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TV display options

Is the era of the CRT coming to an end? With the launch of more and more TV models that use an LCD or plasma screen for the display you might well come to that conclusion. Not only are there more and more sets that use an alternative to the CRT, but in addition there seems to be an industry trend to move away from CRTs, certainly amongst Far Eastern manufacturers. Sharp announced in 2000 that it planned to cease producing TV sets with CRTs by 2005. The time-scale may have slipped, but Sharp is a leader in LCD technology and obviously expects things to go this way. More recently, and perhaps more surprisingly, Sony has announced that it plans to stop producing TV sets with CRT displays in screen sizes below 21in.

The CRT has had a long run. Karl Ferdinand Braun developed a recognisable CRT by 1897, with deflection plates for scanning. By 1906 he had developed the Braun-Wehnelt tube: the wehnelt was a grid that enabled the brightness to be varied. So here was a device with the potential to provide TV displays. In 1907 Boris Rosing, a lecturer at the St. Petersburg Technical Institute, demonstrated a primitive TV system that used a CRT for the display, this time with electromagnetic deflection. The CRT was there, waiting for TV signals to drive it. By the early Thirties TV systems that used CRTs had been developed, and as we all know regular transmissions started later in that decade. The main problem with CRTs at that time was in achieving a good enough vacuum. Contemporary vacuum-pump technology was not quite up to it, and glass-metal seals were also poor. Technological advances soon overcame these problems however.

By the Fifties CRTs were producing high-resolution, full-colour displays. There has been continuous improvement in the technology ever since, to the point where we now have flat, widescreen tubes that provide incredibly good pictures. We don't get to hear a lot about advances in CRT technology nowadays, but the results are there for everyone to see. The high-resolution displays provided by CRT PC monitors, able to cope with several line standards, are particularly striking.

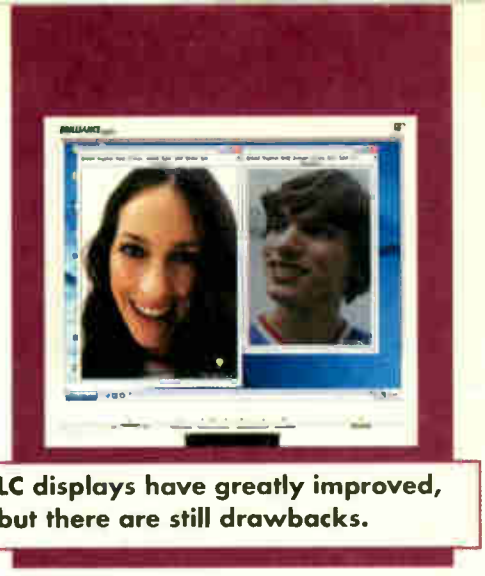
So what's the problem with the CRT? Why use anything else? The main problems are bulk and weight. People seem to want bigger and bigger screens, and CRTs able to provide them are huge, heavy items. A flat-screen panel seems to be the obvious solution. There are at least three technologies that can be used: LCD, plasma and the more recent LCOS rear-projection arrangement. Considerable advances have been made in LCD and plasma technology in recent years. But there are still reasons to suspect that, unless you really are very short of space, the CRT is the best option. Domestic space has always been a problem in Japan, which could explain why Japanese manufacturers have been so keen to develop alternative technologies.

LC displays have greatly improved, but there are still drawbacks. The display has to be backlit, and the viewing angle is limited. The latter doesn't matter with PC displays, where the user sits close to the screen. This doubtless explains the popularity of LCD screens for PC monitors. For TV purposes the disadvantages are the restricted viewing angle and limited contrast ratio, also a lack of brightness.

Plasma doesn't have the viewing angle problem and has an excellent contrast ratio. But the black-level is poor, if you care about that sort of thing (as all TV enthusiasts should!); the panels are still far more expensive than CRTs: the life span is less; and plasma is power-hungry. In some respects the LCOS system seems a better solution.

There's no lack of confidence amongst LCD manufacturers at present. Within days last month Samsung and NEC announced major new investments in LCD plants. Samsung is to spend about $1bn on a new LCD plant, its sixth, in what some observers see as an attempt to achieve industry leadership. Its main competitors in this field are Sharp, LG Philips and two Taiwanese firms, AU Optronics and Chi Mei Optoelectronics. The new plant, due to come on stream by the end of the year, will produce some 60,000 17 and 20in. TV and PC monitor screens a month. LG Philips was the first to begin operating a fifth-generation LCD plant, in mid-2002: its second plant has recently started production. NEC is to build a new LCD plant in Shanghai, in conjunction with the Chinese electronics group SVA. The planned investment is $700m. This will again be a fifth-generation plant, which is due to come on stream in October 2004, producing large TFT LCD screens mainly for the Chinese market. Sharp, the leading Japanese LCD manufacturer, is now concentrating on displays that incorporate the driver ICs and other devices. The company is developing a new production site in western Japan, following completion of a facility that will start production next month. It expects an increase in LCD sales of 33 per cent this year. But profitability has been hard to achieve in this field.

At the present time however the CRT, despite its bulk/weight problem, remains the best option: it provides excellent pictures, and incredible value for money. ■



LC displays have greatly improved, but there are still drawbacks.

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TELETOPICS

BBC's satellite move

The BBC has announced that from May 30 it will be broadcasting its eight digital satellite TV channels without encryption. The Corporation has leased capacity aboard the new Astra 2D satellite for the purpose. As a result digital satellite TV viewers in the UK will be able to receive the BBC channels without the need for a Sky viewing card, using any make of digital satellite receiver. Current and future Sky subscribers will still be able to receive the BBC services of course. Encryption has been used for copyright purposes, to ensure that programmes cannot be received by those in other countries for which rights have not been acquired, and also to ensure that viewers receive the correct national services and regional version of BBC 1 in England. As Astra 2D's beams are more tightly focused on the UK, the rights issue is no longer relevant, though the BBC agrees that some "determined" viewers in mainland Europe will be able to receive its services. All viewers will now have access to the full range of BBC transmissions. Encryption has been provided by BSkyB's conditional-access system.

The move will save the BBC an estimated £85 million over the next five years – £30 million to use Sky's encryption service and £55m to pay for viewing cards. The BBC has been involved in contract renegotiations with BSkyB, which had planned to raise its charges from £7 million a year to £17m, but has decided to go its own way. For viewers to continue to receive the correct regional version when they select BBC 1 or BBC 2 however the BBC will need a one-off change from Sky, for which it has offered to pay a fair price including a profit margin. This involves a simple adaptation to the EPG software. The BBC is also anxious to maintain its current position at the top of the Sky Digital EPG. About £40m of the BBC's savings will be used to improve access to all the Corporation's regional services via satellite.

The move could mean that viewers who currently watch ITV and Channel 4 using a free BSkyB card will no longer be able to do so. The ITV, whose contract with BSkyB lasts until next year, has expressed an interest in following the BBC's move. This has prompted speculation that the BBC might promote a 'Free Sat' service to complement its Freeview DTT service. The BBC points out that nearly eighty TV channels are currently being broadcast in the clear via satellite to Europe, plus 61 radio stations.

The success of Freeview continues: over 1·4m households now have a Freeview decoder. This figure includes 800,000 ex-ITVDigital STB owners and 600,000 who have bought Freeview adapters. Trade estimates suggest that Freeview STB ownership could rise to 3-3·5m by the end of the year, almost as many as for cable TV. Dixons is reported to have placed orders for a million Freeview boxes to be supplied this year. Goodmans is to launch a range of Freeview adapters starting with Model GDB3 in June. This will be followed by a version with an integrated DVD player, Model GDB400DVD, in July.

Sony launches first Blu-ray recorder

Sony has launched the first Blu-ray video recorder, Model BDZ-S77, in Japan. Blu-ray is the high-density (blue laser) optical disc recording system supported by a number of companies including Sony, Philips, Panasonic, LG, Hitachi, Samsung and Pioneer. It enables up to 27GB of data to be stored on a 12cm disc. The basic system specification was listed in the April 2002 Teletopics column.

It's main advantage in Japan is to enable HDTV broadcasts to be recorded: up to two hours of programming can be recorded in the highest-quality mode. Japanese TV viewers can watch HD transmissions via the BS satellite.

The BDZ-S77 has several recording modes, see Table 1. The accompanying photographs show the disc and the recorder. Other features of the recorder include a 5.1-channel audio encoder, an iLink (IEEE 1394) connection and input and output sockets for composite, S- and component video signals. Price of the new recorder in Japan is the equivalent of about £3,000. There are no plans at present for a launch in Europe, where there are no HDTV broadcasts.

Table 1: Sony BDZ-S77 recording modes

Recording mode	*Recording time*	*Bit rate*
DR (direct mode)*	2 hours	24Mbits/sec
BS multiple view, 480 lines progressive	4 hours	12Mbits/sec
BS multiple view, 480 lines interlaced	4·4 hours	11Mbits/sec
HR (high picture-quality mode)	3 hours	16Mbits/sec
SR (standard mode)	6 hours	8Mbits/sec
LR (long-play mode)	12 hours	4Mbits/sec

* 1,080 lines interlaced or 720 lines progressive.
Bit rate is audio + video.

New TV/video products

Sharp is to launch a 37in. LCD TV set this summer. Model LC-37HV4E, which consists of a separate display panel and an AV unit for the tuner and connection sockets. The screen has wide XGA (1,366 x 768 pixel) resolution and uses Advanced Super View and Black TFT technology. Contrast ratio is 800:1, viewing angle 170°. There are also picture-in-picture and picture-and-text functions. Connectors include three scart (two with RGB capability), S-video and PC-input sockets. Model LC-30HV4E is being launched as a replacement for the LC-30HV2E. Sharp is also launching new models (VL-Z1H, VL-Z3H and VL-Z5H) in its Z range of Viewcams. Features include a 250° angle-swivel body and 2·5in. LCD screen with Continuous Grain Silicon technology for clearer viewing. Top-of-the-range Model VL-Z5H has an 800,000-pixel CCD imager, 10x and 500x optical and digital zooms, a colour viewfinder, an iLink terminal, a DV input facility, an 8MB SD card slot and a USB port.

Samsung demonstrated a 54in. LCD screen at the CeBIT exhibition in Germany in mid-March. It has a resolution of 6·2 million pixels, a contrast ratio of 800:1 and a viewing angle of 170°.

The Sharp Aquos LCD model LC-37HV4E.

Goodmans is to launch a DVD player/recorder, Model HEC14, in July. It will form part of a home-cinema package. Details of the recording format have not been released. The company is also to launch a portable DVD player, Model GDVD67LCD, which will have a 7in. LCD screen.

Panasonic is launching a new range of products including nine IDTV sets, Models TX-24PS1, TX-28PS1, TX-32PS1, TX-28PS12, TX-32PS12, TX-28PS5, TX-32PS5, TX-32PD30 and TX-36PD30. The sets are Tau 16:9 flat-screen models with Super Digital Scanning. PS1 sets operate at 50Hz and have Nicam sound, the PS12 models operate at 100Hz while the PS5 models operate at 50Hz and have built-in Dolby Digital sound. The PD (Plasma Display) models include DVD progressive-scan input (for NTSC DVD), Virtual Dolby with a built-in sub-woofer, AV picture-in-picture and four scart sockets.

New Panasonic DVD players include Model DVD-S35EBS, which includes MP3 and WMA audio playback, and the portable Model DVD-LX9EBS which can be used as a home player when placed in a docking station. The company is also to launch a new DVD camcorder, Model VDR-M30, which uses DVD-RAM/R discs and has an 800,000-pixel CCD imager, 10x optical zoom, a 2·5in. LCD monitor and a USB port. Panasonic's new VCR line-up includes Model NV-SV120EBS, an S-VHS recorder with a 60sec jet rewind, and Model NV-VP30EBS, a combined DVD player and Nicam VCR with PDC, quasi-S-VHS playback and an external link for timer recording of digital broadcasts.

3D-video Consortium

Five major Japanese companies have formed a 3D Consortium to encourage the development and growth of a mass market for 3D products and applications. The objects are to produce stereographic displays that don't need glasses to be worn, and the creation and distribution of 3D programme material, as commercially viable enterprises. Itochu, NTT DATA, Sanyo, Sharp and Sony are the five steering members of the Consortium, which in addition includes a number of hardware manufacturers, software vendors, video content providers, system integrators, broadcasters and academic institutions. Applications proposed include entertainment, education, medical, computer-aided design, advertising/PR, broadcasting and electronic books. The Consortium forecasts a market potential of over 20bn Euros a year by 2008.

On-line broadcasting

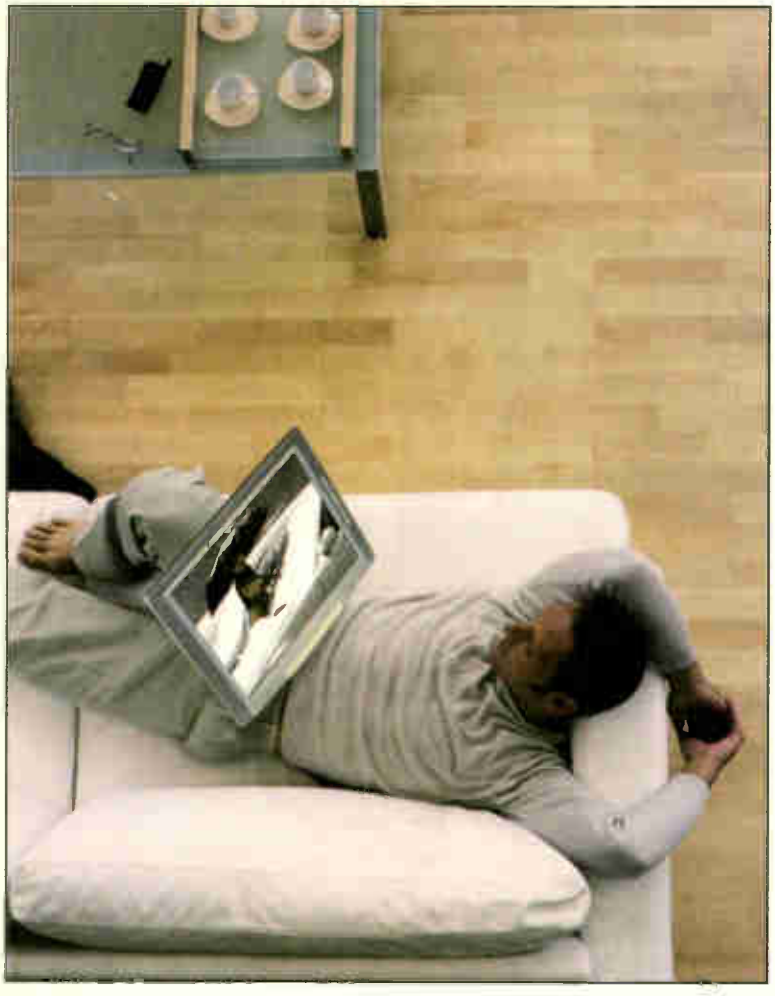
Yahoo! has launched an on-line subscription video programme service in the US. For $9.95 a month subscribers will have access to a package that includes news, sports and entertainment channels. This is similar to the service provided by RealNetworks, a pioneer in on-line streamed media, which now has over 900,000 subscribers. In comparison US cable subscribers pay on average about $50 a month. Earlier last month ABC News announced the first 24-hour on-line video news service.

Media companies in the US are turning to the web to generate extra revenue from 'surplus' content – material that doesn't warrant full TV distribution – taking advantage of the wide availability of broadband connections able to handle video. Once their subscription bases have built up sufficiently Yahoo! and RealNetworks hope to be able to attract advertising.At present such services are seen as being complementary to TV, but competition could develop as viewers spend more time on line.

PVR news

TiVo, the company that launched the first PVR (Personal Video Recorder), has withdrawn from the UK market. The move follows disappointing sales that were estimated to have been in the thousands. In the UK, TiVo products were produced by Thomson Multimedia, which says it will repair any units under warranty. TiVo will continue to supply its subscribers with the programme data service that's used to operate the recorders.

In the US Sonic Blue, which owned the rival Replay TV PVR system, has filed for Chapter 11 (a court order that gives a company protection from creditors while it tries to restructure its business) and has sold its Replay TV operation for $40m to D&M Holdings. Sonic Blue blames its problems largely on a lawsuit brought against it by almost thirty entertainment companies, who objected to Replay TV allowing users to share recorded material over the internet and also skip commercials automatically.



Philips recently demonstrated a number of new and interesting technologies relating to AV/computer convergence, flat-screen TV and recordable DVD. Many products that incorporate these advances will be launched during the coming months. George Cole provides a briefing on what to expect

Philips' latest technology

One of the cornerstones of Philips' future strategy is what the company calls The Connected Home. Ever since consumer electronics products started to move from using analogue to digital technology, beginning with the audio CD, there has been much interest in the possibilities of convergence between CE products and computers, and the advantages that this might provide. There has also been a drive to develop home networks that connect CE products, PCs and home appliances. Philips has been involved in domestic networking for some years, and was one of the main drivers behind the D2B (Digital Data Bus) initiative, which was launched in the early 1990s and subsequently renamed the Domestic Digital Bus. D2B was a technology ahead of its time however, and the project foundered.

The Connected Home

Philips is now promoting its concept of The Connected Home, which is defined as a household with a broadband interconnection such as ADSL, cable or satellite and two or more devices connected in a home network, ideally a wireless one. More and more householders are converting from slow, dial-up internet connections to faster broadband links. Although the UK currently has one of the lowest broadband penetration rates in the Western world (less than ten per cent), this is expected to grow significantly in the next few years. Philips quotes market research which suggests that one in three homes in Western Europe could have a broadband connection by 2005. The European Commission has set a target of fifty per cent of households by this date.

While the broadband connection delivers digital content to the home, for example audio, pictures and streamed media material, the home network will distribute it. Many companies see the home of the future as being centred on a domestic server, which will store digital content. Philips thinks the best device to use for the purpose is a consumer electronics product, see below. But PC companies such as Microsoft and Intel think the home computer is the natural product to use. Pace on the other hand believes that the digital set-top box could evolve to become a home gateway that does the job, while Sony and Microsoft see games consoles as becoming broadband home-entertainment products.

Whatever system is used, on-line content will need to be protected. It's no accident

The SBC-LM4005 Digital Multimedia Receiver can handle a variety of types of media data files, including MP3 and JPEG.

that Philips and Sony, another company that's promoting broadband technology, have formed a joint venture to develop and license DRM (Digital Rights Management) technology.

Home networking

The second major component is a home network. Past systems have used leads or powerline technology, the latter based on use of the electric mains wiring. But there is now more interest in the use of wireless network systems based on the IEEE 802.11 standard, which is being marketed as WiFi. One standard, 802.11b, has been around for some time, and many products use it. It operates in the 2·4GHz band (the same as other devices such as microwave ovens) and has a maximum data rate of 11Mbits/sec, though in practice the rate is often less than half this. The operating distance is about 100m indoors, about three times this distance outdoors.

Two other 802.11 standards are likely to be adopted in products in due course. The 802.11a standard has a maximum data rate of 54Mbits/sec and operates in the 5GHz band. In real-life conditions however the data rate is about half this figure. The 802.11g standard uses the same data rate as 802.11a but operates in the 2·4GHz band, in theory providing a greater degree of backwards compatibility with 802.11b devices.

Connected Home products

Philips' new Connected Home products include the Digital Multimedia Receiver Model SBC-LM4005, which incorporates WiFi technology to enable it to receive media data from a WiFi-enabled PC that acts as a store and internet link. The decoded data is then fed to a home TV set or a hi-fi system. The SBC-LM4005 can handle a variety of types of media data files, including MP3 and JPEG. It can also handle moving video data files in the MPEG-1 and DiVx formats. The latter uses MPEG-4 compression, which increases the compression by eight times in comparison with MPEG-2. It's often described as the MP3 of video. Note that as yet the SBC-LM4005 cannot be used to view MPEG-2 video files or fast-moving, graphics-intensive games with a domestic TV set.

The PC can be used in the normal way while the Digital Multimedia Receiver is in use, having multitasking capability. The receiver remains permanently linked to the PC, providing instant access to PC-based media at any time without the need for any start-up or connection procedures. Its output connectors include composite video, S video, phono audio and coaxial digital.

Philips is also to launch the Streamium Model MC1250, a WiFi-enabled hi-fi system that can receive internet radio and online audio files via a broadband wireless link.

The iPronto is a wireless controller that can be used to operate a variety of items such as TV sets, DVD players, lighting and security systems. Like an intelligent remote-control handset, it has a built-in bank of control codes for many models and brands. New product codes can be entered manually. It can also receive and display web pages, such as news and weather information.

Model 42PF9965 which will include PixelPlus.

The DesXcape (see heading photo) is a wireless flat-screen display that gives the user access to the contents of a PC's hard drive almost anywhere in the home.

During one demonstration Philips showed how the SBC-LM4005 receiver can be used to display the contents of JPEG files on a TV set's screen, with the receiver connected to the TV set via a cable. The logical progression would be to build WiFi into the TV set itself. How close are we to seeing such a product in the stores? Philips wouldn't say, but did confirm that it was "investigating" this approach. It might well be that all future TV sets above a certain screen size will have WiFi technology built in as standard.

The convergence of consumer electronics and computer technology also raises the question as to whether CE products will become more like computer ones, with the need for consumers to replace or upgrade their equipment far more regularly than they do with their current TV sets and VCRs. But Philips thinks that the new 'convergence products' will be closer to CE items than to PCs – and this includes the way in which they will be operated.

Television

The biggest news in this year's TV range is that Philips is integrating its PixelPlus technology into many flat-screen sets, both LCD and plasma. PixelPlus is one of a number of technologies designed to provide, by use of digital-processing techniques, high-definition picture quality from standard-definition material. Others include Sony's Digital Reality Creation-Multifunction, Toshiba's Digital Frame Scan and JVC's Digital Image Scaling

The Streamium Model MC1250, a WiFi-enabled hi-fi system that can receive internet radio and on-line audio files via a broadband wireless link.

Technology. A standard PAL display consists of 625 lines with 1,024 pixels each. PixelPlus can increase the vertical resolution by up to 33 per cent, to 833 lines, and double the horizontal resolution to up to 2,048 pixels. This is achieved by using interpolation techniques that calculate the luminance value between pixels. Motion-prediction software is added to smooth the on-screen action. Picture quality is also enhanced by doubling the field rate to 100Hz.

I must confess that some of these pseudo high-definition systems have left me less than impressed. But the Philips' system is one of the best I've seen, both with live broadcast and recorded (VCR or DVD) material. You can switch PixelPlus off should you find that it produces digital artefacts with some material. Philips plans to include PixelPlus with some of its plasma TV sets first – Models 32PF9965, 37PF9965, 42PF9965 and 50PF9965.

Philips uses an external TV tuner/connector with its plasma displays. This is known as an E-box, and acts as a complete connection centre including four scart inputs, with component video input and PC input. Its features include Active Control, with an ambient light sensor

The DVD recorder Model DVDR80, which has an eight hour recording mode.

The JackRabbit portable DVD player/CD burner which can be connected to a domestic TV or a PC.

(except for the 50in. model), to adjust the brightness to suit viewing conditions. Other features include a two-tuner double window, enabling two channels to be viewed simultaneously on a split screen, and CinemaLink, which provides simple interconnection and one-touch home-cinema control with Philips' DVD-Video players. DVD recorders and video recorders that are compatible with this feature.

As a result of its joint venture with LG, Philips is also involved in LCD production. The company already markets two LCD TV receivers. Models 15PF9925 and 20PF9925 (15 and 20in. respectively). Its latest offering is Model 15PF9936, which includes a built-in TV/FM radio tuner, a high-resolution (1,024 x 768 pixel) LCD panel, and CrystalClear-III plus Active Control picture-quality processing. Philips is to extend the range to include 17-23in. models (17PF9945-23PF9945) with the same features plus a 1,280 x 768 pixel display panel, Dolby Virtual surround sound processing and four scart sockets, with provision for component video and PC inputs.

DVD developments

Philips has been one of the main promoters of consumer CD recorders and home DVD recorders. The company, along with Sony and a group of PC manufacturers, developed DVD+RW, an 'unofficial' recordable DVD format that's claimed to have better compatibility with DVD players than the official formats (DVD-RAM and DVD-RW). According to Philips some 70 companies now support DVD+RW.

The latest DVD recorder from Philips, Model DVDR80, incorporates some interesting technology including an eight-hour recording mode. This has been made possible by using a lower record bit rate (see Table 1). Other features include two scart sockets, a front AV socket, and the ability to read DVD+RW, DVD+R, DVD-R, DVD-RW (in video mode), DVD-Video, Super Video CD, Video CD, Audio CD, MP3 CDs and CD-R/RW discs. It can record on DVD+RW and DVD+R discs.

One of its most interesting features is Gemstar's Guide Plus+ technology. Gemstar developed the VideoPlus+ system, which is now standard on all but the lowest-price VCRs. Guide Plus+ is an on-screen electronic programme guide that makes it very easy for users to schedule recordings and set the timer. It works by transmitting programme data, which is stored in the recorder's cache memory, during the field blanking interval. Guide Plus+ can in this way provide up to seven days of programme information. The user sets the timer by simply pointing the remote-control handset at the desired on-screen programme listing and then pressing a button. The system is free, supported by advertising. It works with DTT transmissions but not with digital cable or digital satellite signals.

Another useful feature is Disc Manager, which provides on-screen information on the contents of each recordable DVD disc (it works with up to 1,000 discs). The information is stored in the recorder itself. Disc Manager also keeps track of the empty space available in a disc for making new recordings. And by using PDC data the DVDR80 can automatically name each TV programme, so there's no need for users to enter titles manually.

Philips showed two other interesting DVD products. Model DVD760 incorporates a multiple memory-card reader that enables the player to be used with a wide variety of memory cards, including CompactFlash, SmartMedia, Memory Stick, Secure Digital (SD), Extreme Digital (XD), MultiMediaCard and Microdrive – some of these require a card adaptor. By this means the user can display the contents of a JPEG file on a TV set's screen and play MP3 files using a TV set or stereo audio system.

The JackRabbit is a portable DVD player/CD burner that's designed for connection to a domestic TV set or a PC. Its features include 5.1-channel surround sound, MP3 CD playback and USB 2.0 and 1.1 interfaces. ■

Table 1. Recording modes, Model DVDR80

Recording time minutes	*Bit rate Mbits/sec*
60	9·72
120	5·07
180	3·38
240	2·54
360	1·70
480	1·27

DVD player Model DVD760 incorporates a multiple memory-card reader that enables the player to be used with a wide variety of memory cards.

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Practical PAT testing

Safety testing of electrical equipment is a legal requirement in the UK. Ian Rees provides a practical guide on how to carry out this type of work. Details of a tester design for the constructor will follow in Part 2 next month

Electrical safety testing, commonly referred to as portable appliance testing (PAT), is an 'inferred' legal requirement (see below) in the UK. Although electrical safety testing has come to be thought of as applying to portable appliances only, it also covers fixed installations and systems. Companies, businesses and individuals that ignore or neglect the need for inspection and testing can receive heavy penalties should they be caught out. The HSA records about a thousand people a year in the UK who suffer accidents at work involving electric shocks, with some thirty fatalities.

This article provides a guide to the practice of electrical safety testing as it applies to portable appliance tests in the workshop, or to used, second-hand or repaired equipment that's offered for sale or hire etc.

How the regulations work

The Health and Safety at Work Act 1974 has been with us for nearly thirty years. Amongst other things, it states that all persons at their place of work have a duty of care for the health and safety of themselves and others. Over the succeeding years further legislation has been introduced, to cover specific conditions that apply in the many, varied work situations.

The origins of current electrical procedures and practices in the UK are to be found in four main sets of regulations. These are (1) The Health and Safety at Work Act 1974 (HSW Act), (2) The Electricity at Work Regulations 1989 (EAWR), (3) The Management of the Health and Safety at Work Act Regulations 1992 (H&SWA), and (4) The Provision and Use of Work Equipment Regulations 1992. Today's codes of practice have evolved from the interpretation of these regulations. While the acts are clear about who is affected and their individual responsibilities, you might be surprised to find that there is no mention of regular inspection/checking of electrical systems or keeping records.

As the key to all this, regulation 4 (2) of the Electricity at Work Regulations 1989 states: "As may be necessary to prevent danger, all systems shall be maintained so as to prevent, so far as is reasonably practical, such danger". This regulation thus infers some form of preventive maintenance, to detect faults in equipment and systems before they become dangerous. Preventive maintenance in turn calls for scheduled inspection and testing. Further, it has been surmised that some form of record keeping is desirable to keep track of the process. And so on. Therefore rules in the form codes of practice have evolved to ensure that systems are 'maintained' to comply with the spirit of the legislation.

Three 'layers' of inspection and test have been incorporated into the codes of practice. These are (1) user checks, (2) formal visual inspection and (3) formal full inspection and test.

User checks

Each individual user is expected to carry out his/her own visual inspection of the equipment or system before using it. Simple common sense rules apply, which should be backed up with simple instructions on what to look for. The main checks are as follows:

(1) Check for damage to the supply lead insulation. Sheathing scuffs are acceptable provided the insulation of inner conductors is not visible. Simple taped joints or screw terminal blocks are not acceptable. Cut leads should ideally be replaced or shortened to remove the join. Taping is acceptable where only the cover is involved. Self-amalgamating tape must be used sheathed with tough heat-shrink sleeving. Approved BS cable joiners that incorporate strain-relief clamps can also be used. In-line plugs and sockets should be approved types, and male live conductor pins must not be exposed when unplugged.

