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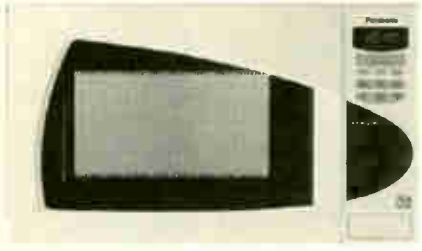

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Freeview's good start

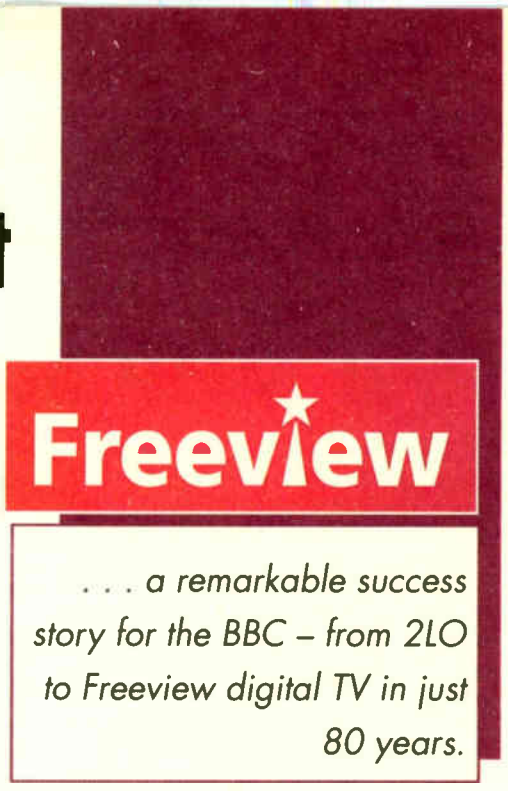
Reports from digital TV adaptor manufacturers and the trade suggest that the BBC-led digital terrestrial TV service Freeview has got off to a successful start. The set-top boxes are apparently being sold as fast as they can be produced. It looks as if the Freeview approach to providing a DTT service will catch on with the public in a way that ITV Digital signally failed to do. Satellite TV as something rather different could get away with charges and subscriptions, but terrestrial TV viewers don't seem happy with this approach – especially when what's on offer is inferior. With Freeview however there's a straightforward proposition that the public can understand and is clearly willing to accept. Paying for your own digital adaptor is no great deterrent provided the price is reasonable. About £100 is not over the top, and you get the box to own and use with no strings attached. In short the Freeview approach seems right and the cost, just a single one-off purchase (unless you need an aerial upgrade), is also right.

It could be that the failure and protracted death of ITV Digital means there is a pent-up demand for DTT waiting to be satisfied. Be that as it may, once the Freeview roller coaster gets under way it's unlikely to come to an abrupt halt. We can expect it to accelerate for a while on the 'success breeds success' principle.

The interesting question is how the eventual balance between satellite, terrestrial and cable TV will work out. Cable looks to be a dead duck at present. The providers are virtually bankrupt, having had to borrow huge sums to provide the infrastructure while little cash came in. Promotion is in consequence at a halt. Satellite sails on merrily, and is technically the logical way to provide TV services. The terrestrial approach appeals to tradition, the way we've always done things, but now upgraded with extras. It is clearly the way in which a substantial proportion of the populace want to get their TV, and now it's working.

A number of digital TV adaptors are available, from Pace, Grundig, Daewoo, Nokia, Panasonic and no doubt others by the time you read this. The price benchmark is about £99. Pace, Daewoo and Grundig have adaptors at this level. If the adaptors are "flying out of the door" (Nokia), price competition is not going to be a significant factor just yet. But chip and software developments are making it possible to produce cheaper and cheaper STBs. It seems that adaptors are readily available at about £65 in Germany. The outcome is likely to be that manufacturers won't be in for a bonanza but retailers, who can concentrate on maximising throughput, should do well. Just consider: we already have a great sales success with DVD, it has been suggested that digital adaptors will outsell DVD players within months, IDTV sets are going to be in increasing demand, and sales figures show that UK consumers are now taking to widescreen sets in a big way. The immediate future for the consumer electronics retail trade looks good.

Freeview started on October 30th. Those of us with an historical bent might have preferred the BBC to have delayed the start for a couple of weeks, till November 14th. Why? Well, it would have been a nice celebration of the start of BBC (then the British Broadcasting Company) broadcasting on that date in 1922, from the famous 2LO transmitter at Marconi House, London. Not quite so well known is the fact that the BBC's 2ZY transmitter in Manchester and 5IT transmitter in Birmingham started up the following day. The original 2LO transmitter was just a few weeks ago donated to the Science Museum. It's been a remarkable success story for the BBC: from 2LO to Freeview digital TV in just 80 years.



. . . a remarkable success story for the BBC – from 2LO to Freeview digital TV in just 80 years.

The major question that remains is the analogue TV switch-off date. The government hopes for 2010, but industry watchers are sceptical about this. There's a tricky chicken-and-egg type problem here: digital transmitter outputs can't be increased significantly while an analogue service still has to be provided, while analogue can't be closed down until the digital coverage is roughly equivalent. At some stage it might yet be necessary to provide subsidised or free adaptors. Maybe I'll wait: I might get a free aerial as well!

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TELETOPICS

First MHP licence

Panasonic has become the first company to be given permission to use the MHP (Multimedia Home Platform) logo by the Digital Video Broadcasting (DVB) project, a consortium of more than three hundred manufacturers, broadcasters, infrastructure providers and other organisations from more than forty countries. DVB is the European digital TV standard, with variants covering satellite, terrestrial and cable transmission. MHP has been developed as an open interactive TV system which provides a common API (Application Program Interface) that's completely independent of the hardware with which it is being used. The logo guarantees that the decoder meets the specification for interactive TV and especially the requirements for MHP applications.

The first product to use the logo, the TU-MSF100 universal decoder, went on sale in Germany last November. Panasonic is working with German and international broadcasters and applications producers to develop the MHP market.

Nokia and Matsushita (Panasonic) have agreed to carry out joint development of technology that will enable consumer equipment such as TV sets and VCRs, also domestic appliances, to be controlled via a mobile phone. Matsushita licenses Nokia's Series 60 software for its Panasonic-brand handsets. The deal is one of the first concrete moves towards the development of a networked society.

Satellite news

Hot Bird 7 was launched by Arianespace in late November to be co-located with the other Hot Bird satellites at 13° E. It provides full coverage of Europe, North Africa and the Middle East. The Hot Bird satellites transmit over 650 TV and almost 500 radio channels to an estimated 96m homes with satellite or cable reception facilities. Two months earlier Eutelsat launched Hot Bird 6, which increased the number of Hot Bird transponders to 102. Hot Bird 7 is replacing Hot Bird 3. A seamless transfer of broadcasters from Hot Bird 3 to Hot Bird 7 is in progress, the frequency allocations remaining the same. Hot Bird 3 is to be relocated to another orbital position. Hot Bird 7 provides powerful widebeam coverage plus two spot beams for spare capacity, each with ten transponders.

Astra 1K, launched at Baikonur, Kazakhstan on November 26, was lost when it failed to reach orbit. It was the largest communications satellite ever built, weighing 5·78 tonnes, and had been intended as a replacement for three other Astra satellites, transmitting TV and radio channels and providing mobile telephone and internet connections. The cause of the loss was the rocket boost unit, which failed to accelerate and take the satellite from its preliminary to its final orbit. Astra is to reassess its requirements – the present fleet of thirteen satellites has a surplus capacity of about twenty per cent.

Latest TV indexes

The *2003 Television Index and Directory* is now available on CD-ROM at £199. It covers fifteen years of *Television* magazine issues, from 1988-2002, with the text of some 15,000 fault reports on TV sets, VCRs, camcorders, DVD players, monitors, audio equipment and satellite receivers/decoders in full, searchable by make and model; the text of over 200 servicing articles; a spares guide; a directory of trade and professional organisations; a TV transmitter list; an international TV standards guide; a satellite TV channel finder; and a compendium of internet resources for service engineers. A full upgrade for those with previous index CD-ROMs is available at £46.

A *Television* index only, covering 1988-2002, is available at £36, or an upgrade costs £16.

These and other services are available from SoftCopy Limited, 1 Vineries Close, Cheltenham GL53 0NU. Call 01242 241 455 or email sales@softcopy.co.uk

For further information see page 187.

LCOS rear-projection TV

The LCOS (Liquid Crystal on Silicon) projection TV system, devised by Thomson with several partners, was first seen at the 2001 Las Vegas Consumer Electronics Show, where it impressed many visitors. The set being demonstrated there carried the RCA brand name. More recently, at the autumn Taitronics exhibition held in Taipei, Taiwan's second-largest TV manufacturer, Kolin, exhibited a 50in., 16:9 aspect-ratio set that uses this advanced rear-projection technology. The pictures displayed were clear with excellent colour and a brightness level to 775 nits. Cabinet depth front-to-back is only 43cm – Kolin hopes to reduce this to 35cm shortly.

The system uses a prism to produce, from a very pure light source, three RGB light beams. These are modulated by the LCOS light imagers with high-definition video signals. The three laser-like, modulated light beams are then combined, magnified and deflected to produce the screen display, the result being a picture with perfect alignment. Sophisticated optical arrangements are used before and after the LCOS imagers.

Sets using this technology can be made to sell at some forty per cent less than plasma sets, with the added advantages of considerably lower power consumption, a sixty per cent reduction in weight and longer life span. Jeff Tsai of Kolin said that during the past eighteen months the company has diverted its efforts from plasma to the LCOS-type display, believing this to have far greater potential.

Sky services

Internet service provider AOL is now available via Sky Active. The service includes instant messaging and email as well as news, sport and weather information. It can be accessed in two ways. One is to press the red button on the Sky TV remote-control unit while watching any Sky channel other than Sky Travel and Sky Box Office, use the arrows to choose email/messaging from the menu on the left, then select AOL. Viewers can continue to watch TV in quarter screen. Alternatively press the remote-control unit's interactive button, select Sky Active, then select AOL from the email/messaging options. In this way the AOL service is used full screen. Additional connection charges apply for use of the service, and will be listed in the telephone bill as 'multimedia' or as a call to phone number 0901 171 0001. There's an initial 12p connection fee, after which users are billed at local call rates by the telephone provider. Emails and messages can be composed using the Sky remote-control unit or an optional infra-red keypad.

Channel 4 has launched an interactive TV service called Four Active. It provides extra content for individual programmes plus services such as email, shopping and banking, and will be the basis of Channel 4's future interactive applications. Access to interactive content and services is by pressing the red button. Viewers can continue to watch Channel 4 and E4 in quarter screen while browsing.

A small number of subscribers have complained to BSkyB about unusually high phone bills caused by their digiboxes dialling out to the speaking clock on number 123. Sky digiboxes contain a modem that communicates with BSkyB once a month to confirm that the connection is still in place. One customer received a 105-page phone bill documenting 10,488 calls to 123 at £1,000. A major set-top box manufacturer has carried out an investigation on behalf of BSkyB. On the basis of its report, which concludes that the problem does not result from any technical fault or action taken by Sky, BSkyB is refusing to compensate subscribers.

A possible cause of the problem could be the user accessing the special service menu, which is designed for installers and service staff, and altering the dial-up prefix. Some internet sites have published hacks that are supposed to enable viewers to watch pay-per-view events free. One of these includes altering the digibox phone prefix. The hack doesn't work, and owners who use the 123 prefix may get very high phone bills as a result of the digibox making vast numbers of calls to the speaking clock.

Multi-Contact has added new test probes to its Isoprobe series. The Isoprobe II types incorporate a range of new and enhanced performance features including improved electronic characteristics and increased dielectric strength, making them ideal for use with oscilloscopes. The probes are fully insulated (touch protected to 1kV, CAT II) and are specially moulded for non-slip handling, with the compensation system integrated to eliminate the need for an awkwardly-placed compensation box in the connecting lead. The series ranges from an entry-level economy model to a professional high-quality version, covering division ratios from 1:1 to 100:1 and operation to 150, 250 or 450MHz. Also available are a demodulator probe for measuring HF signals using a multimeter, and the Actiprobe set of 'active' probes. These combine extremely low input capacitance with a wide frequency range, making them suitable for use where steep pulses have to be displayed.

For further information contact Multi-Contact (UK) Ltd., 3 Presley Way, Crownhill, Milton Keynes, Bucks MK8 0ES. Phone 01908 265 544 or email sales@multi-contact.co.uk

Multistandard mains-battery TV

Aerial Techniques has in stock the new Grundig 14in. multistandard mains-battery portable Model Davio 37, an ideal set for travellers and DX enthusiasts. It covers the VHF Bands I/II/III and UHF plus the in-between cable channels, and caters for PAL I, B/G and D (for China), Secam L, D/K and B/G, and NTSC 3·58MHz via its scart socket. The set includes Fastext and ATS tuning. Operation is at 12/24V DC or 220-240V AC, 50/60Hz. The set is being offered at £299 including VAT. Overnight delivery anywhere in the UK is £12.

For further details call Aerial Techniques Ltd. on 01202 423 555 (Bournemouth, Dorset) or email atech@dircon.co.uk

New TVs

JVC has launched a new TV set, Model HV-32D25, which incorporates the company's DIST (Digital Image Scaling Technology) system. This uses line interpolation to double the number of scanning lines to 1,250. It also provides flicker-free pictures. According to JVC DIST works with virtually all current video-signal formats. Other features of the set include a fine-pitch CRT that provides twenty per cent more pixels than a standard version, with a super-fine shadowmask pitch of 0·59mm. There are two tuners for picture-in-picture displays, picture-and-text (which displays a picture in one half of the screen and text in the other), Dolby Digital/3D Phonic (upgradable to 5.1-channel sound), a 720-page teletext memory, and a full complement of scart and input sockets.

Sony has announced a second-generation Wega plasma TV range that uses the company's MR (Media Reality) technology. This is a newly-developed IC system that's designed to provide optimum picture quality from any video source by minimising the number of digital-to-analogue conversion processes. There are two models in the range, KE42MR1 and KE50MR1, with 42 and 50in. screens respectively. Further improvement is obtained by using a new plasma-display panel driver IC, which enhances the contrast in low-brightness parts of the picture. This enables an 8-bit panel to provide performance equal to that of a 12-bit panel. Stylish design adds to the viewing experience: the screen is mounted in a glass frame to give it a 'floating' appearance. The separate receiver unit caters for all likely signal sources: there are four scart sockets for RGB, component video and PC inputs, and a Memory Stick slot. The 42in. model is currently available throughout Europe, with the 50in. version due for launch early next year.

Philips has launched its largest flat-screen TV set to date, Model 50PF9964, which has a 50in. widescreen plasma display panel. This uses Philips' proprietary picture-enhancement technologies Digital Natural Motion, Digital Crystal Clear and Active Control. The 'e-box' is a compact unit that conceals cable bundles in one package. Other features include 1,200-page advanced teletext navigation functions Hypertext and Wordsearch, a dual-screen mode and a Mosaic Screen function. The latter displays a main picture along with eight smaller pictures from other channels.

Sony's latest digital cameras employ sub-miniature engineering without sacrificing image quality or functionality. They are based on use of the Memory Stick flash-memory card. Ralph Buckstone looks at the technology involved

Sony's Cyber-shot U digital cameras

With its Cyber-shot U series Sony has created a new class of ultra-small digital cameras. These tiny cameras are instantly ready for snapping digital still images or recording MPEG movie clips. The first two models to be released are the DSC-U10 and DSC-U20. They are small enough, weighing just 4·3oz including battery and recording memory, to hook on to a belt loop, hang around the neck or carry in a pocket. Yet they include a host of built-in features.

The cameras' simple-to-use interface enables the user to concentrate on capturing the visual moment without being distracted by camera settings – the cameras provide single-handed point and shoot operation. For accurate exposure the cameras incorporate an advanced pre-flash metering system. The flash fires twice at the time of exposure, first to illuminate the subject and calculate the correct exposure, then to record the image with optimum exposure time. In addition, the automatic centre-weighted focusing system helps ensure accurate subject capture.

Flash-memory

The recording medium used by these cameras is the Sony Memory Stick card, a reusable flash memory the size of a stick of chewing gum. Flash memory provides simple, fast information storage. It has more of the character of a hard drive than a RAM and has found various applications, such as the BIOS chip in PCs, the PCMCIA type I and II cards used in laptops and as memory cards for video games.

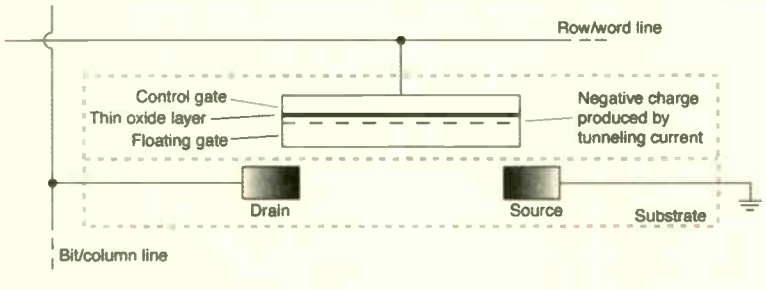

Fig. 1: The basic flash-memory cell.

Flash is a form of EEPROM (electrically erasable programmable read-only memory). As with all solid-state memories, the arrangement consists of an array of cells controlled by a row and column matrix, with the rows as word lines and the columns as bit lines. Each cell is capable of storing a digit, 1 or 0. Fig. 1 shows the basic flash memory cell, which uses a type of MOSFET technology. Each cell consists of a transistor with two gates, the control gate and the floating gate, which are separated by a thin oxide layer. The drain is connected to the bit/column line and the control gate to the row/word line. When the row/word line is active, the cell can go to the 1 state. To change it to the 0 state, a process called Fowler Nordheim tunnelling takes place.

The floating gate is biased via the drain. When the bias reaches a certain point, a tunnelling current flows to the floating gate area. The electrons move across the 'top' section of the floating gate, which thus acquires a negative charge. This acts as a barrier between the two gates, converting the state to 0.

A special device called a cell sensor monitors the charge developed at the floating gate. When the current flow is greater than 50 per cent of the charge, the cell has a value of 1. When the current falls below the 50 per cent threshold, the value changes to 0.

