated. R.E. Potter, 9 Monks Brook Close, Eastleigh, Hants, SO50 9NQ.

**Wanted:** Does anyone know of an equivalent for the E13007F2 chopper transistor used in the Acoustic Solutions Model DVD451? I have had intermittent start-up problems with this unit, but replacing the start-up resistors and all the electrolytics in the power supply hasn't helped. When the units work they are fine: all the supply lines are smooth and stabilised. Has anyone solved this problem? I suspect that other models in other brand ranges use the

same power supply unit. Roger Burchett, Haytor, Stone Street, Lympe, Hythe, Kent, CT21 4JY. Phone 01303 267 969.

**For sale:** *Television* magazines from 1984 to date, £50; 1,700 service manuals (TV, VCR, audio, MWO, miscellaneous) £50. Lawrence Smith, 12 Swanzy Road, Sevenoakes, Kent, TN14 5EE. Phone 01892 664 821.

**Wanted:** A number of encoder/decoder chips type UM3750. Peter Ward, Petgra, Forest Corner, Ringwood, Hants, BH24 3JW. Phone 01425 475 445.

**Wanted:** Remote-control units for the Sony VCR Models SLV70 and SLV315 (they were lost during a house move). Willing to pay. Phone Derek on 01722 335 590.

**Wanted:** For spares, Quad 33 or 44 control units and 303 or 405 power amplifiers. Also panels and boards for these models. Working or non-working. Phone Mike on 01758 613 790.

**Wanted/for sale:** Require a power supply panel for the Tandberg Model CTV2-6-133, new if possible or from an existing set. This 26in. model with remote control was top of the CTV2 range. Have for sale a Tandberg Model CTV1 and a new A56-540X tube. S. Mann, 12 Levens Way, Silverdale, Carnforth, Lancashire, LA5 0TG. Phone/fax 01524 701 431.

**Wanted/for sale:** Require a circuit diagram for the Xcom Multimedia Xsat

CDTV200 digital satellite receiver. Have for sale a Telequipment D32 10MHz, dual-trace portable oscilloscope with leather case. It works with battery or mains powering but needs a service. £75 o.n.o. Vi Smith, 175 Lyon Park Avenue, Wembley, Middx, HA0 4HD. Phone 020 8902 5447.

**For sale:** A 37in. Grundig Model M95-1159 IDTV set with PIP, remote-control unit, cabinet and circuit diagram. In 'good condition' with good tube. Also a Philips projection set, Model 46PP912A-05 (PTV FL1 AB chassis), in good condition complete with remote-control unit. All tubes OK. Went off in a power cut. Neither set works but could be repaired or used for spares. Phone G. Howe on 01502 713 942.

**Wanted/for disposal:** Require a tuning scale and a telescopic aerial for the Grundig Yacht Boy 202E radio. Have for disposal the following: a Decca Model CS2032 fitted with the Bradford chassis; a JVC CR-6000E U-matic VCR; and a Rank 55 405/625-line pattern generator. Also the following CRTs: A66-510; 560DYB22 (56-001); 560BWB22. Michael Ashley, South Normanton, Derbyshire. Please email [mick@mickash.fsnet.co.uk](mailto:mick@mickash.fsnet.co.uk)

**Wanted:** Video heads for the Sony SLC9UB Betamax video, Sony part no. DSR-21R. Phone Andy on 01902 880063.

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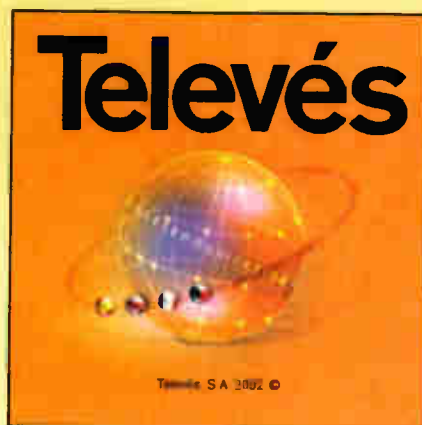
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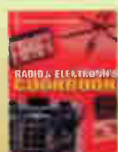
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# WHAT A LIFE!