(2) Check for correct cable clamp retention at the plug or equipment. The outer cable sheath should be firmly held in the strain-relief clamp of the plug/socket, with no inner insulation/wires showing.

(3) Check for overheating or damage to the equipment casing, including loose or missing covers. The user should not be able to touch live parts even if the original design allows this. It's often possible, for example with old radiant fires that have widely-spaced grid guards.

(4) Check for dirt or water contamination of the equipment – the casing can become live if damp.

(5) Check that inspection/testing is up-to-date.

Faulty equipment should be removed from use and boldly labelled "faulty do not use".

Apart from a log of faulty equipment, no record of this check procedure is normally made.

Formal visual inspection

This is a formal, scheduled inspection that should be carried out at regular intervals by a 'suitably trained' person. The person concerned should have some basic written instructions on the task to be carried out and have been trained to know what to look for. A record of each inspection is normally made.

In addition to the previous checks, the formal inspection should include the opening of 13A square-pin plugs etc. to ensure:

(1) Good strain-relief clamping of the cable sheath.

(2) Satisfactory tight wiring termination, with insulation running right up to the terminal (wiring in screw terminals can relax and loosen with prolonged use).

(3) Correct polarity and wire colour coding.

(4) Correct plug-top fuse rating. This is 1A up to 240W, 2A 240-450W, 3A 450-700W, 5A 700W-1kW, 10A 1-2kW, 13A 2-3kW. Note that some equipment/systems are subject to surges at switch-on. Check manufacturer's rating plate or instructions for correct fusing. Fuses should be BS1363/Asta types.

(5) Fuse-holder contacts should be clean and hold the fuse tightly. Panel-mounted fuse-holders must have live power connected to the tip of the holder. This prevents anyone who removes a fuse making contact with a live-side contact.

(6) Check the suitability of supply cable to carry the current (up to 700W 0·5mm, 700W-3kW 0·75-2·5mm). Cables must have double layers of suitable insulation. If used, coloured outer sheaths should be blue for 240V, yellow for 110V. In commercial premises trailing leads should ideally have an earth-armoured metal sheath. Class 1 appliances and systems must be earthed via a dedicated conductor cable.

Formal full inspection and test

The third level of scheduled checks includes all the former and adds high-voltage insulation and earth bonding/screen tests, which have to be carried out by a 'competent' person. No formal qualifications are required to carry out these tests however. Competence can be gained through a short training course or familiarity with testing methods etc. Because of the higher degree of competency involved, this work is often contracted out. It's necessary to understand electrical equipment classification for test purposes before the tests themselves can be considered.

Classification of equipment

Electrical appliances are divided into classes that require different scheduled tests, periods and procedures. These classes are as follows:

Class 0: Obsolete. Usually old equipment/appliances with metal cases that are not earthed. Shock prevention relies on basic insulation. Such equipment should not normally be used without conversion to Class 1, except under special circumstances.

Class 01: Same as Class 0. Earthing is provided but the supply cable has only two cores. The plug may have no earth pin. Such equipment should not normally be used without conversion to Class 1, except under special circumstances.

Class 1: An appliance with exposed metal/casing, incorporating a circuit protective conductor (CPC) that's earthed. The supply lead has three cores, including a safety-earth terminated with a suitable earthed plug etc.

Class 2: A double-insulated appliance, where great care has been taken in the manufactured design to isolate live parts. The supply lead has two cores. A double-box symbol, see Fig. 1(a), should be visible on the casing.

Class 3: Equipment supplied from a separate electrical low-voltage (SELV) source whose output does not exceed 50V. A box symbol with three vertical dashes, see Fig. 1(b), should be visible on the casing. The power supply should conform to BS3535 and carry the symbol shown in Fig. 1(c).

Equipment and systems are also classified by types which, in conjunction with class and usage, define the period between inspections and tests. Types are as follows:

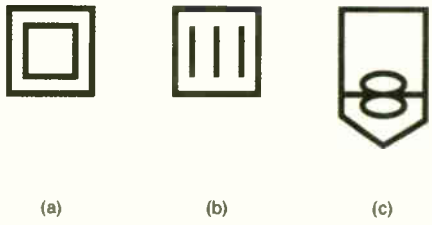

Fig. 1: (a) Double-box symbol indicating a Class 2 double-insulated appliance. (b) Box symbol with three dashes, indicating equipment fed from a separate low-voltage source (50V or less). (c) Separate low-voltage source that complies with BS3535.

Portable: Easily moved while powered, e.g. toaster, kettle, vacuum cleaner etc.

Hand-held: Portable equipment designed to be used while held in the hand, e.g. hairdryer, soldering iron, drill gun.

Movable: Items weighing 18kg or less, fitted with wheels or feet, e.g. welders, tumble dryers, floor polishers.

Stationary: Items weighing 18kg and more and not easily moved, e.g. washing machines, refrigerators.

Fixed: Items fixed in place, e.g. lathes, boilers, space heaters.

IT: Computer-related equipment.

Extension leads: All types, including multi-outlet and suppression types.

Schedules

Table 1 sets out a guide to recommended intervals for inspection and testing. It can be revised in the light of experience.

Record keeping

The complexity or otherwise of the

Electrical safety inspection / test **For company:**

Item no.	Equipment	Class	Normal location	Vis	Ins	Eth	OK	Comments	Date
01									
02									
03									
50									

Sheet of Signed:

Fig. 2: Arrangement of the electrical safety inspection/test record sheets used by the author.

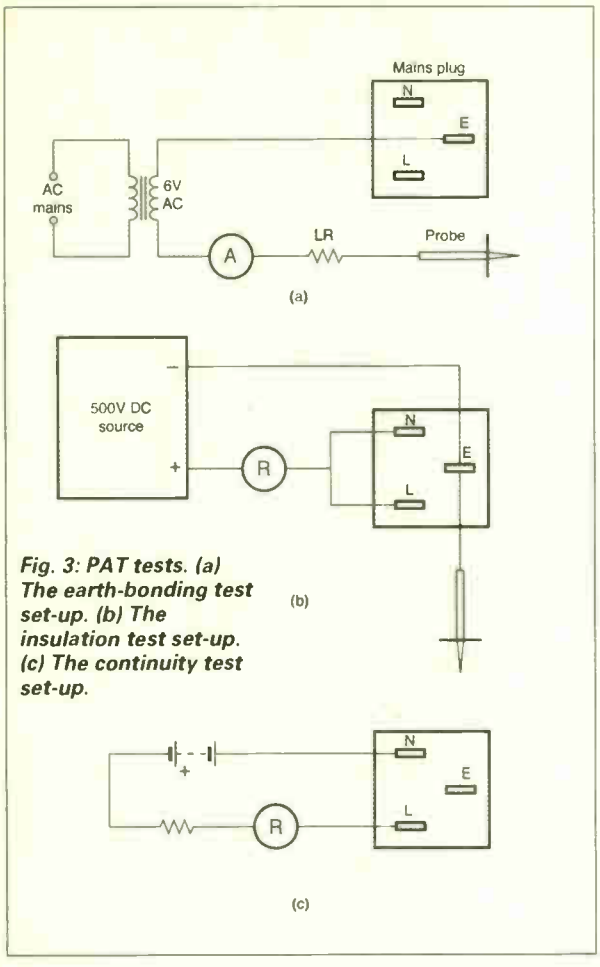

Fig. 3: PAT tests. (a) The earth-bonding test set-up. (b) The insulation test set-up. (c) The continuity test set-up.

records kept depends on the company. Some keep individual records for each appliance or system, others have just one sheet that covers everything. Many are kept in spreadsheet form in a PC. Several equipment supply companies can supply blank (free to copy) forms that are suitable for photocopying. Or you can design your own form to suit your needs.

The headings for mine are shown in Fig. 2. The arrangement evolved gradually, to be as simple as possible in the light of experience gained actually doing the job. The form is printed on a single sheet of A4 paper, portrait style. Each sheet has fifty entry lines and is numbered according to the total number of sheets (1 of 2, 2 of 2 etc.).

The first column carries a unique number that's assigned to a particular appliance and is logged on the label attached to the appliance. The second column indicates the appliance type (fan, kettle, etc.). Next comes the class it belongs to. Normal location indicates where it is used (office, kitchen, workshop, etc.). There follow four tick- or cross-boxes for Vis (Visual inspection), Ins (Insulation test), Eth (Earth-bonding test) and OK (result, pass/fail). The comments column is very useful for noting any simple faults that are found/corrected or other points. The final column is for the date of the test. The box at the bottom is for the sheet number and the tester's signature. I make my entries in pencil as I go and photocopy the completed sheet(s), giving the customer a copy and keeping a set for myself.

Inspection/test labels can be bought ready made or printed off to your own design, using Avery-style labels and a PC. As a minimum the labels should include the unique equipment number, the date of last test or retest, and the initials of the tester. Take the advantage to advertise your firm on both the labels and the forms.

I usually correct simple faults, like changing fuses to the correct rating or remaking joints, as I go, making notes in the comments column. I'm often given the job of repairing rejected items, which brings in useful extra income. They are put back into service after a second PAT test and the record is updated (hence the pencil entries).

Other considerations

Various common-sense observations should be noted during an inspection and drawn to the attention of the appropriate person for corrective action. It should be possible to isolate appliances easily, so switches/sockets should not be hidden or inaccessible (behind desks or filing cabinets for example). Leads should be dressed away to prevent them being tripped over or snagged by passing traffic. Tight strung-out leads should be avoided. Extension leads on drums can overheat if they are left coiled while drawing power. Advice on the dangerous use of mains adaptors should be given, especially where several are plugged together.

On industrial sites the use of suitable isolation transformers with 110V tools is obligatory.

The danger of liquid spillage into electrical equipment as a result of practices such as putting cups or plants on computer monitors etc. should be pointed out. Poorly positioned equipment (in enclosed spaces or too close to walls) could cause overheating and requires alteration. Covered ventilation grills on equipment can cause the same problem.

Finally, beware of equipment that has built-in contactors or relays in the mains supply. A standard insulation test carried out with such equipment will extend only to the isolating device. To extend the test into the equipment, the contactors or relays will have to be bypassed.

Sale, repair or hire of equipment

If you wish to sell, repair or hire electrical equipment it must have been safety tested. Scrapped equipment should be made inoperable, e.g. by cutting the mains lead off at the appliance body or dismantling it. Auctions normally offer for sale electrical items that have been PAT tested. With boot and private sales and sales from second-hand shops and via classified advertisements the equipment is much less likely to have been tested. There have been some well-publicised prosecutions of second-hand shops in my area by Trading Standards, with large fines for each item that was found to be unsafe.

Testing

With equipment and systems that are designed to be plugged into the mains supply, the tests to be carried out depend on the class the equipment falls into. Before any checks are carried out, equipment must be disconnected or isolated from the mains supply. We'll take each class in turn.

Class 1: Earth-bonding tests are carried out first, see Fig. 3(a). 10V AC or less is usually applied between the earth pin of the supply plug and the exposed conductive casing or fixing screws etc. of the appliance or system. A minimum current of between 1·5-2 times the fuse rating (up to a maximum of 25A) is passed for about five seconds. The resulting resistance of the earth path is calculated and checked against the cable diameter and length. Bonding resistance of about 0·1-0·5Ω is expected. Take care not to cause a flash burn when the test probe or clip connects with a decorative surface. Do not extend the test by more than five seconds. Heating the earth conductor wire can damage its insulation. A lesser test current is used with low-current class 1 equipment (IT etc.).

Having established that the earth bond is satisfactory, the next step is to carry out insulation checks, see Fig. 3(b). A simple continuity test, see Fig. 3(c), is desirable to ensure that the equipment or system is switched on and its mains fuse is intact. For the insulation test 500V DC is applied between the earth and the live/neutral pins (shorted together) of the supply plug. Insulation resistance better than

Table 1: Guide to intervals for electrical inspection and testing

Type of business	*Formal visual check*	*Inspection and test*
Equipment hire	Before and after return	Before issue
Construction	Before use one month	Every three months
Industrial	Before use three months	Every 6-12 months
Office/low risk	Depends, see below	Depends, see below

Equipment/use	*User visual*	*Formal visual*	*Inspection and test*
Battery operated, <20V	No	No	No except class 1 supply/chargers
Low-voltage (<50V) class 3	No	No	No except class 1 mains-supply unit
IT (computer related)	No	2-4 years	Class 2 no, otherwise 5 years
Class 2 (not hand-held*)	No	2-4 years	Class 2 no, otherwise 5 years
Class 2 (handheld †)	Yes	6 months/year	No, otherwise 5 years
Class 1‡	Yes	6 months/year	1-2 years
Accessories§	Yes	6 months/4 years	1-5 years (depends on type of equipment)

*Photocopiers, fax machines etc. that are rarely moved.
† Fans, desk lamps etc.
‡Kettles, floor and vacuum cleaners etc.
§Mains leads used with the above equipment and socket mains extensions.
Source of information, HSE document INDG236 11/99 C250

2MΩ is expected with as-new and 500kΩ with longer in-service equipment.

Class 2: Only an insulation test is required with class 2 equipment and systems. Again, the equipment or system must be switched on. The insulation check (at 500V DC) is applied between the live/neutral pins (shorted together) of the supply plug and any exposed conductive surface of the appliance or system. Insulation of better than 7MΩ is expected with as-new household appliances (BS3456), hand-held tools (BS2769) and IT equipment (BS EN 60950). New luminaries (BS4533) and mains-operated electronic equipment (BS415) passes at better than 4MΩ. With all the above types, older in-service equipment passes at better than 1MΩ.

Class 3: No checks, other than visual, are normally required. The power supply should carry the correct symbol and BS3535 rating marks. Otherwise treat it as a class 2 device.

Flash testing

Flash testing is controversial, because it can break down or weaken the insulation of otherwise good equipment. The mains filters often incorporated in modern appliances can fail, as the working voltage of the suppression capacitors is exceeded. IT and sensitive electronic equipment must never be flash tested.

Professional testing companies will flash test only when a signed disclaimer has been provided by the customer to take into account the possibility of damage to the equipment.

The test is carried out as for an insulation test, but 1kV is applied with class 1 and 3kV with class 2 equipment. Leakage currents are monitored. A pass level of less than 3mA is expected.

Because of the danger of electrical shock to bystanders, a segregated and fenced-off area should be created for flash testing. Prominent warning notices to keep out should be posted around it.

Test equipment

A wide range of dedicated test equipment is available from companies like Robin, Edgcumbe, Seaward and Avo. Basic entry-level PAT testers for use by non-technical people start at around £200. They tend to be go/no-go types that provide little discrimination with problem equipment. False rejections occur, and they can't always be used with IT equipment. At the other end of the scale come the all signing and dancing, highly automated computerised models with a price tag around £1,000. Software is available to interface them with a PC, though this can set you back another £400. In between are the semi-automated and manual models.

Most electricians and electronics engineers own an insulation tester. Some are not suitable because they can't maintain a 500V terminal voltage on load during the test. To check whether they can, fit a 500kΩ resistor between the terminals and measure the voltage across this resistor while the test is in progress, using a high-impedance voltmeter (>10MΩ). The reading should be close to 500V. You may be surprised to find that some old or cheap meters maintain a test voltage of 200V or less. This is because of the high impedance or poor regulation of the power supplies they use.

Next month

I designed my own PAT tester some time ago and have subsequently used it on a regular basis. Its features are: Class 1 earth-bond checks to below 0·1Ω (maximum 25A at 6V AC); IT etc. earth (shield) bond test to below 0·1Ω (0·1V DC at 100mA); live/neutral continuity check to confirm that equipment is switched on and the fuse is OK, greater than 100kΩ (9V DC); earth to live/neutral insulation test >20MΩ (500V at 500kΩ load); all tests carried out through a standard 13A mains socket. A piece of equipment of this type would cost in excess of £250, so it's well worth the time taken to build it, especially if more than one is required. The prototype cost about £50 to make. Circuit, construction and set-up details will be provided in Part 2 next month, along with instructions for using it. ■

HELP WANTED

The help wanted column is intended to assist readers who require a part, circuit etc. that's not generally available. Requests are published at the discretion of the editor. Send them to the editorial department or email to tessa2@btinternet.com – do not write to or phone the advertisement department about this feature.

Wanted: Circuit diagram for the Matsui Model 1407 colour TV set. P. Guarini, 31 Alderson Avenue, Rawmarsh, Rotherham, S62 7DE. Phone 01709 371 188.
Wanted: Power control circuit diagram for the Kuba 5000P VCR. I think it may be a Panasonic clone, dating from the mid-1980s, with bar-code programmer. Please contact Alan Stubbins on 01522 702 610 (Lincoln) evenings/weekends.
Wanted: Older type video sender for experimental purposes. Please contact Alan Meade on 01339 883 605 or email meadea@compuserve.com
Wanted: For spares etc. Quad 33 or 44 preamplifiers, 405 power amplifiers, FM2 and FM3 tuners etc. Phone Mike on 01758 613 790.
Wanted: Operation manual, original or copy to buy, for the Tektronix 222 hand-held scope. Please contact Dave Miller on 01332 793 266 (Derby) or email dave.windymiller@virgin.net
Wanted: Main microcontroller IC for the Acer 7176ie monitor, or a scrap chassis with this item, or information on a possible source. Barry Knapp, 83 Haywards Road, Cheltenham, GL52 6RQ. Phone 01242 519 742 or email barry@bknp.fsnet.co.uk
Wanted: Circuit diagram for the Tobishika portable 5·5in. TV+radio Model KTV502-BS. Robert Crooks, 42 Edenderry Village, Shaws Bridge, Belfast, BT8 8LG. Phone 07989 119 675 9 a.m.–5 p.m.
Wanted: Old half-inch ferrite rods. Willing to pay good money for them. Please contact Peter Tankard on mobile phone no. 07931 463 823, 9 a.m.–10 p.m.
Wanted: Power/deflection circuit diagram for the Hitachi Model C2519T (G8Q chassis) with TDA3654 field output chip. Laurie Watkinson, Telesonic Services, Week St. Mary, Holsworthy, Devon. EX22 6UJ. Phone 01288 341 254.
For disposal: Over 80 radio and TV valves, 19 in original manufacturers' boxes. For more details phone David Bolt on 01473 780 833 (Woolverstone, Suffolk) or email david.bolt@breathemail.net
Wanted: Semi-automatic record player mechanism type HPD550 for the Murphy CD mini system Model S2790-2. R.E. Gosden, 6 Taplings Close, Winchester, Hants, SO22 6HQ. Phone 01962 886 906.
Wanted: Line output transformer for the Daytec DT1730 monitor. The transformer has the number TLF 057-05-38 on the plastic casing and labels with the numbers LCE CF 0779 and Lot No FI 26. Any information on a possible source for this item would be welcome. Grahame Pittaway, 13 Belvoir Close, Fareham, Hants, PO16 0PJ. Phone 01329 239 326 or email grahame@planetwitness.com
Wanted: 26in. Telefunken Model 743 (711/711A chassis), working or not. Will collect. This model dates from about 1973-4. Please contact Paul Godley at PA Technical Services on 07958 216 933 or email paul.goggo@btinternet.com
Wanted: CRT type A80EFF002X43 for the Toshiba Model 3388. Phone 020 8397 9840 or email tvrchess@aol.com
Wanted: Tuner/IF panel in working order for the Mitsubishi VCR Model HSB30. Ellis James, 8 Bryn-y-derwydd, Trefin, Haverfordwest, Pembrokeshire, SA62 5AY. Phone 07814 176 641.
Wanted: Tube board for the 20in. Ferguson Model 20E1/Logic Model 4090 (TX90 chassis), or a scrap set. Can collect. The set doesn't focus, and a blue arcing can be seen where the focus lead connects to the tube board. Please call Chris Graves on 01604 709 522 (Northampton) or email chrisgraves2003@yahoo.co.uk
Wanted: Discatron, Emerson, Wondergram, Philips car record players from the Sixties, working or faulty. Also parts and information. And a Philips W66ESF 28in. widescreen tube. Have a Daewoo R-30SVC set-up remote-control unit available for hire. Call Martin Randall on 01285 658 715 or email av1@aol.com

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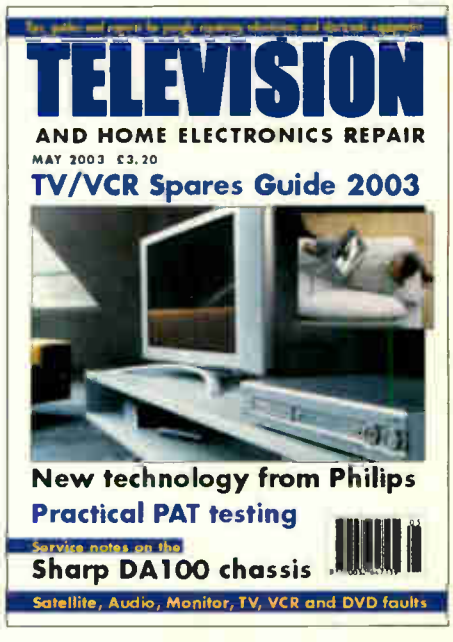

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22uF	CAP53	£0.45	10
33uF	CAP54	£0.50	5
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68uF	CAP133	£0.55	10
100uF	CAP56	£0.85	10
150uF	CAP57	£0.95	5
220uF	CAP58	£1.45	5
330uF	CAP134	£1.60	10
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470uF	CAP69	£4.35	10
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220uF	CAP86	£2.80	10
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470uF	CAP88	£5.25	10
680uF	CAP89	£5.00	10
1000uF	CAP90	£5.40	5
100 Volts			
0.47uF	CAP91	£0.50	5
1uF	CAP92	£0.85	10
1.5uF	CAP93	£0.70	5
2.2uF	CAP94	£0.50	5
3.3uF	CAP95	£0.50	5
4.7uF	CAP96	£0.50	5
10uF	CAP97	£0.95	10
22uF	CAP98	£1.05	10
33uF	CAP99	£1.55	5
47uF	CAP100	£1.75	10
100uF	CAP101	£2.10	10
220uF	CAP102	£6.00	5
470uF	CAP103	£6.00	5
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10uF	CAP147	£1.40	10
22uF	CAP148	£1.80	10
33uF	CAP149	£2.30	10
100uF	CAP150	£3.25	5

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3.3uF	CAP104	£1.75	10
10uF	CAP105	£2.60	10
22uF	CAP153	£2.30	10
47uF	CAP106	£4.35	10
100uF	CAP154	£4.50	5
220uF	CAP155	£2.00	2
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3.3uF	CAP157	£1.50	10
10uF	CAP158	£2.25	10
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STK5434	£5.70
STK5436	£5.00
STK5441	£3.50
STK5443	£5.75
STK5446	£3.50
STK5451	£3.90
STK5461	£5.00
STK5462	£3.50

Part No.	Price
STK5464	£3.00
STK5466	£5.00
STK5467	£4.00
STK5468	£3.00
STK5471	£9.00
STK5472	£3.75
STK5473	£4.80
STK5474	£5.00
STK5476	£3.50
STK5477	£4.50
STK5478	£2.50
STK5479	£3.00
STK5481	£4.70
STK5482	£2.85
STK5483	£4.40
STK5486	£4.50
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STK5488	£4.80
STK5490	£4.50
STK561	£4.00
STK563	£4.15
STK5632	£3.00
STK5720	£4.00
STK5725	£3.50
STK5730	£3.00
STK583	£4.00
STK6316	£3.00
STK6324B	£5.00
STK6327	£12.00
STK6328A	£4.00
STK6431	£6.00
STK6607	£4.00
STK6712BIV	£5.50
STK6722	£6.50
STK6732	£10.00
STK6822	£7.50
STK6875	£6.50
STK6922	£10.00
STK6932	£4.50
STK6962	£2.75
STK6972	£3.00
STK6981B	£5.00
STK6982	£6.00
STK6982H	£6.00
STK7216	£4.20
STK7217	£2.50
STK7225	£5.00
STK7226	£17.00
STK7233	£7.00
STK7251	£5.00
STK7253	£6.50
STK730-060	£6.50
STK730-080	£6.00
STK7308	£7.00
STK7309	£4.00
STK7310	£3.20
STK73405 II	£5.50
STK73410	£3.50
STK73410 II	£5.00
STK7348	£4.00
STK7356	£4.25
STK7358	£4.40
STK7359	£4.25
STK73605	£3.75
STK73907	£7.00
STK73908	£5.50
STK73908	£5.50
STK7402	£5.60
STK7404	£6.00
STK7406	£6.50
STK7406H	£7.50
STK7408	£6.75
STK7410	£15.00
STK7458	£12.50
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STK7554	£4.80
STK7561	£6.50
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STK7576	£15.00
STK760	£5.00
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STK770	£4.00
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STK78617	£24.00
STK795	£3.25
STK8050	£16.00
STK8250	£5.00
STK8260	£12.00
STK8280	£18.50
STR10006	£4.50
STR11006	£3.25
STR17006	£5.00
STR20005	£4.50
STR30115	£2.75
STR3315	£2.75
STR370	£3.00

Part No.	Price
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STR380	£3.50
STR381	£3.90
STR383	£4.10
STR384	£3.50
STR40090	£3.50
STR40115	£6.00
STR4090A	£6.50
STR41090	£3.30
STR4142	£4.50
STR4211	£3.15
STR43111	£9.50
STR440	£8.00
STR441	£9.50
STR44115	£4.75
STR442	£16.00
STR450A	£7.00
STR451	£8.00
STR45111	£5.50
STR4512	£4.00
STR452	£4.75
STR453	£5.00
STR454	£13.00
STR455	£5.50
STR456	£4.70
STR457	£6.00
STR470	£3.00
STR50020	£3.50
STR50092	£5.50
STR50103A	£2.60
STR50112A	£6.50
STR50113	£5.00
STR50115	£5.00
STR50213	£4.00
STR50330	£4.75
STR51041	£5.00
STR51213	£5.00
STR51424	£7.00
STR53041	£4.00
STR54041	£3.20
STR5412	£2.80
STR55041	£4.50
STR56041	£5.50
STR58041	£2.50
STR59041	£3.00
STR60001	£5.25
STR6008X	£5.75
STR6020	£2.70
STR61001	£4.75
STR7001	£6.00
STR80145	£4.75
STR81145	£3.75
STR81159	£4.00
STR8124	£10.00
STR83145	£5.00
STR83159	£7.00
TDA1420	£8.00
TDA1470	£12.00
TDA1514A	£3.25
TDA1540	£4.20
TDA1541	£5.00
TDA1541A	£4.00
TDA1546T	£10.50
TDA1547	£10.00
TDA1552Q	£3.50
TDA1553AQ	£3.25
TDA1553CQ	£3.00
TDA1554Q	£3.00
TDA1555Q	£3.75
TDA1556Q	£3.25
TDA1557Q	£3.00
TDA1558Q	£3.00
TDA1561Q	£5.00
TDA1562Q	£5.50
TDA1580	£4.25
TDA1599	£4.00
TDA1602A	£4.00
TDA16846	£2.00
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TDA16833	£2.00
TDA16846	£2.00
TDA1701	£14.00
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TDA1870A	£2.00
TDA1872A	£2.75
TDA1908A	£2.50
TDA1940	£6.00
TDA1941	£3.00
TDA2003	£0.65
TDA2004	£1.50
TDA2005	£1.50
TDA2006	£0.70
TDA2009	£1.60
TDA2020	£1.20
TDA2030	£0.80
TDA2030H	£1.00
TDA2048	£6.00
TDA2050V	£2.00
TDA2051V	£4.50
TDA2052V	£5.25

Part No.	Price
TDA2450-3	£10.00
TDA2460-2	£0.70
TDA2501	£3.00
TDA2506T	£8.00
TDA2507	£4.50
TDA2510	£4.50
TDA2514A	£5.00
TDA2515	£4.50
TDA2520-1	£9.00
TDA2521	£8.00
TDA2522	£12.00
TDA2523	£8.50
TDA2525	£4.50
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TDA2548	£2.60
TDA2549	£3.00
TDA2558	£4.00
TDA2560Q	£7.00
TDA2560-3	£14.00
TDA2574V	£3.50
TDA2576A	£9.00
TDA2577A	£2.00
TDA2578A	£7.00
TDA2579A	£2.10
TDA2579B	£3.25
TDA2652	£48.00
TDA2653A	£4.50
TDA2710-1	£4.00
TDA2820M	£1.00
TDA2822M	£0.60
TDA3190	£2.00
TDA3301B	£16.00
TDA3303	£7.00
TDA3501	£3.00
TDA3502	£3.60
TDA3504	£3.00
TDA3507	£4.50
TDA3521	£7.50
TDA3560	£6.00
TDA3561	£3.00
TDA3561A	£3.00
TDA3562A	£2.60
TDA3563	£3.50
TDA3563A	£4.00
TDA3564	£3.25
TDA3565	£2.20
TDA3566	£2.80
TDA3566A	£3.00
TDA3567	£3.50
TDA3569	£3.00
TDA3570	£3.75
TDA3576B	£7.00
TDA3650	£6.75
TDA3651	£2.00
TDA3651A	£3.50
TDA3652	£5.00
TDA3652TX10	£8.00
TDA3653B	£0.80
TDA3653C	£0.85
TDA3654	£0.80
TDA3654Q	£0.85
TDA3724	£3.00
TDA3725	£3.00
TDA3730	£4.00
TDA3740	£4.00
TDA3750	£4.00
TDA3770	£7.75
TDA3771	£4.60
TDA3803A	£5.00
TDA4400	£1.75
TDA4420	£1.20
TDA4421	£3.00
TDA4422	£2.00
TDA4427	£3.00
TDA4429T	£20.00
TDA4431	£1.50
TDA4474	£4.00
TDA4480	£6.00
TDA4481	£2.15
TDA4482	£11.00
TDA4500	£3.00
TDA4501	£2.80
TDA4502	£4.00
TDA4503	£3.25
TDA4504B	£8.00
TDA4505A	£3.00
TDA4505E	£6.50
TDA4510	£2.00
TDA4556	£3.70
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TDA4560	£2.70
TDA4565	£1.50
TDA4566	£2.50
TDA4568	£2.25
TDA4580	£10.00
TDA4600	£2.00
TDA4600II	£1.60
TDA4601	£1.20
TDA4601D	£0.65
TDA4605	£1.90
TDA4610	£3.70
TDA4650	£3.00
TDA4651	£8.00