With a blank EEPROM the gates are all fully open, each cell having a value of 1. To restore the cells to the 1 state an electric field/higher-voltage charge is applied. With a flash memory erasure can be applied to the whole chip or to sections known as blocks. This enables a targeted area of the chip to be erased then rewritten. Flash memory works much faster than a conventional EEPROM, in which one byte at a time is rewritten.

There are fixed and removable flash memories. A PC's BIOS chip is an example of the former, while various removable types have been developed, including the SmartMedia, CompactFlash, Memory Stick and PCMCIA cards.

Why not use a hard disc? The flash memory has several advantages: it's noiseless; access is faster; it's smaller and lighter; and there are no moving parts. Flash is not going to take over from hard discs however, since the cost per megabyte of the latter is drastically less and falling, while the capacity is much greater and rising. It all depends on the requirements of each particular application.

The SmartMedia card

The SmartMedia card, which was originally known as the solid-state floppy disk, was developed by Toshiba. Capacity ranges from 2-128MB. The card is quite small, approximately 45mm long, 37mm wide and 1mm thick. It's amazing how much data can be packed in.

Construction is elegant in its simplicity. A plane electrode is connected to the flash-memory chip via bonding wires. The chip, plane electrode and bonding wires are then embedded in resin, a technique called the over-moulded thin package (OMTP). It enables everything to be integrated into the single package without the need for soldering. To create the actual card, the OMTP module is glued to a base card.

The electrode connection to the flash-memory chip carries power and data when the card is inserted into a device. A notched corner indicates the power requirement of the SmartMedia card. If you look at the card with the electrode facing upwards, when the notch is on the left-hand side the card needs 5V, when the notch is on the right-hand side it requires 3·3V. It's as simple as that!

With the SmartMedia card memory is erased, written or read in small blocks – increments of 256- or 512 bytes. This means that they are capable of fast, reliable performance while enabling the user to specify the data to be kept. They are small, lightweight and easy to use, but are less rugged than other forms of removable solid-state storage. So you should be very careful when handling or storing them.

CompactFlash cards

This technology was developed by Sandisk in 1994. The cards differ from the SmartMedia card in two important respects: they are thicker, and they use a controller chip. CompactFlash cards consist of a small PCB with flash-memory chips and a dedicated controller chip encased in a rugged shell hat's several times thicker than a SmartMedia card. The width is 43mm, the length 36mm. There are two thicknesses, type I 3·3mm and type II 5·5mm. The cards will work with a 3·3V or 5V supply.

The increased card thickness provides greater storage capacity than with a SmartMedia card. Capacity ranges from 8MB to 1GB. The onboard controller can increase performance, particularly with devices that have slow processors.

Standards

SmartMedia and CompactFlash cards adhere to standards developed by the Personal Computer Memory Card International Association (PCMCIA). These standards make it easy to use the cards in a variety of products. You can also buy adapters that give you access to these cards via a standard floppy drive or PCMCIA card slot – like the one on a laptop. Sony's Memory Stick can be used with a large array of products from Sony and hundreds of compatible high-tech products from other manufacturers.

Although standards have settled down, there are many flash-memory products that are completely proprietory in nature, such as the memory cards in video-game systems.

Back to Sony's cameras

As the Cyber-shot U series digital cameras are based on use of the Memory Stick card, their photos can be transferred to any compatible digital equipment such as TV sets, handheld devices and printers. In addition, for one-step USB photo transfer to a PC, the cameras come with Sony's new Image Transfer software. This is a completely automated, plug-and-play program that provides quick downloading and storing of all digital photos.

With the exception of Models DSC-700 and DSC-770, all Sony's digital still cameras and camcorders store images on a Memory Stick card in the DCF file format. This guarantees playback via any Memory Stick compatible TV set. If the file is renamed or manipulated, DCF file format must be restored before playback is possible. Images captured by all other digital still cameras and camcorders need to be formatted as DCF on a PC.

DCF stands for Design rule for Camera File System, a Japan Electronic Industry Development Association (JEIDA) standard established in December 1998. DCF uses Exif version 2.1 (JPEG-compressed version) as the preferred image format, and provides rules for naming image files and arranging them in directories.

Finally, a brief specification for the Cyber-shot U cameras.

A 128MB Memory Stick card.

The SmartMedia card.

Resolution: Model DSC-U20 has a 2Megapixel (effective) CCD image sensor capable of a providing a resolution of 1,600 x 1,200 pixels. With Model DSC-U10 the CCD image sensor has a capability of 1·3Megapixels.

LCD: The one-inch, back-lit reflective LCD is easy to view even in bright sunlight and makes it esy to compose and review shots.

Movie recording: The cameras' digital still capabilities are complemented by an MPEG-EX video recording (without audio) feature that enables users to record 15sec MPEG-1 movie clips.

Burst mode: This special VGA (640 x 480 pixel resolution) mode enables the user to capture motion by shooting up to five consecutive frames (three shots per second) while pressing the shutter button.

Special-scene modes: Users can choose from a number of scene modes, including Soft Snap for warmer skin tones, Illumination Snap for low-light conditions, and Vivid Nature for vibrant landscapes, to optimise colour and white balance in various situations. ■

Guide to the Panasonic Z8 chassis

The basis of the Z8 chassis is the Philips Ultimate One Chip (UOC) processor, which does just about everything. Unlike the previous Z7 chassis it can be used in sets with screen sizes up to 25 and 28 inches, having provision for EW correction and stereo sound. Brian Storm provides a guide to the circuitry and system operation

The Z8 chassis was developed as a replacement for the Z7, which had a long production run and had been used in Panasonic's 14in. portables and basic 21in. sets. It can also be used in 25 and 28in. sets however, having provision for EW correction and stereo sound. The basis of the Z8 chassis is the Philips Ultimate One Chip (UOC) processor – the TDA9350/60/80 series. These combine the functions of IF processing, colour decoding, video processing, scan generation, sound processing, RGB processing, AV switching, teletext operation, OSD generation and system control.

Larger-screen (25/28in.) stereo models have an additional multi-sound processor chip which is controlled by the UOC via the I²C bus.

Standby power supply

The standby power supply circuit used in the Z8 chassis, see Fig. 1, is similar to that in other recent Panasonic chassis in that its mains transformer is adequate only for standby operation. At power up the reservoir capacitor C1201 would soon discharge and the set would revert to standby were it not for a top-up feed via R1209 and D1205. This feed is derived from pin 6 of the line output transformer. The idea is to keep the power consumption in standby at an absolute minimum.

Bridge rectifier D1201 charges the reservoir capacitor C1201which feeds the 5V regulator IC1202. This supplies the infra-red receiver and the EEPROM chip IC1103. The following regulator IC1201 provides a 3·3V supply for the UOC IC601.

Relay RL801 provides standby/on switching by controlling the feed to the mains bridge rectifier in the main power supply. Q1201 is the relay driver transistor, which is buffered by Q1204. This transistor receives the on/standby command from pin 1 of the UOC. D1202 and C1210 provide protection for Q1201 against the effects of spiking and arcing at the relay's contacts. If Q1201 is damaged, RL801, D1202 and C1210 must also be replaced.

Main power supply

As with the previous Z7 chassis, the chopper transformer (T802) does not provide mains isolation, which is instead provided by the line driver (T553) and line output (T552) transformers and the line scan coils. All measurements in the non-isolated stages are with respect to the mains earth. Again like the Z7 chassis, as there is minimal power transfer via the chopper transformer there is power efficiency saving and a cost saving with the transformer.

Fig. 2 shows the circuitry on the primary side of the chopper transformer. D802 is the bridge rectifier and C809 its reservoir capacitor. The chopper circuit is of the series type and is based on the STRF6523LF51 chip IC801. This contains the MOSFET chopper transistor and is similar to the

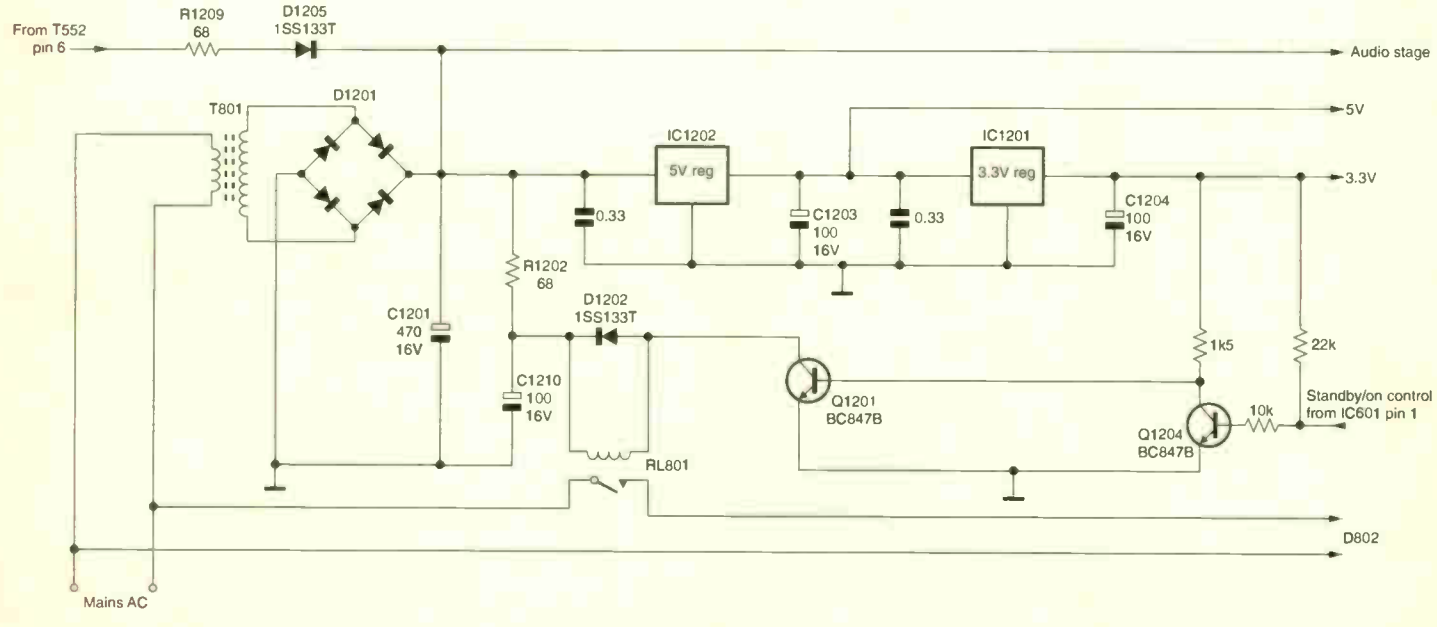

Fig. 1: The standby power supply circuit used in the Panasonic Z8 chassis.

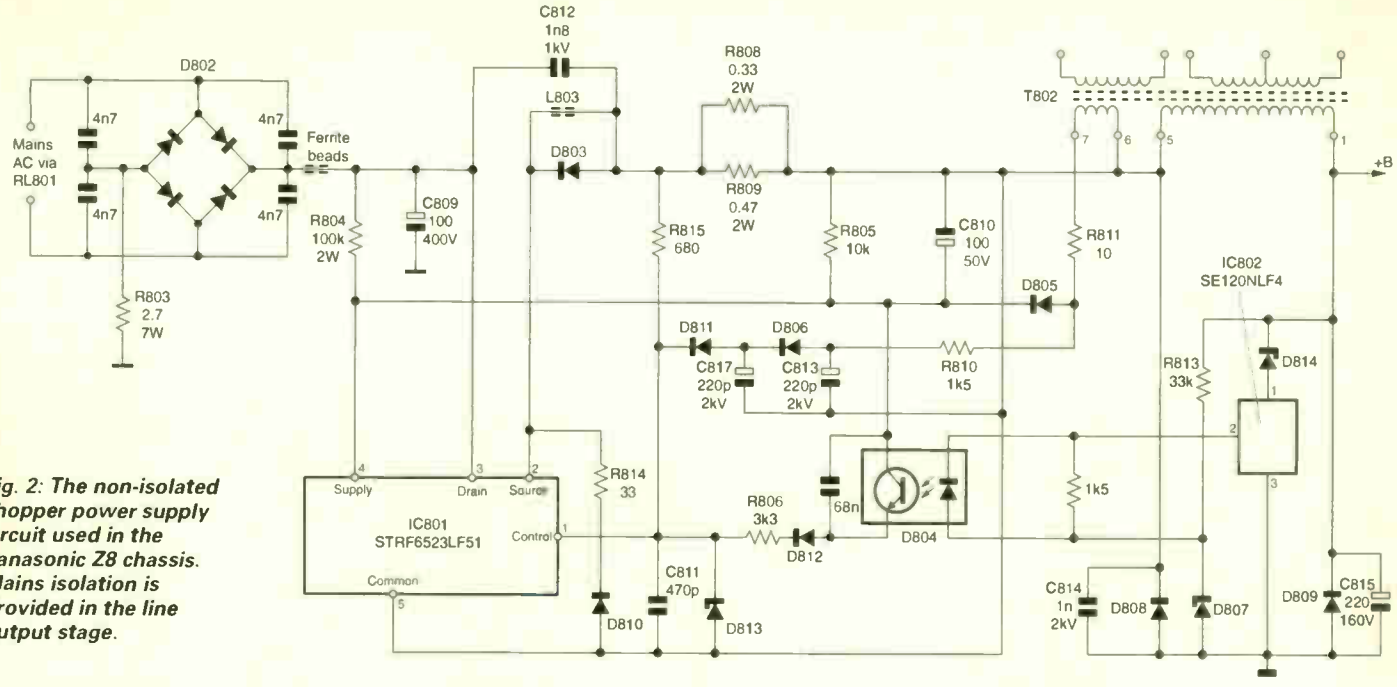

Fig. 2: The non-isolated chopper power supply circuit used in the Panasonic Z8 chassis. Mains isolation is provided in the line output stage.

device used in the Euro-4 chassis. The MOSFET is coupled via L803/D803 and R808/9 to pin 5 of the transformer, with D808 providing efficiency diode action. The primary winding (pins 5-1) acts as an inductive reservoir, the HT generated at pin 1 (+B supply) being fed to the line output stage. D809, an avalanche diode, provides over-voltage protection and C815 smoothing.

R804 provides a start-up feed for pin 4 of IC801. Once the power supply starts up, D805 and C810 maintain the supply to this pin at about 16V. Pin 4 also provides monitoring for over-voltage conditions, tripping an internal latch should the voltage rise to about 20V. This latch can be reset only by disconnecting the mains supply to the set then reconnecting it. The latch also operates should the temperature generated within IC801 rise to 140°C. Current monitoring is provided across R808 and R809, with feedback to pin 1. Activation of excess-current protection makes the power supply pump on a cycle-by-cycle basis until the overload is removed.

Regulation is by varying the duty cycle of the MOSFET's drive waveform. IC801 contains an oscillator circuit to which feedback is applied via pin 1. IC802, with D814, monitors the +B supply. It provides a constant-voltage source. Any voltage variation across IC802 will result in a current variation within the device. This produces an output at pin 2 to control the optocoupler D804. Feedback from this is via D812 and R806 to pin 1 of IC801, where it alters the mark-space ratio of the MOSFET drive waveform.

The UOC chip

As previously mentioned the Z8 chassis is based on one main processor chip, IC601, which provides all the low-level control operations, signal processing and switching required in a set. We'll provide a brief account of the various sections, starting with system control.

The main supply for IC601 is 3·3V which is obtained from IC1201 and fed to pin 61. A power reset at pin 60 comes from IC1102. Pins 58 and 59 are connected to a 12MHz crystal, which is used as the reference for all the TV processing.

The front control keys are connected to pin 6 of IC601. This pin senses voltage changes. The local keys are connected to a resistor ladder network. Thus key presses change the voltage at pin 6. The remote-control input at pin 64 shares the same priority but looks for serial-data commands.

Country options, such as menu language, tuning system and sound carrier, are stored in the EEPROM IC1103 and downloaded to IC601 at pins 2 and 3 via the I²C bus every time IC601 is reset.

Pin 1 of IC601 provides the standby/on relay drive output, which is fed to Q1204.

Models that employ the Q-Link system for communication between a VCR and a TV set use pins 62 and 63 of IC601 for the data-link in and out. Switching transistors Q1103-6 are used to switch data between these two pins and pin 10 of the scart socket.

Video processing

IC852 provides a regulated 8V supply for the video/chroma/sound processing sections of IC601.

The IF output from the tuner is fed via a SAWF to pins 23 and 24 of IC601. Pin 27 provides an AGC output for the tuner. Video demodulation is carried out within IC601, a composite video signal being produced at pin 38. This is fed to external traps and to pin 19 of the scart socket via buffer transistor Q3104, returning to IC601 at pin 40. Video in from the scart socket or from the front RCA inputs is fed to pin 42. Whichever source is selected is fed to the internal colour decoder. RGB inputs from the scart socket are connected to pins 46, 47 and 48, with fast blanking for synchronisation and control being fed to pin 45.

The RGB outputs to control the CRT drive circuitry appear at pins 51, 52 and 53. IC351 on the CRT base panel produces the drives for the CRT's cathodes. Compensation for CRT ageing is provided at pin 5 of IC351 and is fed back to pin 50 of IC601, where the black-level current is monitored and, if necessary, updated in the EEPROM. This prevents grey-scale drift as the set ages.

Q351 also provides after-glow spot-suppression when the set is switched off.

Teletext and OSDs

The teletext section of IC601 has a ten-page memory for Fastext features or favourite-page storage. The teletext reference is obtained by dividing down from the 12MHz crystal X601. Video for data slicing and acquisition comes internally from the video processing section.

On-screen displays are generated at RGB level and are synchronised internally by the off-air line and field sync pulses or by the internal

clock if stable sync pulses are not available.

Sound processing

With non-stereo models the internally demodulated sound leaves IC601 at pin 44 and is fed to the audio output chip. In addition there's a line-level output at pin 28 for the scart socket.

Stereo models incorporate a separate multi-sound processor chip, IC2001. Pin 35 of IC601 provides an sound IF feed which is passed via IF amplifier transistors Q2003 and Q2004 to pin 47 of IC2001. Pins 24 and 25 of IC2001 provide the drive signals for the audio output stages.