**The shop to myself for a while. Some faulty TVs and a dead VCR.  
Then a visit from the shop steward...  
Donald Bullock's servicing commentary.**

**T**hey are clever lads. "There's a fine new restaurant in town" Steven said to Greeneyes and me the other day as we were closing the shop, "and Paul and I would like to take you both out for a meal tonight." In less than no time we were enjoying the best nosh-up of our lives, wine and all. So instead of being suspicious when, afterwards, they gave us a great joint smile, I smiled back benignly. Then they drove us back home. They're good lads.

"Oh, there's just one thing" they said when we reached the door. "We've got a little trip planned for tomorrow morning, down Meadow Pool way. Pike spinning, you know. Won't take us many hours. Do you think you could open the shop and look after things until we arrive a little later?"

Well of course I didn't mind, and said so. "Take as long as you like" I added.

"Oh, and there's one other little thing" Steven said, "we've a couple of repair jobs due in soon after eight. Best open the shop at eight instead of nine, wouldn't you think?"

## Next morning

At twenty past eight next morning a car drew up outside and a sleek, gentle figure, like a dressed-up and bearded eel, slid out. The day had hardly begun, yet he was smiling happily.

"Ah, you will be being Mr Bullock!" he said softly, "the 'old man' as your sons say."

I shot him a look.

"I am being Mr Ng, and very pleased to meet you."

"I am being, er, pleased to meet you too" I replied, pulling on the best smile I could muster at twenty past eight.

"What is being the aah" then I couldn't control a big yawn. "Sorry about that - television trouble is it?"

"Yes indeed. My misfortune, your gain!" he smiled, "so it is being good

for you that I am unfortunate you see."

We managed to extract two sets from his car, a monster widescreen Bush model and an Aiwa TV/VCR combi unit. Then he was off.

## Mr Ng's sets

The Bush set was fitted with the 11AK19 chassis and was stuck in standby. As I was the only one there, I had no choice but to have a go at it myself. I began by getting to the chassis and giving it a keen examination in the hope of discovering a simple remedy, like a dry-joint. Yes, there it was! A beauty at the anode of D825 in the power supply. Although it had been arcing, the diode was undamaged. I resoldered it feverishly, then tried the set again. To my delight the EHT rustled up and the screen brightened. But there was no video, just a bright screen with no display.

I noticed a video output IC on the tube base panel and decided that it could well be the cause of the problem. I was right. It's a TDA6108JF, and the lads had one in stuck. When I fitted it the set produced an exceptionally good picture.

The Aiwa combi was slow to start up from cold. When it did, it produced murky video and audio wow from our test tape. I have always found that the cause of the trouble is, with these units, low-capacitance electrolytics. This one was no exception. C523 (100 $\mu$ F, 16V) had fallen in value to 60 $\mu$ F, and C522 (2.2 $\mu$ F, 50V) had fallen to 1 $\mu$ F. Replacements cured the trouble.

## Interlude

As I was boxing the unit up the telephone rang. I made a grab at the phone, which slipped off the counter. "What's the bloody matter" I barked when I recovered it just before it hit the ground.

"Mrs Wellington-Harper here" an educated voice boomed. "My tom cat

Marmaduke is bothering Phyllis, my brand new, delightful little girl cat. Will you come out and, er, attend to Marmaduke for me?"

"No" I snarled, and slammed the phone down.

It rang again, and once more I rattled it from its rest. "What is it now?" I shouted.

"What do you mean, Mr Bullock, what is it now?" bumbled an ancient voice. "I haven't telephoned you since 1992."

I wiped my face with my dry hand. "Oh, hello, Mr Dodd" I said, "er, ha ha, was that a crossed line we had there? These things happen, don't they? Ha ha."

"What an odd fellow he must have been" said Old Dodder, "hope he's done - for good."

"Sure to be" I continued, "now what can I do for you Mr Dodd?"

## A Beko

"It's my telly, Mr Bullock. A Beko it is. Got it in Snoddies Sale last week. But when I told the tall thin chap there that it had gone wrong he was most unhelpful, unpleasant in fact, and hung up. Shall I ask my sister Molly to help me bring it along?"