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TDA4665	£2.50
TDA4670	£4.75
TDA4671	£5.00
TDA4680	£3.50
TDA4681	£4.50
TDA4685	£2.75
TDA4686	£5.00
TDA4687	£5.00
TDA4700A	£7.50
TDA4710H	£7.00
TDA4714C	£3.50
TDA4716C	£4.50
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TDA4810	£5.00
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TDA4854	£5.00
TDA4855	£6.00
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TDA4860	£2.00
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TDA4941	£2.80
TDA4942	£2.00
TDA4950	£1.00
TDA4951	£4.50
TDA5010	£3.00
TDA5400	£6.00
TDA5500	£9.00
TDA5600	£4.50
TDA5610-2	£7.50
TDA5620	£4.50
TDA5702	£13.00
TDA5830-2	£11.00
TDA6100Q	£1.50
TDA6101Q	£1.20
TDA6103Q	£2.25
TDA6106Q	£1.25
TDA6107Q	£3.00
TDA6108JF	£3.00
TDA6111Q	£2.25
TDA6120Q	£5.50
TDA6160-2S	£4.75
TDA6160-2X	£2.50
TDA7052	£1.20
TDA7056	£2.00
TDA7262	£3.25
TDA7263	£3.50
TDA7263M	£4.00
TDA7264	£5.00
TDA7265	£5.00
TDA7266	£5.00
TDA7269	£5.00
TDA7269A	£2.75
TDA7293V	£5.50
TDA7294V	£5.50
TDA7295	£4.00
TDA7296	£5.00
TDA7297	£3.50
TDA7300	£5.50
TDA7302	£4.50
TDA7310	£8.00
TDA7312	£4.50
TDA7313	£6.50
TDA7318	£5.50
TDA7330A	£7.00
TDA7340	£8.00
TDA7350	£3.00
TDA7359	£3.00
TDA7360	£7.00
TDA7362	£4.50
TDA7365	£5.50
TDA7370V	£3.25
TDA7372A	£4.50
TDA7374V	£3.50
TDA7375V	£5.25
TDA7376B	£10.00
TDA7377	£4.50
TDA7381	£11.00
TDA7384A	£11.00
TDA7385	£10.00
TDA7386	£11.00
TDA7393	£10.00
TDA7394	£6.00
TDA7396	£4.50
TDA7431	£7.00
TDA7439	£6.50
TDA7495	£4.25
TDA7560	£18.00
TDA8000	£4.25
TDA8116	£3.50
TDA8120B	£4.00
TDA8137	£2.00

Part No.	Price
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TDA8138A	£1.30
TDA8138B	£2.00
TDA8139	£2.00
TDA8140	£2.00
TDA8143	£1.60
TDA8145	£1.20
TDA8146	£2.00
TDA8153	£10.00
TDA8170	£1.70
TDA8171	£2.30
TDA8172	£2.00
TDA8173	£1.75
TDA8174	£2.00
TDA8175	£7.00
TDA8177	£3.00
TDA8177F	£3.50
TDA8179S	£7.50
TDA8180	£12.50
TDA8205	£12.50
TDA8212	£3.50
TDA8214B	£10.50
TDA8215H	£3.00
TDA8217	£2.25
TDA8303	£2.50
TDA8304	£4.00
TDA8305	£5.00
TDA8305A	£5.00
TDA8310	£6.00
TDA8350Q	£2.75
TDA8351	£2.00
TDA8354Q	£2.75
TDA8356	£2.00
TDA8360N3	£8.00
TDA8361AN3	£8.00
TDA8361N3	£9.00
TDA8362AN	£12.00
TDA8362AN3	£7.50
TDA8362BN3	£8.50
TDA8362N3	£12.00
TDA8362N4	£9.00
TDA8362N5	£12.00
TDA8366N2	£15.00
TDA8366N3	£11.50
TDA8370	£11.50
TDA8372A	£16.50
TDA8374	£10.00
TDA8375A	£12.50
TDA8376	£15.00
TDA8380	£2.00
TDA8424	£4.00
TDA8425	£5.00
TDA8432	£5.50
TDA8433	£6.00
TDA8440	£3.00
TDA8443	£3.50
TDA8451	£3.25
TDA8453	£3.50
TDA8461	£9.50
TDA8501	£3.75
TDA8505	£11.00
TDA8560Q	£4.25
TDA8561Q	£5.25
TDA8562Q	£5.00
TDA8563Q	£4.75
TDA8565Q	£11.00
TDA8566Q	£5.50
TDA8567Q	£7.00
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TDA8569Q	£8.00
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TDA8703	£5.00
TDA8708	£6.00
TDA8709	£7.00
TDA8741	£5.50
TDA8745	£8.50
TDA8840	£10.00
TDA8841	£10.00
TDA8842	£14.00
TDA8843	£15.00
TDA8844	£14.00
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TDA9103	£4.75
TDA9105	£5.00
TDA9109	£10.00
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TDA9143	£4.00
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TDA9151	£11.00
TDA9160A	£9.50
TDA9162	£11.00
TDA9170	£7.00
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1427T	PSU	ONWAKIT
1402	PSU	ONWAKIT
1455T	PSU	ONWAKIT
1456T	PSU	ONWAKIT
1458T	PSU	ONWAKIT
1459T	PSU	ONWAKIT
1499Y	STANDBY	MODKIT37
2002	PSU	ONWAKIT
2009B	PSU	ONWAKIT
2052T	PSU	ONWAKIT
2152T	PSU	ONWAKIT
2099TX	STANDBY	MODKIT37
BTV17	STANDBY	MODKIT37
CTV501	PSU	ONWAKIT
CTV701	PSU	ONWAKIT
CTV840	PSU	ONWAKIT
CTV841	PSU	ONWAKIT
CTV485	PSU	ONWAKIT
AKAI		
CT1417	PSU	ONWAKIT
CT2159U	PSU	ONWAKIT
CT2162UNT	PSU	ONWAKIT
CT2863UNT	PSU	ONWAKIT
DECCA/TATUNG		
TVC563	STANDBY	MODKIT37
GOLDSTAR		
CF25A50F	FRAME	MODKIT36
CF25C22C	FRAME	MODKIT35
CF28A50F	FRAME	MODKIT36
CF28C22F	FRAME	MODKIT35
CF28C28F	FRAME	MODKIT36
CF29C42F	FRAME	MODKIT35
GOODMANS		
147TT	PSU	ONWAKIT
149T	PSU	ONWAKIT
1430RA	PSU	ONWAKIT
1430RS	PSU	ONWAKIT
1430RW	PSU	ONWAKIT
1450T	PSU	ONWAKIT
1455TS	PSU	ONWAKIT
2019R	PSU	ONWAKIT

MAKE & MODEL	KIT TYPE	CODE
GOODMANS..Continued		
2029T	PSU	ONWAKIT
2029TA	PSU	ONWAKIT
F16 CHASSIS	FRAME	GOODKIT1
F16 CHASSIS	LINE	GOODKIT1
F16	PSU	GOODKIT1
F16	VIDEO	GOODKIT1
GRUNDIG		
CUC 7350		GRUNDIGKIT1
CUC 7301/3 (BUZ90)	PSU	GRUNDIGKIT2
CUC 7301/3 (MJF18004)	PSU	GRUNDIGKIT3
HINARI		
HIT14RC	PSU	ONWAKIT
JVC		
AV29SX1EK	FIELD O/P	JVCKIT1
AV29SX1EN	FIELD O/P	JVCKIT1
AV29SX1EN1	FIELD O/P	JVCKIT1
AV29SX1PF	FIELD O/P	JVCKIT1
AV29TSIE1	FIELD O/P	JVCKIT1
C14E1EK	PSU	ONWAKIT
C14T1EK	PSU	ONWAKIT
C21ET1EK	PSU	ONWAKIT
CS21M3EK	PSU	ONWAKIT
MATSUI		
1455	PSU	ONWAKIT
1498	PSU	ONWAKIT
2086	PSU	ONWAKIT
2098	PSU	ONWAKIT
21V1N (BUZ90)	PSU	GRUNDIGKIT2
21V1T(MJF18004)	PSU	GRUNDIGKIT3
TVR180R/T/2080	STANDBY	MODKIT37
MITSUBISHI		
AV1 SERIES	PSU	MITSKIT3
CT1M5B	PSU	MITSKIT3
CT21M5BT	PSU	MITSKIT3
CT25M5BT	PSU	MITSKIT3
CT21A2STX	TDA 8178S	MITSKIT1
CT21AX1B	PSU	MITSKIT3
CT21A3STX	TDA 8178S	MITSKIT1

MAKE & MODEL	KIT TYPE	CODE
MITSUBISHI..Continued		
CT21AV1BS	PSU	MITSKIT3
CT25A2STX	TDA 8178S	MITSKIT1
CT25A3STX	TDA 8178S	MITSKIT1
CT25A4STX	TDA 8178S	MITSKIT1
CT25A6STX	TDA 8178S	MITSKIT1
CT25AV1B	PSU	MITSKIT3
CT25AV1BS	PSU	MITSKIT3
CT25AV1BD	PSU	MITSKIT3
CT25AV1BDS	PSU	MITSKIT3
CT28AV1B	PSU	MITSKIT3
CT28AX1BD	PSU	MITSKIT3
CT28AV1BDS	PSU	MITSKIT3
CT29AS1	TDA 8178S	MITSKIT2
CT29A4	TDA 8178S	MITSKIT2
CT29A6	TDA 8178S	MITSKIT2
CT29B2	TDA 8178S	MITSKIT2
CT29B3	TDA 8178S	MITSKIT2
CT29B6	TDA 8178S	MITSKIT2
CT33B3	TDA 8178S	MITSKIT2
M5 SERIES	PSU	MITSKIT3
NEI/NIKKAI		
CE25 CHASSIS	PSU	NIKKAIKIT1
C289FTXN	PSU	NIKKAIKIT1
C28F41FXN	PSU	NIKKAIKIT1
PANASONIC		
IC561	TDA 8175	PANKIT1
TX25XD60	VERT OUTPUT	PANKIT2
TC28XD60	VERT OUTPUT	PANKIT2
TX28XD70	VERT OUTPUT	PANKIT2
TX29XD70	VERT OUTPUT	PANKIT2
TX-W26D3	VERT OUTPUT	PANKIT2
PHILIPS		
310.10708		PHILKIT3
310.20491		PHILKIT2
310.20496		PHILKIT10
310.31994		PHILKIT6
310.32252		PHILKIT5
310.32253		PHILKIT4
310.32254		PHILKIT9
310.32255		PHILKIT7

MAKE & MODEL	KIT TYPE	CODE
PHILIPS..Continued		
310.32262		PHILKIT8
310.62264		PHILKIT1
ANUBIS A	SOPS	PHILKIT2
CP110 CHASSIS	SOPS	PHILKIT8
G90A CHASSIS	SOPS	PHILKIT10
G90B CHASSIS	SOPS	PHILKIT10
G110 CHASSIS	SOPS	PHILKIT3
GR2.1 CHASSIS	SOPS	PHILKIT1
GR2.2 CHASSIS	SOPS	PHILKIT1
D-16 CHASSIS	SOPS	PHILKIT6
HSM VIDEO	SOPS	PHILKIT5
JSM VIDEO	SOPS	PHILKIT4
KSM VIDEO	SOPS	PHILKIT9
LSM VIDEO	SOPS	PHILKIT7
SAMSUNG		
CI5944	FRAME	SAMKIT2
CI6844	FRAME	SAMKIT2
VIK310	PSU	SAMSUNGKIT
VIK320	PSU	SAMSUNGKIT
VIK350	PSU	SAMSUNGKIT
VI375	PSU	SAMSUNGKIT
VI395	PSU	SAMSUNGKIT
WINNER 1	PSU	SAMSUNGKIT
SHARP		
51CS03H	PSU	SHARPKIT1
51CS05H	PSU	SHARPKIT1
59CS03H	PSU	SHARPKIT2
59CS05H	PSU	SHARPKIT2
59CSD8H	PSU	SHARPKIT2
59DS03H	PSU	SHARPKIT3
66CS03H	PSU	SHARPKIT2
66CS05H	PSU	SHARPKIT2
66CSD8H	PSU	SHARPKIT2
THOMSON		
35029400		THOMKIT2
35065920		THORNKIT1
FV70	PSU	THORNKIT1
ICC7 CHASSIS	TDA 8178FS	THOMKIT1
ICC7 CHASSIS	FRAME	THOMKIT3
ICC8 CHASSIS	TDA 8178FS	THOMKIT1
ICC8 CHASSIS	FRAME	THOMKIT3
ICC9 CHASSIS	EAST/WEST	THOMKIT4
R3000	PSU	THOMKIT2
R4000	PSU	THOMKIT2
TX92F CHASSIS	EAST/WEST	THOMKIT4

ORDER CODE	PRICE
GRUNDIGKIT1	£ 10.50
GRUNDIGKIT2	£ 10.50
GRUNDIGKIT3	£ 10.50
GOODKIT1	£ 11.00
JVCKIT1	£ 11.00
MITSKIT1	£ 3.00
MITSKIT2	£ 15.00

ORDER CODE	PRICE
MITSKIT3	£ 6.00
MODKIT35	£ 9.50
MODKIT36	£ 5.00
MODKIT37	£ 6.50
NIKKAIKIT1	£ 12.00
ONWAKIT	£ 12.00
PANKIT1	£ 15.00

ORDER CODE	PRICE
PANKIT2	£ 9.00
PHILKIT1	£ 7.60
PHILKIT10	£ 8.50
PHILKIT2	£ 2.50
PHILKIT3	£ 4.00
PHILKIT4	£ 4.25
PHILKIT5	£ 5.75

ORDER CODE	PRICE
PHILKIT6	£ 5.50
PHILKIT7	£ 7.60
PHILKIT8	£ 4.25
PHILKIT9	£ 7.50
SAMKIT2	£ 8.00
SAMSUNGKIT	£ 16.00
SHARPKIT1	£ 11.00

ORDER CODE	PRICE
SHARPKIT2	£ 11.00
SHARPKIT3	£ 9.00
THOMKIT1	£ 7.00
THOMKIT2	£ 12.00
THOMKIT3	£ 9.00
THOMKIT4	£ 4.00
THORNKIT1	£ 12.75

Satellite Repair / Mod Kits

Amstrad DRX100
Tuner Repair Kit

Order Code
SATKIT35

Price
£ 1.40 + vat

Amstrad DRX100
Power Supply
Reliabilty Kit

Order Code
SATKIT36

Price
£ 12.00 + vat

Amstrad DRX100
Power Supply
Repair Kit

Order Code
SATKIT37

Price
£ 13.50 + vat

Grundig GDS200
Digital Satellite Receiver
Repair Kit

Early psu
MODEL : DS0 - 0385 REV C

Order Code: SATKIT34A
Price : £ 10.00 + vat

Grundig GDS200/300
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 Satellie Receiver Fan Kit

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

Order Code : FANKIT2
Price : £ 15.00 + vat

Grandata Ltd

distributor of electronic components

Aerial & Digital Satelitte Accessories

Sky™ Digital Remote & TV Link Eye Combination

Order Code : SKYPACK1

Price : £ 16.00 + vat each

5 +

£ 14.50 + vat each

Sky™ Digital Remote Controls

Order Code : RCSKY

1 +
£ 7.95 + vat each

5 +
£ 7.45 + vat each

10 +
£ 6.95 + vat each

Sky™ Digital Remote & SLx Link Eye Combination

Order Code : SKYPACK2

Price : £ 13.00 + vat each

5 +

£ 11.50 + vat each

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

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

Integrated Digital By Pass

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

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

Coax Coupler Socket to Socket

Order Code
PLG54
Bag of 10
Price : £1.50 + vat

Coax Coupler Plug to Plug

Order Code
PLG55
Bag of 10
Price : £1.50 + vat

Y Splitter Inductive 3 way

Order Code
YSPLITTER
Price : 40p + vat
Bag of 10
Price : £ 3.00 + vat

SLx Link Eye

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

Order Code : 27833R

1 - 9
£ 6.50 + vat each

10 - 24
£ 5.50 + vat each

Sky™ Digital TV Link Eye

Order Code : TVLINKEYE

Price
£ 10.75 + vat

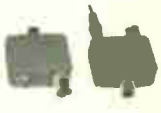
5 +
£ 7.99 + vat each

10+
£ 6.99 + 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

Digital Satellite splitters 5 - 2400 MHz

Item	Code	1 +	10 +
2 way splitter (Power Pass 1 Port)	27900R	£ 2.40	£ 2.00
3 way splitter (Power Pass 1 Port)	27901R	£ 2.70	£ 2.25
4 way splitter (Power Pass 1 Port)	27902R	£ 2.80	£ 2.40
6 way splitter (Power Pass 1 Port)	27903R	£ 5.00	£ 4.00
8 way splitter (Power Pass 1 Port)	27904R	£ 5.60	£ 4.65

Grandata Ltd

distributor of electronic components

KÖNIG ELECTRONIC

Konig Remote Controls

KÖNIG ELECTRONIC

Part No.	Code
AKAI	
CT2582E	IR9700
CT2585	IR9700
CT2885	IR9700
CT2885E	IR9700
IR16	IR9700
RC556	IR9700
RC85	IR9700
AMSTRAD	
SRD550	IR9386
SRX510	IR9386
AE6001	IR9352
B & O	
Beolink 100	IR9843
BEKO	
RC51321	IR9398
RC51331	IR9398
RC61331	IR9398
BLAUPUNKT	
8669493	IR9188
1532	IR9503
1570-46	IR9516
627 105 463	IR9188
8888813000	IR9516
1555 46	IR9516
1563-46	IR9516
IB16	IR9504
IC16	IR9504
ID32	IR9503
IL32	IR9503
IM32	IR9503
IM55-16	IR9516
IM63-16	IR9516
IM70-16	IR9516
IP32	IR9503
IQ16	IR9504
IR32	IR9504
TC108	IR9406
TC110 PIP	IR9248
TC143	IR9406
TC144	IR9406
TC190	IR9529
TC192	IR9529
TC194	IR9529
CROWN	
RC51331	IR9398
RC61331	IR9398
2190T	IR9397
DAEWOO	
DMQ1414	IR9397
DMQ14A 1	IR9840
DMQ20A 1	IR9840
DMQ2195	IR9840
DMQ2595	IR9840
DMQ2895	IR9840
FERGUSON	
20H3	IR9594
22B5	IR9584
22H3	IR9594
2415	IR9584
2422	IR9584
2423	IR9584
2433	IR9584
2445	IR9584
2452	IR9584
2453	IR9584
2463	IR9584
2475	IR9584
26H3	IR9594
29132	IR9584
36K2	IR9594
41H3	IR9594
4233	IR9584
4414	IR9584
4415	IR9584
4423	IR9584
4433	IR9584
51A0	IR9584
51A2	IR9584
51A3	IR9584
51A4	IR9584
51A5	IR9584
51G2	IR9594
51G3	IR9594
51H3	IR9594
51H4	IR9594
51J7	IR9594
51K3	IR9594
5980	IR9584
59B2	IR9584
59B3	IR9584
59B4	IR9584
59B5	IR9584
59D2	IR9584
59D3	IR9584
59G2	IR9594
59G3	IR9594
59H4	IR9594
59H5	IR9594
59J7	IR9594
59LS2	IR9639
6223	IR9584
6245	IR9584
66B2	IR9584
66B3	IR9584
66H3	IR9594
66H4	IR9594
66H5	IR9594

Part No.	Code
FERGUSON ..continued	
68LS2	IR9639
A10R	IR9259
A14R	IR9259
A36R	IR9259
B51F	IR9639
B51NX	IR9639
B59F	IR9639
B59N	IR9639
B59NX	IR9639
B68F	IR9639
B68NX	IR9639
C59NX	IR9639
C68NX	IR9639
D51ND	IR9639
D59F	IR9639
D59N	IR9639
D68N	IR9639
D78N	IR9639
E51N	IR9639
E59R8	IR9639
RCU1734	IR9584
RCU1742	IR9584
RCU1785	IR9594
RCU1789	IR9594
RH880	IR9594
RH885	IR9325
RHT01	IR9259
RHT10	IR9639
RHT30	IR9259
T49F	IR9639
T49N	IR9639
T51F	IR9639
T51N	IR9639
T59F	IR9639
T59N	IR9639
T68N	IR9639
T742	IR9584
T752	IR9584
T758	IR9584
T789	IR9594
T78DPL	IR9639
GOLDSTAR	
105-068	IR9403
105209B	IR9862
105210A	IR9862
105-219J	IR9854
105-224V	IR9854
105-229H	IR9854
105230A	IR9862
105-230C	IR9854
38T1	IR9854
CB20E40X	IR9854
CBT2190E	IR9403
CBT4902	IR9403
CBT4902E	IR9403
CBT9905	IR9403
VS068K	IR9862
GRUNDIG	
CUC503	IR9614
CUC5200	IR9614
CUC5301	IR9529
CUC5302	IR9529
CUC5310	IR9614
RC212	IR9614
RC300	IR9614
TP500VT	IR9500
TP590VT	IR9509
TP600VT	IR9509
TP610	IR9509
TP621	IR9299
TP630	IR9509
TP650	IR9509
TP661	IR9562
TP661 TOP	IR9615
TP663	IR9614
TP710	IR9529
TP711	IR9529
TP712	IR9614
TP715	IR9749
TP720	IR9614
TP760HIFI	IR9614
TP770	IR9749
TP771	IR9749
TP800	IR9749
TP900	IR9749
TRC1	IR9715
TRC2	IR9715
HITACHI	
2970491	IR9479
A518780	IR9142
C1405	IR9476
C1414	IR9476
C2057H	IR9142
C2067	IR9142
C2067H	IR9142
C2114	IR9476
C2146TN	IR9677
C2147TN	IR9677
C2156TN	IR9983
C2166TN	IR9677
C2170TN	IR9983
C2186TN	IR9983
C2257H	IR9142
C2259H	IR9142
C2261	IR9142
C2267H	IR9142
C2268H	IR9142
C2273	IR9142
C2273H	IR9142
C24W1TN	IR9983
C24W511TN	IR9983

Part No.	Code
HITACHI ..continued	
C24WS511T	IR9983
C2514	IR9476
C2546	IR9677
C2546TN	IR9677
C2547TN	IR9677
C2556TN	IR9983
C2566TN	IR9677
C2567TN	IR9983
C2567TN2	IR9983
C2586TN	IR9983
C2605H	IR9142
C2660	IR9142
C2661	IR9142
C2846TN	IR9677
C2847TN	IR9677
C2856TN	IR9983
C2866TN	IR9677
C2886TN	IR9983
C28W410TN	IR9983
C28W510TN	IR9983
CBP1476R	IR9142
CBP1646R	IR9142
CBP2067	IR9142
CBP2216	IR9142
CBP222	IR9142
CBP226	IR9142
CBP260	IR9142
CL2156TAN	IR9983
CL24W1TAN	IR9983
CL2556TAN	IR9983
CL2586TAN	IR9983
CL2856TAN	IR9983
CL2886TAN	IR9983
CL28W1TAN	IR9983
CL28WD2TAN	IR9983
CL32WD2TAN	IR9983
CLE871A	IR9602
CLE871B	IR9602
CLE874A	IR9602
CLE874B	IR9602
CLE876	IR9476
CLE876C	IR9477
CLE876D	IR9477
CLE876G	IR9477
CLE902A	IR9677
CLE902B	IR9677
CLE903A	IR9677
CLE921A	IR9983
CLE921B	IR9983
CLE922A	IR9982
CLE922B	IR9982
CLR876E	IR9477
CP2146TA	IR9677
CP2546	IR9677
CP2546TA	IR9677
CP2556TAN	IR9983
CP2841TA	IR9677
CP2856TA	IR9983
CP2856TAN	IR9983
CP2886TAN	IR9983
CP28WD2TAN	IR9983
CP32WD2TAN	IR9983
CPT1556	IR9576
CPT1557	IR9576
CPT1560	IR9576
CPT1561	IR9576
CPT2155	IR9575
CPT2164	IR9575
CPT2558	IR9575
CPT2564	IR9575
CPT2566	IR9575
CPT2669	IR9575
CPT2785	IR9575
CPT2870	IR9575
CST1430	IR9576
CST1435	IR9576
CST1560	IR9576
CT2116	IR9476
CTRM200M	IR9542
JVC	
AV21TS1EN	IR9698
AV25TS1EN	IR9698
AV25VM1EN	IR9698
AV28VM1EN	IR9698
AV29SX1EN	IR9698
AV29TS1EN	IR9698
AV32WZ2EN	IR9698
RC8072	IR9698
RC8074	IR9698
RMC530	IR9698
RMC682	IR9698
RMC761	IR9698
RMC7611E	IR9698
RMC770	IR9698
RMC771	IR9698
RMC7711E	IR9698
RMC793	IR9698
RMC7931E	IR9698
LOEWE	
FB300	IR9616
FB50	IR9514
FB52	IR9514
FB70	IR9514
FB72	IR9514
FB90	IR9514
FB91	IR9514
MATSUI	
076G047240	IR9490
076L067240	IR9490
2076R	IR9490
2092T	IR9490

Part No.	Code
NOKIA	
3126	IR9157
3126F	IR9157
C1	IR9161
C2	IR9161
C3	IR9161
C4	IR9161
CM 1	IR9569
D1	IR9161
D2	IR9161
E1	IR9161
E2	IR9161
EM2	IR9700
ES5	IR9701
FS10	IR9573
FS11	IR9508
FS4/1	IR9573
FS4/2	IR9573
FS5	IR9506
FS5/1	IR9573
FS9	IR9506
FS9	IR9573
IRC1	IR9157
IRC2	IR9157
IRM1	IR9525
IRS1	IR9535
IRS2	IR9535
IRS3	IR9535
RCN610	IR9752
RCN620	IR9751
RCN624	IR9757
SM1	IR9491
SM2	IR9491
PANASONIC	
02280227	IR9835
91005926	IR9835
EUR50100	IR9826
EUR51920	IR9835
EUR51921	IR9835
IR3592	IR9826
TC1485DR	IR9826
TC14S1R	IR9834
TC150E	IR9562
TC1656PFR	IR9826
TC1785DRS	IR9826
TC1785IR	IR9826
TC1785UR	IR9826
TC2185DRS	IR9826
TC2185IR	IR9826
TC21R1C	IR9826
TC21R1U	IR9826
TC21S1R	IR9834
TCC23PFR	IR9826
TNQ1410	IR9826
TNQ8E0421	IR9826
TNQ8E0422	IR9826
TNQ8E0428	IR9826
TNQ8E0430	IR9826
TNQ8E0432	IR9826
TNQ8E0435	IR9836
TNQ8E0436	IR9836
TNQ8E0441	IR9826
TNQ8E0461	IR9834
TX14S1T	IR9834
TX21S1RC	IR9834
TX21S1T	IR9834
TX21S1TC	IR9834
TX21T1C	IR9826
TX25A2C	IR9836
TX25A2CI	IR9836
TX25W2	IR9836
TX25W2C	IR9836
TX25W2CI	IR9836
TX28A1D	IR9826
TX28A2C	IR9836
TX28A2CI	IR9836
TX28W2	IR9836
TX28W2C	IR9836
TX28XDP1C	IR9835
TX29AD1D	IR9835
TX29W2CI	IR9836
TX33A2C	IR9836
TX33A2CI	IR9836
PHILIPS	
RC5002	IR9510
RC5140	IR9510
RC5154	IR9510
RC5240	IR9510
RC5250	IR9510
RC5260	IR9510
RC5300	IR9510
RC5350	IR9510
RC5410	IR9553
RC5420	IR9553
RC5540	IR9510
RC5701	IR9434
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RC5801	IR9556
RC5901	IR9556
RC5903	IR9556
RC6008	IR9434
RC6404	IR9465
RC6416	IR9465
RC6512	IR9464
RC6804	IR9434
RC7118	IR9464
RC7141	IR9465
RC7500	IR9484
RC7507	IR9710
RC7512	IR9864
RC7535	IR9864
RC8201	IR9434
RC8205	IR9710
RC9010	IR9434