Scan drives

The line drive output at pin 33 of IC601 is generated using the 12MHz crystal as a reference. Flyback pulses are fed back to pin 34. The horizontal phase-control system is decoupled at pins 16 and 17.

The field drive output is at pins 21 and 22. It's produced from the line generator via an internal divider. The amplitude and shape of the field drive is determined by the *RC* components connected to pins 25 and 26, i.e. R803 and C614.

An EW drive output is available at pin 20 for 110° large-screen models.

Protection systems

Beam-current limiting by contrast and brightness reduction is achieved by connecting pin 49 of IC601 to the earthy end of the EHT supply. C558 decouples the feed while R557/8 provide a DC bias to hold the voltage variations within a predetermined range.

Monitoring for general protection is at pin 36 of IC601. This pin is biased low by R2202 and R621. Q603 switches pin 36 high should a safety problem occur.

The 200V supply for the RGB output IC is monitored via D603 and R631. If the voltage drops, D603 conducts and Q603 switches on. Pin 36 of IC601 goes high and within ten seconds the set will switch to standby by releasing RL801.

The 5V supply is monitored via D601. If the voltage falls because of an overload, the same switching action occurs.

Excess beam current protection is provided via D403 and R629. Should the beam current exceed a certain level zener diode D403 and Q603 will switch on.

Field scan failure is monitored via Q401 and Q402. During normal field scanning C409 is charged via D401, switching Q402 on. With Q402 conductive, Q401 is off. If there is no field scanning C409 is discharged, Q402 switches off, Q401 switches on, D603 conducts and Q603 switches on taking pin 36 of IC601 high.

IC601 also monitors the 8V supply, using the 3·3V supply as a reference. Should the 8V supply fall below 6V IC601 will release the standby/on relay RL801.

Service menu

Access to the service menu is by setting the sharpness to minimum while at channel position 99, then pressing V at the front of the set at the same time as mute on the handset. Use the channel up/down buttons to navigate through the menu and the volume +/– buttons to alter values. ■

The MacDougall shop at Falkirk.

In earlier times families often remained loyal to a trader for years and even decades at a time. Things may well have changed with modern chain-store selling. Tom MacDougall writes about a strange family that continued to obtain its TV sets from him from the 405-line days to the mid-Eighties

The Scots Family Robertson

The first time I encountered a member of the Robertson family was in the mid-Sixties. On a wet November day the shop door tinkled and in walked Ma Robertson. She held the door open with one hand and carried a huge floral message bag in the other. A voice like a foghorn demanded to know if I repaired televisions.

When I confirmed that I did she advanced and gave me her name and address. The fault with her set appeared to be a bad picture.

First visit

That afternoon I called at her house, which took only fifteen minutes to reach in the van. It was in a large council estate, and first appearances were not favourable. A slabbed path led up to the front door, which was grimy and dusty. There were no broken glass panes covered with cardboard and sticky tape however. That would have set alarm bells ringing. The ground at each side of the path consisted of mounds of turned-over soil. Nothing grew there, and on subsequent visits I never saw a single flower in that garden.

There was neither a bell nor a knocker on the door. I rapped on it loudly and heard sounds of footsteps. Ma Robertson opened the door, and I entered her home for the first time. My feet made quite a noise as I walked down the bare floor of the hall towards the living room. There were no pictures on the walls, just dingy-coloured emulsion paint.

The living room was also gloomy. A solitary light socket hung from the ceiling, with no bulb. Two dark brown sofas faced each other across the room. There was a display cabinet in one corner and a table with a waxed cloth in another. The television set sat on another table, next to the window. It was switched on, and had a very snowy display.

"Do you like the wallpaper?" thundered Ma Robertson.

Because of the lack of light, I hadn't noticed the walls.

"The boys picked it for me. What do you think?"

I peered at the walls and discovered that they were covered with Beatles wallpaper. Paul, George, John and Ringo stared at me on all four sides. "Very nice" I replied. And so to the job in hand.

The set was a 17in., 405-line RGD table model. The cabinet was a mess, covered with greasy grime. I checked the aerial plug, which was OK. Then I switched the set off, unscrewed the back and replaced the tuner valves – PCC84 and PCF80. There was now a good picture, so I finished the repair by cleaning the turret-tuner contacts. They were bound to be dirty in that atmosphere.

Ma Robertson shouted her appreciation. "How much do I owe you?" she enquired. We settled the bill and I was escorted back along the hall to the front door. After returning to base my first action was to wash my hands and face in hot soapy water. But a bad odour hung about my clothes for the rest of the day.

Six months later

About six months later I was called out again for what was described as a similar fault, namely a poor picture. It was late in the day when I arrived, and the living room was pretty gloomy. You could hardly see across it. As before, there was no bulb in the ceiling light socket. When I asked whether she could provide some lighting, Ma Robertson produced a key from her jacket, went over to the display cabinet in the corner, unlocked it and produced an opal light bulb. She reached up, inserted it in the socket, then went over to the wall switch and flicked it on.

The light revealed three figures on the sofa next to the television set. By way of introduction, Ma shouted that they were her sons – Johnny, Hugh and George. They were obviously waiting for the set to be fixed, to give them their evening's entertainment.

Ma said that Johnny and George worked for the local council. Hugh was blind and stayed at home all the time. When I asked about the ceremony of the light bulb, she explained that once the boys had all gone upstairs for the night she would remove the bulb, lock it away, then go to bed herself. This would prevent any of her sons coming down during the night then returning upstairs without remembering to put the light out.

At least there was now enough light to begin work. The picture on the screen was very snowy, and I suspected aerial trouble. Having checked the connections to the coaxial plug, I traced the cable back to its source behind the window curtains. It was attached by its screening to a metal hanger.

Reception was very good in the area where the Robertsons lived,

Tom MacDougall at the accessories counter.

but this was ridiculous. I went out to the van and returned with a portable set-top aerial, the V-shaped type. There was a top-class picture when I connected it to the aerial socket.

A quick repair. Ma paid up with a smile, and I was soon on my way.

The UHF era

It was almost a year before I heard Ma Robertson's unmistakable voice again. She visited the shop to tell me that she wanted to buy a new set to take advantage of the new 625-line services. Having inspected the array of sets on offer, she chose a 23in. Ultra model with a nice teak wood cabinet.

All the sets were displayed with the cash price, and weekly terms were offered. Terms were what Ma wanted, but there was no chance of her being accepted by a finance company. She was a householder, but was classified as a housewife with no earnings. Since I knew that she had income from her sons and was not exactly a lavish spender, I arranged credit for her on a personal basis. Having reached agreement, she asked about an allowance for trading in her 405-line RGD set. I think we settled on £5.

The following day I set off with the Ultra set and an Antiference set-top aerial. This time Ma had the light bulb in place, and the three sons were sitting on the sofa awaiting my arrival. I placed the set on the linoleum-covered floor, took the RGD set off the table, then substituted the new set, which I'd already wired with a 13A plug. With its new aerial, there were perfect pictures. I then explained the operation of the set to Ma, who seemed to take it all in.

As I bent down to pick up the old TV I noticed that the other sofa was devoid of seat cushions. I asked Ma if this was the start of a cleaning operation. "No" she replied, "that's for Will and his dog."

At that moment the front door banged open. There was a frantic scrambling noise in the hall, then a large greyhound lurched into the room. It made straight for the sofa, leapt on to it, lay flat out and went to sleep. A slower, measured tread sounded in the hall and Will, the fourth son, came in and sat by the dog.

"That's Will" Ma announced, "he's on the dustcarts too. Jock's the dog's name."

I had now met the whole Robertson family.

Dud sets

Ma became a regular weekly visitor to the shop each Saturday when she brought in her payment to be noted in her card. Eventually Johnny took over the task. The first time he came he had with him a large pram that had seen better days. Inside lay a television set, which he brought in and placed on the floor. "Would I fix it?" he asked.

It transpired that the set had been left on the pavement for collection by the dustmen. Johnny had liked the look of it and had decided to bring it to the shop for repair. It must have taken him an hour and a half to push it all the way from his house, and it would take him as long to return. Once he'd paid his dues and exchanged a few words he was off, and I moved the set to the workshop at the back.

This continued to happen, about four times a year, as old abandoned sets were picked up on the dustcart's rounds. None of them was ever repaired. The causes of their demise were usually low tube emission, a broken tube neck, all valves missing, the inside stripped out, or a cabinet with bits bitten out. I just took them to the local incinerator, where they would have gone had they not been intercepted by Johnny. This never disturbed him however: he just kept bringing sets along to the shop.

A renovation

I had always done good business with traded-in equipment that I was usually able to sell after repairs and refurbishment. Eventually, after it had languished in the workshop for a few weeks, I got around to checking Ma's old RGD set. It sprang to life when switched on, but the picture was flat and lacked width, and the sound was rough. As it had normally run from 5 p.m. to midnight seven days a week, putting in more hours at the weekends, this was to be expected. The interior was a sea of black coal dust. I vacuumed this out and set about dealing with the faults.

Performance was excellent once new tuner and line and sound output valves had been fitted. I decided to replace the other valves as well, as their condition would have been well below par. It was the only time I've replaced every valve in a TV set. The chassis was then removed to enable the cabinet and external knobs to be cleaned. The wooden frame and back were washed with hot, soapy water, and the knobs were given the same treatment. Swarfega was used to remove the smoke and grime on the inside and outside of the screen. I left everything for several days to dry out, then reassembled and polished the set.

The results were remarkable. The cabinet was now in showroom condition, with not a scratch to be seen, and there was a superb picture. I placed the set in the showroom and priced it at £35. Unbelievers read on – the best is yet to come!

The next day being a Saturday, Ma Robertson arrived late morning to pay her account. As she was leaving she caught sight of the RGD set, which was switched on and displaying a great picture. "That's a good bargain" she said, "the boys were wanting a set for the bedroom. It'll do fine." She marched back to the counter, whipped out £35 and asked for a receipt.

What could I say? I obliged and

arranged delivery. On the following Monday I deposited the set on the living room linoleum for Johnny to take upstairs – I didn't fancy going where no TV engineer had gone before! I never saw that set again, so it must have given sterling service.

Maintaining contact

Apart from Ma coming to the shop and Johnny with his old TVs, the only other member of the family I ever saw outside the house was George. One summer day I happened to be looking out of the shop window when I noticed a large dustcart that had stopped in a traffic hold-up outside. There, lying on top, was George Robertson. He was puffing away at a clay pipe, clearly without a care in the world, despite his precarious position.

Over the next twelve months the payments were made regularly and the Ultra set gave no trouble. Once the set had been paid off, Ma disappeared for a while, but colour TV had by now come along. I didn't lose contact with them altogether, because it was my practice to send Christmas cards to regular customers. Mine was probably the only one the Robertson family received.

Colour

Then, one Saturday afternoon in the early Seventies, Ma strode into the shop to announce that the boys wanted a colour TV in part exchange for her Ultra black-and-white set. I had to arrange personal credit for a set, and included a three-year service contract. Ma chose a 19in. Marconiphone table model. At the time I was dealing mainly in Thorn colour sets, which had an all solid-state modular chassis, in this case the 3500. Servicing in the field was simple: replace the panel and take the faulty one back to the workshop for repair, using a basic chassis supplied by Thorn.

The following week I arrived at the Robertson household to deliver the set Ma had chosen. I tuned in the appropriate channels and obtained perfect colour pictures. Then I picked up the old Ultra set, took it to the van, and returned to explain to Ma the use of the Marconiphone set's knobs and push buttons.

She took all this in and I turned to leave. Then she called out "wait a minute, we've just redecorated: the boys thought they wanted a change from the Beatles – do you like it?"

Tom with a his Hitachi display.

She flicked the light switch on and beamed expectantly.

The skirting board was now a bright orange, and the images on the wallpaper shone out in glorious technicolour: Batman and Robin! "I painted and papered it all myself" Ma said, "the boys chose it themselves."

"It certainly makes a difference" I said, and left bemused.

I eventually restored the Ultra set. The dirt was so heavily ingrained in the wooden cabinet that I had to use Vim on a damp cloth to get it clean. Once it had thoroughly dried out I applied teak polish to the surface. After some refurbishment to the chassis the set was back in pristine condition and ready for the showroom. It was quickly sold.

The Marconiphone set

Over the course of the next three years Johnny appeared regularly with the payments, and I think I had only two calls for service work during that period. The 3500 chassis was reasonably reliable. Any faults were usually in the power supply or on the line timebase panel, or the EHT tray would fail.

One of the visits was on a cold day in February. Ma had difficulty opening the front door, because there was a build up of ice right round the door, especially at the bottom. The hall was like a skating rink, and the whole house was cold. Ma explained that they were waiting for a coal delivery. They couldn't have possessed an electric fire. I completed the repair as quickly as possible and beat a hasty retreat. Ma didn't seem to feel the cold. She wore an old woolly hat, had a scarf wrapped around her neck and her hands were kept warm by a huge pair of suede and fleece-lined mittens that would have been suitable for Arctic use. The boys were at work except for Hugh, who was probably in bed.

Move to Hitachi

The last time I had occasion to inspect the Marconiphone set was in the early Eighties. Ma had reported that loud noises were coming from it. Alas the dampness had finally been too much. The tube was arcing violently inside and out. There was nothing to be done but to replace the set.

By this time my main line was Hitachi colour sets, which had the most reliable chassis I had ever handled. Ma selected a 24in. free-standing set which had a manufacturer's three-year parts and labour guarantee. It was amazing how very few Hitachi sets ever needed servicing. This suited me and my customers.

Ma paid a large deposit and was able to pay off the balance within a year. I never saw Ma or her boys after that, as the set gave no trouble whatsoever. Years later I heard that Ma had died and her boys were in residential care. I was also told that they were not her own sons. She had fostered them, but from what age I never learnt. They ended up like their old TV sets, thoroughly washed and cleaned. I did see some of them striding around the town, obviously walking everywhere and clearly enjoying life.

With many independent electrical traders now retiring or closing down their businesses, there are probably few customers who have a long-term relationship with a trader. Do such families exist any more? ■

Guide to the

Thomson TX92 chassis

In this third instalment in the series Mark Paul describes the signals side of the chassis – the IF, colour decoder, video processing, RGB output and timebase generator sections

The TX92 chassis is designed for multi-standard operation and is therefore fitted with a VHF/UHF tuner, type MTM4045. The tuning-voltage is provided by the microcontroller chip IR01, which also controls the band switching. The TX92F chassis uses frequency-synthesis tuning, so the type of tuner differs. In the F version the tuning is again controlled by IR01, this time via the I²C bus.

IF strip

There are differences in the IF strip depending on whether the set has stereo or mono sound capability. Fig. 8 shows a block diagram of the stereo-sound version, which uses a TDA9811/V3 sound/vision IF chip, II50. The feed from the tuner to the BF771 SAW filter driver transistor TI20 includes filters that provide a notch at either side of the passband. TI20 drives separate SAW filters, FI10 and FI20, for the vision and sound inputs to II50.

II50 provides a composite video output at pin 10 and FM/Nicam sound at pin 20. The latter is fed to the sound processing section via TI70 (BC848B). Pin 19 provides a tuner AGC output and pin 23 an AFC feed which goes to IR01.

Pin 9 is used for video-standard switching. This is controlled by IR01 via the I²C bus and the video processor chip IV01. The latter's I²C bus decoder provides the video-system control signal at pin 11.

Mono sound models use an STV8224A1 IF chip, II01. The input to this, at pins 19 and 20, is from a single SAWF, the driver transistor TI01 again being type BF771. There's a composite video output at pin 11, an audio output at pin 15, a tuner AGC output at pin 23 and an AFC output at pin 2. As before, the latter goes to the microcontroller chip IR01.

In most versions of the chassis the composite video output (CVBS int) from the IF section is passed to the colour decoder/video processing/timebase generator chip IV01 via the scart section of the chassis, so this must be looked at next. In mono sound sets, which have a single scart socket, the composite video (CVBS) output from pin 11 of II01 goes straight to IV01. II01 contains a switch to select either internal or external (scart) composite video.

Scart section

Fig. 9 shows in block diagram form the AV socket system and its associated video switching used in the TX92 chassis, including all extra options, i.e. a second scart socket and a front connector board (FCB) with DIN socket. The CVBS int signal is one input to the LA7221 video switching chip IX01, which is controlled by the AVE1 and AVE2 lines from the microcontroller chip IR01. The other inputs are CVBS from the AV sockets as fitted.

The FCB option is incorporated in some models, and there are different versions of this. One version used in the TX92F chassis has a DIN input socket for separate video and chroma. This calls for another video switching chip, IM51 (TEA2114), because IX01 does not have available an input to cater for a front-panel CVBS input. Note that in the tuner mode the signal passes

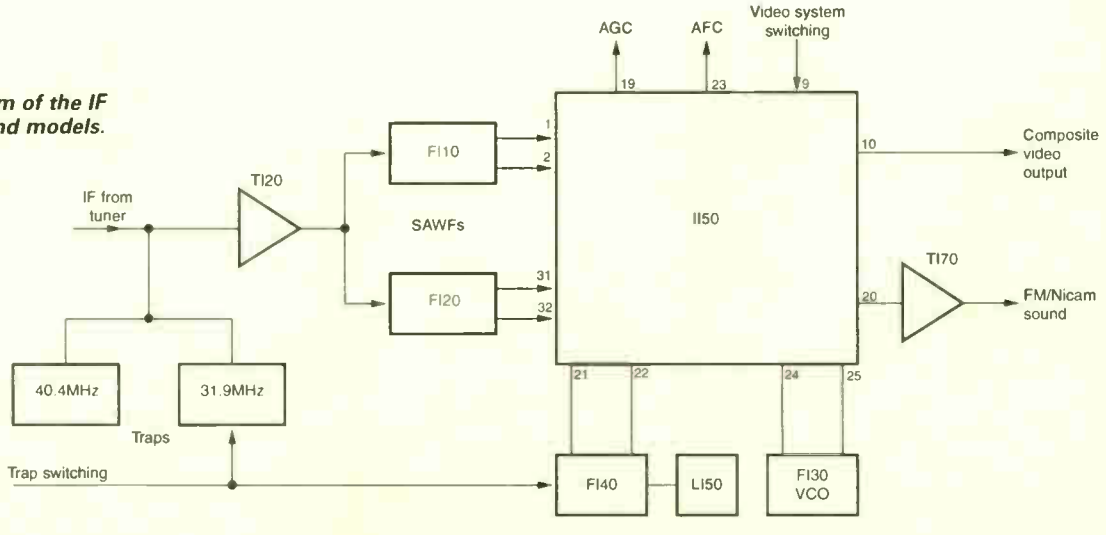

Fig. 8: Block diagram of the IF strip, stereo sound models.

via the FCB: thus absence of this connection leaves a blank screen.