"Er, good idea Mr Dodd" I replied, "in fact spot on!"

There was a pause. "What's 'spot on' Mr Bullock?" he asked.

"Well yes, do bring it along" I said, then gently hung up.

A little while later he drew up outside in his car, with his woolly sister. I went out to help them carry the Beko in. He was tugging it from his side of the car.

"Lift your end, Molly" he shouted "now push it to me."

"No, you push it to me" Molly said.

Old Dodder straightened. "Molly, you're not being at all helpful. Just confusing things. Same as always."

"Stop bullying me Cyril. Did you hear



that, Mr Bullock? He's always been the same."

I waved to them to stop, grabbed the set and took it into the shop.

Old Dodder toddled in after me. "Can I visit your loo?" he ventured.

"Over there" I said, then hastily moved Mr Ng's Bush out of the way.

The Beko was stuck in standby. I checked the line output transistor and found that it was short-circuit. So I fitted a replacement and tried again. The core of the line output transformer then arced violently to the chassis. It was type 1352-5048. The HR8368 is an equivalent and, after finding one in the stores, I fitted it. The set then produced an excellent picture.

Old Dodder reappeared. "Oh that's good" he said when he saw the set. I suppose I must owe you some money."

"You've got it in one" I smiled.

Old Dodder stepped back and looked at me. "What do you mean, Mr Bullock, I've got it in one?" he asked.

Molly had come in. "Cyril" she exclaimed, "concentrate on the Beko. I'm glad we chose it instead of the one you wanted."

"You backed a winner" I pronounced.

Old Dodder frowned. "A winner, Mr Bullock? My sister doesn't bet on horses, you know."

"Definitely not" Molly rejoined.

### Another Beko

As the old pair left I saw that they had forgotten their umbrella, and picked it up to chase after them. But just then Greeneyes came in, looking quite ravishing in the new green and beige outfit she had worn the week before for son James's wedding to Dawn at Porthmadog in North Wales. And, as if by magic, Mr Flighty also entered the shop, jauntily with his fetching smile and pencil moustache. He was wearing a cravat and a black blazer with a gaudy, club-type red and gold crest.

"Hello dear" he sang out to Greeneyes, "my you do look sparklingly attractive today. As always, of course."

Greeneyes smiled demurely and, at that, Flighty pretended to notice me for the first time.

"Oh, hello Donald old chap. My! Time passes! Bad night last night? Still on the tablets? Do you always carry an

umbrella. Donald?"

I smiled at him as best as I could manage. "Some sort of trouble, Mr Flighty?" I enquired.

"Well yeah, Don. It's a Beko telly that belongs to my neighbour. She's a young widow, poor thing..."

"I understand," I said simply.

He did a double-take at my sincere face. "Er, black lines keep coming and going on the picture. When they appear there's none of the usual writing to tell us what it's on. Only I'd like to help her, you know..."

"I'm sure you would" I replied. "why not bring it in then?"

He went back out to his car and returned with the set, a Beko Model NR20242-8R. Then he smirked at Greeneyes and departed.

We've had this trouble before. The TV trouble, I mean. It led us a merry dance until we discovered the cause, which is a tiny 1,000pF surface-mounted capacitor, C410. It often disintegrates as soon as it's warmed by the iron.

I fitted a replacement then turned to Greeneyes. "What shall we charge him dear. Eighty quid maybe?"

"How could you!" she exclaimed.

"Aw, well, it would be quite easy" I said.

### A Mitsubishi VCR

Colonel Starch marched in shortly afterwards. He retired twenty five years ago and still goes on and on.

"Hello Donald, old boy" he rasped, pumping my hand energetically.

"Always good to see you, and your charming young wife. What a lucky chap you are! And so you should be. One of us. True British! But, as you know Donald, my dear wife is so silly. Bought one of those Jap video recorders. Against my advice, I might add. Told her British is best! Always was!"

"Er, what did she buy?" I ventured.

"Told you! I'll go get the thing in."

He strode off to his vintage car and returned with a Mitsubishi VCR, Model HS641V.

"Says she can't see the dial thing, or whatever it is" he continued.