Part No.	Code
PHILIPS ..continued	
RC9020	IR9434
RC9030	IR9434
RC9050	IR9556
RC9057	IR9710
RC9060	IR9556
RC9070	IR9434
RC9133	IR9710
SAMSUNG	
CX5312W	IR9432
CX5325W	IR9432
CX532WT	IR9432
CX534WT	IR9432
RM104	IR9432
RM109	IR9546
SANYO	
4AA4U1TO092	IR9459
JXBA	IR9457
JXCL	IR9530
JXCR	IR9530
JXFF	IR9457
JXGA	IR9139
JXGE	IR9139
JXGT	IR9460
JXGW	IR9460
JXGY	IR9460
JXLB	IR9460
JXLG	IR9460
RC238	IR9974
RC254	IR9974
RC258	IR9530
RC305	IR9974
RC307	IR9457
RC308	IR9457
RC317	IR9457
RC318	IR9457
RC321	IR9457
RC612	IR9457
RC625	IR9457
RC628	IR9457
RC642	IR9530
RC645	IR9974
RC685	IR9457
RC700	IR9139
RC702	IR9139
RC710	IR9139
RC711	IR9460
RC901	IR9139
S02	IR9460
S03	IR9460
SHARP	
37AM12S	IR9788
51AM12S	IR9788
51AT15S	IR9788
54AM12S	IR9788
54AT15S	IR9788
54CS05SN	IR9711
5V2044	IR9487
5V2145	IR9487
70CS03S	IR9711
72CS03S	IR9711
72CS05SN	IR9711
C1421	IR9487
C2021	IR9487
CV2121	IR9487
CV3707	IR9487
CV3709	IR9487
CV3710	IR9487
CV3720	IR9487
DV1416SN	IR9487
DV1506SN	IR9487
DV1706SN	IR9487
DV21081S	IR9711
DV2130EX	IR9487
DV25071S	IR9711
DV25073S	IR9711
DV25081S	IR9711
DV25083S	IR9711
DV28037S	IR9711
DV28071S	IR9711
DV28081S	IR9711
DV28083S	IR9711
DV3750S	IR9788
DV3760S	IR9788
DV5160S	IR9788
DV5403S	IR9711
DV5432S	IR9711
DV5465S	IR9711
DV5470S	IR9711
DV5935H	IR9711
DV6301S	IR9711
DV6303S	IR9711
DV6311S	IR9711
DV6313S	IR9711
DV6332S	IR9711
DV6336S	IR9711
DV7001S	IR9711
DV7002S	IR9711
DV7003S	IR9711
DV7011S	IR9711
DV7024S	IR9711
DV7032S	IR9711
DV7036S	IR9711
RRMCG0351CESA	IR9487
RRMCG0351CESB	IR9487
RRMCG0351CESD	IR9487
RRMCG0370CESA	IR9487
RRMCG0483PESA	IR9487
RRMCG0489CESB	IR9487
RRMCG0568PESA	IR9487
RRMCG0617PESA	IR9487
RRMCG0618PESA	IR9487

Part No.	Code
SHARP ..continued	
RRMCG0662PESA	IR9487
RRMCG0739BM5A	IR9711
RRMCG0777PESA	IR9487
RRMCG0833PESA	IR9487
RRMCG0898CESA	IR9487
RRMCG1014BM5A	IR9711
RRMCG1023BM5A	IR9711
RRMCG1031BM5A	IR9788
RRMCG1036BM5A	IR9711
RRMCG1046BM5A	IR9788
RRMCG1048BM5A	IR9788
RRMCG1050BM5A	IR9788
RRMCG2799CESA	IR9487
SV2044G	IR9487
SV2044S	IR9487
SV2145G	IR9487
SV2145S	IR9487
SV2577S	IR9487
SV2777S1	IR9487
SV2877S	IR9487
SV2877S1	IR9487
SONY	
RM604	IR9974
RM607	IR9974
RM609	IR9974
RM615	IR9511
RM620	IR9511
RM625	IR9511
RM630	IR9511
RM631	IR9511
RM632	IR9511
RM633	IR9511
RM634	IR9511
RM635	IR9511
RM640	IR9321
RM641	IR9321
RM641A	IR9321
RM650	IR9336
RM651	IR9336
RM652	IR9336
RM654	IR9336
RM656	IR9448
RM657	IR9336
RM658	IR9321
RM661A	IR9321
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RM672	IR9123
RM673	IR9123
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RM682	IR9442
RM683	IR9442
RM684	IR9442
RM685	IR9442
RM686	IR9442
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2145DB	IR9852
2145DD	IR9852
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2152DB	IR9953
2152DD	IR9953
2155DB	IR9953
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2866DD	IR9953
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2877DB	IR9953
2879DB	IR9953
3327DB	IR9953
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CT9455	IR9962
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Service Casebook

Michael Maurice

I've been seeing a lot of Bush/Alba TV sets recently. Most of them are made in the Vestel factory at Manisa, western Turkey, one of the largest TV plants in the world. Hitachi, Mitsubishi, Sanyo, JVC and Toshiba are amongst the well-known TV manufacturers that have used Vestel chassis in their budget sets. Amongst other contracts Vestel supplies sets for retailers Carrefour of France and Quelle in Germany, to sell under their own brand names. The company is making use of Turkey's low-cost labour and its customs union with the EU to concentrate on high volumes. Production has risen steadily from 350,000 sets in 1994 to an estimated six million last year. The manufacturing process is flexible – Vestel claims to be able to carry out any customised order in just a week! Other Vestel products include PCs.

Vestel has R&D centres in Turkey, Taiwan, Bristol in the UK and California. It's UK centre has developed software to enable TV, satellite reception, internet use and DVD playing to be integrated. A low-cost flat-screen TV set is being developed with Thomson. There's no doubt about it, we shall see a lot more from Vestel.

So, on to Bush. The company's products are aimed at the budget end of the market, which seems to be what most customers want nowadays. From our point of view it's an advantage that these sets use fairly conventional and simple circuitry. Bush has an excellent technical help department that you contact initially by fax. You will usually get a phone call within a day or two with advice on how to resolve the problem.

Bush 2871NTX (11AK19 chassis)

When it was turned on this set would go to standby. When you tried to bring it out of standby the set would try to start for a couple of seconds then revert to standby. The customer also complained that the width had been decreasing intermittently, but he had kept the set going "to keep the kids happy".

I attended to several dry-joints in the power supply, and replaced R629 (2·7Ω) in the EW modulator drive circuit, but the set still didn't work. The cause was not far away. L601 (part no. 30002026) in the line scan circuit was burnt out. Once I had replaced it there was an excellent picture.

Bush WS7673SIL

This set was only eighteen months old when it died. A quick check revealed dry-joints at diode D002, which is mounted on a sub-module that's soldered to the main PCB – it was the connection to the main PCB that was dry-jointed. I also found that the chopper FET was short-circuit, but all the fuses and fusible resistors were intact. I attended to the dry-joint, then replaced the chopper FET and the control IC. But the set remained lifeless. To add to my problems, the set was up four flights of stairs and there was no lift. Now as I've said before I'm not a weightlifter, and moving the set to the workshop did not appeal to me.

Fortunately Bush sets go straight into standby when powered. This is a great help. I removed the electronics, making a note of where all the wiring goes, and took the main board back to the workshop. It didn't take long to discover that L801 was open-circuit. When a replacement was fitted the power supply started up: the HT rose to approximately 150V, then fell to about 30V as it should when the power supply goes to standby. I returned to the customer and refitted the board, after which the set worked well.

In some circumstances it can be a viable option to take a chassis out of a set and work on it in the workshop. When you consider the weight of some modern sets, this may be the only way to go about repairing them.

Bush 2871NTX

This set wouldn't tune in correctly. In fact it would tune in only ITV (channel 23), which was at the far end of the set's tuning band! The 33V supply to the tuner was low, the cause eventually being traced to C504. This surface-mounted capacitor was leaky.

Bush 2866NTX/SM2

The customer said there was sound but no picture, just a bright white screen. Easy I thought, loss of the 200V supply to the RGB output stages. But I was wrong. The bright white screen wasn't so bright, and there were no flyback lines. It seemed likely that the TDA8363AN3 jungle chip was to blame. So, after a short discussion with the customer, I ordered one from CPC. After fitting it the set worked normally.

Bush 2876NTX

This set also produced a bright white screen, and this time the 200V supply was low. The culprit was the fusible resistor in the feed to the RGB output IC.

JVC HRD540, HRD560, HRD910, HRJ200 etc

A common fault with these machines is that the grease used to lubricate the idler dries up. As a result the idler cannot move between the spools and the tape gets chewed. There's no need for a replacement idler. Simply remove it, strip it down, clean all the surfaces, relubricate and reassemble it. All will then be OK. ■

Service notes on the

Sharp DA100 chassis

This chassis is used in several widescreen models. Philip Laws summarises his experiences after buying a number of sets for repair

While things were quiet a few months ago I was looking for ways to boost business. I found that most dealers in my area don't handle Sharp TV sets, so I bought some service manuals and let it be known that I now serviced them. On the whole this turned out to be quite successful and profitable. So when I was given the opportunity to purchase a quantity of faulty widescreen sets at a knockdown price I decided to go ahead, and then had to really get to know the chassis concerned. The following article is based on my experiences and some useful course notes I received a few years ago. These brief servicing notes are intended to be used in conjunction with the service manual, which is a must when working on the sets. I found the main circuit diagram too small to work with, so I scanned it and printed it out in poster format. This worked quite well.

The chassis is the DA100 (50Hz), which is used in Models 56FW53H, 66FW54H and 76FW54H. The 32in. version differs from the smaller sets in having two extra PCBs, which are mounted at each side of the main chassis. The one on the left contains the EHT/focus assembly and some extra scan-correction circuitry, the one on the right being the Dolby Pro-Logic board. Most faults occur on the main PCB however, so servicing is much the same whatever the model.

The chassis can be withdrawn and mounted upright. To do this, disconnect the front AV PCB, unclip the customer control panel after removing the screw, and undo the various harness clips.

Servicing these sets is much like any others, but a knowledge of the design helps a lot – some unusual circuitry is used.

Service mode

To enter the service mode, switch the set on while pressing volume – and channel + on the user control panel. Adjustments are selected and altered with the remote-control unit. Use channel +/– for selection and volume +/– for alteration. Press the standby button to store.

The power supply

Figs. 1 and 2 show the power supply circuitry, on the non-isolated (primary) and isolated (secondary) sides respectively. There are actually two power supplies, the main chopper one that provides the HT and the usual LT voltages, and a second one which provides 5V and a 100Hz timing pulse for the primary-side microcontroller chip IC702. This 5V supply is also used for the on-board control keys and the infra-red receiver. It's energised whenever the mains supply is connected to the set. IC702 controls the chopper power supply for on/standby switching. The main items here are D730 and Q702, which shorts the gate of the chopper transistor Q701 in standby.

When the mains supply is first connected however IC702 allows the chopper power supply to start so that the main microcontroller chip IC1001 can complete its boot-up sequence. Line drive is muted during this process. The boot-up sequence takes about three seconds, which is long enough for all the secondary supplies to be established. So, even if you have a protection or I^2C fault, you can find out whether all is well in the power supply.

The most common power supply fault is excessive HT. This can destroy the line output transistor Q601, or sometimes the HT rectifier D720 and its reservoir capacitor C720. The culprit is the optocoupler IC705. Occasionally the chopper FET Q701 will have failed, in which case Q702, Q703, D712 and R716 should also be replaced. Care is required when replacing the surface-mounted optocoupler IC705, as it's securely glued to the PCB. When fitting the replacement the soldering-bit temperature must not exceed 250°C. Note that there are three of these optocouplers in all. The other two, IC703 and IC704, are used to enable the primary-side microcontroller chip IC702 and the main microcontroller chip IC1001 on the secondary side to communicate with each other.

When dealing with a suspect power supply I've found it best to disconnect the HT supply to the line output transistor and fit a 60W bulb as a dummy load across C720.

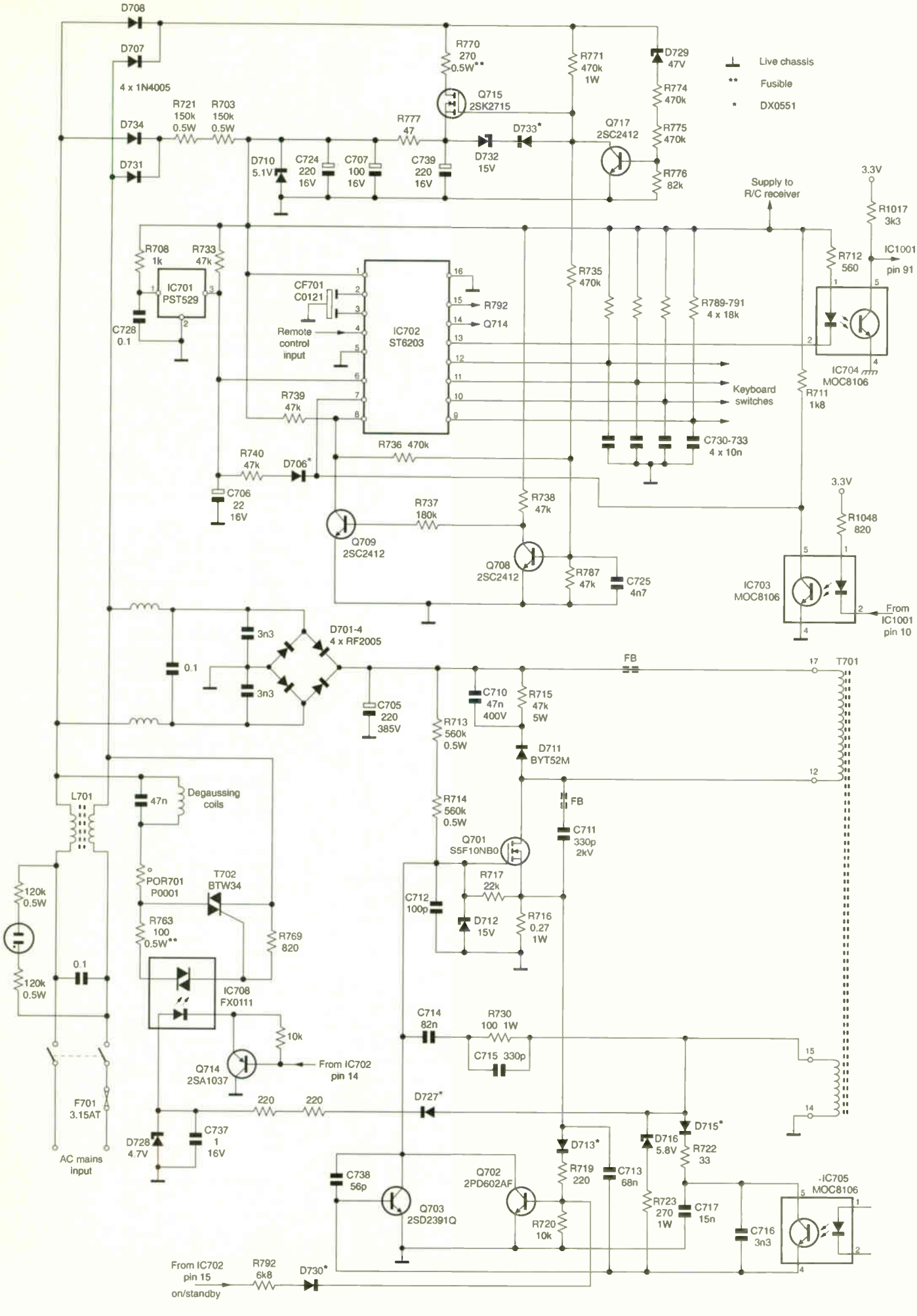
The line timebase

The line timebase features a transformerless driver stage which uses two transistors, Q603 (2SC2412) and Q602A (KSC2500). These require positive and negative supplies which are provided by the main power supply and supplemented by the outputs from windings on the LOPT. There is also a line-drive mute transistor, Q607 (2SC2412), whose base is controlled by pin 57 (H out) of the main microcontroller chip IC1001. It's active during the boot-up sequence and certain fault conditions, including I^2C bus faults.

Failure of the line output transistor Q601 (BUH515) can, as previously mentioned, be caused by excessive HT. But there are other causes: check for dry-joints at C601 in the EW modulator circuit (a common problem) and C613 in the line scan circuit.

Q506 (2SD2391) is the EW modulator

Fig. 1: Power supply circuitry on the primary (live) side. In addition to the main microcontroller chip IC1001 there's a microcontroller, IC702, on the primary side. These two communicate with one another via the optocouplers IC703 and IC704. Optocoupler IC705 is used for regulation feedback The optocouplers are all type MOC8106 or FX0106. Note the switched degaussing system, controlled by IC702. In the standby mode IC702 switches Q702 on, earthing the gate of the chopper transistor Q701.


D708
D707
4 x 1N4005
D734
D731
R721 150k 0.5W
R703 150k 0.5W
D710 5.1V
C724 220 16V
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R777 47
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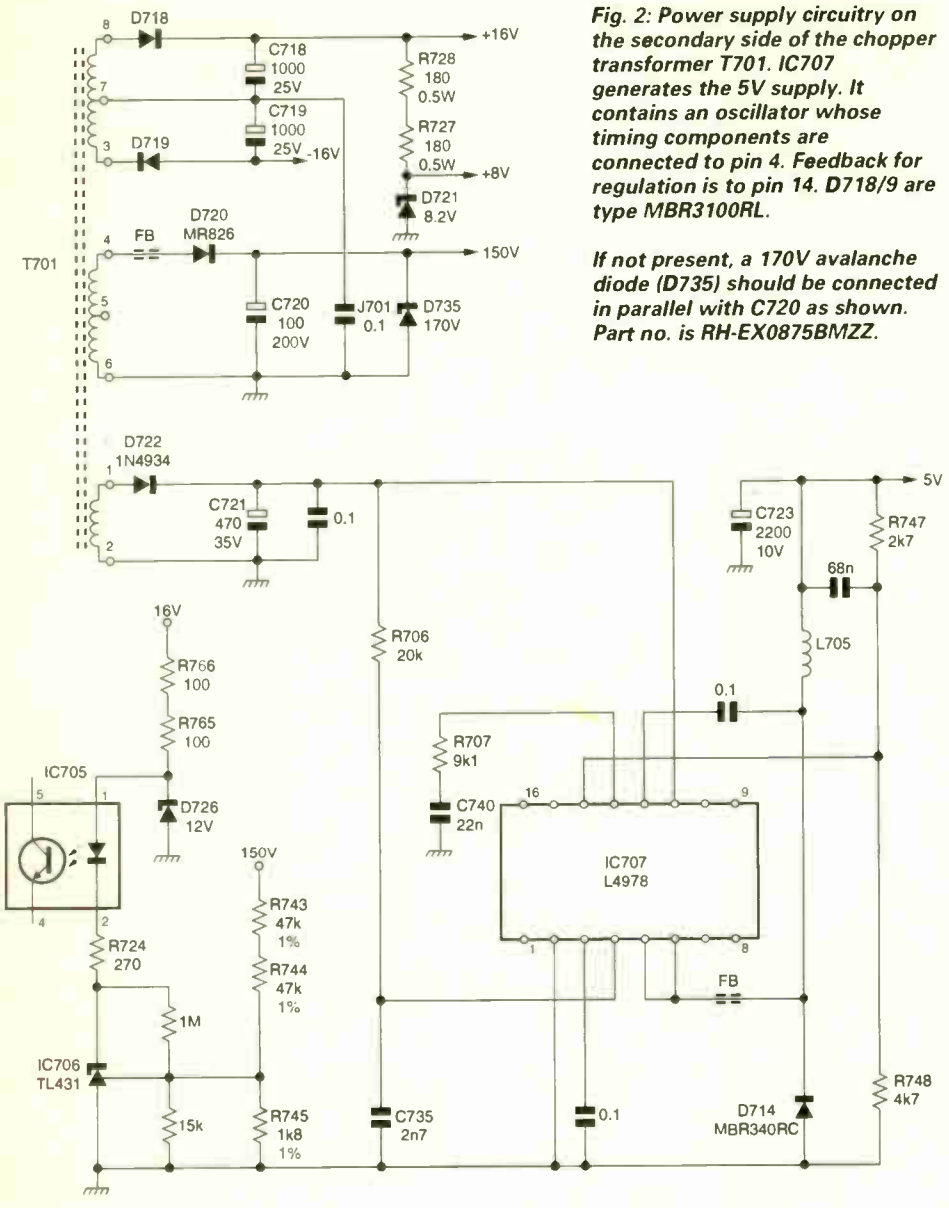

Fig. 2: Power supply circuitry on the secondary side of the chopper transformer T701. IC707 generates the 5V supply. It contains an oscillator whose timing components are connected to pin 4. Feedback for regulation is to pin 14. D718/9 are type MBR3100RL.

If not present, a 170V avalanche diode (D735) should be connected in parallel with C720 as shown. Part no. is RH-EX0875BMZZ.

driver transistor. It can also fail as a result of C613 being dry-jointed. Q506's drive comes from IC503 (BA10393). The associated bias resistor R519 (100kΩ, 0·5W) can go high-resistance or open-circuit. The result is poor EW correction and excessive width. On one occasion there was no EW drive to IC503 from pin 32 of the VDP3120C2 chip IC801. This chip was faulty, with a measurement of only a few ohms between pin 32 and chassis.

The field output stage

The arrangement used here is anything but conventional. Basically, one end of the scan coils is driven by a ramp waveform that rises from –20V to +10V and can be measured at pin 4 of IC501 (TX1786). The other end is connected to a flyback generator that develops a +25V pulse at the collector of Q502 (KSA926). This also provides the field protection (V Prot) pulse input at pin 11 of IC801 (VDP3120C2).

Most field faults seem to be caused by the flyback generator circuit, the FET Q503 (IRFR01C) in particular. But it's worth checking for a ramp waveform at pin 4 of IC501.

Servicing summary

As with sets from so many manufacturers nowadays, the rest of the circuitry in this chassis relies heavily on I²C bus control and large-scale integration, differing mostly in component choice. Many of the surface-mounted transistors used in the chassis were new to me, but most of the components I've needed are listed in SEME's excellent SALI CD.

There are some protection and operating sequences to note. These are as follows.

(1) With a working set the time taken from switch-on to an EHT rustle being heard is approximately three seconds. The sequence of operations is as follows. The supply for the primary side microcontroller chip, reset etc. is established. The main power supply is then switched on, supplying LT to the main microcontroller chip. The latter reads the EEPROM and communicates with other ICs via the I²C bus, while inhibiting line drive via its H out signal (pin 57). It communicates with the primary side microcontroller chip, confirming that all is OK and asking whether the set was previously in standby or on. The H out signal is finally withdrawn, and the line timebase starts up.

(2) Protection. Pin 95 of the main microcontroller chip IC1001 switches the set to standby when it goes low. Q606 monitors the beam current. Q302/3/4 monitor the audio output stages, and can be sensitive enough to trigger the protection mode if the main speakers are unplugged.

(3) Pin 11 of IC801. V prot, blanks the RGB drives when the field flyback pulse is missing or distorted.

(4) Pin 12 of IC801 appears to monitor the line flyback pulses and hence the EHT via a zener diode. I've had no problems here.

(5) The front LEDs give some error indications. Four flashes with a gap were noted when IC801's clock and data lines were disconnected (this is the VDP3120C2 IC).

I²C related faults

Set appears to be stuck in standby but the chopper power supply is running with the HT output correct. No line drive because the H out 'on' condition is permanent. No lights flashing. Cause of the trouble was the X24645 EEPROM chip IC1003.

As above but the stereo light flashes three times then a gap. Cause of the fault was the MSP3410P sound processor chip IC305.

As above but the stereo light flashes four times then a gap. IC801 (VDP3120C2) faulty.

Set starts up then reverts to standby. Sometimes a picture can be seen, other times the line stage is noisy (similar to a faulty line output transformer) and there's no field drive. IC1003 (X24645) faulty.

In conclusion

This concludes the notes I made while dealing with this batch of faulty sets. I hope the information will be of help to other engineers. It's rare that we get a chance nowadays to learn about a chassis like we used to, but when you've bought a number of them you have to!

Editorial note: A detailed article on the circuitry used in this chassis and fault-finding procedures is being prepared by the Sharp Technical Team and will appear shortly. Note that there are several wire links that go open-circuit in the event of excessive current flow in the circuit concerned. ■

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The Toshiba C5SS chassis

With reference to the servicing article on this chassis last month, a little clarification on the functions carried out by the hybrid IC Z801 on the secondary side of the power supply may be helpful to readers.

Pins 1 and 2 are used for excess current sensing, i.e. the HT voltage across R470 is monitored. Pin 1 is also used to check for excessive HT voltage and for voltage regulation. Pin 5 provides the supply for the reference-voltage zener diode in the error-voltage detector circuit. The output from this circuit, at pin 3, drives the optocoupler Q826.

Pin 16 of Z801 is the protection output. In the event of excessive HT current or voltage, or excess current demand from the LOPT-derived 27V supply (monitored at pin 14), the output at pin 16 goes low. QB30 is therefore switched off, and the voltage at pin 9 (on/standby switching) goes low. In turn the voltage at pin 12 goes low, switching off Q430 and the supply (H Vcc) to the line generator in IC501. This is the standby condition. The on/standby commands from the microcontroller chip QA01 are also fed to the base of QB30, with the same results.

In standby the operation of the regulation feedback loop is altered. This is done within Z801. In this state the input to Q840 is at approximately 9V.

Cyril Snapshaw,
London W4.

Monitors etc

The question of spares for Belinea monitors has come up in these pages recently. As a monitor and printer engineer, my experience with these monitors has been that they are seldom worth repair. We've had to throw many of them away. The circuitry in the small ones can burn out. The larger, 17in. ones are better, but the main board tends to break because of a plastic support in the centre beneath it. The monitor is then scrap.

Monitors seem to be classed as throwaway items nowadays. Printers are a different matter. Companies like HP, Epson, OKI etc. have good spares provision, and service information is available at their websites. Some companies, like Brother and Manessman, also have good customer training courses.

It seems that modern components such as electrolytic capacitors (see photo on the Letters page in the February issue for example) are not as good as they used to be. But genuine Japanese ones and those from firms such as Elna and Marcon are far more reliable.

Mark Garton,
Broomsgrove, Worcs.

Useful projects

A number of projects of one sort or another have appeared in these pages over the years. I've built several of them and would like to recommend the following to other readers.

The Simple ESR Meter for Electrolytics by Ray Porter in the April 1993 issue has been a huge time saver. It has often identified high-ESR capacitors in chopper power supplies, saving a lot of time and silicon. It doesn't have a meter readout but gives you a reading by viewing a calibrated scale as a potentiometer is adjusted.

Another excellent project was the Simple Transformer Tester by Ian Rees in the September 1993 issue. This piece of test gear is used in conjunction with your oscilloscope. Here's one example of the help it has provided. The Ipsalo transformer (expensive) in a set fitted with the Salora L chassis was suspect. The tester ruled it out as being faulty, and I subsequently found that the line output transistor was leaky.

The other project I would recommend is the Switch-mode Power Supply for the Nikkai Baby 10 by Michael Dranfield in the May 1996 issue. This has proved to be very reliable. I recently visited a caravan park where I had carried out the mod back in 1996 and found that the set was still going strong. With the original linear regulator you would be lucky to get a year's service before it would fail again.

Symon McCabe, B.Eng. (Hons), MIEE,
Redruth, Cornwall.

RSL TV stations

The lengthy list of RSL local TV stations published in the February issue is a bit misleading, suggesting as it does that this is a thriving and growing sector. In fact local television is positively moribund. There are only about six stations actually on air, and it's extremely unlikely that the number will increase. Even those like Southampton, to which Roger Bunney referred, look unlikely to survive the analogue switch-off. This is apart from the economic problems, of which there are many. And the political will to make local television work seems to have disappeared.

Jane Scarfe, Abacus Television,
East Carleton, Norwich.

As we were

In about 1950 my farmer uncle lived north of Ely, virtually out of range for television from London. He had another problem: no mains electricity, only a 110V supply that was obtained from sixty (yes, sixty!) large accumulators, possibly ex-Navy, housed in a large shed. As no 110V television sets were available, he obtained a rotary converter to provide a 240V AC supply.

It was rather noisy however, and almost drowned the TV sound! This problem was solved by housing the

converter upstairs in the airing cupboard. The picture itself varied and was grainy, as you might expect. He next decided that the two large trees near his house could possibly be used to improve reception. With great difficulty the aerial was resited at about 50/60 feet up the larger of the two trees. The result was vastly improved reception!

Philip Bearman,
New Barnet, Herts.

Audio faults

I thought I was unique in having found a dead-short reservoir capacitor in an amplifier, but Pete Roberts reports a similar experience with a Nytec C252 (April issue, page 373). I recently had in for repair the CTA252XD/CXA252, a stereo amplifier pair that are coupled together via a reverse-connected 5-pin DIN lead to form a bi-amped system (pin 1 to pin 3 atc., remembering the 1 4 2 5 3 pin sequence). The CTA252XD is the 'mother' unit, which also contains a stereo FM radio. Its LH output feeds low frequencies to one speaker, the high frequencies coming from the RH channel. The CXA252, which has its own power supply, feeds the other speaker in a similar manner. When you listen via the headphone sockets you get a mono signal, with the low and high frequencies split L/R. The two units are interdependent to the extent that if either fails there will be no sound part from a 'thump' at switch on.