Connector BX50, which is included in all versions of the chassis, is used for alignment purposes during production.

The fast-blanking input from the AV1 scart socket is passed to an additional detector circuit, using transistors TX55 and TX56, which provides a feed (FBD) to IR01 for RGB 'full-page detection'. This enables IR01 to distinguish between full-page and inserted RGB signals.

The video processing chips

Two chips are used in the video processing section of the chassis, IV01 and IC01. The former is an I²C bus-controlled device that carries out colour decoding (multi-standard), video switching and processing and generation of the timebase drive waveforms. It's usually type STV2118, but there are two other versions: type STV2112 does not have provision for NTSC signals, while type STV2116 has no provision for Secam. IC01,

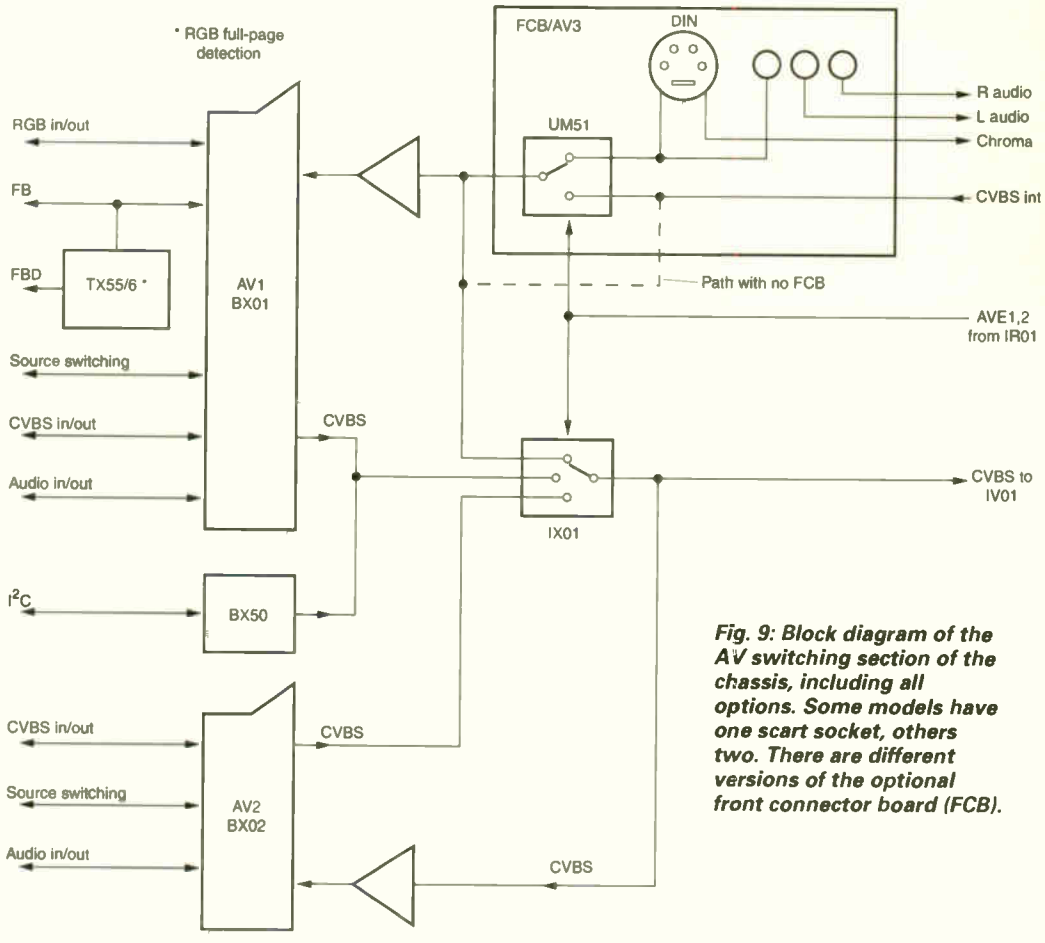

Fig. 9: Block diagram of the AV switching section of the chassis, including all options. Some models have one scart socket, others two. There are different versions of the optional front connector board (FCB).

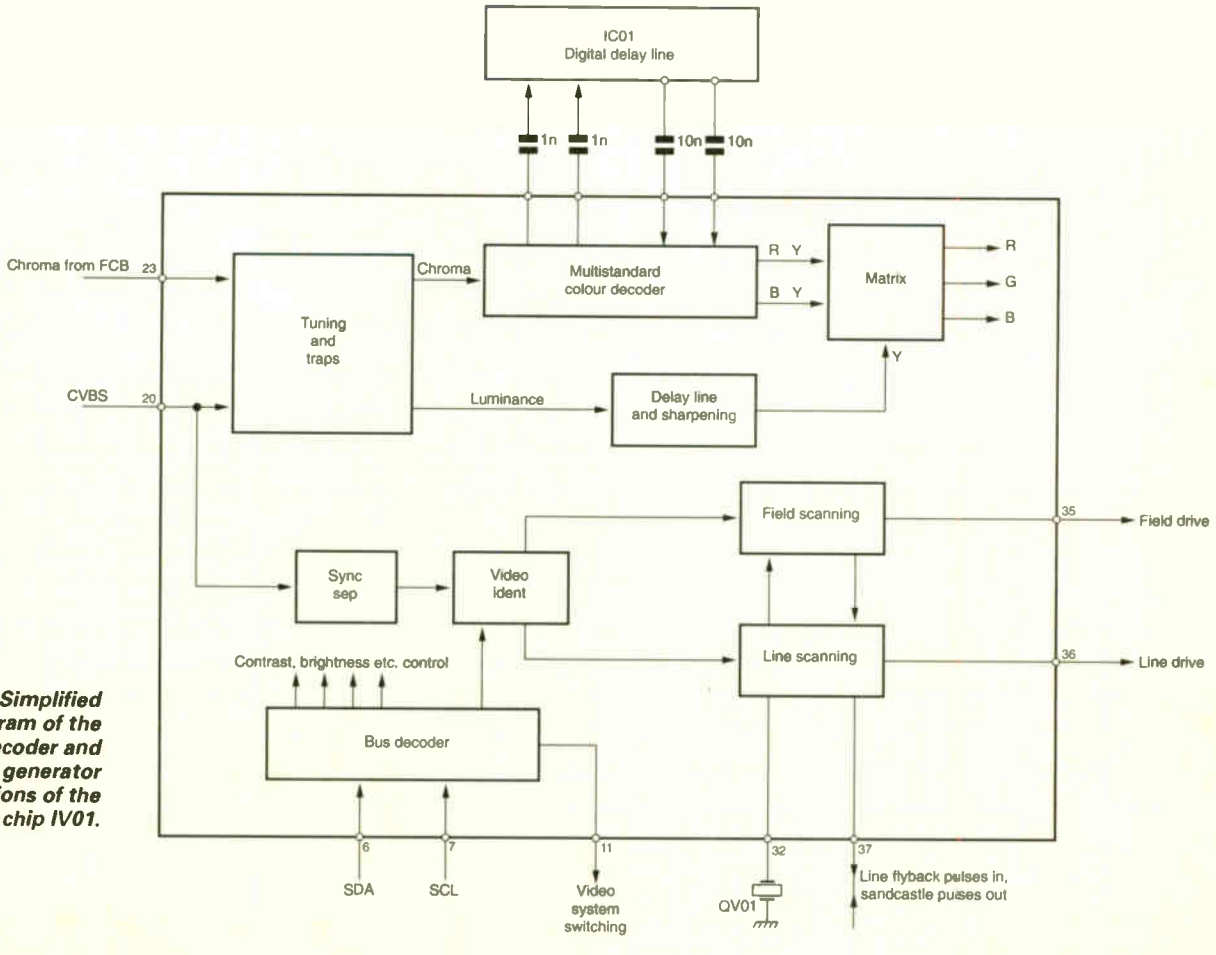

Fig. 10: Simplified block diagram of the colour decoder and timebase generator sections of the STV2118 chip IV01.

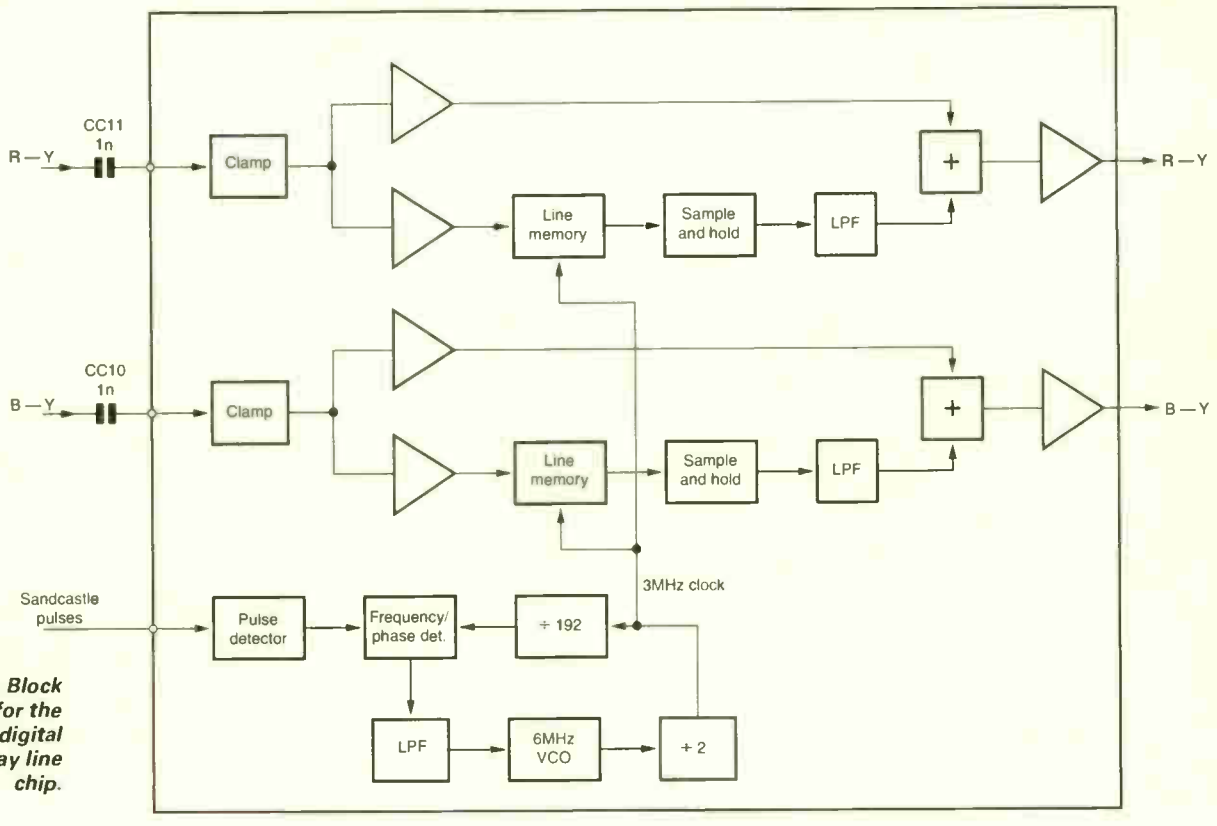

Fig. 11: Block diagram for the TDA4665 digital chroma delay line chip.

type STV2180 or in some later sets type TDA4665, is a digital chroma delay line: note that these two chips are not pin compatible.

IV01 has two supply pins. Pin 42 receives a 9V feed (VCC2) from the TDA8139 IC in the power supply. This is used by the chroma, scanning and bus decoder sections of the chip. Pin 22 also receives the 9V supply (VCC1) but this time via switching transistor TV62 (BC337-40), which switches on when the 13V supply is produced by the line output stage. The voltage at pin 22 is used by the video section of IV01. Total current consumption, VCC1 plus VCC2, is about 148mA. IC01 has a current consumption of 15mA.

Colour decoding

Fig. 10 shows in simplified block diagram form the colour decoder and timebase generator sections of IV01. There are inputs for CVBS at pin 20 and for SVHS chroma from the FCB at pin 23. In normal operation the CVBS signal is fed to either a bell (cloche) filter in the Secam mode or a bandpass filter in the PAL/NTSC mode. A phase-locked loop consisting of a bandpass filter, a phase comparator and a loop filter capacitor (CC03, connected to pin 8) tunes the filters. The reference signal is the 4·43 or 3·58MHz carrier from the colour decoder VCO. The PLL sets the centre frequency of the bandpass filter to coincide with the reference signal frequency and adjusts all the other filters. The bell filter is fine tuned by a second PLL that operates during the field flyback.

Filters separate the chroma from the incoming CVBS signal. For SVHS operation the bell/bandpass filter is linked to the chroma input at pin 23.

The colour decoder section carries out conventional decoding, either PAL, NTSC or Secam, to produce R – Y and B – Y outputs for the RGB matrixing stage. It operates in conjunction with the chroma delay line chip IC01.

Fig. 11 shows the arrangements within the TDA4665 delay-line chip in block diagram form. The operation of the chip is controlled by a 6MHz oscillator which operates within a PLL that uses the burst gating component of the sandcastle pulses as a reference. Its output is divided by two to provide the 3MHz switching signal. Since the operation of the delay lines is locked to the line frequency via the burst gating pulses. they operate correctly at the PAL and NTSC frequencies as well as the variable line frequency from a VCR.

The colour-difference signals are capacitively coupled to IC01 by CC10 and CC11. They are clamped then split between two paths, direct and delayed. The one-line delay is carried out by a memory, which consists of switched capacitors, followed by a sample-and-hold circuit then a low-pass filter.

There are 190 parallel capacitors in each memory, and each capacitor has a write and read switch. At a line frequency of 15·625kHz and a clock frequency of 3MHz, there are 192 clock cycles per line (3MHz ÷ 15·625kHz = 192). The delay through the 190 capacitors plus the delay between the input buffer amplifier and the delay-line output is exactly one line period minus 3t ÷ 2, where t = 333ns. The sample-and-hold circuit is used to restore a continuous signal and eliminate 'staircase' components. It introduces a delay of t ÷ 2 while the LPF adds a delay of exactly t. As a result, the delayed signal has undergone a delay of exactly one line period.

The delayed and undelayed colour-difference signals are then added to cancel any spurious phase shifts, buffered and returned to IV01 for further processing.

Timebase generator section

Sync separation consists of low-pass filtering and black-level alignment followed by slicing to remove the sync content of the CVBS signal. Video is identified as being present when there is coincidence between the tip of the

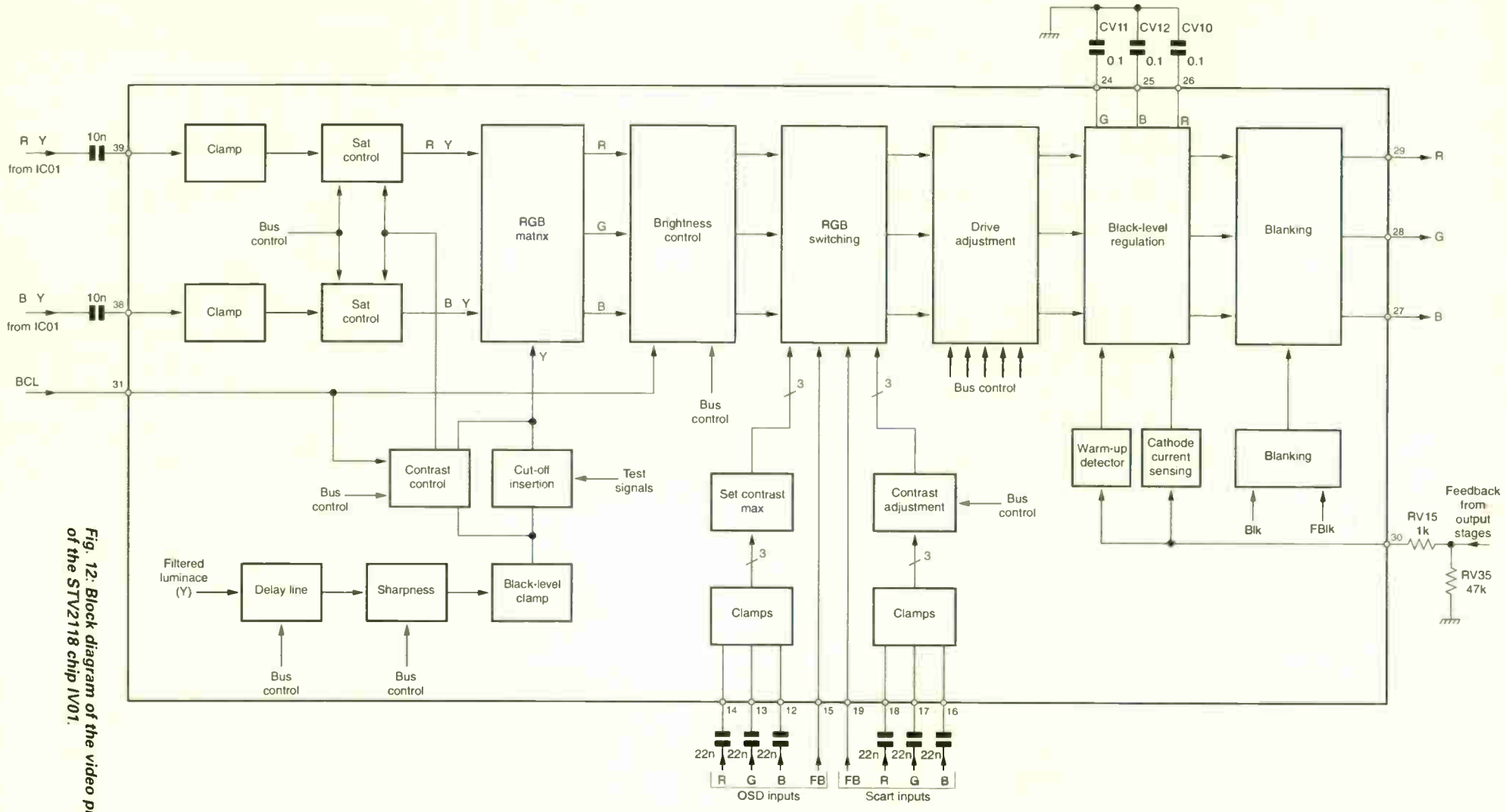

Fig. 12: Block diagram of the video processing sections of the STV2118 chip IV01.