"Don't know why she'd want to, but there it is! We have to make allowances, I suppose."

When he'd departed I put it on the bench. It was dead, with no display. Faults like this mean something wrong in the power supply of course. Sure enough one of the outputs was very low indeed. The relevant reservoir capacitor is C910 (4.7µF, 50V). I wasn't surprised to find that it was open-circuit. A replacement worked wonders, with everything then working correctly.

### The shop steward

During the late afternoon, as I was beginning to look at my watch, we had our last caller that day. He was a forthright, formidable-looking fellow. We soon learnt that he was Jim Fargill, the top shop steward at a nearby factory.

"Still working hard at this end of the day?" he commented. "You want to join a union, you know. What's your boss like? I'll bet he's taking it easy somewhere luxurious."

I wondered whether he meant Steven or Greeneyes, but never mind. We need his patronage.

"Look" he said, raising his left palm and tapping it with the forefinger of his right hand. "Point 1, I've got a Goodmans TVC46 combi unit, right?"

I nodded.

"Right. Point 2 it's as dead as a door-nail, right?"

I nodded again.

"Point 3, I want it repaired. Got it? Can you manage that?"

I nodded weakly, then he went out and returned with the TV/VCR unit. He placed it on the counter, shook my hand and announced that he would be back the following day.

I was feeling tired, but opened the unit and headed for the power supply section. An easy one. The power switch SW08 was badly dry-jointed.

I resoldered it and tried the machine out. There didn't seem to be anything wrong with it, so I boxed it up and turned to Greeneyes

"Time for home I think, dear" I said.

### Keep it up!

Many thanks to all who have sent me interesting emails recently. These are welcome, and I'll be commenting on some of the points raised. You can reach me at

donald@wheatleypress.com

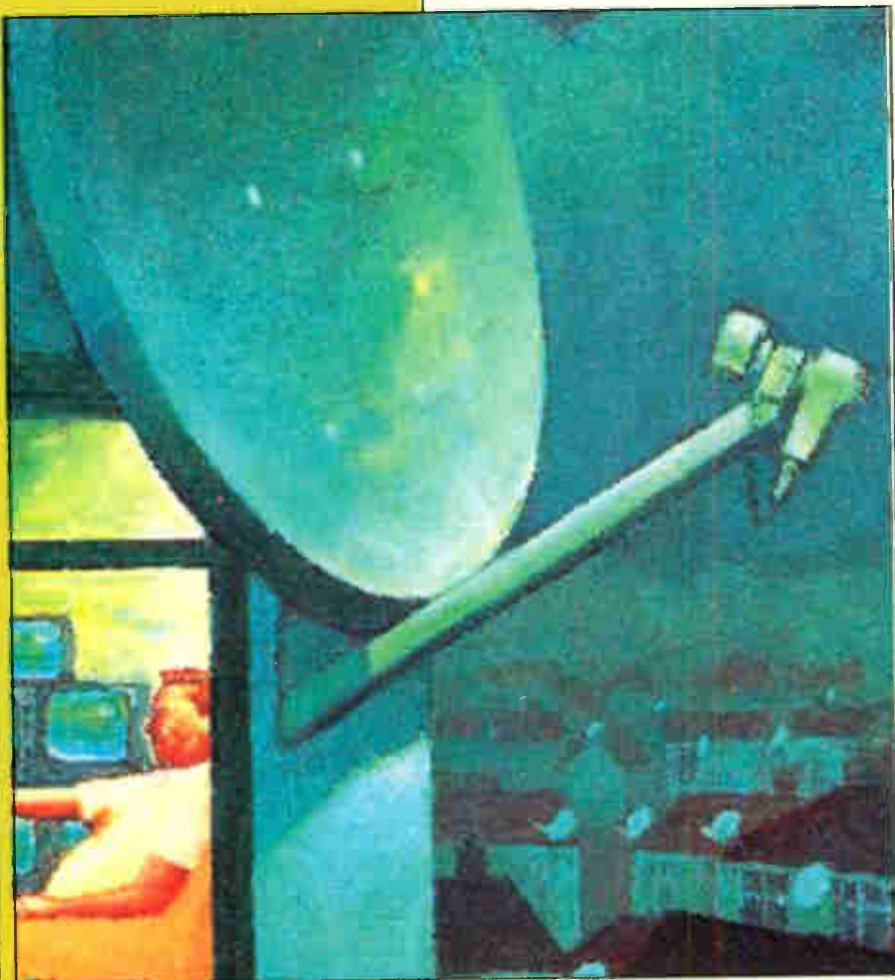


Photo 1: Favourite Language/Audio setting with a Sky digibox.