The trouble with the CXA252 amplifier was exactly as Pete described. A dead-short 3,300µF, 63V reservoir capacitor had blown the 150mA fuse. The owner had taken this to a nearby shop and had asked for one "just like it". He had been given a 15A fuse, which he subsequently fitted. It didn't blow when he switched the unit on, and fortunately he didn't leave it on long enough for any further damage to occur. The bridge rectifier in this unit consists of four 1N5408 diodes, which I replaced for good measure. There's provision on the PCB to fit either two 3,300µF or three 2,200µF electrolytics in parallel.

This choice is not available with the CTA252XD, which required three new 6·5A indicator bulbs that failed two weeks later! This unit had three 2,200µF 63V capacitors fitted, and the bridge rectifier diodes were type 1N5401. I upgraded them to type 1N5408. The cause of the final fault was that the 150mA fuse had simply died of old age. Once I'd replaced this, and the other two fuses as a precaution, the system was back in working order.

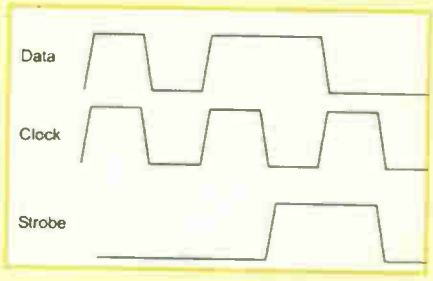
Incidentally the value of R615, which burns to an unreadable crisp, in the Philips AZ1101 (page 373 again) is 82Ω.

Peter Graves,
London E5.

PC-camcorder connection problems

The waveforms shown in Fig. 6 on page 269 of the March issue, unfortunately had a slight error. We show the correct waveforms in the drawing alongside.

Steve Beeching, I. Eng., MIEE,
Newark, Notts.



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Dual See Wizard Distributors.

Dynatron Pre-1981 sets, see Philips Service; post-1981 sets, spares from SEME.

Elftone Electronics Ltd., 4 Beresford Avenue, Wembley, Middx HA0 1YZ.
Tel 020 8902 6222
Fax 020 8903 5011.
e.mail: enquiry@elftone.com

Etron Brand name used by Nikkai Imports Ltd.

Eurosat Distribution Ltd, 5, Oxgate Centre, Oxgate Lane, London NW2 7JA.
Tel 020 8452 6699

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Fax 020 8452 6777.
www.eurosat.co.uk

Expert. Sets use Tatung, GEC, or Luxor chassis.

Falmouth Hi Fi, 14 Market Strand, Falmouth, Cornwall TR11 3DE. Spares available for **BPL, Crown, Dansai, Datsurai, Kuro and Zenor**.
Tel 01326 313 412
e.mail falmouthhifi@yahoo.co.uk

Ferguson Spares available from Thomson Multimedia Sales UK Ltd., 30 Tower View, Kings Hill, West Malling, Kent ME19 4NQ.
Tel 01732 520 958
Fax 01732 520 971.
e.mail: spares@thomson.net
See also CPC, HRS, Chas Hyde, SEME and Wizard.

Fidelity Spares available from SEME, HRS, CPC, Wizard and Willow Vale.

Finlux Spares available from GenServe Ltd.

Fisher Spares available from Sanyo UK Sales Ltd., Sanyo House, Otterspool Way, Watford, Herts. WD2 8JX.
Tel 01923 222 244
Fax 01923 477 355.
See also CPC and Chas Hyde.

Fujitsu General, Unit 150 Centennial Park, Centennial Avenue, Elstree, Herts WD6 3SG.
Tel 020 8731 3450
Fax 020 8731 3451
e.mail:
ann.north@fujitsugeneral.co.uk

GEC Spares available from CPC, HRS, and SEME.

General See Fujitsu General.

GenServe Ltd.,
11 Caen View, Rushy Platt, Swindon SN5 8WQ.
Service 01793 886 333
Spares 01793 886 322
Fax 01793 886 323.
e.mail:genserve@dial.pipex.com

GoldStar See LG Electronics UK Ltd. Also A.R.D, CPC, Chas. Hyde and SEME.

Goodmans See Alba Radio Ltd. or Comet Group plc. depending on model. Also CPC.

Grundig Spares available from CPC and Willow Vale. Spares for VCR4000 and SVR4004 ranges available only from Willow Vale.

Harwood Spares available from Key Electronics.

Hinari Spares available from CPC, Chas Hyde and SEME.

Hira The Hira Co., Ltd., Elizabeth House, 1 Elizabeth Street, Manchester M8 8JJ.
Tel 0161 8347 432
Fax 0161 8324 566.

Hitachi Sales (UK) Ltd., Dukes Meadow, Millboard Road, Bourne End, Bucks SL8 5XF.
Tel 01628 643 435
Fax 01628 643 000.
www.hitachi.service
See also Chas Hyde and Willow Vale.

HMV Sets use Ferguson or Fidelity chassis.

HRS Electronics Ltd., Medco House, Connect Business Park, Bordesley Green Road, Birmingham, B9 4UA.
Tel 0121 766 6668
Public orderline
Tel 0121 766 5124
Fax 0121 766 7274.
e.mail:
mailorder@connect-distribution.co.uk
Wide range of video, audio and television spares for Fidelity, GEC, Hitachi, Nikkai, Pace, Philips, Pye, Saisho, Sanyo, Sharp, Tatung, Toshiba and many more. Also all leading domestic appliance brand spares.

Charles Hyde & Son Ltd.,
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Tel 01759 303068
Fax 01759 303620.
Web site: charleshyde.co.uk
Sole authorised UK spares distributor for Akai, Hitachi, Marantz, Nokia, Sanyo, Teac, Tascam and Yamaha.
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ITT Spares available from GenServe Ltd. See also CPC.

JVC (UK) Ltd., JVC House, JVC Business Park, Priestley Way, Staples Corner, London NW2 7BA.
Tel 020 8208 7603
Fax 020 8452 5415.
Account holders only.
See also CPC, Chas Hyde and Willow Vale.

Kenwood Electronics UK Ltd., Kenwood House, Dwight Road, Watford, Herts WD1 8EB.
Tel 01923 816 444
Fax 01923 819 131.
See also KSA.

Key Electronics Unit 5, Brow Mills Industrial Estate, Brighouse Road, Hipperholme, Halifax HX3 8EF.
Tel 01422 203676
Fax 01422 263224.
Spares for Crown Corporation, Harwood, Kyosho and Ssangyong products.

Konica Plane Tree Crescent, Feltham, Middx TW13 7HD.
Tel 020 8751 6121
Fax 020 8755 0681.

Körting See SEME.

KSA Wholesale Components, 582 Green Lane, Small Heath, Birmingham B9 5QG.
Tel 0121 772 2834
Fax 0121 772 7487.
Authorised spares distributor for Aiwa, Kenwood, Philips, Philex, Pioneer, and Samsung.

Kyoshu Spares available from Key Electronics.

LG Electronics UK Ltd., LG House, 264 Bath Road, Slough, Berks SL1 4DT.
Tel 0870 607 5544
Fax 01753 517 445.
See also A.R.D. Electronics, CPC and Willow Vale.

Lloytron Laltex Group, Laltex House, Leigh Commerce Park, Greenfold Way, Leigh, Lancashire WN7 3XH.
Tel 01942 687 000
Fax 01942 687 070.

Logik Brand name used by Dixons. Spares available from Partmaster, CPC, HRS.

Loewe Spares available from Wizard.

Luxor Spares available from GenServe Ltd., CPC, Chas Hyde and Willow Vale.

Manhattan
Eurosat Distribution Ltd., Oxgate Lane, London NW2 7JA.
Tel 020 8452 6699
Fax 020 8452 6777.

Marantz Hi Fi UK Ltd., Kingsbridge House, Padbury Oaks, 575/583 Bath Road, Longford, Middx UB7 0EH.
Tel 01753 680 868
Fax 01753 680 428.
See also Chas Hyde & Son Ltd.

Matsui Brand name used by Currys and Dixons. Spares available from Partmaster. Also CPC, Chas Hyde, SEME and Wizard.

Metz No UK source of spares. Manufacturers address: Metz Werke Gmbh 2 Co., D8510, Furth, Germany.

Mitsubishi Spares available SEME, CPC, Willow Vale and Wizard.

Morphy Richards
Spares available from Roberts Radio Technical Services.

NCS See GenServe Ltd.

NEC Spares available from SEME and CPC.

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NEI See Stewart (Iain) and SEME.

Nikkai Spares available from CPC, HRS, Stewart (Iain) and Wizard.

Nokia Spares available from GenServe Ltd. and Chas Hyde.

NordMende Spares available from Thomson Multimedia. See also SEME.

Orion See CPC and Chas Hyde.

Osaki Brand name used by Rumbelows. Spares for models VCR31/32/33, also mechanical parts for VCR35 available from Diamond Television. See also SEME.

Pace Micro Technology plc, Victoria Road, Saltaire, Shipley, West Yorkshire, BD18 3LF.
Tel 01274 532 000
Fax 01274 537 128.
Spares also available from A.R.D. Electronics, Eurosat, HRS, CPC and Willow Vale.

Panasonic (UK) Ltd., Panasonic House, Willoughby Road, Bracknell, Berks
RG12 8FP.
Tel 01344 860 133
Fax 01344 861 598.
See also SEME Ltd.
e.mail: spares@panasonic.co.uk

Partmaster Direct, PO Box 1924, Sheffield S2 5XX
Tel 0870 909 0444
Fax 0870 909 0333.
www.partmasdter.co.uk
e.mail: sales@partmaster.co.uk
Spares for Dixons/Currys ranges – Matsui, Link, Logik, Prinz, Saisho and Sanyo.
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Philips Service Centre, 420/430 London Road, Croydon CR9 4QX.
Tel 020 8686 5414
Fax 020 8681 0796.
e.mail:
cesparesuk.orders@philips.com
Account holders only supplied.
See also CPC, HRS, Chas Hyde, KSA, Willow Vale and Wizard.

Pioneer (GB) Ltd., Pioneer House, Hollybush Hill, Stoke Poges, Slough SL2 4QP.
Tel 01753 789 876
Fax 01753 789 534.
Account Holders only.
See also CPC, KSA and SEME.

Prinz Brand name used by Dixons. See Partmaster.

Proline Brand name used by Comet Group plc.

Pye See Philips Service. Also SEME.

Quart see Denon, Hayden Lab.

Questar See CPC.

Roberts Radio Technical Services
97-99 Warton Road, Isleworth, Middx TW7 6EG.
Tel 0208 560 6644
Fax 020 82329739
Helpline 020 8758 0338.
e.mail: spares@rmtv.co.uk
Spares for Roberts Radio and Morphy Richards models.

Roadstar See Alba, CPC and SEME.

Saba Spares available from CPC.

Saisho Brand name used by Dixons. See Partmaster, CPC, HRS, Chas Hyde, SEME, Willow Vale and Wizard.

Salora Spares available from GenServe Ltd. and CPC.

Samsung Euro Service Centre, Unit A, Stafford Park 12, Telford Shropshire TF3 3BJ.
Tel 01952 207 171
Fax 01952 293 459 (spares only).
Also CPC, Chas Hyde, KSA, Willow Vale and Wizard.
Agents in Ireland Don Berg Elec tronics Ltd., School Masters House, Ranafast, Co Donegal, Eire.
Tel 00 353 754 8275
Fax 00 353 757 1031.

Sansui Spares available from CPC, or Diamond Television for VCR Model SV77.

Sanyo UK Sales Ltd., Sanyo House, Otterspool Way,Watford, Herts WD2 8JF.
Tel 01923 222 244
Fax 01923 477 355.
See also Chas Hyde, and Partmaster.

Schneider Spares available from Wizard and CPC.

Seleco See SEME.

SEME Ltd., Hudson Road, Melton Mowbray, Leics LE131BS.
Sales Hotline 01664 484 000
Fax 01664 563 976.
e.mail: sales@seme.co.uk
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Spares available for Akai, Amstrad, Bush, B&O, Braun, Burley, Cambridge, Crosslee, Decca, Denon, Dyson, Fisher, Finlandia, Finlux, GEC, Goodmans, Grundig, Hinari, Hitachi, Kenwood, Leisure, Logik, Nokia, Numatic, Orion, Pifco, Proline, Saba, Sabre, Salora, Samsung, Schneider, and Suncrest.

Sentra Post-1991 spares available from Alba.
See also SEME, CPC and Wizard.

Sharp Spares available from A.R.D. Electronics, Willow Vale, CPC, HRS, SEME and Wizard.

Siemens Spares available from Appliance Care Limited, Unit F4, Ballymount Drive, Ballymount Road Industrial Estate, Walkinstown, Dublin 12.
Tel 00353 145 02655
Fax 00353145 02520.

Skantic Spares available from GenServe Ltd. and CPC.

Solavox Brand name used by Comet Group plc. See also CPC.

Sony UK Ltd., Spares Division, PO Box 58, Newbury, Berks RG13 9LQ.
Tel 01635 861 133
Fax 01635 874 099.
Sony and Aiwa account holders only. See also CPC, Chas Hyde, Willow Vale and Wizard.

Ssangyong Spares available from Key Electronics.

Steepletone Products Ltd., Park End Works, Croughton, Nr Brackley, Northants NN13 5RD.
Tel 01869 810 081
Fax 01869 810 784.

Stewart (Iain)
3 Royds Avenue, Linthwaite, Huddersfield HD7 5QU.
Tel 01484 842 761
Mobile 0777 307 0474.
Stockist for NEI and some Nikkai spares, also spares for current Akura models.

Tandberg R.D.E. Tandberg, Holly Tree House, The Green, Full Sutton, York
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Tel 01759 372 795.

Tatung (UK) Ltd., Service Division, Stafford Park 10, Telford, Shropshire TF3 3WF.
Tel 01952 290 111
Fax 01952 292 096.
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Technics See Panasonic.

Telefunken Spares available from Thomson Multimedia (see Ferguson) CPC and SEME.

Teleton See Fujitsu General.

Texet Spares available from The Hira Co, Ltd.

Thomson See Ferguson and Willow Vale.

Thorn brand equipment. Spares

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available from Thorn UK Ltd., Glaisdale Drive, Bilborough, Nottingham NG8 4LA.
Tel 0115 900 7111
Fax 0115 929 5899.

Toshiba European Service Centre, Units 6/7 Admiralty Way, Southern Trading Centre, Camberley, Surrey GU15 3DT.
Tel 01276-694 000
Fax 01276-600 521.
www.toshibs-tuk.com
See also A.R.D. Electronics, CPC, HRS, KSA, Chas Hyde, SEME, Willow Vale and Wizard.

Trical Brand name used by Hinari Consumer Products Ltd.

Trio See Kenwood Electronics.

Triumph Brand name used by Currys. See Partmaster, CPC.

Willow Vale Electronics Ltd., Connect Business Park, Bordesley Green Road, Birmingham B9 4UA
Tel 0870 6000 271
Fax 0870 6000 272.
E-mail sales@willowvale.co.uk
Web www.willowvale.co.uk
Appointed spares distributor for JVC and Sharp.

Spares distributor for Alba, Amstrad, Aiwa, Bush, Grundig, Hitachi, LG, Mitsubishi, Pace, Panasonic, Philips, Saisho, Samsung, Sony, Tatung, Thomson, Toshiba.
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Tel 0121 772 2733
Fax 0121 766 6100.
e.mail: sales@wiltsgrove.co.uk
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Wizard Distributors, Empress Mill, Empress Street, Manchester M16 9EN.
Tel 0161 872 5438 or
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Fax 0161 873 7365
e-mail:
sales@wizard-distributors.co.uk
Website:
www.wizard-distributors.co.uk
Spares stocked include Akai, Alba, Amstrad, Decca, Dual, Ferguson, Fidelity, Hitachi, Loewe, Matsui, Mitsubishi, Nikkai, Philips, Pye, Saisho, Samsung, Schneider, Sentra, Sharp, Sony, Tatung, Toshiba. Trade only.

Yamaha
Spares availble from Chas Hyde

Zenor Made in India models see BPL.

General/miscellaneous parts suppliers

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186 Croydon Road,
Croydon CRO 4PJ.
Tel 020 8656 6006
e.mail: avservicing@aol.com
Spares distributor for König and Philex. Genuine spares for Ambersil, Beko, Mercury, Mitsubishi, Philips and TDK.

Cricklewood Electronics
40-42 Cricklewood Broadway, London NW2 3ET
Tel 020 8452 0161
Fax 020 8208 1441
www.cricklewoodelectronics.co.uk

Economic Devices,
The Coach House, Muxton Lane, Telford, Shropshire
Tel 01952 273130
Fax 01952 405478
e.mail: john@telepart.co.uk

East London Components,
63 Plashet Grove, East Ham, London E6 1AD.
Tel 020 8472 4871
Fax 020 8503 5926.

Electromail, PO Box 33, Corby, Northants NN17 9EL.
Tel 01536 204555
Fax 01536 405 555.

Electrovalue Ltd,
Unit 5, Beta Way, Thorpe Ind. Park, Egham, Surrey TW20 8RE.
Tel 01784 433 604
Fax 01784 433 605.

Express Tubes,
The Mill, Mill Lane, Rugeley, Staffs WS15 2JW.
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Fax 01889 575 600.

Farnell Electronic Components, Canal Road, Leeds LS12 2TU.
Tel 0870 1200 200
Fax 0870 1200 201.

Grandata Ltd,
KP House, Unit 15, Pop In Commercial Centre, Southway, Wembley, Middx HA9 0HB.
Tel 020 8900 2329
Fax 020 8903 6126.
e.mail:sales@grandata.co.uk

J.W. Hardy,
231 Station Road, Stechford, Birmingham B33 8BB.
Tel 0121 784 8478
Fax 0121 789 7931.

Irwin Electronics,
Unit 200, JC Albyn Complex, Burton Road, Sheffield S3 8BX.
Tel 0114 273 9622
Fax 0114 273 7919.

JJ Components,
Rear of 243/247 Edgeware Road, Collindale NW9 6LU
Tel 020 8952 2371
Fax 020 8952 7982.
e.mail:
jjcomponents@compuserve.com

LRC Broadcast S
5 Whitfield Street, London W1T 2SA.
Tel 020 7323 2107
Fax 020 7323 2191.

Manor Supplies,
9 Whitchurch Parade, Whitchurch Lane, Edgware, Middx HA8 6LR.
Tel 020 8952 8808
Fax 020 8952 8809

Maplin Electronics, Freepost NEA9433, Barnsley S73 0BR.
Tel 01226 751 155
Fax 0870 264 6001.
e-mail: <recipient>@maplin.co.uk
Website: www.maplin.co.uk

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Fax 0161 746 8136.
www.mces.co.uk
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Nikko Electronics, 358 Kingston Road, Ewell, Surrey KT19 0DT
Tel 020 8393 7774
Fax 020 83937395.

Philex Electronic Ltd.,
Philex House, Kingfisher Wharf, London Road, Bedford MK42 0NX
Tel 01234 263 700
Fax 01234 267 097
e.mail: sales@philex.com

PV Tubes, 108 Abbey Street, Accrington, Lancs BB5 1EE.
Tel 01254 390 936
Fax 01254 872 166.

RS Components, PO Box 99, Corby, Northants NN17 9RS.
Tel 01536 201 201
Fax 01536 201 501.

Sendz Components,
63 Bishopsteignton, Shoeburyness, Essex SS3 8AF.
Tel 01702 338 894
Fax 01702 338 805.

TW Electronics (Newbury) Ltd., Beacon House, Harts Lane, Burghclere, Newbury, Berks RG20 9JZ.
Tel 01635 278 678
Fax 01635 278 266.

Vista Electronics,
Unit 2, Wingate Grange Industrial Estate, Wingate, Co. Durham TS28 5AH.
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DX and Satellite Reception

Terrestrial DX and satellite TV reception. Aerial notes. News items. The future of terrestrial TV transmissions. Book reviews. Roger Bunney reports

The Fox uplink site in Baghdad, a hotel balcony. Picture received via Eutelsat W1 (10°E).

February this year maintained the tradition of being a very quiet month for DX-TV reception. The only activity worth reporting was a small tropospheric lift over the period 15-17th. This produced Band III and UHF signals from the Benelux countries, West Germany and Denmark in the eastern and central parts of the UK. Band III was particularly rewarding. French TV signals across the UHF bands were received here at Romsey, Hants. But there were no reports of exceptional tropospheric signals. The openings we experienced in past decades, when good signals were present throughout Band III and the UHF bands, seem to have died with the global warming!

Satellite sightings

There was a telephone call as I arrived back from work on February 25. It was Roy Carman, phoning to suggest a check on Eutelsat W2 at 16°E. Sure enough CBS Baghdad was linking a live interview between CBS's Dan Rather and Iraqi president Saddam Hussein. Though the interview was formally conducted, with an interpreter, footage before and after revealed a much more informal relationship between the personalities. Apparently the two had met on previous occasions, which undoubtedly helped make the interview possible. As the military activity has increased over the past few weeks I've been monitoring the news feeds from the Gulf region.

On several nights Fox News Kuwait via Eutelsat W1 (10°E). at 11·164GHz V (SR 3.255, FEC 5/6), transmitted hour-long videotapes of US military manoeuvres, featuring tanks, personnel carriers, hovercraft landings and assault motorboats. During one tank exercise a squadron drove into a wadi (depression in the desert) where a large communications centre had been set up, with tents, vehicles, containers, massive aerials and two large (approximately 20ft diameter) dishes at a very low elevation, suggesting a single transatlantic hop to the military control centre in Colorado. On the 25th Fox News Baghdad via 10°E (11·166GHz V) changed to Fox News Adana Turkey, where a US airbase is sited.

While taking a look at 10°E on the 18th, seeking other Gulf feeds, I came across a Swedish sports feed, Teracom SWE 010A. This was at 10·996GHz V (6,117, 3/4). It carried several ice hockey matches for Canal+, though whether for the Nordic, German or French networks I don't know. Cricket was much in the news during the month. On the 7th and 8th there were live inserts for BBC News from Cape Town, reporting on the situation in Zimbabwe. The GlobeCast Africa frequency (11·512GHz V, 5,632 3/4) was being used for two-way interviews and reports from the World Cup Cricket Stadium. Hardly typical African nights however – there were high winds and sweeping rain.

The Columbia shuttle tragedy occurred on the 1st, just after I'd finished the last column. Live output was being carried from the Johnson Space Control Centre at the time, via the GlobeCast Atlantic Bird-1 multiplex (12·5°W, 11·114GHz H, 20,145, 3/4). The Centre was using channel 1, with the video/audio downlink from the shuttle on channel 3. The final words from the Centre queried awareness of a rise of temperature in the left side wheel compartment. The reply was never completed. Subsequently there were a couple of desperate calls from the Centre, while the control room staff could be seen standing in disbelief at the tragedy which had just happened. The GlobeCast feeds continued for perhaps an hour, channel 3 with just audio and video noise, eventually being replaced with colour bars. Over the next few days there were press reports via Atlantic Bird-1 and NSS-7 (21·5°W) on the salvage operation then, on the 4th, the CNN Newsource feeder carried a memorial service in full, attended by President Bush.

Dave Dyson (Accrington) reports that a fourth regional TV feed can be seen via Telecom 2D (8°W). These feeds use BT trucks – TES-41 at 12·570GHz, TES-43 at 12·580GHz, TES-9 at 12·590GHz and TES-42 at 12·600GHz, all H, 5,632 + 3/4, with clear MPEG-2.

The Curacao Music Festival (West Indies) was a rare sighting

via Atlantic Bird-1 on the 7th, at 12·740GHz H (5,200 + 3/4), with live music and interviews.

Kurdistan TV is now present at 11·137GHz H via Hot Bird (13°E). HRT-1 (Croatia) is available at 11·304GHz H via 8°W. These transmissions both use 27,500 + 3/4.

RSL-TV

Following the news that the ITC has withdrawn seven licences previously assigned to the Local Media Corporation (also known as LMC, and formerly Brendart), the Commission reports that no applications have been received for the Aberdeen RSL-TV licence. Reasons for lack of interest in setting up RSL-TV stations are low advertising income, the short licence period (four years) which is insufficient to make investment worthwhile, and the relatively low transmission powers allowed. The Oxford Channel has commented that RSL-TV stations need to think "more commercial than community".

DTV-UK

Barry Cox, deputy chairman of Channel 4 and chairman of the Digital Television Stakeholders Group, has suggested that the analogue TV switch-off in the UK may not happen until 2014. The government is aiming for 2010. Forty per cent of UK households have now gone digital, 15 per cent with a Freeview box, but it will take some years before the 95 per cent figure required for the switch-off is reached. He has called for action from the broadcasters, the government and the phone companies (who will buy the analogue spectrum that becomes available) to stimulate the move to digital, rather than relying on folk buying DTT equipment as and when replacement sets are needed.

Satellite news

A one-off programme for satellite enthusiasts, DrDish@TV, is to be broadcast via the Nordic Ku beam of Intelsat 707 (1°W) on May 7 at 2200 CET. Frequency of the transmission is 11·596GHz, SR 6,110 and FEC 3/4: the polarisation is not known. Unfortunately the beam provides only about 42dBW in eastern parts of the UK, 40dBW in western parts, so a dish of 80-100cm diameter would be required, depending on the LNB. Dr Dish will answer questions either phoned in or emailed to show@drdish.tv

A French-language TV-enthusiast programme is being transmitted FTA every Saturday night from 2100-2200 hours CET until mid-summer. You'll find it at 12·245GHz H (27,500 + 3/4) via Hot Bird (13°E). This is the CFI PECO PRO multiplex, a GlobeCast lease. The downlink is run by CFI (Canal Plus International) with encryption, and the FTA service TV5 Europe. CFI finishes at 2100, followed by the satellite programme and then TV5.

Intelsat 907 is now in operation at 27·5°W, providing a full range of data, internet and video services via 76 C-band and 22 Ku-band transponders. Coverage includes Europe, Africa and the Americas. Once 907 is fully operational Intelsat 605 will be moved from 27·5°W to an unusual slot, at 29·5°W, "to support additional customer demand also in the Americas, Europe and Africa". This is very close to the Hispasat slot at 30°W.

The Racing Channel closed in early February when an agreement with Horse Racing Ireland ended. The agreement had allowed Irish racing to be broadcast FTA alongside coverage from ten smaller UK race courses. Loss of the Irish coverage was a terminal blow to channel content.

Future of terrestrial TV transmissions

A major article in the February issue of the New Zealand magazine *SatFACTS* discusses the future of analogue TV in the digital era. Here are some of the points made. They have relevance in Europe and other areas as well.

About 23 per cent of Australian viewers now receive their signals via either cable or satellite. As viewers move away from terrestrial reception, so the income of the terrestrial broadcasters

Staff at the Johnson Space Centre when the Columbia shuttle was lost. Picture via Atlantic Bird-1 (12·5°W).

falls. This leads to economies with programming, and reduced regional output. It's significant in this respect that the ITC recently approved a reduction in the requirement for ITV regional output (hours per week). In the Netherlands 92 per cent of viewers receive their programmes via cable, so broadcasters provide their services mainly in this way with little need to transmit terrestrially. In the US 86 per cent of viewers receive their TV via cable or DTH satellite transmissions. Again the easiest course for

A hostage incident. Police surround a white mail van in downtown Miami. Live transmission via NSS-7 (21·5°W).

broadcasters is simply to feed their output into the cable head-ends or satellite uplinks.

The article continues with the "remote-control syndrome". Because of laziness, viewers tend to stay with one mode of reception instead of switching from one mode to another. If they are using a dish, they are unlikely to switch to terrestrial reception.

Digital reception is either good or non-existent, whereas analogue reception can be very variable. This could well drive viewers away from analogue reception. In the US, Australia and elsewhere analogue and digital terrestrial transmissions tend to come from different sites, unlike the co-sited transmissions in the UK. This is given as a reason for the success of Freeview in the UK, with increasing sales of DTT boxes and wideband aerials – because a single aerial can provide lots of channels, mostly free. Elsewhere in the world DTT is struggling.

A nice clean dish (right-hand side) – the initial results of my dish cleaning with Somerfield's All Purpose Cleaner. Grime has been left on the left-hand side of the dish to show the effectiveness of the cleaner.

A further point is that in the US some newer broadcasters don't bother with parallel analogue and digital terrestrial transmissions, they simply supply their programmes to the cable and DTH satellite services.

There's much more in the original article, and it's all very thought provoking. In worldwide terms there seems to be a big question mark over the future of terrestrial transmissions.

Aerials

In the March issue I raised the matter of cleaning fibreglass satellite dishes – my own 1·2m Channel Master dish had become very dirty. My cleaning efforts proved successful, using Somerfield's All Purpose Cleaner (pine) diluted in warm water and a draining-board sponge (not the Brillo pad side!). Circular rubbing followed by rinse off cleared 95 per cent of the grime. A second go should clear the rest. The accompanying photograph shows about two-thirds of the dish face cleaned off. The back of the dish cleaned instantly – it has a smooth surface. I imagine that Asda, Tesco and so on have similar own-brand cleaners.

I noticed an interesting wall-mounted aerial system on an end-of-terrace house at Arundel, West Sussex, see photo. It consists of a vertically-mounted UHF bow-tie system with, below, a couple of FM loops. You can see it from the River Arun Bridge on the A27 bypass. Unusual to see stacked bow-ties at other than DX installations.