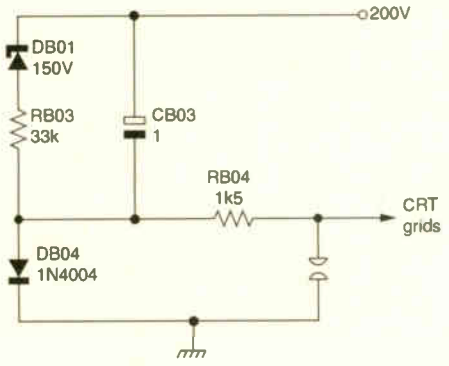

Fig. 13: The spot-suppression circuit on the CRT base board.

line sync pulses and a line-frequency window set by phase-lock loop 1 (PLL1). This PLL is based on a 500kHz VCO which operates with an external ceramic resonator, QV01, that's connected to pin 32. It has three modes of operation, which can be selected by the I²C bus: normal, short time-constant and long time-constant.

The normal mode uses both time-constants, long in normal operation and short that's automatically introduced during the field flyback and in the search mode operation of a VCR – when the field frequency is different from normal off-air reception. In the short time-constant mode this time-constant is in continuous use while in the long time-constant mode the long time-constant is in continuous use.

The line scanning section also generates the burst gate pulses and a line-frequency signal for controlling the chroma and video circuits. The line drive pulses fed out at pin 36 have a width of 28µsec. They are produced when the VCC2 supply at pin 42 rises to 6·8V at start-up. When VCC2 drops below 6·2V at shut down the line drive output is disabled. A soft-start duty cycle is also built in, related to the rising and falling values of the VCC1 and VCC2 supplies. The line drive can also be disabled via the I²C bus: it then remains at the high level. Line position adjustment is also carried out via the I²C bus.

Pin 37 of IV01 is used for the line flyback pulse input and sandcastle pulse output. The input has two thresholds: the lower one enables line blanking pulses to be extracted while the higher one enables pulses to be extracted to feed to PLL2. This is used to shift the scan to compensate for the storage time of the line output transistor TL19.

For perfect interlacing the field sync pulses are locked to twice the line frequency. The field sync window is from line 248-252 – this is the catching range. IV01 actually has two windows for field frequency selection, 248-288 for the 60Hz mode and 248-252 for the 50Hz mode. In the 50Hz mode the field blanking pulse runs from line 1 to line 22. The field drive pulses, which leave at pin 35, are some 10·5 lines long. As we saw last month they are passed to the STV2145 chip IF02.

Video processing

Fig. 12 shows a block diagram of the video processing sections of IV01. The luminance signal (Y) is separated from the chroma signal by internal filtering. It's then passed to a delay line which has different delay times depending on mode. This is followed by peaking (sharpness), after which the signal goes via a black-level clamp to the control section. Sharpness is controlled by the I²C bus with a range of between +5 and +30 per cent. The colour-difference signals from IC01 are clamped, subjected to saturation control then fed to the RGB matrix, along with the Y signal. Contrast, brightness and saturation, also the RGB gains, are all adjusted via the I²C bus.

The RGB switch section selects RGB from the matrix, external SC RGB from the scart circuitry, or external OSD RGB from the microcontroller IR01 or the teletext processor IT01. Selection is controlled by the fast-blanking signals FB SC or FB OSD, with FB OSD having the higher priority. When the FB lines are inactive (low) the internal RGB signals are selected. The RGB OSD inputs are always set at maximum contrast while the RGB SC inputs can be controlled within a range of 12dB.

The signals pass to the output section, where cut-off regulation and drive adjustment are carried out. The output stages can be blanked under I²C control.

The beam current limiting input is at pin 31 and is used to reduce the contrast and brightness. The contrast is reduced when the voltage at pin 31 is less than 6V. At less than 5V the brightness is also reduced. These are automatic adjustments to prevent CRT and line output transformer stress.

Automatic black-level regulation is built into IV01 to adjust the grey-scale as the tube ages. Feedback from the RGB output stages on the CRT base board is applied to pin 30, being detected as a voltage across RV35. Although black-level (leakage current) measurement is carried out sequentially for the three beams, the results are fed to the common resistor RV35. An internal warm-up detector prevents the feedback loop operating during start up from cold. It holds off measurement until the CRT's cathode currents reach a nominal value.

The leakage current measurements are carried out during the field blanking period by adding pulses to the RGB output waveforms. The blue current is measured during line 21, the green current during line 22 and the red current during line 23. The differences between the measured values and the values previously stored in internal capacitors are compared to an internal reference voltage. The error voltages thus generated are used to adjust the DC offsets at the respective outputs, keeping the cut-off currents constant. Three external capacitors are used to store the error voltages, CV10, CV11 and CV12 (100nF each). They are connected to pins 26, 24 and 25 respectively. The DC offset remains constant during the field.

The RGB output stages

The RGB outputs from IV01 are fed to a TEA5101B RGB output chip, IB01, on the CRT base panel. Target bandwidth is greater than 5MHz at the –3dB points. The associated input and feedback resistors set the gains and DC output levels.

The CRT's grid circuit incorporates a spot-suppression circuit, see Fig. 13. CB03 charges to 200V during normal operation. A constant current flows via DB01, RB03 and DB04, setting the CRT's grid voltage at 0·7V. At switch-off the 200V supply, which is derived from the line output transformer, rapidly drops to zero. DB04 is then reverse biased by the negative charge held by CB03. The CRT's grids remain at about –200V for more than a minute, blanking the screen, as CB03 discharges via RB03 and DB01.

Video alignment

Various menus can be used in the service mode for video alignment via the I²C bus. This includes CRT A1 voltage adjustment and drive, peak-white and cut-off adjustments to the country standard.

Next month

In the concluding instalment next month we'll look at the microcontroller, teletext and audio arrangements used in the chassis. ■

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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
TDA1670A	£2.00
TDA1675	£2.50
TDA1675A	£2.00
TDA16833	£2.00
TDA16846	£2.00
TDA1701	£14.00
TDA1770	£7.50
TDA1771	£2.00
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
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
TDA2530	£3.00
TDA2548	£2.00
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
TDA4557	£4.00
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	£0.85
TDA4605	£1.90
TDA4610	£3.70
TDA4650	£3.00
TDA4651	£8.00
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
TDA4720	£6.60
TDA4725	£7.50
TDA4780	£6.00
TDA4800	£3.00
TDA4810	£5.00
TDA4850	£4.75
TDA4851	£3.25
TDA4852	£3.25
TDA4854	£5.00
TDA4855	£6.00
TDA4856	£5.00
TDA4858	£3.50
TDA4860	£2.00
TDA4861	£3.50
TDA4866	£2.75
TDA4880	£4.50
TDA4918A	£17.00
TDA4930	£5.00
TDA4935	£3.00
TDA4940	£2.00
TDA4941	£2.80
TDA4942	£2.00
TDA4950	£1.00
TDA4951	£4.50
TDA5010	£3.60
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
TDA749S	£4.25
TDA7560	£18.00
TDA8000	£4.25
TDA8116	£3.50
TDA8120B	£4.00
TDA8137	£2.00
TDA8138	£2.00
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
TDA8568Q	£6.00
TDA8569Q	£8.00
TDA8571J	£9.00
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
TDA9102C	£2.50
TDA9103	£4.75
TDA9105	£5.00
TDA9109	£10.00
TDA9141	£6.25
TDA9143	£4.00
TDA9144	£12.00
TDA9151	£11.00
TDA9160A	£9.50
TDA9162	£11.00
TDA9170	£7.00
TDA9176	£6.50
TDA9177	£8.00
TDA9210	£4.50
TDA9302H	£2.25
TDA9500	£7.50
TDA9503	£9.00
TDA9610H	£9.50
TDA9614H	£8.00

Please note that this a very small selection of the transistors and IC's that we stock.
We stock a full range of Japanese Transistors 2SA,2SB, 2SC,2SD,2SJ,2SK series , Diodes , CMOS , TTL Logic ICs , Computer ICs , Zenor Diodes...etc

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Tel : (020) 8900 2329 Fax : (020) 8900 2329 Email : sales@grandata.co.uk

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CD Pick Ups and Mechanisms

Part No	Price
CDM12.1 Mechanism	£14.00
KHM220AAA DVD Mechanism	£ 40.00
KSS 210A Original	£11.00
KSS 210A Replacement	£9.50
KSS 210 B	£15.00
KSS 213 B	£8.75
KSS 213 C	£9.50
KSS 213 D	£16.00
KSS 213 F	£12.00
KSS 240 A	£30.00
NKS 240 A Replacment for KSS240A	£20.00
OPTIMA 6 S	£11.50
OPTIMA 5	£11.50
RCTRTH8151	£20.00
RCTRTH8112	£14.00
RCTRH8147 Mech	£ 10.00

CD Spindle Motors

22.5 mm Shaft — Order Code : CDMOT1 — Price : £ 2.00 + vat

8mm Shaft — Order Code : CDMOT2 — Price : £ 2.00 + vat

105°c Radial Electrolytic Capacitors

VALUE	CODE	PRICE	PER PACK
10 Volts			
100uF	CAP118	£0.45	10
470uF	CAP29	£1.20	10
1000uF	CAP119	£1.50	10
2200uF	CAP120	£2.10	10
16 Volts			
22uF	CAP121	£0.35	10
33uF	CAP122	£0.35	10
47uF	CAP123	£0.35	10
100uF	CAP124	£0.60	10
220uF	CAP125	£0.80	10
330uF	CAP30	£1.75	10
470uF	CAP31	£1.75	10
680uF	CAP32	£2.10	5
1000uF	CAP33	£2.10	10
2200uF	CAP34	£5.25	10
3300uF	CAP35	£5.00	5
4700uF	CAP36	£6.10	10
25 Volts			
10uF	CAP37	£0.45	10
22uF	CAP38	£0.45	10
33uF	CAP126	£0.40	10
47uF	CAP39	£0.48	5
68uF	CAP127	£0.55	10
100uF	CAP40	£0.70	10
120uF	CAP128	£0.85	10
150uF	CAP41	£0.95	5
220uF	CAP42	£1.20	10
330uF	CAP43	£1.40	5

VALUE	CODE	PRICE	PER PACK
35 Volts...continued			
470uF	CAP44	£1.90	10
680uF	CAP45	£3.15	5
1000uF	CAP46	£3.65	101500uF
	CAP47	£3.90	5
2200uF	CAP48	£2.00	2
3300uF	CAP49	£2.20	2
4700uF	CAP50	£3.65	2
6800uF	CAP51	£3.90	2
35 Volts			
1uF	CAP130	£0.40	10
3.3uF	CAP131	£0.40	10
4.7uF	CAP132	£0.45	10
10uF	CAP52	£0.50	10
22uF	CAP53	£0.45	10
33uF	CAP54	£0.50	5
47uF	CAP55	£0.85	10
68uF	CAP133	£0.55	10
100uF	CAP56	£0.85	10
150uF	CAP57	£0.95	5
220uF	CAP58	£1.45	5
330uF	CAP134	£1.60	10
470uF	CAP135	£1.75	10
680uF	CAP59	£6.50	10
1000uF	CAP60	£4.35	10
2200uF	CAP61	£2.45	2
3300uF	CAP62	£10.00	5
4700uF	CAP136	£3.50	2
50 Volts			
1uF	CAP137	£0.35	10

VALUE	CODE	PRICE	PER PACK
50 Volts...continued			
2.2uF	CAP138	£0.35	10
3.3uF	CAP139	£0.35	10
4.7uF	CAP140	£0.35	10
10uF	CAP63	£0.50	10
22uF	CAP64	£0.70	10
33uF	CAP141	£0.85	10
47uF	CAP65	£0.85	10
68uF	CAP142	£0.90	10
100uF	CAP66	£0.85	10
220uF	CAP67	£1.75	10
330uF	CAP68	£2.45	10
470uF	CAP69	£4.35	10
680uF	CAP70	£4.90	5
1000uF	CAP71	£5.25	10
1500uF	CAP143	£4.50	5
2200uF	CAP72	£3.25	2
3300uF	CAP144	£3.25	2
63 Volts			
0.22uF	CAP145	£0.45	10
0.47uF	CAP73	£0.35	10
1uF	CAP74	£0.35	10
2.2uF	CAP75	£0.35	10
3.3uF	CAP76	£0.50	10
4.7uF	CAP77	£0.35	10
10uF	CAP78	£0.50	10
15uF	CAP79	£0.95	5
22uF	CAP80	£0.75	10
33uF	CAP81	£0.85	10
47uF	CAP82	£0.95	10

VALUE	CODE	PRICE	PER PACK
63 Volts...continued			
68uF	CAP83	£1.30	5
100uF	CAP84	£1.20	10
150uF	CAP85	£2.80	5
220uF	CAP86	£2.80	10
330uF	CAP87	£4.00	10
470uF	CAP88	£5.25	10
680uF	CAP89	£5.00	10
1000uF	CAP90	£5.40	5
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
160 Volts			
2.2uF	CAP146	£0.45	10
10uF	CAP147	£1.40	10
22uF	CAP148	£1.80	10
33uF	CAP149	£2.30	10
100uF	CAP150	£3.25	5

VALUE	CODE	PRICE	PER PACK
200 Volts			
100uF	CAP151	£3.25	5
250 Volts			
1uF	CAP152	£0.60	10
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
350 Volts			
1uF	CAP156	£0.70	10
3.3uF	CAP157	£1.50	10
10uF	CAP158	£2.25	10
22uF	CAP159	£3.40	10
400 Volts			
1uF	CAP107	£2.15	5
2.2uF	CAP108	£2.25	5
4.7uF	CAP109	£3.15	5
10uF	CAP110	£4.00	5
22uF	CAP111	£2.50	2
47uF	CAP112	£3.50	2
100uF	CAP160	£4.00	2
220uF	CAP161	£7.00	2
450 Volts			
1uF	CAP113	£2.80	5
2.2uF	CAP114	£3.20	5
4.7uF	CAP115	£4.95	5
10uF	CAP116	£5.50	5
22uF	CAP117	£4.15	2

Fuses

20mm Glass

Time Lag

CURRENT RATING	ORDER CODE	PRICE
100mA	FUSE36	75p
160mA	FUSE01	75p
250mA	FUSE02	75p
315mA	FUSE03	75p
400mA	FUSE04	75p
500mA	FUSE05	75p
630mA	FUSE06	75p
800mA	FUSE07	60p
1A	FUSE08	60p
1.25A	FUSE09	60p
1.6A	FUSE10	60p
2A	FUSE11	50p
2.5A	FUSE12	50p
3.15A	FUSE13	55p
4A	FUSE14	55p
5A	FUSE15	60p
6.3A	FUSE16	60p

Quick Blow

CURRENT RATING	ORDER CODE	PRICE
100mA	FUSE37	60p
160mA	FUSE17	60p
250mA	FUSE18	60p
315mA	FUSE19	60p
400mA	FUSE20	60p
500mA	FUSE21	60p
630mA	FUSE22	60p
800mA	FUSE23	60p
1A	FUSE24	60p
1.25A	FUSE25	60p
1.6A	FUSE26	60p
2A	FUSE27	60p
2.5A	FUSE28	60p
3.15A	FUSE29	50p
4A	FUSE30	50p
5A	FUSE31	50p
6.3A	FUSE32	50p

All above Fuse prices are for a pack of 10

Wickman Fuses

Fast Blow

CURRENT RATING	ORDER CODE	PRICE
0.04A	FUSE53	60p
0.05A	FUSE54	35p
0.063A	FUSE55	35p
0.08A	FUSE56	35p
0.1A	FUSE57	30p
0.125A	FUSE58	30p
0.16A	FUSE59	30p
0.2A	FUSE60	30p
0.25A	FUSE61	30p
0.315A	FUSE62	30p
0.4A	FUSE63	30p
0.5A	FUSE64	30p
0.63A	FUSE65	30p
0.8A	FUSE66	30p
1A	FUSE67	30p
1.25A	FUSE68	30p
1.6A	FUSE69	30p
2A	FUSE70	30p
2.5A	FUSE71	30p
3.15A	FUSE72	30p
4A	FUSE73	30p

Slow Blow

CURRENT RATING	ORDER CODE	PRICE
0.05A	FUSE74	65p
0.063A	FUSE75	65p
0.08A	FUSE76	65p
0.1A	FUSE77	35p
0.125A	FUSE78	35p
0.16A	FUSE79	35p
0.2A	FUSE80	30p
0.25A	FUSE81	30p
0.315A	FUSE82	30p
0.4A	FUSE83	30p
0.5A	FUSE84	30p
0.63A	FUSE85	30p
0.8A	FUSE86	30p
1A	FUSE87	30p
1.25A	FUSE88	30p
1.6A	FUSE89	30p
2A	FUSE90	30p
2.5A	FUSE91	30p
3.15A	FUSE92	30p
4A	FUSE93	30p
5A	FUSE94	30p

All above Wickman Fuse prices are for single units

Axial Lead Fuse Protectors

CURRENT RATING	COLD RESISTANCE (Ohms)	ORDER CODE	PRICE
125mA	1.7	FUSE95	£3.00
250mA	0.665	FUSE96	£3.00
375mA	0.395	FUSE97	£1.20
500mA	0.28	FUSE98	£3.00
750mA	0.175	FUSE99	£3.00
1A	0.125	FUSE100	£1.20
1.5A	0.0823	FUSE101	£2.00
2A	0.0473	FUSE102	£1.20
2.5A	0.036	FUSE103	£2.00
3A	0.029	FUSE104	£2.00
3.5A	0.024	FUSE105	£2.00
4A	0.0204	FUSE106	£2.00
5A	0.0155	FUSE107	£1.20
7A	0.10105	FUSE108	£2.00
10A	0.00705	FUSE109	£2.00