Photo 2: The software disc with DVD-RAM driver on it.

# SATELLITE NOTEBOOK

**Reports from  
Christopher Holland  
Hugh Cocks  
Michael Dranfield  
and  
Robert Philpot**

## Audio narrative setting

From time to time we receive a complaint from a customer about someone speaking in parallel with the main sound track, describing what's happening on the screen at the time. This happens particularly with channel 5. The cause is that some programmes have an added audio narrative track to assist those who are visually impaired to follow the action.

To prevent a digibox adding narration to the sound, go to the 'System Setup' menu, choose option 3 'Language and Subtitles', and change the 'Favourite Language/Audio' setting from 'Narrative' (see Photo 1) to 'English'. If it's set to

another language, say Italian, this will be heard on the Euronews channel (EPG no. 528) and any other channel that transmits the relevant soundtrack. C.H.

## Digital channel update

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 various radio channels mentioned last month, via Eurobird transponder D9S (11.623GHz H), have been given the following EPG numbers: Kiss Radio 920, Smash Hits 922, Kerrang 928, The Hits 929, Magic 930, Mojo 931, Q 932 and Heat Radio 933. C.H.

## Recording MPEG-2 signals on a DVD

I recently installed a DVD recorder drive in my PC. It can be used in conjunction with the PC-based SkyStar 2 satellite receiver (described in the September 2003 issue of *Television*) to record material on a DVD for playback via any DVD player – this provides an alternative to recording on the hard disk. This month I'll describe installation of the drive and becoming

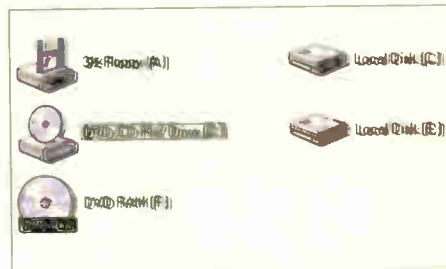


Photo 3: Windows has assigned letter F to the new driver.



Photo 4: Georgian TV via Express 3A at 11°W.

familiar with its use: next month I'll deal with recording off-air signals.

The drive I installed was an LG GSA4040B, which cost less than £100 – it has since been replaced by the GSA8081B. It works with DVD+R/RW.





Photo 5: Georgian TV via Express 3A at 11°W.



Photo 6: Kurdsat TV via Express 3A at 11°W.



Photo 7: A Mediaset feed via Express 3A at 11°W.



Photo 8: An RAI feed via Express 3A at 11°W.

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

Channel and EPG no.	Sat	TP	Frequency/pol
Globecast test card	EB	D12S	11-681GHz/V
Information TV (692)	EB	D9S	11-623GHz/H
UK History + 1	2A	15	11-922GHz/H

TP = transponder. EB = Eurobird. 2A = Astra 2A.

DVD-R/RW and DVD-RAM discs, also CD-R and CD-RW discs, but will record on only single-layer, 4.7GB DVDs (sometimes referred to as DVD 5 discs, while dual-layer types are referred to as DVD 9 discs). Drives for dual-layer, 9.4GB recordable DVDs are due to become available later this year. At the time of writing there is debate as to whether these recordable dual-layer discs will be readable by many existing DVD players, which should work fine with current prerecorded DVD 9 discs.

Drive installation is straightforward. The minimum PC requirements are a 700MHz Pentium processor, 128MB of RAM, 5GB of spare hard-disk space and a Windows 98 or later operating system. Full fitting instructions come in a booklet that's supplied with the unit. When installing any software or hardware with a Windows XP or ME operating system it's a good idea to create a 'system restore' point beforehand, so that should anything unexpected happen the PC can return to its settings prior to the new work being undertaken! You can find the 'System Restore' menu via the 'System Tools' menu. Windows 98 and 2000 don't have this facility.