A curiosity was noted on a semi-detached house near here at Romsey. The standard 18-element group A Yagi had been erected by the householder, who had followed instructions from the electrical shop from which he'd bought it. There's a twin-element reflector, part of the original design, and an additional aluminium sheet (stamped out type) reflector between the dipole and the twin-element one. I wonder why? Another one for the CAI's black museum!

Books

A couple of interesting books have come my way recently. *The Pye TVT Story*, published at the end of last year, tells the story of Pye TVT, the broadcast part of the larger Pye group. It charts the technical progress and achievements of the company, and recalls the personalities who made a success of it. The decline came as the giant Philips organisation took control.

The growth of Pye from the late thirties through World War II (even I can recall the Pye 45MHz IF strip with EF50 valves!), then the post-war period with the reopening of BBC TV and the start of ITV in the fifties, is described. After the war Pye entered the TV equipment market, providing design, supply and installation capabilities. By the fifties Pye TVT was producing the full range of audio and video equipment for TV studios and outside broadcasting. As TV started to spread across the world, so Pye TVT went with it, providing complete turnkey installations from basic studios to TV links and the transmitters themselves. By the sixties, as TV moved into the UHF bands, Pye was in the forefront and was an equal competitor to the renowned Marconi company of Chelmsford, selling to the world.

The fortunes of Pye TVT peaked in the seventies. As Philips became more closely involved with the company, first the Pye studio equipment facility then others were transferred into the Philips/Bosch organisation. Today the name Pye TVT has all but disappeared.

The Pye TVT Story is packed with pictures of broadcast equipment, OB vans, transmitters, masts and studio cameras. There's information on the commercial politics of the time and, as interesting, there are the anecdotes on the folk that were Pye TVT. It's written by Richard Ellis, former Chief Engineer of Pye Studio Activity. I've only one adverse comment – there's no index. I used Pye gear when I was at Southern TV: a quick check to find what Richard had to say about Southern would have been helpful.

The soft-back, A5-sized book has 342 pages and is highly recommended. It's published by APP Publishing Partnership Ltd., Venture House, Cross Street, Macclesfield, Cheshire SK11 7PG

(phone 01625 511 645). The ISB number is 1 89340 17X. You can obtain a copy for £12.50 plus £2 post and packing from Richard Ellis, 114 Dixon Drive, Chelford, Macclesfield, Cheshire, SK11 9BX. Make the cheque payable to 'R.J.G. Ellis Book'.

The other book, *Pop went the Pirates*, tells a totally different story. I can recall hearing Cilla Black, on a grey Good Friday afternoon in 1964, singing *Anyone who had a Heart*. Here in Romsey it was a noisy, fading medium-wave signal that came from Radio Caroline in the Thames Estuary. Over the next twelve-eighteen months numerous radio ships began to ring the UK. I received Radio London, Radio 390 and even, a true DX catch, Radio Such from a Thames Estuary fort. It was an exciting period, with several manufacturers even producing bandspread transistor portables with a 'pirates' band detailed on the tuning scale! The Marine Offences Act eventually brought these transmissions to an end – apart, of course, from Radio Caroline.

For many years two books by Paul Harris provided a definitive history of the period. These were *When Pirates Ruled the Waves*, published by Impulse Books, The University Press, Aberdeen, at 36s (£1.80) in 1968-70 (four editions); and *Broadcasting from the High Seas*, published by Paul Harris Publishing at £7.50 in 1977 (ISBN 0 904505 07 3). The latter covers offshore radio in Europe over the period 1958-75. If ever you come across one of these hardback books for sale, grab it!

Pop went the Pirates by Keith Skues was first published in 1994 by Lamb's Meadow Publications, Sheffield S18 5WQ. It's a massive softback volume that runs to 568 pages and must be the final word on offshore radio. Keith himself was a pirate DJ, and writes on the subject with authority. The book covers the ships, the equipment, the DJs, the infrastructure that provided support and also the intrigue and certain criminal activities – the pirates themselves became pirates, boarding rival transmitting ships/structures. There's a mass of photographs (230).

A good test of the book and its coverage is the fact that includes Tower TV and the Dutch REM TV island. It even mentions Richard Woods, an old TVS mate of mine, who DJ'd on Aabie Nathan's Voice of Peace ship in the Mediterranean. The book is now available at £14.99 plus £1.75 (UK orders), order code POPPIR, from the SWM/PW bookshop, PW Publishing Ltd., Arrowsmith Court, Station Approach, Broadstone, Poole, Dorset, BH18 8PW. Cheques should be made payable to PW Publishing Ltd. For enquiries and credit card orders call 01202 659 930. It's another book that I highly recommend. ■

Stacked bow-tie aerials with, below, a couple of FM loops. Seen at Arundel in West Sussex.

Test Case 485

VHS video recorders have been in use in the UK for twenty five years. During this time their mechanics and electronics have undergone much honing and refinement – and cost reduction! The basic tape-scanning system and the format parameters remain the same of course, and the fault symptoms associated with them likewise remain unchanged. Mistracking, for example. Now Sage has been repairing VCRs for all these many years, and didn't expect to have any trouble in tracing the cause of the fault with an Hitachi VTF860 machine he found on his bench. There was a mistracking bar at the top of the playback picture, and the image juddered vertically and rolled at frequent intervals. This happened with both known good recordings and those made by the machine itself.

Sage started by checking the tape's back-tension, using one of those wonderful test cassettes that give an on-screen indication of this. It was rather low, which was soon corrected by fitting a replacement control band and a little cleaning and tweaking. This had no effect on the fault however. So Sage connected a double-beam scope to the playback RF envelope and SW25 test points then played a good recording. There was a ragged hole in the envelope waveform at the beginning of the scan. It embraced the top of the picture and the field sync pulse. The cassette was then ejected and the tape guides, and the upper and lower drums were thoroughly cleaned. Once this had been done a 'dummy' cassette, i.e. one with no tape, was loaded to enable the positioning of the entry guide on the left side of the drum to be checked. Sage found that it went home fully and was adequately tensioned by the spring in the loading mechanism.

With a good recording back in the deck and the oscilloscope used to monitor the RF envelope, Sage tried some careful entry-guide adjustment. This certainly had an effect, but the hole in the waveform remained regardless of the guide position. Once again our veteran technician closely examined the surface of the lower drum at the tape-entry point, the guide and its positioning, and the lie of the tape as it entered the drum-wrap. But nothing untoward could be seen.

At this point the customer phoned to check on the progress of the repair. Told that diagnosis was proving difficult, he commented that Twenty-Twenty Vision (a repair shop two streets away) had had trouble with the machine as well. After spending a long time in their workshop, and several requests for its return, it had come back with a note to the effect that it needed a new head drum assembly and was thus uneconomic to repair. It had been released only on payment of a £23.50 labour charge.

That was interesting! Sage could not see how a faulty drum, upper or lower, could cause this symptom in view of the fact that the machine had worked all right for years. Soon afterwards the cause of the trouble was tracked down – in a rather unexpected area – and cured. It was significant that the machine had been elsewhere for attention! Do you have any ideas about this? It's true to say that if the job had come to Sage directly the repair would have been much easier to carry out. For the solution, turn to page 441.

DVD

Fault reports from Geoff Darby and Philip Salkeld

We welcome fault reports from readers – payment for each fault is made after publication. See page 428 for details of where and how to send reports.

Sony HCD-S400

There were two complaints with this unit, which is part of the DAV-S200 home-cinema system. First was intermittent sound from a couple of the six channels. I went straight for the output chokes and, as usual, found that a couple of them were badly dry-jointed. A blanket resolder here cured this problem. The second fault was described by the owner as "dim display". In fact when the unit was powered the display flickered between full on and nothing at all and then, after a few seconds, settled at either full, nothing or dim.

The negative and heater AC supplies for the VFD are generated on a little sub-board which is screwed to the front panel, underneath the disc tray. I can't understand why, when someone has gone to the trouble of designing a model-specific switch-mode power supply, from which any supplies needed could be derived using only a couple of components, it should be necessary to design another separate inverter, using about twenty components, to run the VFD. When I removed this sub-board I was able to inspect the joints on it carefully. There were no obvious signs of poor soldering, but a blanket reflow of all the connections provided a complete cure. **G.D.**

H + B DVD4155S

This unit was to all intents and purposes dead, but checks in the power supply revealed low output voltages. On making a closer visual examination I noticed two slightly tired-looking electrolytic capacitors on the secondary side of the circuit. For some reason the electrolytics have E designations on the silk screening instead of the usual C.

The two electrolytics concerned, E6 and E8, both have a value of 1,000µF, one being rated at 10V and the other at 16V. According to the ESR meter the worse-looking electrolytic had the better performance. For good measure I replaced them both. This restored full outputs from the power supply and brought the unit back to life. **G.D.**

Sony HCD-S880

This player is part of the DAV-S880 home-cinema system. The fault symptom was that it went into the protection mode shortly after switch-on. When there are six output stages to choose from, it's always difficult to know which one might be the cause of the trouble. The system microcontroller chip monitors the lot, shutting the unit down when it detects a fault in any one of them.

In this design the six separate power amplifier ICs have fully-floating differential outputs. These outputs are monitored by pairs of transistors, Q101 to Q112, which are connected to digital transistor Q114 via OR diodes. Q114 drives another digital transistor, Q113. The output from this device is connected to pins 8 and 18 ('Diag A' and 'Diag B' respectively) of each output IC. The line is connected to the 5V supply via R300, and leaves the AMP PCB to head for the DVD PCB. When it leaves the AMP board the signal is called 'Diag'. After arriving at pin 13 of CN004 on the DVD board it becomes 'OCP'. Its final destination is pin 44 of the system microcontroller chip IC901.

According to the circuit diagram pin 44 of IC901 should be at 4·9V, which confirmed my interpretation of the circuit's operation. So I disconnected the collector of Q113 on the AMP board to override the protection system temporarily – making sure that no speakers were connected to the unit of course. As expected, the microcontroller chip's fault-sense pin and the Diag pins at the output ICs all rose to 4·9V. This enabled the system to power up and stay on.

Checks at the output pins of the audio ICs showed that they were all at approximately half-rail voltage, i.e. about 8V, except for pin 19 (Out B) of IC307. The voltage here was zero. A cold check at this pin revealed a dead short to chassis. When I disconnected the pin the short was still present. This left D324, zener diode D344 and C458 (1µF) as possible suspects: they are all connected between pin 19 of IC307 and chassis. The culprit turned out to be D324. Normal operation was restored once this surface-mounted diode had been replaced, along with reconnection of Q113's collector and pin 19 of IC307. **G.D.**

Toshiba SD210EB

I needed help with this one. My thanks to Toshiba Technical for providing it. The symptom was very low sound output, the cause being C929 (100µF, 6V) which was short-circuit. It's on the MPEG board, next to the phono sockets.

This fault can also occur with Models SD110EB, SD110EE, SD110EL, SD210EE and SD210EL. **P.S.** ■

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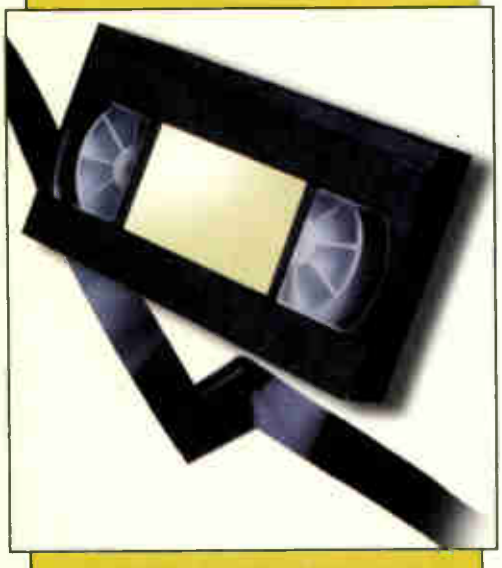


VCR CLINIC

Reports from
Bob Flynn
Gary Laidler
Philip Blundell, MIIE
Ivan Levy
Dean Ratcliffe
J.C Sebastian
J.S. Ogilvie
and
Nick Beer

We welcome fault reports from readers – payment for each fault is made after publication. See page 428 for details of where and how to send reports.

Saisho VR3400

This VCR would usually wind or rewind but would struggle when towards either end, sometimes with a very jerky motion. At other times it wouldn't wind or rewind at all, leaving a loop of tape out when it stopped. The cause of the trouble was the reel idler. When the part in the centre of the gear (underside), that holds it all together, has a split in it the idler starts to come apart. **B.F.**

Akai VSG280

When this machine was asked to play a tape there was very weak forward drive, resulting in a tape build up. Forward wind was also weak, but rewind was OK. Once the take-up spool had been unclipped the felt brake pad could be seen to be dirty and hardened. Giving it a good clean, also the surface of the spool, was all that was required. **B.F.**

Ferguson FV44L

All functions worked but there was an extremely dim clock display. This model has the same power supply as the **JVC HRD860**. A check with the circuit diagram in my service manual for this model suggested that the items to replace would be C28 (120µF, 6·3V) and C29 (100µF, 6·3V) in the + and –3·8V DC supplies to the display. Once this had been done the display was back to normal. **B.F.**

Panasonic NVG25 (G deck)

The customer asked if anything could be done about setting this VCR's clock: the year would only go up to 2001, so he couldn't set up the timer recordings properly. Nothing can be done to the VCR but there's a thing called a perpetual calendar, which is a list of years that exactly match the days and months of other years. For 2003 the matching year is 1997. Setting the clock to 1997 will give the correct days throughout this year. Unfortunately 2004 is 1976, but 2005 is 1994 and 2006 is 1995. **B.F.**

Philips VC522 (Turbo deck)

The mains bridge rectifier's 100µF, 385V reservoir capacitor was replaced to restore power. Everything was then OK except for background interference on E-E pictures. This varied with mechanical operation. Suspecting further problems in the power supply I replaced C2280 and C2281 (both 47µF, 50V). This cleared the interference. **B.F.**

Toshiba V709B

The problem with this machine was tape chewing. It's fairly straightforward to cure. Replace the 'gear centre assembly', which can be ordered from SEME under part number VDC7720. The price is very reasonable and it's quite simple to fit. The old part looks OK until flexed: you can then see the cracks. The same deck is used in the **Fidelity VCR1600F** – I had three in one week. So it looks as if this is a common fault. **G.L.**

Goodmans VN9600B

This machine was dead. Fortunately the game was given away by a slight bulge in C805 (47µF, 400V). As a precaution I also replaced C806 (1µF, 160V). **G.L.**

JVC HRD790EK

We still get these old-timers in. Usually the pictures they produce are better than with new machines. This VCR was dead. Cold checks in the power supply showed that R2 (330kΩ) was high in value, reading 950kΩ, while R3 (330kΩ) had gone slightly high. Once replacements had been fitted the results were excellent. **G.L.**

Grundig VS720

The fault symptom was weak sound with playback of prerecorded and own-recorded tapes. The sound was rather 'tinny', which suggested that the audio head was clean. This was the first thing I checked however, to no avail.

In this model the audio/video PCB is mounted above the power supply and is subjected to a certain amount of heat. So a dried-up electrolytic capacitor seemed to be the next possibility. I replaced C425 (4·7µF), C423 (47µF) and C415 (4·7µF), which cured the fault.

When these capacitors were checked out-of-circuit the culprit was found to be C423. It was leaky. **P.B.**

Panasonic AG5260 (K mechanism)

This machine produced error code E5 in its display. On investigation I found that tension post P5 was bent. When I replaced this and checked the loading motor pulley the VCR worked but produced only mono sound. A check on the audio RF carrier showed that only one of the hi-fi heads was in operation. A replacement drum and alignment cured this fault. **I.L.**

Sanyo VHR777E

This machine was dead with circuit protector PR512 (1·25A, 125V) in the power supply blown. The item to check in this situation is the surface-mounted servo chip IC351, which goes short-circuit. It's visible through one of the holes in the plastic chassis when the metal base is removed. **D.R.**

Hitachi VTF540E

There was no take-up, fast forward or rewind with this machine, and tape was left

out of the spool on eject. The item to replace is pulley part number 6823333. **D.R.**

Sony SLVSE70

This machine chewed tapes when it got to the fully-loaded position, then powered down. For this fault check whether the cam-follower shaft associated with the press block assembly pinch has snapped off. If so, replace. The part number is A6759615A. **D.R.**

Hitachi VTFX765E

This machine was dead with 320V present at the chopper transistor. A check on the voltage at the start-up resistor R856 (220kΩ) produced a low reading of 2·5V. It must be about 12-14V for the machine to work. The cause of the low voltage is usually the PC123FY optocoupler PC851, which becomes leaky between pins 3 and 4. **D.R.**

Panasonic NV45

There was a tape stuck inside this very old machine, which was dead. The customer wanted it repaired because of its sentimental value. It's quite common knowledge that the high-voltage capacitor in the power supply in these older models tends to fail. In this case the capacitor is C1003. It had become leaky. A replacement restored normal operation. **J.C.S.**

Sanyo VHR279

This machine had a tape stuck in it and failed to eject the tape when the cassette housing was removed. When you get this situation, check the right-hand side of the housing. I usually find that the right-hand side arm assembly is broken. If the broken off piece can be found repair can be carried out with a small screw and a spot of glue. If not, replacement is necessary. **J.S.O.**

Hitachi VTF650E

This VCR would struggle to load a tape then shut down, leaving a loop of tape. In this event take a look at the tape-tension band, which will probably be stuck to the supply reel. A replacement will cure the fault. **J.S.O.**

Hitachi VTF350

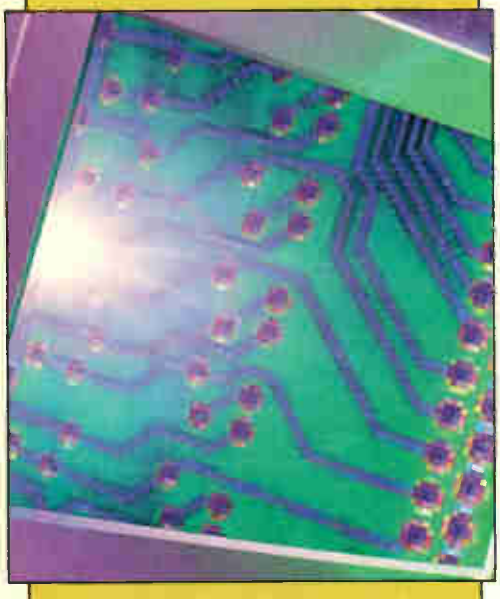
This VCR ran slow, giving the impression that the capstan motor was faulty. I tried one from another machine but there was no difference. So I checked for dodgy capacitors in the power supply. C12 and C13 (470µF. 16V) read OK with our meter. but the fault was cured when replacements were fitted. **J.S.O.**

Sony SLV-SE30UX

The problem was intermittent tape damage. When I removed the cassette housing I found that the take-up brake assembly had broken and its spring, which links the supply and take-up brakes together, had fallen off. If you are careful you can repair this without having to fit a replacement. **J.S.O.**

Sony SLF30UB

No you are not dreaming: this is a Betamax machine, and no way could I put the owner off having it repaired! The machine was dead, apparently following a power cut. In the UK version there's a linear power supply, so electrolytic capacitor problems are less likely than in newer units that use a switch-mode power supply. The only sign of life was that the power LED in the centre of the power button lit up green. There was no display, and no mechanism activity. Checks showed that the unswitched 6V and 5V supplies were missing, because Q106 was open-circuit base-to-emitter. A 2SC1740 transistor had been fitted, though the circuit diagram shows a different type in this position. A replacement got the machine working, but the ACE assembly was heavily worn, also the drum's surfaces. **N.B.** ■



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Fault reports from
Gerry Mumford
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and
Ian Field

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tessa2@btinternet.com

Proview PK770M

The fault report read "will not switch off". Surprisingly, this was correct. When an attempt was made to switch the unit off it would power down for about a second then click loudly and power up again. These monitors have a soft-start switch instead of the usual mains switch, and it was this item that was faulty. It's a non-latching push-switch. Use of a continuity checker showed that the contacts would make and break several times when the switched was pushed, creating lots of illegal logic states that confused the microcontroller chip.

The switch is a sealed unit that cannot be taken apart. But it's a double-pole, double-throw type and, as the monitor uses only one pair of contacts, it was a simple matter to reconnect the wires to a neighbouring pair of unused contacts. This cured the fault. **G.M.**

Hewlett-Packard D2800A (Panasonic HV4 chassis)

This huge monitor seemed to be totally dead apart from a brief flash from the green power LED at switch-on. In fact the power supply was shutting down very quickly, because its output voltages were too high. When I replaced C824 (10µF, 50V), C825 (3·3µF, 50V), C823 (4·7µF, 50V), C828 (47µF, 50V) and C829 (220µF, 35V) on the primary side of the power supply the output voltages were back at the correct levels and the monitor remained powered. It produced a very nice display. **G.M.**

KDS KD1510

This old monitor was badged Fujitsu on the front but was obviously a KDS, as the rear label stated. The main problem was EW bowing with excessive width. In addition the display was quite blurred. EW modulator diode D412 (unmarked, use type UF5407) in the line output stage was found to be leaky, and R459 (1·2kΩ, 0·5W) had burnt out. Replacement of these two items restored correct width with straight edges, while a tweak of the focus control on the LOPT produced acceptable focusing. This must be considered a very old unit now. **G.M.**

Compaq S510

This 15in. monitor was only fourteen months old and had just come out of its warranty period. The complaint was lines across the screen. I couldn't see the fault, so I decided to put the monitor on soak test – the field engineer assured me that it was definitely faulty. The fault appeared after a few hours. There were lines across the screen along with line foldover, indicating a line timebase fault. But the symptom hadn't developed over a period of time. It appeared suddenly, suggesting a component breakdown or possibly a dry-joint.

Close inspection of the PCB ruled out dry-joints. The soldering on this almost new chassis was perfect. I decided to replace the TDA9113 deflection processor chip then soak test the monitor, but unfortunately the fault was still present. As it was intermittent, I next tried heating and freezing various components around the TDA9113 chip. It wasn't long before I obtained some reaction, but this type of fault-finding can be misleading in sensitive circuitry that contains phase-locked loops etc. Nevertheless when I applied heat to one particular component it failed completely, producing the exact symptoms that occurred during the soak tests. The faulty component was the 10nF Mylar capacitor C404, which is connected to pin 5 of the chip. **B.B.**

Apricot XJ58210

The complaint with this 17in. monitor was that after a period of time the brightness would change to a level at which the display was only just visible. A soak test proved this to be the case. Before checks can be made on the CRT base PCB it's necessary to remove the surrounding metalwork. This consists of a heavy-gauge metal plate to which the PCB is screwed (it also forms the heatsink for the RGB output IC) and a thinner screening plate.

Close inspection of the PCB revealed a few dry-joints, which I reworked, but I didn't think that these could be the cause of the fault. Further tests showed that the tube's A1/G2 supply fell when the fault occurred. It's derived from the line output transformer. The cure was to replace the 10nF, 2kV decoupling capacitor C236.

When the monitor was being soak tested after the repair I noticed that the green content of the display had been lost. The cause was failure of the CVA2419TX RGB output chip IC202. An LM2419T is a suitable replacement. **B.B.**

Nech Checksum CB6525

It seems that every other one of these monitors we get in nowadays suffers from the same problem: the screen fades out when the monitor has been in use for an hour or two. The cause is always the same, a dry-joint at the heater earth connection on the CRT base panel. The tedious repair involves removal of the screen can from he CRT PCB in order to gain access. **A.R-W.**

Apple M4681

This 15in. monitor has built-in stereo amplifiers and speakers, but is more conventional than some Apple monitors I've come across in the past. Getting to the

print side of the PCB is another matter! The symptoms were dead with the mains fuse intact. There was no degaussing or relay operation. Once I'd stripped the unit down to the PCB the cause was obvious: there was a dry-joint at the negative side of the bridge rectifier. It was the third time I've had this fault over the last year. **A.R-W.**

Nech CA6515DL (Model no. CA6525DL)

This monitor was dead with the internal mains fuse F501 (3·15AT) shattered. I replaced the fuse and checked the T120/9834 degaussing thermistor, which was virtually short-circuit but didn't rattle. Type PTH451C seems to be a suitable replacement. I've used it on numerous occasions and have had no bounces. The original device has the same basic physical shape but is larger than the one used in the HT circuit in mid-Nineties Hitachi TV sets. **A.R-W.**

ADI L5032TD

There was lack of height and width, with EW bowing. When you get this problem check the heatsink of the TDA4866 chip U501 for signs of overheating. The heatsink is usually fixed to the PCB with a brown glue that turns black when subjected to high temperature. If you find that this has happened, check R527 (1Ω, 2W high-stability), which is located inwards on the PCB from U501. It will usually have doubled in value. The IC usually survives. **A.R-W.**

Hewlett-Packard DeskJet 640C printer

I've had to replace the actuator switch, part no. HPIC289060078, in quite a few of these printers recently. It's a plastic slide bar that breaks, and is sometimes found rattling in the bottom of the case. The job can be done without dismantling the printer, but is much more easily done the first time with the case removed. The procedure is as follows:

(1) Remove the two Tork screws under the paper tray.

(2) Remove the PCB cover at the back – disengage the tabs at the bottom, then hinge the cover upwards to slide it off.

(3) Remove the four-way ribbon cable at the top of the PCB panel, at socket J1 to the on/off and paper-feed buttons.

(4) Disengage the tabs that hold the cover to the metal chassis and remove the plastic base plate. The printer mechanism is now free and can be removed from the remainder of the case. **A.R-W.**

Proview PX765M

If one of these monitors is completely dead with the internal mains fuse intact, check for a dry-jointed and burnt surge-limiting thermistor, circuit reference number RT502. In this case the thermistor was so badly burnt that its type number couldn't be discerned. An inrush current limiter type SG39 from Farnell Electronic Components, order code 606-777, proved to be a suitable replacement. **A.R-W.**

Panasonic TC15M1M

This 15in. monitor was dead – the customer said it just went off. Checks in the power supply revealed that R802 (4·7Ω) was open-circuit, Q801 short-circuit and IC801 (STR55041) also short-circuit. I replaced these items, said a little prayer and switched on. To my relief the monitor came to life with a good display. To be on the safe side I checked for dry-joints before returning it to the customer. **J.F.**

Compaq 445

This monitor's missing display reappeared after a general resolder. The main areas attended to were the ribbon cables between the main PCB and the CRT base PCB, the electrolytic capacitors and chokes on the secondary side of the power supply, the driver transformers for the line output transistor and the B+ control MOSFET and the frame output IC.

This is a Philips-designed chassis with a TO220 MOSFET and a three-terminal regulator that are clamped to the rear metal bracket/heatsink. These components usually wear out their solder joints as a result of thermal expansion. Although the soldering on both items looked OK, they were included in the 'solder transfusion'. **I.F.**

Tests after dead mains fuse

This monitor was manufactured by Top Victory Electronics, China, had a badge that said Unika at the front and came in an AOC box marked 5elr. A tail of four or so sticky labels was dangling over the power supply to assist combustion in the event of a blow up, to which AOC monitors are prone. I was told that it had been caught in a downpour while being unloaded and had never worked. On inspection I found that the 2·5AT mains fuse was blackened, but no shorts could be detected.

To confirm that nothing broke down at full voltage, I tested the unit with the chopper MOSFET and degaussing posistor removed and a 60W lamp connected across the fuseholder. It passed this test, and I then found that the MOSFET was not short-circuit. The next step was to open the posistor to inspect the thermistor pellets. These were intact, but were coated with a thick, oily substance. As I didn't have an exact replacement I refitted it and repeated the test, with the lamp still in place to limit any fault current. Because of the drastically reduced current, the posistor can take several minutes to heat sufficiently to extinguish the lamp. But it did so, proving that it was not short-circuit. Once all the parts that had been removed to conduct tests had been refitted and the fuse had been replaced the monitor worked normally. **I.F.**

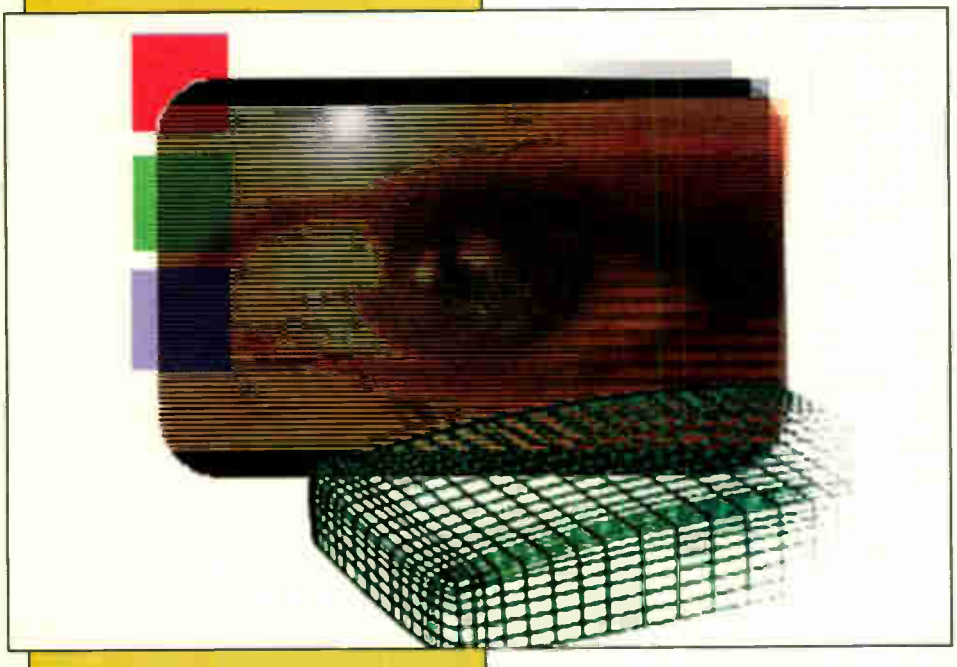
Taxan EV865/MV875 – AST/Digital VRC16

A fellow engineer gave me a folder of Taxan circuit diagrams. Being curious I immediately delved into the folder to see what new information I had acquired. As I sat there intrigued by how similar the power supply circuitry was to that in the AST/Digital VRC16 monitor, I noticed that the pinout designations, such as B+ –PGM and others, were also so similar that it couldn't be a coincidence. Closer inspection of the circuit revealed that the power supplies are indeed virtually identical. It would be interesting to hear from anyone who knows whether an AST is a badged Taxan or vice versa? **I.F.**

Project LM1764

When this monitor was switched on its power supply immediately shut down. As the leads for the line output transistor are soldered into eyelets, unsoldering them to check it was going to be difficult. Furthermore the chassis construction made it very awkward to get at the transistor's mounting screw to remove it. Attention was therefore turned to the power supply and the B+ regulator. These checked out OK, so Q813 (2SC5251) had to be removed after all! It was short-circuit.