SPECIFICATION

Voltage Rating : 125 V upto 5A , 50V 7A,10A

Operating Temperature : -55C TO +125C

All above Axial Lead Fuse Protetor prices are for a pack of 5

Grandata Ltd

distributor of electronic components

Television Repair / Mod Kits

MAKE & MODEL	KIT TYPE	CODE
ALBA		
1452T	PSU	ONWAKIT
1427T	PSU	ONWAKIT
1402	PSU	ONWAKIT
1455T	PSU	ONWAKIT
1456T	PSU	ONWAKIT
1458T	PSU	ONWAKIT
1459T	PSU	ONWAKIT
1499Y	STANDBY	MODKIT37
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
MAKE & MODEL	**KIT TYPE**	**CODE**
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	£ 11.00

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

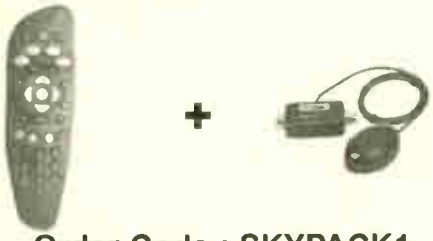
Order Code : FANKIT2
Price : £ 15.00 + vat

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	IR9397
RC85	IR9700
AMSTRAD	
SRD550	IR9386
SRX510	IR9386
AE8001	IR9352
B & O	
Beolink 100	IR9843
BEKO	
RC51321	IR9398
RC51331	IR9398
RC61331	IR9398
BLAUPUNKT	
8669493	IR9188
1532	IR9503
1570-46	IR9518
8627 105 463	IR9188
8628813000	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
TC106	IR9406
TC110 PIP	IR9248
TC143	IR9406
TC144	IR9406
TC190	IR9529
TC192	IR9529
TC194	IR9529
CROWN	
RC51331	IR9398
RC61331	IR9398
2180T	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
2463	IR9584
2463	IR9584
2475	IR9584
28H3	IR9594
29132	IR9584
38K2	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	IR9258
A14R	IR9258
A36R	IR9258
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	IR9584
RH885	IR9325
RHT01	IR9258
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	IR9584
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
C2548	IR9677
C2546TN	IR9677
C2547TN	IR9677
C2556TN	IR9983
C2566TN	IR9677
C2567TN	IR9983
C2567TN2	IR9983
C2586TN	IR9983
C2659H	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
CP2WD2TAN	IR9983
CP32WD2TAN	IR9983
CP11556	IR9576
CP11557	IR9576
CPT1560	IR9576
CP11561	IR9576
CP12155	IR9575
CPT2164	IR9575
CPT2558	IR9575
CP12564	IR9575
CPT2566	IR9575
CPT2669	IR9575
CPT2785	IR9575
CPT2870	IR9575
CST1430	IR9576
CST1435	IR9576
CS11560	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	IR9516
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	IR9506
FS4/1	IR9573
FS4/2	IR9573
FS5	IR9506
FS5/1	IR9573
FS9	IR9506
FS9	IR9573
IRC1	IR9157
IRC2	IR9157
IRM1	IR9535
IRS1	IR9535
IRS2	IR9535
IRS3	IR9535
RCN610	IR9752
RCN620	IR9751
RCN624	IR9757
SM1	IR9491
SM2	IR9491
PANASONIC	
02280227	IR9835
31005926	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
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TNQ8E0435	IR9836
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TX21S1RC	IR9834
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TX28A1D	IR9826
TX28A2C	IR9836
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TX28W2C	IR9836
TX28XDP1C	IR9835
TX29AD1D	IR9835
TX29W2CI	IR9836
TX33A2C	IR9836
TX33A2CI	IR9836
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RC5002	IR9510
RC5140	IR9510
RC5154	IR9510
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RC5250	IR9510
RC5260	IR9510
RC5300	IR9510
RC5350	IR9510
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RC5420	IR9553
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RC5701	IR9434
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RC6404	IR9465
RC6416	IR9465
RC6512	IR9464
RC6804	IR9434
RC7118	IR9464
RC7141	IR9465
RC7500	IR9464
RC7507	IR9710
RC7512	IR9864
RC7535	IR9864
RC8201	IR9434
RC8205	IR9710
RC9010	IR9434

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RC9020	IR9434
RC9030	IR9434
RC9050	IR9556
RC9057	IR9710
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RC9070	IR9434
RC9133	IR9710
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CX5312W	IR9432
CX5325W	IR9432
CX532WT	IR9432
CX534WT	IR9432
RM104	IR9432
RM109	IR9546
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4AA4U1TO092	IR9458
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JXGT	IR9460
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JXGY	IR9460
JXLB	IR9460
JXLG	IR9460
RC238	IR9974
RC254	IR9974
RC258	IR9530
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RC710	IR9139
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37AM12S	IR9788
51AM12S	IR9788
51AT15S	IR9788
54AM12S	IR9788
54AT15S	IR9788
54CS05SN	IR9711
5V2044	IR9487
5V2145	IR9487
70CS03S	IR9711
72CS03S	IR9711
72CS05SN	IR9711
C1421	IR9487
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CV2121	IR9487
CV3707	IR9487
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CV3710	IR9487
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DV6311S	IR9711
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SHARP ..continued	
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RRMCG0739BM5A	IR9711
RRMCG0777PESA	IR9487
RRMCG0833PESA	IR9487
RRMCG0898CESA	IR9487
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RM650	IR9336
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RM652	IR9336
RM654	IR9336
RM656	IR9448
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RM658	IR9321
RM661A	IR9321
RM670	IR9123
RM671	IR9123
RM672	IR9123
RM673	IR9123
RM677	IR9451
RM681	IR9441
RM682	IR9442
RM683	IR9442
RM684	IR9442
RM685	IR9442
RM686	IR9442
RM687B	IR9448
RM687C	IR9448
RM689	IR9441
RM694	IR9452
RM698	IR9442
RM717	IR9448
RM719	IR9448
RM816	IR9441
RM817	IR9441
RM820	IR9452
RM826	IR9441
RM828	IR9452
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RCT5000	IR9258
RCT5020	IR9502
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1400R	IR9852
1400RB	IR9852
1400RBG	IR9852
1400RBN	IR9852
1400RBT	IR9852
1400RBW	IR9962
1400RDT	IR9852
1440RB	IR9852
1440RBT	IR9852
1440RD	IR9852
1440TB	IR9852
1440TBT	IR9852
1450RB	IR9852
1450RD	IR9852
1480RB	IR9953
1480RBT	IR9953

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TOSHIBA ..continued	
1480RBW	IR9953
1480TB	IR9953
1480TBT	IR9953
1480TBW	IR9953
1480TBY	IR9953
1480TBZ	IR9953
1510RBT	IR9962
1510RDT	IR9962
1510RT	IR9962
155R9B	IR9962
155R9BT	IR9962
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155R9BZ	IR9962
156R9	IR9962
156R9B	IR9962
156R9BG	IR9962
156R9BW	IR9962
1720RB	IR9962
1722TB	IR9852
1732TD	IR9852
2100RB	IR9962
2100RBG	IR9962
2100RBT	IR9962
2101RBZ	IR9962
2102RBZ	IR9962
2121RD	IR9962
2132DB	IR9852
2140RB	IR9852
2140TB	IR9852
2141TB	IR9852
2145DB	IR9852
2145DD	IR9852
2150TD	IR9953
2152DB	IR9953
2152DD	IR9953
2155DB	IR9953
2163DB	IR9953
2163DB	IR9953
216R9B	IR9962
216R9B2	IR9962
2173DB	IR9953
2180TD	IR9953
2181TB	IR9852
2181TB	IR9953
219R	IR9962
219R9B	IR9962
219R9B2	IR9962
2522DB	IR9953
2522DD	IR9953
2527DB	IR9953
2535DB	IR9852
2535DD	IR9852
2537DD	IR9852
2545DB	IR9852
2545DD	IR9852
2550TB	IR9953
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2555DD	IR9953
2557DB	IR9953
2563DB	IR9953
2563DD	IR9953
2573DB	IR9953
2577DB	IR9953
2579DB	IR9953
2636B	IR9953
2835DB	IR9852
2837DD	IR9852
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2853DD	IR9953
2855DD	IR9953
2857DB	IR9953
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2866DD	IR9953
2873DB	IR9953
2877DB	IR9953
2879DB	IR9953
3327DB	IR9953
3339DB	IR9953
3357DB	IR9953
3377DB	IR9953
3387DB	IR9953
3787DB	IR9953
40PW8DB	IR9953
48J6DB	IR9953
48PJ6DG	IR9953
55PJ6DB	IR9953
56PW8DB	IR9953
7037DD	IR9852
7053DD	IR9953
CT6869	IR9953
CT9369	IR9852
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CT9396	IR9962
CT9399	IR9962
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CT9432	IR9962
CT9455	IR9962
CT9475	IR9962
CT9476	IR9962
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CT9552	IR9962
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Live-test ESR checker

Electrolytic capacitors are the cause of a large proportion of faults. Ian Field has devised a way of checking them in circuit while the equipment is in operation

This project arose from the idea that it would be helpful to be able to check the ESR of an electrolytic capacitor while it's working. The design consists of a probe that incorporates an optocoupler for isolation, and a tester section with a sensor circuit and an LED indicator. The LED flashes when a capacitor's ESR is such that there is excessive ripple across it.

Evolution

I started off with delusions of grandeur. It would be nice to have a simple bar-graph display as the indicator. But I wanted to run the tester off a Duracell MN21 (A23, K23A or LRV08) 12V car-key fob battery, and make it small enough to fit a matchbox-size case, so this was ruled out.

Many prototypes were knocked up and tested, including fully discrete-transistor designs, versions that used a variety of op-amps and comparators, and others with a BF981 tetrode MOSFET and the TBA2800 infra-red receiver chip. Most of the discrete-component designs were ruled out because quite a number of transistors were needed to provide adequate gain, and I felt that the complexity would discourage constructors. I ruled out the TBA2800 and several other infra-red remote-control preamplifier chips on the grounds that they might be difficult to obtain.

The final design is based on a TL431 programmable voltage reference chip (that's what Maplin call it anyway). It's actually a very high-gain comparator with a built-in voltage reference, housed in a very compact TO92 package. The device is widely used and readily available, and its small size makes it easy to fit the circuit into a matchbox.

The key component that makes the project possible is the PC733 (or similar) AC-input optocoupler. This device is widely used in modern telephony circuits, and you can often salvage one from a scrap modem. As it's built into the probe head, high voltage isolation is achieved.

Testing

When a reservoir electrolytic in a switch-mode power supply has a high ESR (effective series resistance) a large HF ripple will obviously be superimposed on the steady voltage across it. This basic fact can be exploited using a very simple circuit. If the ripple current present in an electrolytic reservoir or smoothing capacitor doesn't develop a significant ripple voltage, the capacitor is serving its purpose and can be left to do its job. What we need to do is to be able to check the ripple quickly, which is what this design does. The circuit is shown in Fig. 1.

The circuit is designed for live testing, so there is no risk of blowing up a complex and expensive item of test gear by forgetting to check that the capacitor to be tested is fully discharged. C1 blocks DC while passing the ripple voltage, and R1 limits the surge current as C1 charges and discharges. Shunt diodes D1-D6 are optional. They can be fitted to protect IC1, but reduce the sensitivity of the probe considerably. They are not needed if a telephony type optocoupler is used, as this will be able to withstand a high peak current.

R5 and RV1 will not be required if good-quality components are used, as the leakage current through the phototransistor section of the optocoupler will not be enough to switch on the comparator in IC2. When there is no illumination for the phototransistor, the very slight leakage (dark current) will increase the voltage drop across R2 and R3 in equal proportions. The voltage drop across R2 is of course subtracted from the voltage across C2, so the amplifier acts in a similar manner to a transimpedance type. If all is well, the sum of the voltages across R2 and R3 will be less than the LED's forward bias voltage, so it will light only when a pulse is received. If any difficulty is experienced in this respect, R5 and RV1 can be added – try including R5 first. It should be at least 10kΩ, as the value of RV1 will need to be of the order of several tens of MΩ to avoid reducing the sensitivity. If the sensitivity is too great however this is the best way to reduce it. A shunt-type variable-resistor focus control with a value in the region of 50MΩ would be ideal.

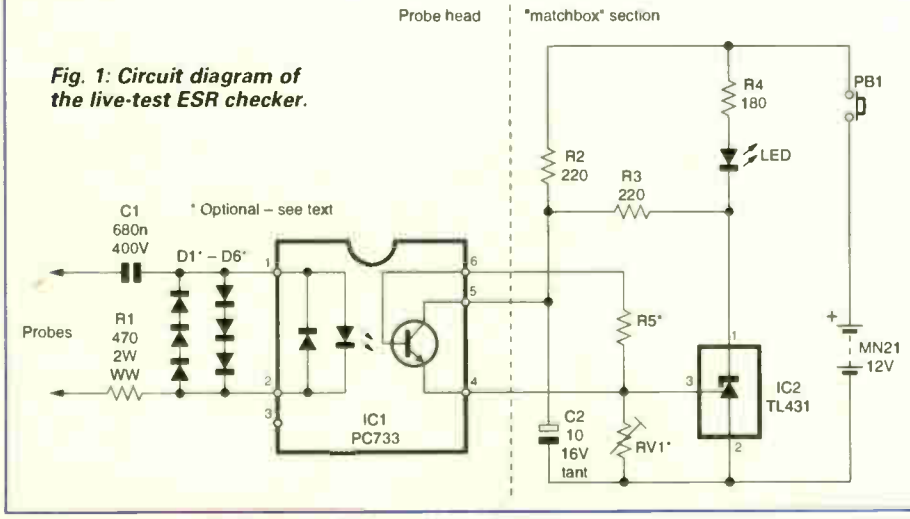


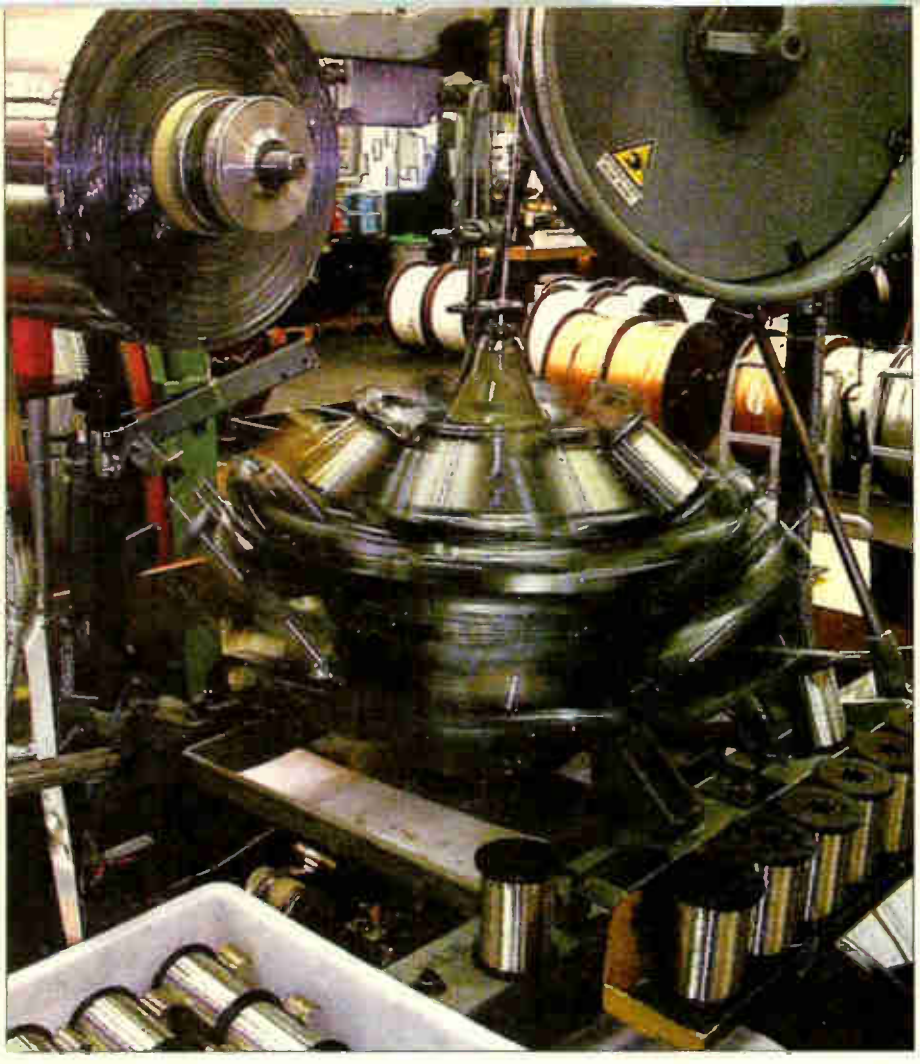
Fig. 1: Circuit diagram of the live-test ESR checker.

Construction

The TL431 circuitry, push-button switch and battery will fit in an ordinary matchbox. The probe unit requires more careful construction of course, because of the high voltages likely to be encountered. I recommend the use of a small plastic box with two halves that clip together. The capacitor, resistor and AC-input optocoupler can be assembled "bird's-nest" style in one half of the box and potted in epoxy resin. I also recommend that the optocoupler is linked to the other components using a turned-pin socket. This can be pressed into the epoxy resin just up to the socket's plastic header, so that it remains possible to replace the optocoupler should the need arise. Any wires that remain exposed can be covered by a further careful application of epoxy as the probe tips are being glued in place.

IR handset testing

Initial testing of the prototype was carried out using an infra-red detector diode and a spare TV remote-control handset. So it would clearly be possible to include an infra-red detector diode in the TL431 circuit, with a changeover slide-switch, so that the tester could also be used to check the operation of infra-red remote-control handsets.



J. LeJeune recently visited a state-of-the art coaxial cable manufacturer, Italiana Conduttori, near Milan. He reports on developments in coaxial cable production

Modern coaxial cables

Coaxial cable is part of the everyday life of those involved in TV installation and repair. The stuff seems to be everywhere – sometimes there are even short pieces of it inside the TV receiver! Its manufacture is a fascinating business. And its application, in this digital age, can be critical. The industry is nowadays taking it more seriously than ever before. Fortunately modern cable has a much longer life than that of ten or fifteen years ago, thanks to improved materials, manufacturing techniques and quality standards. The advent of digital signals has demanded more of it: better screening, lower loss, improved flexibility and better resistance to the elements.