I already had a CD-RW drive in my PC, so the jumper connector at the rear of the new drive was set to slave, leaving the CD-RW drive as the master one. The new drive was connected to the motherboard via spare flat 40-pin IDE and power-supply cables.

No special device drivers have to be loaded into the PC which, once booted up, should detect the new drive and assign it a drive letter (hopefully not moving all the PC's existing drive letters around!). The instruction book has a section on procedures to follow should you have an installation problem – fortunately I didn't encounter any.

A software disc with a DVD-RAM driver on it (see Photo 2) is supplied. This is useful as a DVD-RAM disc (one is supplied with the drive) can then be used effectively as another hard disk within the PC. Windows will immediately save anything to the drive letter it assigns to the new driver (see Photo 3). The DVD-RAM disc is rewritable and can be reformatted at any time with the software provided.

Unfortunately not all PC DVD drives

can read DVD-RAM discs: check on this should you plan to use a DVD-RAM disc to transfer data between PCs. If inserting the DVD-RAM disc produces a 'Disc Not Recognised' or 'No Disc' message, you will have to use a DVD+/- R/RW type disc and a form of burning software such as Nero.

Unfortunately inserting any other type of recordable DVD disc into the new drive and trying to save something to it directly, similar to the DVD-RAM procedure, doesn't work. It produces an unhelpful Windows message about not having authorised access to the drive! This is because direct recording by Windows on to the drive has to be disabled for the RAM driver to work. There is no point in enabling Windows to record to the drive however as to my knowledge there's no DVD burning facility within Windows XP and earlier versions. If you are using Windows to burn directly with an existing CD-RW drive, this will not be affected by the new installation.

To get round this problem, and for general CD/DVD burning, I also installed the well-known Nero version 6 CD/DVD burning program (it's available from [www.nero.com](http://www.nero.com)). Upgrading from version 5 or 5.5 to version 6 is worthwhile, as this includes full DVD burning facilities. Installation of Nero is straightforward. It automatically detects the available recording drives, which can be selected prior to burning a disc. Nero will record on any type of DVD, using the new drive. The discs with the widest DVD player compatibility are the DVD-R/RW types. These are also slightly cheaper to buy, which helps!

When you initially try out the DVD drive it's a good idea to use DVD-RW discs. These can be overwritten, and the players I've tried them in accept them without any problems. If you buy DVD-R discs, which can be written on only once, they may end up being thrown away once should the initial DVD writing tests go wrong. As with recordable CDs, I've found that some of the cheaper brands can be of variable quality. So stick with a well-known brand to start with, even if it means paying a bit extra. This will avoid blaming the drive when the culprit is a dodgy disc. It's important to avoid scratching the disc surface of course.

H.C.

**Table 2: Express 3A's active Ku-band transponders**

Frequency	Symbol rate	FEC	Services
11.463GHz	4,340	1/2	Georgian TV. See Photos 4 and 5. Also Georgian radio
11.469GHz	3,254	2/3	Kurdsat TV. See Photo 6
11.483GHz	12,800	3/4	Mediaset (Italy) feeds. See Photo 7
11.516GHz	2,200	5/6	Mediterraneo TV (Italy)
11.520GHz	2,894	3/4	RTS TV (Serbia). Also Radio Belgrade
11.525GHz	3,864	2/3	Playlist Italia. Also Radio Italia
11.529GHz	3,254	2/3	Coming Soon TV (Italy)
11.532GHz	2,033	3/4	ETV (Italy)
11.611GHz	5,632	3/4	RAI feeds
11.620GHz	5,632	3/4	RAI feeds. See Photo 8
11.629GHz	5,632	3/4	RAI feeds
11.638GHz	5,632	3/4	RAI feeds
11.660GHz	6,400	3/4	Mediaset (Italy) feeds. See Photos 9 and 10
11.669GHz	6,400	3/4	Mediaset (Italy) feeds
11.683GHz	12,800	3/4	Mediaset (Italy) feeds

### Express 3A

Table 2 lists the active Ku-band transponders aboard the Russian Express 3A satellite at 11°W. Its C-band transponders were listed here last April. The Ku-band footprint covers most of Europe. All the Ku-band transponders use vertical polarisation.