During the initial examination I noticed that one lead of C851 (47µF, 250V) was loose in its solder. This had been dealt with at the time. The monitor worked when a new line output transistor was fitted, but the display was too wide. Wiggling C851 produced display fluctuations. I removed it for examination and found that there was a corrosion stain around the positive lead. After fitting a replacement I checked the other +B supply electrolytic C301 with my ESR meter. This capacitor proved to be in good condition. The width could now be adjusted between over and under scanning with the user controls. **I.F.** ■



TV FAULT FINDING

Reports from
Michael Dranfield
Philip Salkeld
Peter Dolman, I. Eng.
Martyn S. Davis
Arthur Jackson
R.J. Evans
Matthew Biddlecombe
Dave Husband
Martin McCluskey
and
Dave Clark

We welcome fault reports from readers – payment for each fault is made after publiation. See page 428 for details of where and how to send reports.

Sharp 51AT-15 (5BSA chassis)

This set seemed to be dead but the power supply was up and running and the field scan coils were buzzing. In this chassis the field output stage is powered from the chopper transformer instead of the line output transformer, hence the active field output stage. Checks showed that there was no drive signal at the base of Q603 in the line driver circuitry. The cause of the problem was loss of the 5V supply at pin 8 of the EEPROM chip IC1002, because the 5V regulator transistor Q704 (BC338-40) had an open-circuit emitter connection.

A good-quality transistor from a reputable supplier must be used in this position, otherwise there will be a repeat failure a few months later. I get my replacements from Farnell Electronic Components. **M.D.**

Matsui 2107T

I was beginning to lose patience with this set, mainly because I had blown so many components while looking for the cause of the fault. Every time I switched on, ten quid's worth of components went up in smoke! I would find the chopper FET dead short-circuit, the 5·6Ω surge-limiting resistor open-circuit and, to be on the safe side, would replace the TDA16846 chopper control chip IC501. Then, at switch on, the power supply would strike up, the standby LED would light up and the FET would go short-circuit.

The cause of the trouble was eventually traced to R532 (1·5MΩ), which is connected to pin 2 of IC501. For good measure I decided to replace R529 (1MΩ) as well. Use 0·75W, 350V metal-oxide resistors. **M.D.**

Sony KVX2552U (AE1C chassis)

This set would produce an intermittent loud crackle on sound and, sometimes, the picture would go off. I spent a long time resoldering various dry-joints to no avail – after a lengthy soak test the problem would recur. The cause was eventually traced to dry-joints at the 5V regulator IC604 and the associated feed rectifier D612. I had failed to spot this earlier because these two components are obscured by the plastic frame that holds the chassis – it has to be unscrewed and removed to reveal them. I've since had the same fault with three more of these sets. **M.D.**

Bush WS6673SIL

If one of these sets is tripping with a faulty 2SD2579 line output transistor, the cause is usually a dry-joint at the flyback tuning capacitor C626 (12nF, 2kV). Don't just resolder it though. Take it out and measure its value. You may find that this has fallen, as a result of internal heating. **M.D.**

Beko NR28411ND

The 2·5A sand-filled fuse in this dead set had failed. I've often had it go in older Beko sets for no apparent reason. Not this time however: there had been a power supply blow up. The following items had to be replaced: R639 (15Ω, 0·5W); R606/7 (both 0·47Ω, 0·5W); IC601 (MC44608P40); and the chopper transistor T601 (K2545). All was well once the replacements had been fitted. **P.S.**

Sharp 66FW-53H (DA50W chassis)

A fault that's starting to show up with these sets is distorted sound. You'll find a surface-mounted chip, IC1300, on the small plug-in audio board in the right-hand corner of the main chassis. It cooks and contaminates the board. Fortunately the board is available at a modest cost. The part no. is DUNTK7285BMW1. **P.S.**

Bush WS6672

This set was dead with a smell of burning. In the past several of these sets have come in with a large burn-up on the main PCB. On this occasion however I found that the on/off switch had been arcing. I recognised it as being similar to the one in the Wharfedale Model 550, so I decided to

order the replacement from CHS (order code MS32) as this seems to be quicker. **P.S.**

Panasonic TX25MD1/M (Euro-2 chassis)

There was a picture tearing fault with this set. Teletext was OK, but the fault was also present with a scart input. The cure was to replace the video processor chip IC601, part no. VDP3108-APPA1. **P.S.**

Sharp 76FW-53H (DA50W chassis)

It's rare that you get snowy picture faults nowadays. I adopted the old TV servicing diagnostic measure of tapping the tuner, but this proved very little. Nevertheless a replacement cured the fault. The circuit reference no. is TH201, the part no. RTUNH0123BMZZ. **P.S.**

Bush 2868NTX (11AK19-5 chassis)

There was no teletext, just '100' in the left-hand corner of the screen. It's a known fault with this model. The cure is to replace the multi micro/text chip, type SDA5255-A047. It is important to get the last four digits right or you will end up with all sorts of problems. The chip is available from CHS. **P.S.**

Sony KV28FS20U (BE3E chassis)

The faults with this newish widescreen set were EW pincushion distortion and intermittent width variations. The line/field scan output connector CN800 was the cause of the width instability: the EW problem remained when this had been dealt with. I wondered whether the arcing contacts could have caused EEPROM corruption, but a scope check at the input to the EW control chip IC800 revealed a normal-looking parabolic waveform that could be varied when the relevant settings were altered in the service mode. Adjustment had no effect on the raster geometry however. Reference to earlier fault reports in *Television* convinced me that the cause of the problem lay in the driver stages, particularly as brief scope checks showed that there was no field-frequency parabolic waveform at the EW driver FET Q801. So I ordered replacements for IC800 and Q801. There was no change when they had been fitted.

What I should have done was to think a bit more about how the circuit operates. The purpose of IC800 is to produce a pulse-width modulated output, at line rate, from the parabolic input. So you won't see any parabolic waveforms when you carry out scope checks at the output from IC800 onwards! This elegant approach allows Q801 to be operated in class D, minimising its dissipation. The principle is explained in Giles Pilbrow's excellent article on the BE3D chassis, in the April 2001 issue. The cause of the trouble was simple. R835 (27Ω, 3W), which couples the drive output to the EW modulator diodes, was open-circuit. The moral of this little story is not to leap to conclusions without first thinking through the circuit operation! **P.D.**

Sharp 76FW-53H (DA50W chassis)

The reported fault with this set was "white line down the middle". Sure enough at switch on the symptoms were sound but no picture. Instead, there was a bright dot in the centre of the screen, with a vertical line that extended upwards from this dot. A brief inspection revealed that C620 had bulged at the top. It's part of the line scan current path: C619, C620 and D613 are connected in series, with R613 in parallel with D613 and the s-correction capacitor C613 in parallel with the lot. C613 had become dry-jointed, forcing all the current through the parallel path. As a result R613 had overheated. Because of its close proximity, part of C613 had actually melted. C620 had overheated, blown its top and gone open-circuit. Hence no line scan. Normal operation was restored once all these items had been replaced. **M.S.D.**

Hitachi C32WD2TN2 (A7 chassis)

The report with this two-three year old set was "dead, tripping". In fact I could hear the rustle as the line timebase tried to get going. So I spent a long time resoldering dry-joints, replacing the jungle chip and trying to find the line drive before I decided to consult Hitachi technical. It seems that the symptoms are known with this set.

The thing to do is to check resistors R807, R808 and R809 on the CRT base PCB. If one of them has burnt out, the Philips tube has an internal short-circuit. In this event the recommended cure is to replace the tube and the tube base PCB, as several transistors here will have been compromised. The part nos. are A527110 for the CRT base PCB, and T176001 for the CRT, type W76ESF031X13. **M.S.D.**

Sanyo CE28WN5/32WN5 etc (EB6-A chassis)

Intermittent sound, which may be sensitive to PCB flexing, is common with this chassis. The cause of the problem has in every case been poor soldering of the surface-mounted main microcontroller chip, IC801. Resoldering this item provides a reliable repair. **A.J.**

Philips 21PT1663 (L7.2E chassis)

This set would switch on briefly then revert to standby (bright LED). These symptoms indicate that the protection mode has come into operation, and are often caused by a faulty line output transformer (T5445). In this case however the cause was a field output stage fault. The output chip IC7401 was short-circuit, and the two safety resistors in the – and + supplies to the IC, R3449 (1Ω, 0·5W) and R3451 (2·2Ω, 0·33W), were both open-circuit. Replacements provided a cure, but Philips recommends adding a BZX79C51 zener diode between pins 4 and 5 of the replacement chip, anode to pin 4, to prevent damage to the chip. **A.J.**

Thomson 14MG15U (TX807C chassis)

This quite new 14in. set produced a dull picture with low contrast, though some change could be seen as the contrast was adjusted through its range. The cause of the trouble was in the beam-limiter circuit, where RL002 (100kΩ, 0·25W) was open-circuit. You'll find it in the line output stage. **A.J.**

JVC C14ET1EK (Onwa chassis)

A fairly common problem with these sets is that the standby relay can be heard to latch on but the set remains dead. If checks show that the HT at the line driver and output stages is normal, but the line drive waveform is missing, the cause of the fault is likely to be in the supply to IC301 which, amongst other things, contains the line oscillator. Check at pin 42. The start-up supply is 8·5V, which is derived from the HT supply via R323 (6·8kΩ, 5W). This resistor fails for no apparent reason. It's worth replacing C909 and C911 as well on the primary side of the power supply to ensure correct HT voltage. **A.J.**

JVC 7860GB

I installed this set for my aunt in 1976. In spite of being in daily use it only recently developed its first fault. The symptom was a slightly overbright picture with flyback lines. The cause was a low supply to the RGB output stages – the voltage was about 110V instead of 150V. The source of this supply is D08 in the line output stage, where I found that the associated capacitor C21 (47µF, 50V) was open-circuit. It seems to couple line pulses to D08

for rectification. In the absence of these pulses the supply came solely from the 110V HT line.

I fitted a replacement capacitor and gave the set a general service, after which there was an excellent picture. **A.J.**

Bush 2059/2159NTX (Onwa chassis)

The picture alternated with a blank raster. When it was present it had corrugated verticals. The cause of the trouble was the HT supply, which was fluctuating. Checks showed that the reservoir capacitor C915 (100µF, 160V) was open-circuit. **R.J.E.**

Panasonic TX25MD3 (Euro-2M chassis)

The picture gradually faded away after a few minutes, reappearing when the set was switched off then on again. This was followed by a repeat of the fault symptom. The audio remained OK. A check on the RGB outputs from IC601 showed that they faded away when the fault occurred, though the video input remained constant. All IC supplies were OK. The fault was cured by replacing IC601, which is type VDP3108APPA1. It's not cheap! **R.J.E.**

JMB NO28WSS (PT92 chassis)

The green LED was flashing. Apart from that the set appeared to be dead. The voltages at the secondary side of the power supply were more or less non-existent. When I disconnected the feed to the line output stage and substituted a dummy load the HT and the other outputs from the power supply were correct. The line output transistor (TD02) and transformer both checked OK. I eventually found that DD07 (BY228) was the cause of the trouble. I missed it first time round as I had given it only a forward diode test, which was OK. **R.J.E.**

Panasonic TX25MD1 (Euro-2L chassis)

If the set is dead apart from the green LED lighting for approximately one second every eight or nine seconds, replace IC601 (type VDP3108-29). This IC is no longer available, but there's a replacement kit. It consists of IC type VDP3108APPA1, EPROM type 27CO10-603 that just pushes into the holder, and a 4pF surface-mounted capacitor. **R.J.E.**

Sony KVM2140 (BE2A chassis)

When this set had been on for about an hour the sound would suddenly decrease. There was a drop in picture brightness at the same time. No amount of heating and cooling on the component side of the PCB would instigate the fault, but when transistor Q005 (type DTA143TK) on the print side was frozen the sound and picture immediately returned to normal. In the fault condition the voltage at Q005's collector read 2·5V instead of 11·7V. The transistor read all right out of circuit, but a replacement cured the fault. **M.B.**

Philips 25PT4475 (L9.1E chassis)

I replaced the tuner, at thirty odd pounds, to cure snowy pictures. But when I switched on there was no sound. Maybe the new tuner was faulty? No, because there was no audio via the scart socket either. Then, while leafing through the service manual, I came across a page marked "option bytes". When I entered the service mode – press 0, 6, 2, 5, 9, 6 and menu – I found that option SB was incorrect. As a result the TV thought it was a mono set and ignored the Nicam/audio processing IC. I assume that the faulty tuner had corrupted the NVM. **D.H.**

Sanyo CE32WN4 (EB6-A chassis)

This was typical of the sort of set that frightens me – big, wide and silver! The LED glowed orange, and there was no HT. But the fault turned out to be a quickie. R621 (120kΩ) on the primary side of the power supply was open-circuit. **D.H.**

JVC AV29SX1EK

The picture was excellent but after ten minutes the brightness started to flutter rapidly, with the picture occasionally blanking out altogether. Normal operation was restored when the 16/9 button on the remote-control unit was pressed, though with reduced height of course. A replacement TDA8350Q field output chip cured the fault. **M.McC.**

Amstrad CTV3028

These sets also appear under the **Fidelity** and **Bush** labels. This one worked fine with an off-air signal but there was no picture via the scart input. Video was present at pin 15 of the TDA8361 jungle chip, and the AV switching voltage at pin 16 was correct. A new IC cured the fault. **M.McC.**

Hitachi C28WD2TN

The complaint with this widescreen set was no picture. On test a faint blank raster could be seen with the workshop lights switched off. A picture appeared after a few seconds when the first anode voltage was increased, but it was in blue and green only. Checks on the CRT base panel showed that the voltage at the red cathode was zero, which would normally mean a peak red raster. The tube had an internal fault. **M.McC.**

Sony KVM2101U (BE2A chassis)

If the picture produced by one of these sets has bowed sides with slightly increased width, replace C806 (47nF, 250V) in the EW diode modulator circuit. My thanks to Sony technical for this one. **M.McC.**

Philips 28CL6770/252 (FL1.10 chassis)

Two of these heavyweights came in on the same day with the same symptom, stuck in standby. The cause of the failure with the first set was the usual one: the line output transistor was short-circuit because of dry-joints at the CRT end of the scan-coil plug. The cause of the problem with the second set was less common. R3347 on the plug-in power supply control board had risen in value from 75kΩ to 100kΩ. It's in the set-HT potentiometer network. **D.C.**

Thomson 28WS23U (ICC17 chassis)

This set came in with a now common symptom: at switch on the EHT rustled up then the set shut down. In most cases a replacement line output transformer, with modification kit, cures the fault. A new transformer stopped the shutting down and the EHT was present. The tube's heaters lit up, but there was no sound or raster, while the front LED blinked from green to orange twice then six times. I read this as error code Z6, which didn't provide much help. To cut a very long story short, after chasing down many blind alleys I discovered that CB01 (10nF, 3kV) on the CRT base panel was leaky, so there was little A1 voltage. Sounds easy, but I find fault diagnosis difficult with these sets. **D.C.**

Philips 32PW9523/05M (MG2.1E chassis)

I'm not sure whether you could call this tripping. The set seemed to start up, relays clicked, then the set shut down with LED flashing. The clue was that the voltage across the reservoir capacitor came up then decayed quickly, even before the LED started to flash. Relay 1010 was faulty, conducting only momentarily at switch on. **D.C.** ■

Bench Notes

In Part 3 of his series on PC servicing Adrian Gardiner continues with the BIOS settings

Last month I covered the standard and advanced sections of a typical BIOS program. We continue this time with the second part of the BIOS settings.

Chipset

These settings are specific to the chipset used on the motherboard. Thus most of them should normally be left in their default state. Be sure to note the values of any settings before you change them, to allow for correction later if necessary.

DRAM parity checking: When enabled, this turns on parity checking for the system RAM. It should be enabled if you are using parity checking (or ECC), otherwise disabled. The default is normally disabled, as most modern systems don't use parity memory.
DRAM speed/timing: Where possible set this to 'auto'. When setting it manually, set it to the appropriate timing for the memory fitted in the system. If more than one type of memory is fitted, the speed must be set for the slowest memory in the system.
Memory hole: Some expansion cards require access to particular memory areas in order to function correctly (it's unusual however). This parameter enables you to set aside the appropriate memory area for such cards. Typical memory areas that can be set aside are 512-640KB (the upper 128KB of conventional memory) and 15-16MB. This setting should be disabled unless you have a card that you know requires it.
ISA clock speed: This setting controls the speed of the ISA bus, usually as a fraction of the PCI (PC Interconnection bus) clock speed. The setting to chose is the one that puts the ISA clock speed as close as possible to 8·33MHz, which is the accepted maximum clock speed for the bus. Anything higher than this is considered to be 'overclocking'. 8·33MHz means that the correct option with a 33MHz or 30MHz PCI machine is 'PCICLK/4'. For a 25MHz PCI machine it would be 'PCICLK/3'.
8-bit I/O recovery time: This setting controls the number of clock cycles during which the processor waits after an 8-bit I/O request. The setting that's normally appropriate is 1.
16-bit I/O recovery time: As with the 8-bit setting above, the normal setting for this is 1.

Power management

The various parameters here control the way in which the system handles the power management features. The important thing is to distinguish between settings that determine how power management is controlled, and those (timers) that determine the length of time during which the system is idle before power management becomes active. With modern systems that run Windows 98 or above there's no need to be concerned about timers as Windows controls this itself. All that's required is to set how this takes place.
Global setting: This determines whether power management is enabled, which is the normal setting.
Video power-down mode: Select 'DPMS' if the monitor supports it. This is the preferred and usual default setting: most modern monitors support DPMS. When the 'V/H sync + blank' option is selected the video card cancels its vertical and horizontal sync outputs to the monitor and sends blank data. The 'blank screen' option simply blanks the monitor.
Video power-down timer/hard disc power timer/system standby/system doze: These are timers that are best left for Windows to control. Leave them set at the default values.
IRQ wake-up and activity monitors: These settings determine the items that are monitored in the system sleep mode. When activity is detected the system wakes up. Once again it's best to leave these settings at their default values and let Windows control this feature.

Integrated peripherals

Most of this section of the BIOS is self-explanatory. It simply switches on or off the various controllers on the motherboard.
Floppy controller: Unless the PC doesn't have any floppy drives this is set to 'enabled'.
IDE controller: This slightly more complex parameter allows you to decide whether to enable the primary channel, the secondary channel or both. 'Both' is the appropriate setting for normal set-ups.
Serial 1/2: These are normally set to 'auto'. With your own PC however disabling them will free resources if you don't need the serial ports.
Parallel port (LPT1): This is normally set to 'auto' to enable the printer connection. If it's your own PC and you connect the printer via the USB, disabling this will free resources.
Parallel-port mode: The ideal setting is 'EPP', which gives good bi-directional performance with few compatibility problems. Feel free to experiment with this setting however, to obtain the best performance from your system.
PS2 mouse: Leave this setting enabled.
USB support: Enable this to ensure that the USB ports work.
USB legacy: Enable this only when you use a USB-type keyboard.
Integrated VGA/sound/modem: Set these to enabled when the motherboard has built-in video, sound and/or modem cards, to ensure that they work. Disable them if you intend to fit your own cards to provide these features.

IDE device set-up

As mentioned in the section on standard settings last month, the IDE (integrated drive electronics) parameters should be set to 'auto'. The BIOS then checks for devices connected to the IDE buses each time it starts. Thus this section of the BIOS is not really needed! In a nutshell, it searches for IDE devices then enters the details of what it finds in the 'standard settings' section.

Security settings

This section enables you to specify a password to protect either the BIOS (user) or the entire computer (supervisor). If you decide to use a password, be careful not to forget it! Clearing a password requires removal of the system's battery for several hours, and in doing so clears all the BIOS settings! As most BIOS passwords require a fixed six digits, it's probably better not to use them and employ some other form of security software instead.

To follow

That's nearly it for the BIOS. Next month we'll conclude this section then move to the next software layer, the operating system. ■

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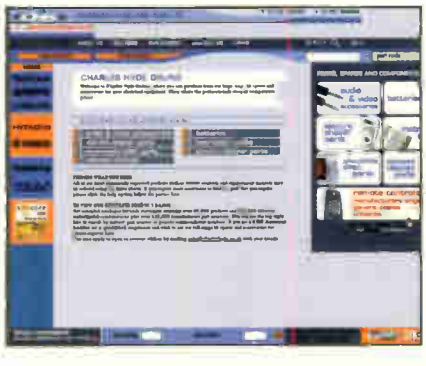

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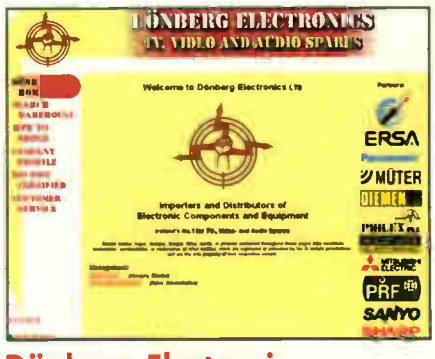

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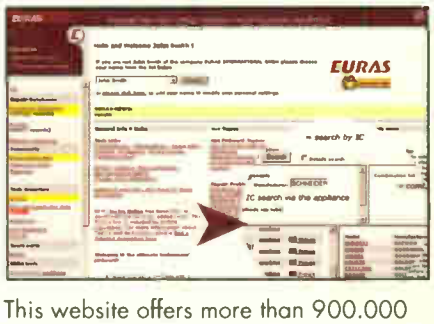

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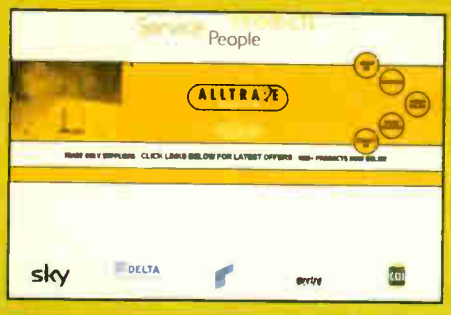

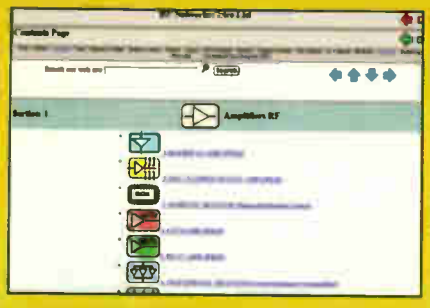

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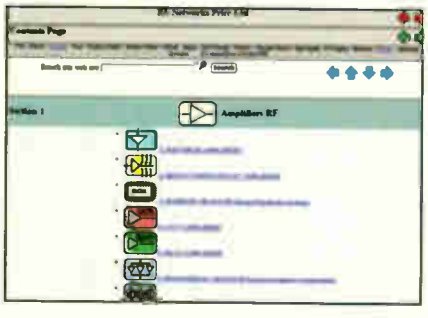

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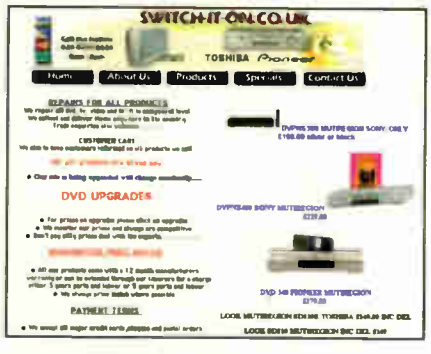

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AUDIO FAULTS

Reports from
Chris Bowers
Geoff Darby
Eugene Trundle
and
Roger Burchett

We welcome fault reports from readers – payment for each fault is made after publication. See page 428 for details of where and how to send reports.

Sony HCD-H4900

When this unit was powered up and the CD eject button was pressed it would only open the drawer and not close it. The cause of the problem was traced to failure of the loading-motor driver chip IC203, which resulted in excessive power consumption. A quick IC replacement cured the fault. **C.B.**

Sony HCD-MD373

There was no audio from the AM/FM tuner in this unit. When it was in the tuner mode there was only a slight clicking sound as the volume control was turned. Voltage checks at the tuner block connector (CN105) on the main board showed that the 12V and 5V supplies were present and correct. An oscilloscope check at the tuner output pin at CN105 then showed that there was no output. A replacement tuner block, circuit reference 57, part no. 1-693-473-41, restored normal operation. **C.B.**

Sony HCD-CP33

The display had no backlight. When I carried out meter checks at the LCD display board I found that the two LED strips were open-circuit. According to Sony Technical they can become open-circuit because of thermal expansion of the epoxy. They need to be replaced with four single LEDs, D601-4. At the same time you have to change the value of the two surface-mounted resistors R372 and R373 on the main board from 82Ω to 120Ω. Once this had been done the display was fine. **C.B.**

Sony CDP-CX235

This is a 200-disc carousel CD player. The complaint was no mechanical operation after being moved by the customer. A close look inside the unit revealed the cause of the trouble: several discs had been knocked out of the carousel holder with the result that the CD mechanism has locked up. Removal of the jammed discs restored normal operation. **C.B.**

Sony TC-TX313CEK

This unit would switch itself off after a short while. Checks on the low-voltage board, using a voltmeter and a can of freezer, revealed that IC06 appeared to be faulty (overheating). I was told by Sony Technical that the replacement should be type NJM78M05FA, part no. 8-759-701-56. The new regulator stopped the switching off. **C.B.**

Sony HCD-G1

This unit's display didn't light up and the radio just made a loud buzzing sound. I found that the protection resistor R389 had gone high in value – the reading was in the kilohms instead of low-ohms range. A replacement restored the display and stopped the loud buzz from the radio. **C.B.**

Sony MZ-R35

The door of this personal MiniDisc unit wouldn't open, though the release button felt normal in operation. According to the fault card the unit had been dropped. There were no signs of external damage however. What had gone wrong was apparent once the bottom cover had been removed and the door catch had been released.

The door-catch mechanism consists of two plates. The outer one engages with the 'open' button on the case while the inner one has the actual door catch attached to it. Clearly the two plates have to be linked for the button to move the catch. This link is provided by a metal tab that's attached to a plate on the over-write head motor drive. The idea is to prevent the door being opened whilst recording, as this would prevent the TOC being rewritten to reflect the recording that had taken place and would also leave the over-write head down, in a vulnerable position.

The metal tab had become bent and had disengaged from its hole in the chassis, through which it passes to link the two plates. The problem was easily corrected by winding the mechanism manually until the tab withdrew, then bending it back straight so that it would pass back through its hole. A full function test, including a recording, proved that there were no other problems. **G.D.**

Kenwood RXD-3L

The customer had said that this unit wouldn't play CDs. There were two discs in it, and they certainly wouldn't play, but this was because the unit didn't come out of standby properly. The unit would come out of standby when the power button was pressed, but relays then clicked and the display went back to being a line of flashing horizontal bars.

The manual doesn't mention this condition. I suspected that some sort of protection mode was in operation, so I phoned Kenwood Technical for confirmation. The chap I spoke to said he didn't know about such a condition, but felt that I was probably right and that the most likely cause was defective output transistors. Hmmm.

I decided to tackle the problem from a different angle. The easiest way to get at the main PCB is to turn the unit upside down and remove the bottom tray, complete with the mains transformer. The mains lead can be released from its clamp to facilitate this, while the transformer's output cables are long enough for it to be placed to one side. The output transistors and the entire underside of the main PCB

are then accessible.

Checks on the output transistors showed that they were OK, and both output stage supply voltages were present and about equal during the brief period before the unit shut down. The mid-point voltage in both channels was fully negative however, so this was the cause of the shutdown.