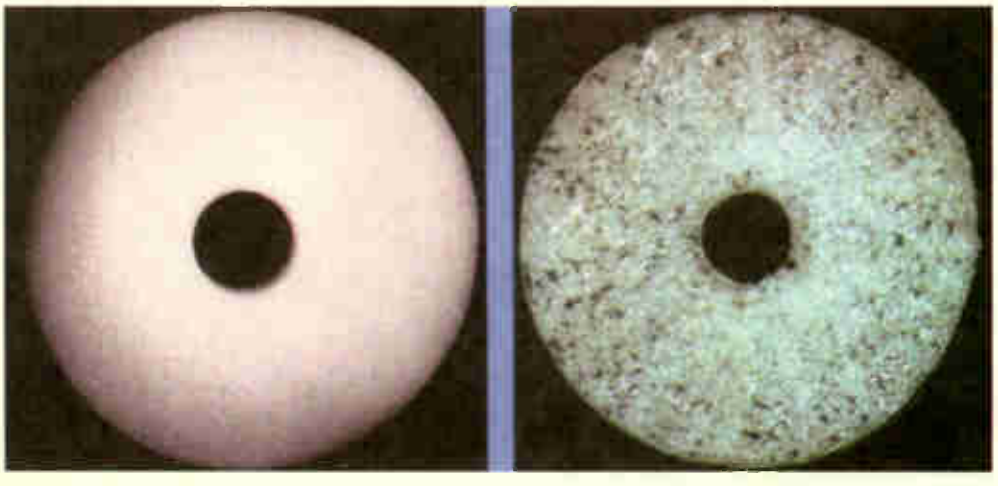


Photo 1: A comparison between the older chemical foam (left) and gas-injected foam (right).

Centre conductor

Manufacture begins with the centre conductor. This can be a single copper, tinned copper or copper-coated aluminium wire, or a stranded version of these for applications such as car radio installations where a high degree of flexibility is required at the installation stage. Incidentally car radio coaxial cable has an impedance of about 120Ω, so 50 or 75Ω type is not really suitable.

The centre conductor is drawn from wire of a much larger diameter. It's drawn through a reduction head after passing over pulleys that measure length and a sensing head that checks for breakage or unusual lumps and joins that could damage the reduction head. Lubrication is applied before the wire is drawn to the required diameter, and the reduction head is heated. After the drawing process the wire is annealed to restore its flexibility. It is then spooled on drums for storage and subsequent transport to the next

stage. To prevent oxidation, a steam oven is used for annealing.

The dielectric

The addition of the dielectric is carried out in an extrusion plant. Foamed polyethylene is extruded on to the centre conductor in a process that involves melting polyethylene beads, foaming the melt with nitrogen gas, and forming it concentrically around the centre conductor. The dielectric expands as it leaves the extrusion head, and is cooled in a water bath. This process also forms a skin on the inner and outer surfaces of the dielectric, aiding adhesion and providing a smooth finish. Eddy-current heating of the inner conductor gives the dielectric good adhesion.

After cooling, the partially-completed cable is air dried and checked continuously to ensure that its capacitance, which is directly related to its characteristic impedance, is within tolerance limits.

A breakdown test for perforations follows, using a high voltage, from 3-8kV depending on cable diameter. Insulation breakdown will occur when a perforation is present, so the line is stopped and the defect is rectified manually. After quality-monitoring checks the product is again stored on drums.

To achieve a constant characteristic impedance the position of the centre conductor within the dielectric must be accurately maintained. This is achieved entirely by mechanical means. The cable's impedance is also directly affected by the composition and density of the polyethylene dielectric. Control of this is linked to the capacitance test, but requires human intervention to judge when adjustments to the foam must be made.

Spooling of the cable on to drums is semi-automatic. Changeover from a full to an empty drum only requires the operator to change drums.

Outer conductor

The next stage is the application of the outer conductor, a particularly fascinating procedure. The braiding machines, see heading photograph, can cater for various combinations of tape and braid, and operate at a phenomenal speed. Screening tape, copper or aluminium backed with polyester film, can be applied at this stage if required. The dielectric plus centre conductor is passed upwards through a hole in a spinning platform that carries ten spools of fine copper or aluminium wire.

Photo 2: Laboratory test rig for measuring the screening factor.

When tape is required beneath the braid, this is applied from a spool beneath the platform. Once again the product is fed on to drums for storage then application of the outer sheath.

The screening tape's polyester backing gives it strength. Without it the copper or aluminium screening would break at bending points. The braid will maintain electrical continuity, but the screening efficiency is reduced when there`s a fatigue break in the tape.

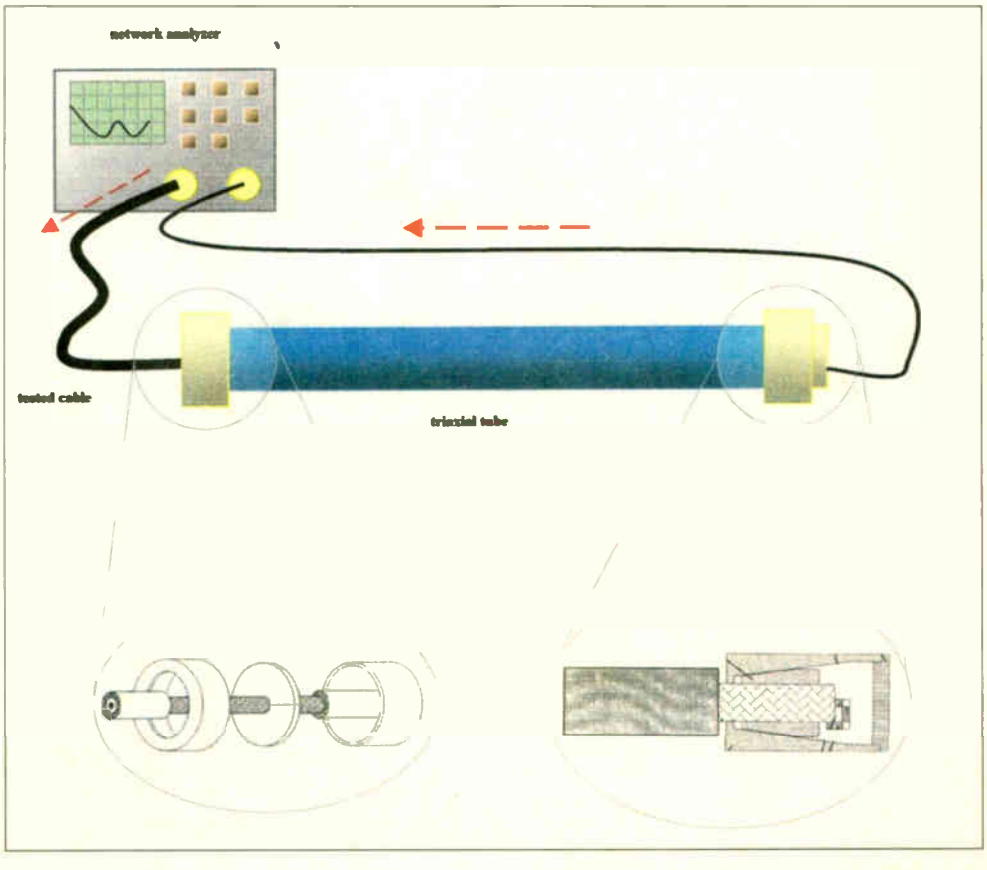
Italiana Conduttori has introduced triple-screened coaxial cable that has metallic tape beneath and on top of the braid. The inner tape is a sandwich of aluminium foils separated by a polyester film. The outer tape is a polyester film backed by aluminium foil. One edge of the tape is folded out so that it makes contact with the inner side of the opposite edge, effectively forming a tube of aluminium foil that improves the screening factor by some 20dB.

Adding the outer sheath

The next stage is to add the outer sheath to the cable. This is again done by an extrusion process. The unsheathed cable is fed into an extrusion head, from which it emerges with a white, black, green or brown coating of PVC, alkathene or any other desired material.

The factory I visited also prints distance markings at one-metre intervals on the outer sheath so that the installer can determine, as the cable is used, the amount left on the drum.

Photo 3: The triaxial tube test arrangement.



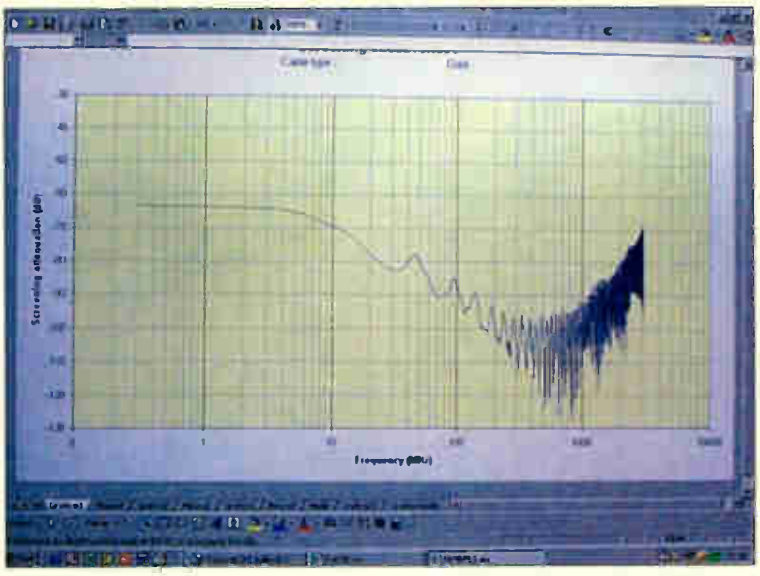


Photo 4: Monitor display showing the screening factor test results produced by the computer.

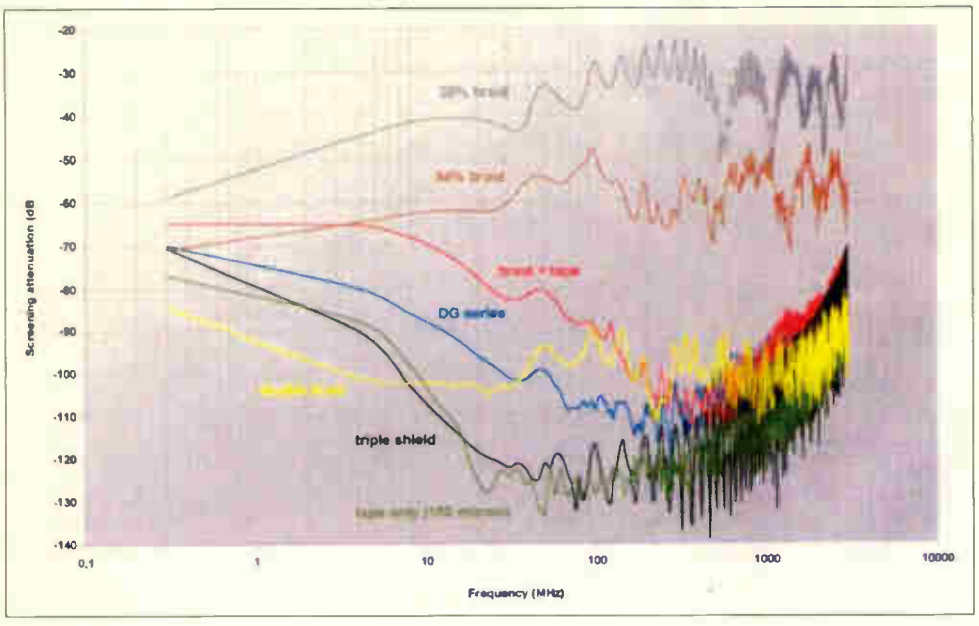


Photo 5: The performance of different types of cable manufactured by the company.

Diameter, perforation and continuity checks are made continuously as the cable progresses along the production line.

Spooling

100m spools are probably the most commonly used type in the TV trade. The cable is first wound as an unsupported coil and secured with plastic tape. This prevents the coil losing its shape when the cardboard is fitted. The completed assemblies are collected into groups of six for the cartoning machine, after which the cartons go to the warehouse for storage and dispatch.

Quality checks

The factory has ISO9002 certification. Additional quality checks are carried out on drums selected at random from the warehouse stock however. Quality inspectors check the polyethylene dielectric foam under a microscope.

Gas-injected foam uses high-density polyethylene and has a coarser appearance than the older chemical foam that uses softer, low-density material. A comparison is shown in Photo 1. The change to gas-injection, using nitrogen, was made to improve the long-term attenuation characteristics. Chemical foam has residues that erode the outer surface of the centre conductor. This erosion disrupts the skin effect on which HF currents rely, raising the cable attenuation over a period of time. The CENELEC ageing test produces a 65 per cent increase in attenuation with chemical foam compared with only five per cent when gas-injected foam is used.

Additional advantages of gas-injection are improved resistance to bending and compression damage, higher velocity ratio figures and lower attenuation for the same cable diameter.

The laboratory carries out checks on randomly-selected drums of cable from the warehouse. A test rig, see photo 2, measures the screening factor. This test normally requires a screened room with air-conditioning, filtering and massive RF seals. Instead a 3m long tube on the test bench replaces the screened room and allows greater flexibility with test procedures.

The cable being tested is placed on supports inside the tube. Its screening braid is earthed to the tube at the input end and is terminated with a 75Ω load at the far end. The braid is connected to the centre pin of the output socket via a minimum-loss pad to convert the 300Ω impedance to 50Ω for the measuring equipment. At the input end another minimum-loss pad converts the 50Ω output impedance of the measuring gear to 75Ω to match the cable. The results of the sweep test on screening attenuation are stored on a floppy disc and transferred to a computer, where they are fed into an Excel spreadsheet, with correction for the pads and variations in output level from the sweep generator taken into account.

Photo 3 shows the triaxial tube test arrangement, which is approved by the industry and gives an accurate representation of the screening effectiveness of various combinations of braid and tape. Photo 4 shows the monitor screen of the computer on which the test results are processed. Photo 5 shows a composite graph indicating the performance of several types of cable manufactured by the company.

Specialised cables

Some specialised cables are manufactured at the factory. One machine produces a twisted multi-strand centre conductor for cables that need to have high flexibility. The separate strands are fed through a perforated plate and converge into a rotating head. The still-rotating strands then pass over a measuring wheel on to a rotating take-up spool for the next stage of the process, dielectric extrusion.

A similar action is used in a machine that twists several coaxial cables together into a common sleeve. These are mainly used for CCTV purposes, but are useful wherever more than two or three coaxial cables are to be run together.

However mundane coaxial cable may seem, its manufacture is a fascinating process to observe; and knowledge of the care taken over design, production and quality testing is reassuring. ■

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Service Casebook

Michael Maurice

Hitachi C2509T (G7PS chassis)

When pin 3 of the chopper transformer becomes dry-jointed there's a trail of destruction. It provides the feedback, so when it goes open-circuit all the voltages on the secondary side of the circuit go sky high. The usual repair is to replace the 2SD1884 line output transistor Q781, the BUT12AF chopper transistor Q903, R760-2 and R766 which are all 2·2Ω resistors, ZD903 and R901 (6·8Ω, 5W). To improve reliability I also replace R902 and R903 (both 82kΩ, 0·5W) in the start-up circuit, R909 (39kΩ, 0·5W), R912 (47kΩ, 0·5W) and C906 (4·7µF, 250V) – and resolder the pins of the transformer.

This normally cures the fault. But this time the set went to standby and just looked at me. Q902 (BUX86) had failed. When it was replaced the set came to life, but wouldn't go to standby. Q901 (BC328) had also failed.

Matsui 28DW01A

This is an 'integrated digital TV' set, i.e. it has a digital receiver, in this case of Pace manufacture, bolted to the chassis. The fault was simple: the aerial socket had broken off. There is usually quite a lot of dismantling required to get at the digital section, and my problems were compounded by the aerial engineer who had suggested that "it was a five minute job that should cost about £15"! How do you explain to the customer over the phone that it's nothing of the sort? What I did was to arrive late in the evening and start to dismantle the set. The main chassis came out, followed by the digital section, then this section had to be dismantled to get at the tuner.

After watching me do all this and put it back together the customer was on my side and happily paid the bill!

Granada VHSHS5

Sometimes an older VCR is worth repairing, and sometimes it's valued enough by the owner to warrant a large bill. This was an example, because it can record teletext subtitles. The customer was extremely hard of hearing, so this was of immense importance to him. In fact initial contact was made through a telephone relay system, after which communication was by fax.

The symptoms were very poor playback pictures, with the E-E pictures even worse. The cure was to replace all the electrolytic capacitors in the power supply and IF modules.

Proline 28N1

There were two faults with this set, which was just out of guarantee. The first was failure of the line output transformer. A replacement from SEME brought the set back to life but the geometry was way out, notably the width which left vertical black bands at either side. The customer told me that Comet engineers had tried to adjust the settings, but the following day they were out.

As it's almost impossible to get service information from Comet I posted a request on the Euras pin board. A reply arrived a few days later, enabling me to return to the customer to reset the geometry.

In these sets all new settings must be stored individually, which the Comet engineer had failed to do. I plugged in my pattern generator and, after tuning Ch. 1 to the output from the generator, carried out the settings in the service mode. Switching on and off confirmed that everything was now correct.

How anyone can contemplate altering a TV set's g
eometry without a pattern generator is beyond me.

Mitsubishi CT25AV1BS (EE3 chassis)

This set produced a blank screen with no sound but did display graphics. The cause was that the 2SC2236 8V regulator transistor Q952 had failed. In this case it had gone short-circuit collector-to-emitter, while the associated 9·1V zener diode D957 had gone short-circuit. Unfortunately fuse Z953 hadn't blown, and as a result the voltage on the 8V line had risen to 22V. The TEA6415C AV switching chip IC202 and the MSP3410 sound processor chip IC301, which is expensive, had been damaged.

There's a modification kit (8VREG-KIT) that deals with the shortcoming of Q952 by providing an up-rated transistor and a few other parts. The set was OK once this and replacement ICs had been fitted.