Several Italian feeds come and go during the day. After closedown the Georgian TV transmissions revert to colour bars, displaying a 'No Signal' message in English! Hotbird at 13°E relays the Kurdsat and Georgian TV transmissions, picking them up from Express 3A. H.C.

### Grundig GDS2000

Although this digibox had 13V at the LNB socket none of the front-panel LEDs lit up. The problem is sometimes caused by the Amtel chip that controls the LEDs and buttons at the front. Not this time however. The fault was cured by replacing the STi5512SWE BGA-type chip U16. M.D.

### Grundig GDS3000

This digibox produced a pixellated picture with no sound, but the information banner at the bottom of the screen was OK. While this can be caused by a faulty AV SRAM chip, I have found that the usual cause is a defective STi5512SWE BGA-type chip (U12), especially when the chip is running a bit cooler than its normal working temperature of 68°C. Note that this digibox has no ventilation holes at the top, which could possibly contribute to the early failure of U12. M.D.



*Photo 9: A Mediaset feed via Express 3A at 11°W.*

### ODM 300CI FTA receiver

This free-to-air digibox, the later CI model, was made in Scotland in 2000. It was suffering from the after-effects of a thunderstorm – when power was applied



*Photo 10: A Mediaset feed via Express 3A at 11°W.*

the power supply just 'squigged'. I replaced the surface-mounted 1N4148-type diode D63, which was short-circuit, and the KP1010 opto-isolator, which was open-circuit, but the unit then ran for just a few seconds before again 'squigging'. Several zener and other diodes were suspected, but they all proved to be blameless. I then brought my large magnifier into play and found that the surface-mounted resistor R63, which is in series with D63, was askew and was marked 10kΩ. I don't have the circuit diagram but the application notes for the TOP224Y chopper device show a very similar circuit in which the relevant resistor has a value of 10Ω! Ah, a bodger at work! When I fitted a resistor with the correct value the unit sprang to life.

Success – except that after just a few minutes' viewing the unit froze: the decimal point on the front panel kept flashing, no channels could be tuned in and no menus could be selected. "Look for the heat" TV Ted said many years ago. It didn't take long to find a large 5V regulator in the middle of the board with a heatsink that almost encircled two 100μF, 50V capacitors, C165 and C191. When these were checked they were both found to be low in value. Obviously the digital circuitry hadn't been happy with a dirty supply. The repair was completed by fitting nice new 105°C capacitors.

The time wasted looking for a 'fault' caused by the customer's 'neighbour' fitting a wrong-value resistor meant that it would probably have been cheaper for the customer to have bought a new receiver. R.P



## Solution to Test Case 496

- see page 359 -

The video channel on which Cathode Ray spent so much time and effort is of relatively straightforward design, with DC coupling throughout. The initial cascode driver stage has a gain of about 33dB and provides signal inversion. This is followed by a complementary-symmetry emitter-follower output stage. The input to the first stage is via two series-connected resistors, R903 and R905, one of which has a 12pF HF boost capacitor (C902) in parallel for frequency equalisation. The gain of this stage is governed by negative feedback, via R906, so that it is independent of the individual transistor characteristics and the tolerances of the passive components. Amplification is set by the ratio of R906's value to the combined value of R903 and R905.

Because the gain of the R channel had increased so much, logically the first thing for Cathode Ray to check would have been the feedback loop. Other factors, such as the 4.2V bias provided by transistor Tr913, are common to all three channels. In fact the guilty item was the feedback resistor R906, whose value had increased from 180k $\Omega$  to over 2M $\Omega$ . It's rated at 0.5W and has a tolerance of 2%. A replacement cured the fault and, to be on the safe side, the corresponding resistors R926 and R945 in the G and B channels were also replaced - they would have come from the same manufacturing batch.