It's very difficult to trace the cause of a fault like this – unless you can force the unit to remain on so that voltage checks can be carried out. When I looked at the print layout in the manual I spotted a link marked 'protect'. This led off towards the front panel, where the microcontroller chip lives. The unit remained on when this link was disconnected, and within about thirty seconds there was a smell of something getting hot. This turned out to be the –12V regulator transistor Q27 and its feed resistor R271. Cold checks around this transistor showed that there was a short to chassis at its emitter. The most likely culprit appeared to be C142 (220µF, 35V), which was indeed the cause. A replacement restored normal operation, so the protect line link could be refitted. **G.D.**

Sony HCD-BX3

I sometimes think that manufacturers go out of their way to make life difficult for owners and, indeed, service engineers. This unit had been in twice before with the complaint "not reading discs". On neither occasion had I been able to fault it. As the unit was back yet again with the same reported problem, I decided that I had to get to the bottom of it.

Step one was to quiz the customer. This revealed that 'not reading discs' was a rather imprecise description of the problem. The true situation was that the unit would play only disc one of the three-disc carousel. Now I had, on the previous occasions, checked that the unit played discs in all three carousel positions but had done this using the 'direct-play' buttons.

What was actually happening was that at the end of play of disc one the unit didn't automatically move on to play disc two. The cause was found to be the play mode to which the unit had been set. The owner had inadvertently changed this to 'continue one disc'. For the unit to play all three discs in sequence automatically, the play mode has to be set to 'continue all discs'. Other settings for this feature are 'shuffle all discs', 'shuffle one disc' and 'program'. The setting is selected by repeated pressing of the play-mode button. **G.D.**

Sony STR-DE475

The complaint with this tuner/amplifier was "all power being directed to the right-hand speaker". The problem was to do with the electronic volume control: while the left channel's output increased smoothly from zero, the right channel's output never reached zero and, when the setting of the volume control was advanced, this output increased in steps that sounded like four times that from the left channel.

Now I'm a great believer in 'Beer's Maxim' – the one propounded by Nick Beer, that "the likelihood of an IC being faulty falls in direct proportion to the number of pins it has". In this unit however all volume control action takes place in the audio processor chip IC201, which is an 80-pin flatpack device. There seemed little else that could be the cause of the fault, and a replacement cured the trouble. The exception that proves the rule! **G.D.**

Sony HCD-XB200

The antics of some customers never cease to amaze me. The reported fault with this unit was "customer put compost in CD drawer"!! In addition, it was being claimed as an internal warranty on a laser replacement that had been carried out three months before. I wonder how such a customer would get on if he bumped his car then took it to the garage and asked for it to be repaired free of charge because the engine had been serviced three months ago?

When I got down to the job not only was the CD carousel full of compost, there was also a great chunk of magnet in the works – it looked as if it had come from a large loudspeaker. The complete carousel drive had to be dismantled, and the compost painstakingly removed from the gear teeth and slide tracks with a toothbrush and cotton buds. The laser sled drive had to be treated similarly. Eventually, when everything had been cleaned and regreased, the unit was reassembled – and worked correctly. **G.D.**

Technics SA-CH550

This power amplifier, part of a 'separates' group, didn't produce a sound, though the internal cooling fan would rotate at high volume-control settings. All the voltages around the SVI3101D output amplifier chip IC501 were correct, it had L/R inputs, and the protection circuit wasn't in operation. The IC itself was the cause of the fault. Panasonic was able to provide a replacement at the best price. **E.T.**

Aiwa DX990

This CD player belonged to the RX990K ensemble. The trouble was with its disc-loading tray, which sometimes failed to emerge or retract on demand. A replacement tray-drive belt seemed to solve the problem, but the job bounced. The pulley was cracked, and as a result the motor shaft sometimes slipped under load. **E.T.**

Sony STR-DB830

The local Sony dealer had taken on this surround-sound amplifier but had failed to solve the problem. Occasionally when the unit was put in standby one or more of the source-indicator LEDs remained on and the mains relay wouldn't drop out. The unit would have to be disconnected from the mains supply then reconnected before it would work normally. There was no pattern to the fault. On some days the amplifier would go into and out of standby every time, but on another day it would play up on every third or fourth attempt to go to standby. Very occasionally, just to add spice, the amplifier would 'lock up' after working normally for some time. Then nothing could be changed. The source would stay on CD for example (though the display would change), and the speakers couldn't be turned off.

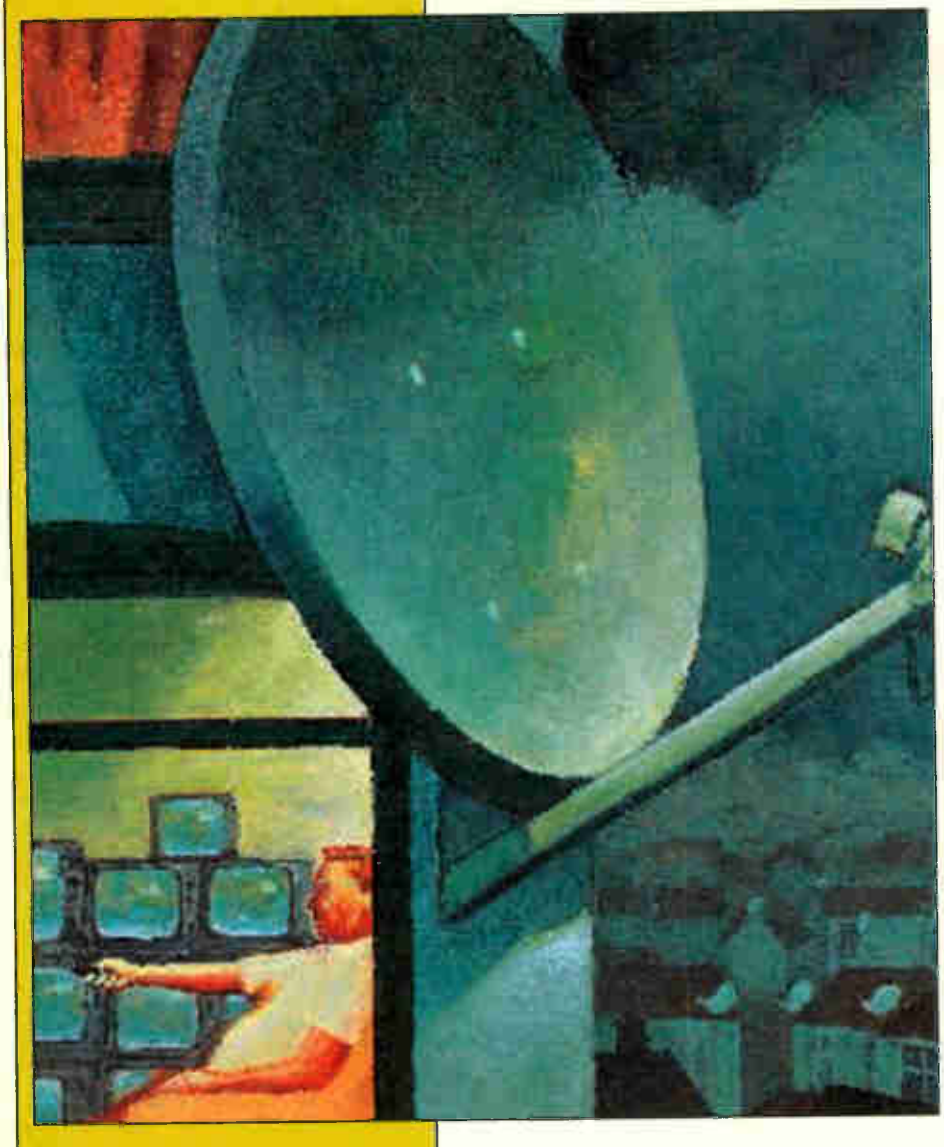
Microcontroller trouble I hear you say. Well, almost. There are four regulators on the top, 'digital' board. This board has print tracks on both sides, with plated-through holes. The 5V regulators IC1201 and IC1205 looked distinctly dry-jointed, but the culprit was IC1204 (BA05T) which was virtually short-circuit input-to-output, putting nearly 8V on the supply to the front control board. **R.B.**

Sony HCD-EX1

The complaint with this CD player/tuner/amplifier was that it would work for about twenty minutes after which the sound would be lost, though all functions remained OK. When I tried it the sound had disappeared permanently. I checked the LM1876FT power amplifier chip IC801 first. This was working, but the headphone amplifier IC501 didn't seem to be working though the socket was OK and the relay could be heard switching the power amplifier on and off.

Checks on the supplies to the main board showed that the –7·5V supply was missing. It's used by the headphone amplifier and the audio preamplifier chip IC111. When I stripped the unit down I found a bent-over pin in the socket on the power board, the one that connects it to the regulator board.

When I reassembled the unit there was a flashing clock display and nothing else – not even remote control of the clock setting. I had fitted the ribbon cable from the front panel to the main board the way is appeared to lay, which was wrong. Fortunately no harm had been done. **R.B.**■



SATELLITE NOTEBOOK

Reports from Michael Dranfield Christopher Holland and Hugh Cocks

Grundig GDS200 series

Here are a few general notes on repairing the power supply in these digiboxes. Dry-joints are beginning to show up at the mains input connector. Although this has not caused me any obvious problems to date, it's good practice to attend to them. When the power supply is tripping, check zener diodes ZD2 (24V, 1W) and ZD1 (30V, 1W). If either of these is short-circuit, resolder the connections to the TL131C adjustable voltage reference chip U3. Invisible dry-joints have been found here, also around the optocoupler. Dry-joints around U3 can destroy the UC3842 chopper-control chip. **M.D.**

Photo 1: CCTV 9 (China) is available via Eurobird transponder D11S.

Photo 2: A non-scrambled BFBS 1 transmission via NSS-7.

Panasonic TU-DSB30

This digibox came in the post for repair. Everything worked apart from the fact that there was no voltage at the RF2 output, though the menu said it was on. Now Panasonic doesn't supply manuals or spare parts, so its digiboxes are always a challenge to repair. By tracing the print tracks and taking voltage measurements in a working box, I found that the source of the missing voltage is pin 1 of a surface-mounted chip, IC506. It appeared to have a house-code marking, but by skill or good luck, call it what you will, I was able to establish that the device is an LP2951 adjustable-voltage regulator, and now have it in stock. A replacement cured the fault.

The relevant circuitry is shown in Fig. 1. It's very simple. Current limiting is set at 100mA within the chip itself. Pin 3 is toggled low or high respectively to switch the output at pin 1 on or off. **M.D.**

Grundig GDS200

This digibox was dead with no standby LED illumination. Scope checks on the supply lines showed that the smoothing capacitors were dud. After replacing the electrolytics the lines were ripple-free but the box remained as dead as before, again with no standby LED illumination. The LNB was being powered, and the tuner produced Q and I outputs, so the ST40 microcontroller chip was probably

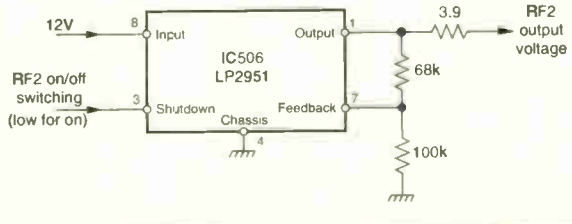


Fig. 1: The RF2 output voltage source in the Panasonic TU-DSB30 digibox.

Photo 3: AIT (Africa Independent Television) via Intelsat 901 at 18·5°W.

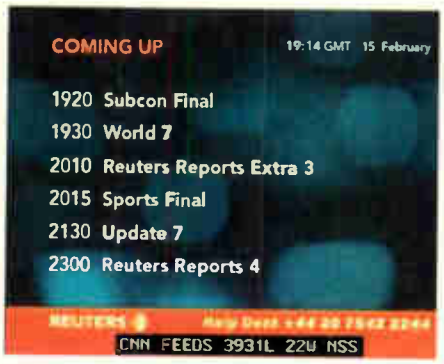


Photo 5: A CNN feed (Reuters) via NSS-7 at 22°W.

Photo 6: CRTV Cameroon via NSS-7.

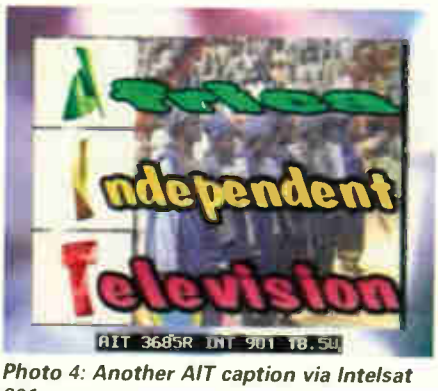


Photo 4: Another AIT caption via Intelsat 901.

working. There was no output from the scart or RF socket however.

There was an H sync signal at pin 1 of U35 but no digital luminance signals at pins 2-9. In view of this I decided that the box was partially functioning and that the problem lay around the front-panel microcontroller chip, which is a pre-programmed Amtel AT87F52. Scope checks at pins 20 and 21 showed that the 11·059MHz clock was not running. A new crystal, X2, solved the problem.

I suspect that the dealer from whom I bought the box had replaced the power supply with a faulty one, as the two faults are unrelated. **M.D.**

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.

Dog-racing channel Go Barking Mad (EPG no. 414) has been renamed Red Button Races. Channel Health (no. 193) and Purple Radio (no. 912) have ceased transmissions. After leaving Eurobird transponder D9S in early February, as reported last month, Radio Caroline

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

Channel and EPG no.	*Sat*	*TP*	*Frequency GHz/pol*
Bravo + 1 (125)	2A	13	11·954/H
CCTV 9 China (534)	EB	D11S	11·662/H
Factory Outlet TV	2B	30	12·285/V
Going Places TV (669)	2D	55	10·921/H
My Travel TV	2D	55	10·921/H
Radio Caroline tests	EB	D7S	11·588/H
Sky Travel Shop (668)	2B	31	12·303/H

TP = transponder. 2A, 2B, 2D = Astra 2A/B/D. EB = Eurobird.

Table 2: Transmissions available via NSS-7 C-band capacity (22°W)

Frequency GHz/pol	*SR/FEC*	*Services*
3·650/RHCP	27,500 3/4	Canal + Horizons*, CFI TV, TV5 Africa, MCM Africa*, Mangas*, RTL9*, Euronews*, Planete France*, Festival* and Tiji*. Plus radio stations Africa No. 1 and RFI Africa
3·660/LHCP	28,135 3/4	Orbicom
3·756/RHCP	27,500 3/4	CFI*, TV5 Asia*, CFI Africa Pro*, France 2 Africa*, France 5*, ARTE*, also colour bars. Plus Radio Notre Dame
3·931/LHCP	25,000 3/4	CNN Europe, CNN feeds (see Photo 5), CNN Newsource feeds*, CNN Asia*. Plus CNN Radio
4·055/RHCP	27,500 7/8	TVE Internacional, CRTV Cameroon (see Photo 6), Saudi TV Ch. 1 (see Photo 7), Jamahirya Satellite TV, TV Congo (see Photo 8), MTA International, Al Manar TV and Equida TV*. Plus Spanish-language radio stations RNE 1 and RNE Exterior, and Arab-language Radio Camaroon, Radio Congo and Radio Japan
4·125/LHCP	3,680 2/3	AFRTS Atlantic*, AFRTS News* and AFRTS Sports*. Plus radio stations Hero*, NPR* and Z Rock*
4·150/LHCP	8,000 1/2	BFBS 1. Plus radio stations BFBS 2, BFBS Atlantic, BFBS Middle East, BFBS Belize/Falklands and BFBS Cyprus.

* Scrambled.

Photo 7: Saudi TV Channel 1 via NSS-7.

Photo 8: TV Congo via NSS-7.

appeared at transponder D7S (there was a break of about two weeks). Photo 1 shows the Chinese CCTV 9 logo. **C.H.**

C-band reception

NSS-7 at 22°W has C-band capacity in addition to its better-known Ku-band outputs. Most of the transmissions are intended for Africa, and all use 625 lines. Table 2 lists the C-band transmissions currently available.

The British Armed Forces channel BFBS TV is scrambled for most of the time, but BFBS Text is available whether or not scrambling is used for the main transmission. It's a mixture of BBC Ceefax and information from BFBS. All BFBS radio stations are transmitted without scrambling – some have even started short-wave transmissions again after many years. Sometimes the main BFBS TV signal's scrambling is turned off, enabling the station to be viewed (see photo 2).

The nearby neighbour to NSS-7 is Intelsat 901 at 18·5°W. This satellite doesn't transmit many TV signals but is home to the Nigeria-based AIT (Africa Independent TV) at 3·685GHz with right-hand circular polarisation (RHCP), see Photos 3 and 4. The symbol rate is a low 4,340, with 3/4 forward error correction. Radio station Ray Power FM is transmitted with the TV station as a 256kbits/sec stereo audio stream. It's a local radio station that's available in Lagos at 106·5MHz and often relays BBC World Service radio. **H.C.** ■

Answer to Test Case 485

– page 423–

Sage doesn't often get 'second-hand' repair jobs, and no one in the Test Case workshop practises what might be called random twiddling. So he was perhaps a little naïve in not suspecting at the outset that this problem could have been a made-made one. In fact he found that the PCB-mounted head switching-point control RT601 had been mis-set, to the point where the head changeover took place during and after the field sync and blanking periods in the off-tape video waveform.

It's likely that the original problem had been to do with the low tape running tension, and the need for a good clean and service. But once the head switching point had been set to destroy the field sync pulse and the first few lines of the picture no amount of mechanical tweaking could put matters right.

With the potentiometer adjusted correctly and the mechanical guide alignment set properly, playback from the Hitachi machine was good and steady regardless of the origin of the recording – except, of course, for those recordings made just before the machine had been taken to the rival workshop. Twenty-Twenty Vision is now on the blacklist as far as Sage is concerned, along with those ladder-louts Wild West and Stick-em-Up Aerials.

NEXT MONTH IN TELEVISION

Test report: The ChipQuick SMD removal kit
Component removal problems are getting worse with the increased use of surface-mounted chips, some of which may have a hundred or so pins that may be arranged in ball-gate array form. You may find it necessary to replace such a device simply to confirm a diagnosis, let alone complete a repair. It's a formidable task but, as Steve Beeching has discovered, there's a solution – the ChipQuick kit. Steve explains how it works and how to use it.

The Panasonic Euro-4H chassis
The 4H is an upgraded version of the Euro-4 chassis, with an added PCB that takes over from the previous video processor/RGB processor/timebase generator chip to provide extra features. Brian Storm describes the changes and what they involve.

All about low-drop linear regulators
Low-drop regulators differ from conventional linear voltage regulators and have critical output capacitor requirements. Failure in this area can result in oscillation, with very confusing fault symptoms. Ray Porter describes this type of device, its operation and the points to note when carrying out repairs.

Latest technology from Sony
Every year Sony hosts a major European event in Berlin, where new products are unveiled and advances in CE technology are outlined. George Cole reports.

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WHAT A LIFE!

Some emails prompt Donald Bullock's reflections this month. On oddballs, radio and TV receivers in the early days, projection TV sets and the present lamentable state of broadcasting

Shortly after last month's issue came out I received an email from David Blount replying to the question I had asked – do I get all the oddballs, or only my fair share? David is in no doubt. "Rest assured" he says, "we all get our share!"

His experience convinces him that they come in well-spaced waves. If this is so, are my waves more closely spaced than those of others?! Compressed into shorter wavelengths, so to speak. He went on to mention two recent examples.

The first nutter had bought a multimeter from the local DIY store. He didn't know how it worked, and had no use for it. He'd bought it simply because it seemed cheap at £4.99. In due course he turned up at the shop and "asked me how to mend television sets with it".

The other one showed up with an old Sony reel-to-reel audio recorder. Since it used tape, he reasoned, and VCRs use tape, "could I convert it to work as a video recorder? I'm not sure how many ways there are to say 'no', but I think I had to use them all!"

Early days

I've had a number of welcome emails recently (if you want to get in touch, the address is donald@bullock-bros.com). David Else refers to my mention, in the January issue, of the development of airborne radar in the UK in 1940. I had mentioned two servicemen colleagues, John Cunningham and Jimmy Rawnsley, who had been given the task of airborne testing with the original prototype. David tells me he knew them both well.

Jimmy Rawnsley had worked with David's father as an electrical engineer at the Hendon Power Company. During the war, when the Elses' family home had been flattened by German bombs, they moved into Jimmy's former flat.

"Rawnsley and Cunningham often stayed there with us when they came to London" he writes, "and at an early age I knew about the radar connection."

David's father was a radio enthusiast in the earliest days, and had a licence to experiment with receiving aerials – presumably a mandatory requirement at that stage. David himself obviously caught the bug, and went on to become an exceptionally keen and productive TV amateur.

"I can recall my father's old plug-in coils, chokes, condensers (not capacitors then!) and valves" he writes. "I used them to learn about wireless. We had been among the few who had a TV set before the war. It was a combined multi-band radio and television receiver which we used after the war as well, when TV transmissions restarted in 1948. We could see the Alexandra Palace transmission aerials from the roof of the flats. When my family eventually replaced the set with a then modern Philips rear-projection model there were problems with too much signal.

During the Fifties, he continues, many shops were selling government surplus electronics components and equipment. Several of them advertised in this magazine, which was then known as *Practical Television*. David built the first of his two home-made TV sets following constructional details published in the magazine. Its display was provided by a surplus radar tube with a green screen. This was so successful that he subsequently built another one. They have been kept in regular use up to the present time, with modification and updating from time to time as necessary. The last such modification was the addition of a Sony teletext panel to one of them. "They both remain in use", David adds, "one having clocked up 18,300 hours of operation, and have proved to be remarkably trouble-free".

David mentions a letter he sent me in February 2001 supporting my complaint, in an article at that time, about the decline in the standards of our radio and TV programmes and their presentation. In his latest communication he notes that the situation has become worse. "For me Radio 2 is a no-listening zone after ten – I listen to Classical FM instead" he concludes.

Projection TV

David's reference to the old rear-projection TV sets brought back the misery and hopelessness they caused me all those years ago. The idea was to get round the size limitation with the direct-view CRTs of the period. Instead, the source of the display was a 2·5in. tube, the Mullard MW6-2, which was operated at the incredibly high (for those days) EHT of 25kV. It produced a very bright picture that was magnified (in size, not brightness) and passed via mirrors and a correcting lens to provide the

display on a translucent glass screen. To my eyes the pictures always looked a sorry mess.

The sets were heavy and cumbersome, and the brilliant picture produced by the valve-sized CRT could make your eyes useless for an hour or so should you fleetingly glance at it. Because of the high EHT the early sets could also be lethal. If the optical system was disturbed, even slightly, it was very difficult to realign it to get a correctly positioned and focused picture. There could be problems even if the optics hadn't been disturbed. In the very earliest sets there was no CRT protection, so failure of either the field or the line timebase would instantly burn a line on the phosphor screen, destroying the tube. A separate unit with a blocking oscillator and a line-type output stage that fed a voltage tripler (three EY51 valves) was used to generate the EHT. Protection was incorporated in later sets. Diodes were used to rectify the outputs from the field and line output stages, providing a bias for the CRT and, sometimes, the video output pentode.

The sets weren't cheap. In fact they were absurdly expensive. They were also very troublesome, and the pictures they produced were terrible. I never knew anyone who would mess with them for choice.

Early radio sets

David's reference to the old plug-in, basketwork coils and the other components that were available for those who built their own sets in the early days of radio took me back to my boyhood. When I was a boy I made a variety of crystal sets and amassed an assortment of these coils, of different sizes and inductances, most of them tuned to receive a particular group of transmissions. They were fitted with a two-pin plug that was inserted in a socket at the front-end of the crystal and valve sets we used to make.

Money was tight when I was young. I used to scour the tables of junk outside the local second-hand shops in my area in search of old hand-built wireless sets, some of the crystal type, which I would find in various states of disrepair. They were often in heavy, hand-made and hand-polished cabinets. These were often a bit bigger than a shoe box, with a lift-up lid supported by a long brass hinge.

The receivers didn't have a chassis, and the components weren't soldered together. Many of them, particularly the condensers, had two screw-holes and would be secured at the bottom of the box by means of small woodscrews. Connections between the components consisted of lengths of carefully cut and angled heavy copper wire. This was often square, not round. Most of the components had tall, carefully turned and knurled brass nuts that securely clamped the wire to the embedded brass bolts. The condensers were of dull black Vulcanite, each about the size and shape of a domino. Their undersides, which consisted of hard yellow-brown resin, were stamped with the value. No one bothered about miniaturisation then – it was a sensible world!

Does any reader recall these products of a bygone age? How many have actually seen a cat's whisker or know exactly what it consists of? I'd like to hear from you – via this modern email system!

The programmes

I agree wholeheartedly with David's comments on the ever-increasing decline in radio and television programme standards. Even when a programme is worth listening to, or watching, the insane presentation often makes you reach for the switch.

There was a time when the BBC, at least, trained announcers to speak well and clearly. With a few notable exceptions, this no longer applies. Many are now just gabbling machines, with hard voices and brazen attitudes. And those who do pass muster on these counts have to compete with pumping, pulsating synthetic noises and drumming sounds that drown them out. This nonsense was started by the commercial broadcasters, with the aim of capturing the attention of viewers so that they would stay tuned in. It was then copied by the BBC. The din even accompanies, and half-obliterates, the opening TV news headlines!

This is not the full extent of the rot. When in Spain I sometimes switch to Sky News because I find much of its reporting crisper than that of the BBC News 24 channel. When I can no longer stand the offensive and frequent adverts, I switch back to the BBC. But what do I find? Similar horrible adverts – for the BBC's forthcoming programmes, for the programme by-products available, or for anything else the Corporation can think of, all with the accompanying pulsing, pounding noises and flashing, zooming vision sequences developed by the commercial broadcasters. And this doesn't end until the latter have ended *their* racket.

As to the programme material, the problems are repetition and similar material being broadcast on most channels at the same time. Suppose, like some of us, you don't want to watch football. Switch channels and what do you get from the 'competition'? More football in all likelihood, with similar noises and the frenetic 'commentary' telling you what you can perfectly well see is happening.

The trouble is that the broadcasters all seem to be petrified at the thought of losing their share of the 'ratings figures'. So they cut their standards, filling the hours with pap that they hope won't offend anyone. There are supposed to be supervisory authorities to ensure that we get variety and some decent programming. They seem to be ineffectual.

It's all such a pity. Broadcasting doesn't have to consist of endless trash.

Back to earth

Back to the subject of oddballs. As I was reading these emails last Sunday afternoon there was a frantic knocking on the front door. When I opened it I was confronted with a huge, scruffy fellow who looked as if he lived in the woods on nothing but rough cider. He started his spiel with the usual words used by Sunday afternoon knockers-up.

"Sorry to bother you on a Sunday afternoon, like, only our telly went pop just as we was settling down to our dinner."

I looked at him hard. "I don't often do calls, and never on Sunday afternoons" I said. But he went on as though I'd said nothing.

"The missus tried callin' at Mr Snoddy's 'ouse up Toff's Hill, 'cos we allus calls Mr Snoddy. But 'e musta been on the larrup last night 'cos 'e was a bit funny like. When 'er asked 'm to come and mend the telly quick, 'e called her some terrible names. Yeah!"

"Anyway I 'spex it's a valve, or the transformer. Give us a valve now and I'll get the missus to try 'im first. If that don't do, you can 'av 'im back an' I'll take a transformer to try. Don't mind 'aving a go like, 'cos you'd charge for a Sunday call, wouldn't you?"

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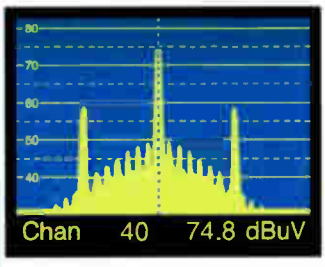

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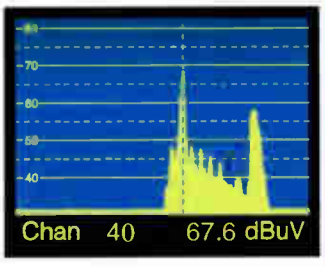

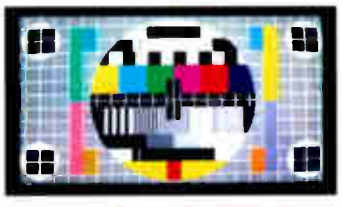

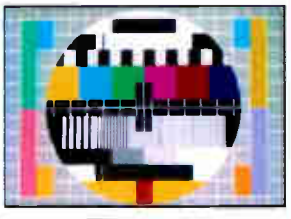

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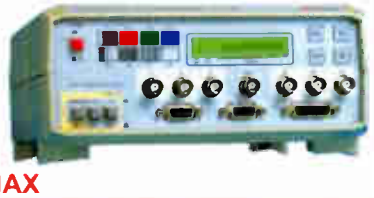

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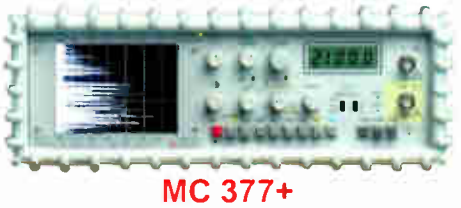

MC 377+

Analogue & Digital, Satellite & Terrestrial
Measures channel power and C/N

PROLINK 3 + 4 SERIES

Satellite & Terrestrial, Analogue & Digital,
Spectrum Analyser with BER (optional on P3)

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