All that remained was to set up the first anode voltage and the primary-colour drive levels. The latter is done in software, using the installation menu. The black levels are set automatically by the colour decoder/drive chip IC501.

## NEXT MONTH IN TELEVISION

### Spares Guide 2004

The annual *Television* TV/VCR spares guide, an updated list of sources of spares for TV and video products. It's essential reference information for the service department.

### Servicing the Toshiba C8SS chassis

The Toshiba C8SS chassis is used in projection models, including the 43PJ93B. John Coombes provides a guide to fault conditions and how to tackle them.

### Days of DC

Here's a nostalgia piece with a difference! We nowadays never have to think about the mains supply: just plug into it. Not so in the period up to the early Fifties however, when AC was distributed at several voltages and there were still quite a lot of areas that had a DC supply. Keith Cummins looks back to the days of DC, including generation and distribution.

### Digital Radio Mondiale

Last year saw the launch of Digital Radio Mondiale, a new digital radio system for use in the long-, medium- and short-wave bands. The DRM consortium was formed in 1998, with the aim of replacing existing analogue services in these bands with something better, and in 2001 the ITU recommended the system for worldwide use. J. LeJeune describes the technology and lists current transmissions.

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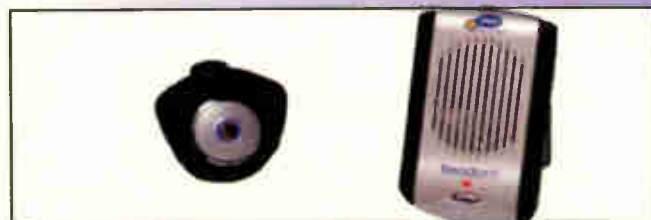
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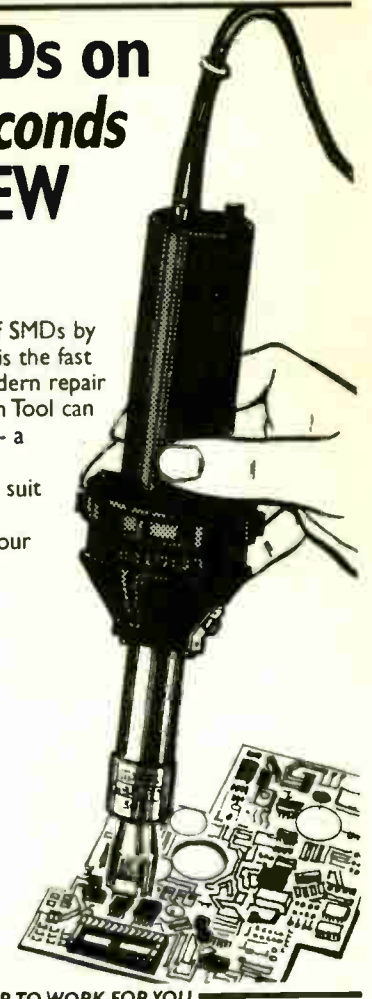
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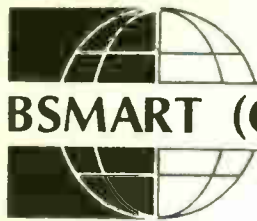
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Andy Flind - EPE Magazine March 2003



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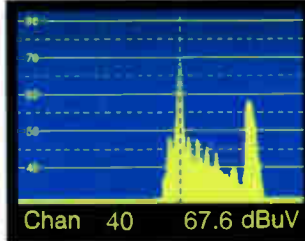
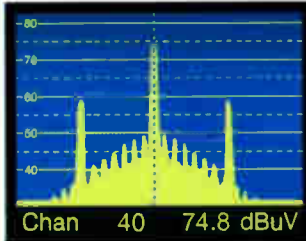




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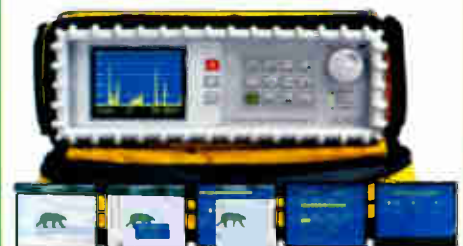
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