Sony KV28WS2U (BE3D chassis)

This set powered up at switch on. The EHT then built up and died, followed by the standby LED flashing. It's quite a common problem, the cause being the surface-mounted EEPROM IC002. When I replaced this the set powered up and ran, but there was severe corruption of the graphics, text and menus. Sony advised replacement of the microcontroller chip, which incorporates the text functions. This is not to be confused with the Megatext chip. I fitted a replacement

and switched the set on, but it was dead as initially.

After a lot of head-scratching a friend suggested replacing the EEPROM again. This time it worked!

Panasonic TX25AD1DP (Euro-2 chassis)

This fault was easy to diagnose – I didn't even have to remove the back! The picture had coloured snow because the VDP3108 video/deflection processor chip IC601 had failed. Panasonic supplies a kit that consists of a new VDP3108AAP1 chip, two surface-mounted capacitors and an EEPROM chip. It comes with full instructions. I've fitted many of these kits to the TX21/25MD1 range of sets without problems, so I confidently set about fitting the kit and switched on. There was nothing! No standby light, just nothing.

What could have gone wrong? The EEPROM is a plug-in device, so it made sense to swap it over with the original device. The set then came on, but there was vertical jitter. When I phoned Panasonic I was told that I had the wrong EEPROM for the set and should obtain a new one, part no. 27C010-800SA. I did, fitted it, and the set worked. But there was still field jitter. A further call brought the information that the EEPROM supplied was correct for the new version of the VDP3108. I was told to re-order the kit and just change the EEPROM. After doing this the set worked correctly. Now all I have to do is to try to obtain some refunds.

All this was done in the customer's home, and required several visits. Why didn't I take the set back to the workshop? Because I'm a TV engineer, not a weightlifter!

Sony KVX2572 (AE2 series chassis)

Dry-joints at and/or complete failure of the TDA8179S field output chip IC1501 is a fairly common fault with these sets. When the chip is faulty the A and B lights at the front of the set flash thirteen times. Replacement of the IC or resoldering usually cures the trouble. On this occasion I had to replace the chip, but this wasn't the end of the story.

A few days later I was called back. IC1501's soldering was OK, so I had to look elsewhere. The next most common problem with these sets is the soldering around the 5V and 12V regulators on signals board A (the TDA8138A 5/12V regulator chip IC681 and the 2SD774 5V regulator transistor Q683). Once resoldering in this area had been carried out the set worked normally.

But I was called back yet a third time, at which point I decided to take the set back to the workshop for a detailed examination of signals board A and power/deflection board D. The cause of the trouble turned out to be a dry-joint at R849 (15Ω, 2W) on board D. It's in the line scan circuit.

Goodmans 2575 (F11 chassis)

This set had suffered from the usual dry-joint that leads to a burnt line output stage tuning capacitor. This time it had damaged the two EW modulator diodes as well, so all three items were replaced (the line output transistor had not succumbed). When I switched the set on there was obviously an EW problem, and the TDA4950 EW correction chip was getting hot. The cause was the loading coil, which had developed shorted turns.

Parts like this for Goodmans sets are not readily available, but a marking suggested that the value was 10mH. As luck would have it I had a Sony 10mH coil for the AE1 chassis (position L807). When I fitted it and switched on everything was OK. Thank you Sony! ■

TELEVISION reader offer:
x1, x10 switchable oscilloscope probes, only £21.74 a pair, fully inclusive*

*Additional pairs as part of the same order, only £19.24 each pair.

Seen on sale for £20 *each*, these high-quality oscilloscope probe sets comprise:

- two x1, x10 switchable probe bodies
- two insulating tips
- two IC tips and two sprung hooks
- trimming tools

There's also two BNC adaptors for using the cables as 1.5m-long BNC-to-BNC links. Each probe has its own storage wallet.

To order your pair of probes, send the coupon together with £21.74 UK/Europe to ***Probe Offer, Jackie Lowe, Highbury Business Communications, Anne Boleyn House, 9-13 Ewell Road, Cheam, Surrey, SM3 8BZ***

Readers outside Europe, please add £2.50 to your order.

Please supply the following:

Probes

Total_____

Name _____

Address _____

_____

_____

Postcode _____ Telephone _____

Method of payment *(please circle)*

Cheques should be made payable to TELEVISION

Access/Mastercard/Visa/Cheque/PO

Credit card no_____

Card expiry date Signed

Please allow up to 28 days for delivery

Specifications

Switch position 1

Bandwidth	DC to 10MHz
Input resistance	1MΩ – i.e. oscilloscope i/p
Input capacitance	40pF+oscilloscope capacitance
Working voltage	600V DC or pk-pk AC

Switch position 2

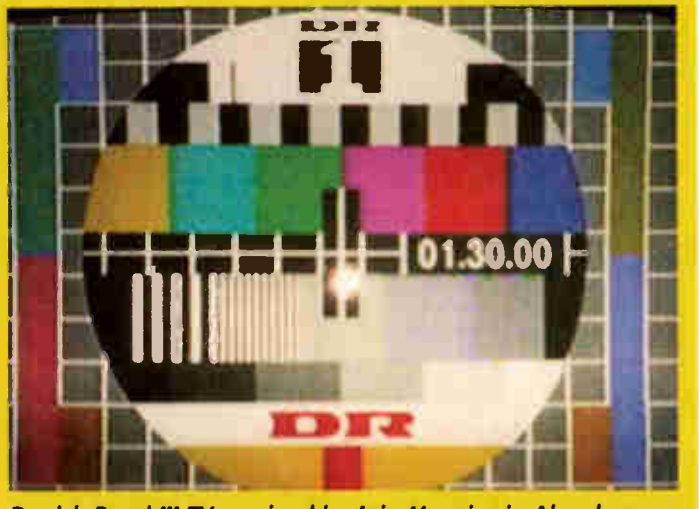
Bandwidth	DC to 150MHz
Rise time	2.4ns
Input resistance	10MΩ ±1% if oscilloscope i/p is 1MΩ
Input capacitance	12pF if oscilloscope i/p is 20pF
Compensation range	10-60pF
Working voltage	600V DC or pk-pk AC

Switch position 'Ref'

Probe tip grounded via 9MΩ, scope i/p grounded

DX and Satellite Reception

Terrestrial DX and satellite TV reception reports. News on TV broadcasting and satellite band changes. Noctovision, fifty years ago and early TV links. Roger Bunney reports



Danish Band III TV received by Iain Menzies in Aberdeen.

The move from autumn to winter produced rain, wind, frost and a little F2-layer reception, as solar cycle 22 declines. Checks with my scanner revealed something of interest on just one day, when there was a tantalising ch. R1 video buzz. This was at 0815, before leaving home for the daily drudgery. During several late October afternoons however there were North American communications signals to mid 30MHz, typically utilities and police.

Cyril Willis (King's Lynn) received TVQ-0 (Australia) ch. A0 on October 18 and 21. Identification was confirmed with his scanner, which showed that the video carrier was at 46·1718MHz. He received ch. E2 signals on the 11th, 19th, 22nd and 23rd. On the latter two occasions locked, multiple pictures could be resolved. Cyril, along with most TVDXers, suffers from 49MHz-band interference. As a result ch. R1 is receivable only in audio form using a narrow-band scanner. However Peter Schubert (Rainham, Essex) managed to receive locked but unidentified ch. E2/R1 pictures on the 22nd.

There have been several reports of late-afternoon TE (Trans Equatorial skip) reception of Equatorial Guinea ch. E2 at scanner level. The scanner shows the video carrier at 48·2503MHz. Some reports were mentioned in the *Skywaves* TVDX bulletin, including the 11th and 19th.

Sporadic E signals were received on October 1 and 7. The log for the 1st was: RAI (Italy) chs. IA and IB, SVT (Sweden) ch. E2 and YLE (Finland) chs. E3 and E4. Reception was during the late evening and coincided with auroral activity. There was more of that on the 3rd. The SpE log for the 7th was: NRK (Norway) chs. E2 and E3, SVT ch. E3.

There was a slight tropospheric lift on the 1st, with German ch. E6 and E9 stations received during the late afternoon.

Anthony Mann (Perth, Western Australia) reports, via the TVDX WebList, reception during mid-October from the Arabian Gulf, Pakistan, Malaysia, Thailand and China (chs. E2/C1). A combined F2 and SpE propagation path on the 19th gave him reception from the Middle East. For latest DXing action check the TVDX WebList from Ab FM Media Plaza, Finland at

http://www.mediaplazashop.com

and, for FM, http://www.fmdx.com

Satellite sightings

News via the North Atlantic path during mid-late October was dominated by the Washington sniper. I am typing these notes at the very time when the sniper and his colleague had been captured and were in transit to the police HQ at Baltimore. Live pictures are being carried by the CNN Newsource circuit via NSS-7 (21·5°W) at 11·563GHz H (SR 6.117, FEC 3/4). During the previous week there had been press conferences at various locations around Washington, including several from Montgomery County, scene of the Chicago-Washington rail crash last August 5, when pictures were carried live by Reuters WNS capacity via NSS K. In recent days 'something' within the 11·605GHz H Reuters feed has made it impossible for my RSD receivers to lock pictures. Even more curious, the receivers have refused to lock CNN Newsource pictures but are OK with Manhattan Gigiplaza. Digital is an odd world!

The Bali explosion that killed nearly two hundred holidaymakers occurred in mid-October. On October 14 there were pictures of blue sea and skies, a sandy beach and bending palms as a backdrop for a reporter updating European news services on the death and carnage nearby. 'Non Cat Thailand' carried many news reports, identifying as 'Globecast Path 1', via Europe*Star-1 (45°E) at 12·644GHz V (6.116, 3/4) over a few days until it became 'old news'.

Europe*Star-1 also carried live reportage from Baghdad of the Iraqi elections, with Saddam Hussein taking 100 per cent of the votes cast. 'APTN Baghdad Path 1' was active on the evening of the 15th, with live pictures showing folk celebrating

in the streets of Baghdad, footage of the counts etc. This was at 12·677GHz H (5,632, 3/4).

Bali is just to the north of Australia. A year ago tests were carried out in mid-Australia, using a 1·8m uplink dish, to confirm that quality pictures can be received in the UK via this extremely low-elevation path. I reckon that we will soon be checking out Europe*Star-1 for live Australian feeds. They are certainly possible. C band (4GHz), the traditional band for long-haul TV links, may be showing its age.

A new satellite! On October 23 Roy Carmen (Dorking) 'found' the recently-launched Russian Express-A 1R satellite at 40°E. He received programming from 'Space TV Azerbaijan' at 11·659GHz V (3,333, 3/4). Though the footprint is centred on Russia, the signal levels in mid-Surrey hovered around 25-35 per cent. Newsfeed traffic has been seen at 11·586GHz V (4,000, 1/2). Roy noticed the new satellite while using his Spectralook system (see review in the November issue, page 8), as he tracked to 45°E.

Stefan Hagedorn (I/net newsletter) reports that Jordan TV can be found at 12·380GHz V (27.500, 3/4) via Hot Bird at 13°E. It's interesting, and unusual, that Edmund Spicer (Littlehampton) found Jordan TV in FTA form at 12·591GHz V (27,500, 3/4) via Hispasat at 30°W. Edmund also reports that a channel of interest to sat-zappers is to be launched in late October/early November via Hot Bird at 11·623GHz V (27,500, 3/4). This is Beur TV: it will include a satellite-enthusiasts' programme at 1530 UK time presented by Daniel Renard, who works for the French-language version of the magazine *TELE-satellite*. You can send questions to this programme for answering at www.tele-satellite.com

Satellite information via teletext is available from the following channels: ONYX.TV page 140; Tele-5 (Astra 1 analogue) page 190; TV5 page 527; ORB page 696. The first two are updated on Mondays and Thursdays.

There have been fewer sightings of Granada group regional satellite links via Intelsat 801 (31·5°W). This could be because of the darker evenings or implementation of economy measures – there are rumours that the magazine programmes will be reduced to twenty minutes nightly. There was a live from Meridian 8Mbit however on October 17th, at the Dover Channel Tunnel terminal. This was at 10·970GHz V (5,640. 3/4). Eurotunnel director John Norton and MP Michael Howard were present to discuss the lack of effective security.

Finally the mid-morning sighting via Intelsat 801 on September 18, reported by Roy Carmen and Dave Dyson (Accrington). of a French memorial/funeral service with President Chirac in attendance has been confirmed as a funeral service for five firemen who were killed during the course of duty. Medals for courage and devotion to duty were presented to relatives.

Broadcast news

UK RSL stations: Southampton TV opened at 1730 on October 21. The 4kW ERP transmissions are on ch. E29 with horizontal polarisation, beamed north from high on the Fawley power station chimney. Content consists of a mixture of local programming and news, Sky News and QVC, originating from studios in central Southampton. Programmes run from 1100-0100. Should be an interesting DX catch – look for the top right-hand corner identification STV. For more information check at www.southamptontv.com

Sister channel Portsmouth TV also operates on ch. E29 with horizontal polarisation, beamed NE from Gosport.

Isle of Wight station Solent TV opened on October 31, replacing TV 12 on ch. E54 (horizontal) at 2kW ERP from Rowridge. The studio is at Newport. At the start there was an "introductory news and information service", to be replaced with a more complete programme schedule in December and a live news service in January.

North of the border, the ITC has invited applications for a new four-year RSL-TV service in the Aberdeen area – the previous licence has been revoked. Coverage is reckoned to be the Aberdeen region extending to Stonehaven.

A live news report on the Bali explosion, via Europe*Star-1 at 45°E.

Germany: The Berlin-Alexanderplatz ch. E5 transmitter (100kW) has closed, the frequency now being used for DVB-T

Saddam Hussein delivers his election victory speech. Reception via the Iraqi Space Channel.

(terrestrial digital TV). This, with various channel changes, is the first step in providing Berlin with digital terrestrial TV services. The on-going programme will involve further analogue TV closures (RTL, Sat-1, etc.) over the next few months. As the analogue transmitters close, digital ones will take over. By Autumn 2003 Berlin will, in theory, be all digital. Information received from Gosta van der Linden.

Spain: In late summer only three mainland Band I transmitters remained in operation, Madrid ch. E2, Aitana ch. E3 and Guadalcanal ch. E4. There is also Izana (Canary Island) ch. E3.

Satellite news

Intelsat has bought the AacAmTel teleport near Los Angeles and has renamed it the Riverside Teleport. It has direct fibre links to nearby major telecom switching centres. This west coast site will provide both Atlantic and Pacific connections – watch out for exotic test cards!

The Hong Kong based Star-TV satellite service for SE Asia is undergoing changes. Uplinking is to be contracted out – the company's teleport has been placed on the market. New Zealand trade press magazine *SatFACTS* comments that Rupert Murdoch's services to India and China are proving less than successful. Piracy is rife, and pirate decoders are on the increase.

Chinese radio experts claim that the recent jamming of radio and TV downlink signals from the Sinosat-1 slot (110·5°E) originates in Taiwan.

Europe*Star plans to have a second satellite in orbit at 45°E by the autumn of 2004 to provide improved reliability and enhanced coverage of the Indian sub-continent. Alcatel, Loral Space and Globecast are planning a Ku-band DTH TV service for India. Sony and Thomson will be involved in the provision of set-top boxes. It is hoped that Doordarsham, Zee-TV and other terrestrial broadcasters will participate, and that a large Indian company will contribute about 80 per cent of the cash required.

Ku band is now established as the main band for DTH TV and radio satellite services in most of the world. The next move is likely to be to Ka band (17·7-21·2GHz), for both up- and downlinking. Eutelsat and others are carrying out long-term tests at these frequencies. New Skies Satellite will shortly launch its NSS-6 satellite into orbit at 95°E. It will have twelve high-gain Ka-band input aerials and convert to Ku band for downlinking. One advantage of this approach is that the problem of rain-fade is reduced, particularly in tropical zones. NSS-6 will cover Asia, the Middle East and parts of southern Africa.

Ka band is increasingly favoured for use with satellite uplink trucks. E2V, Chelmsford is currently selling 120W Ka-band amplifiers for SNG use. The price of Ka-band downlink terminals is likely to fall as commercial use increases – $350 or less is likely by 2005.

Those with internet access can check Andy Middleton's Satellite pages at

http://www.bigwig.net/stuff/sat/links.htm

One tip for FTA broadcast programme information is DigitalSat.UK

Early TV: Noctovision

I'm lucky in having copies of *Television* and *Practical Television* (its previous title) dating back to the early Fifties, and some similar publications that date back to the late Twenties. They provide vital information on the development of TV in the UK, from the Baird days through to today's satellite and DTT services and flat screens.

A query arose recently – when did long-distance TV reception (DXTV) start? In the past I have always quoted the exploits of Charles Rafarel who, in 1933, received Baird's MW-band, 30-line mechanical TV transmissions from Brookmans Park in Leeds. Anyone care to comment on this subject?

The magazine *Television*, published by The Television Society (later to become The Royal Television Society), described itself as "The World's First Television Journal". In the first issue, dated March 1928, Ronald Tiltman described Noctovision. This experimental system was another of Baird's ideas. It enabled television to provide pictures in darkness using infra-red scanning. Baird took out a patent for it in December 1926, and gave a demonstration to the Royal Institution on December 30 that year. The motivation to build a Noctovisor came to Ronald Tiltman when he attended a demonstration of the Baird 30-line system at Leeds on September 7 1927. The subjects sat in darkness and were scanned by "a powerful battery of blinding lights". The pictures were viewed in a building at Leicester Square in London, the signal being transmitted via a telephone line – a second line provided two-way voice communication. Would that count as early DXTV?

One of the things that worried Baird in his early experiments was the brilliant light required to scan the scene, because the photoelectric cells he was using were not very sensitive and the light reached them through the small holes in his scanning disc. He thought it might be possible to scan the scene with light above the normal visual range. Ultra-violet rays were first tried, then infra-red. Use of an infra-red sensitive cell proved to be successful: the scene could be scanned by an infra-red beam, avoiding the discomfort of brilliant light and heat with conventional illumination, yet at the receiving end the scene appeared to be brightly lit. The drawback was that the studio would have to be in darkness, though there was potential for night-time OB work. The Navy showed some interest in the idea, as it appeared to make it possible to see things in a fog. Little more work seems to have been done on it.

It's interesting that The Television Society's magazine negotiated an agreement with the Baird company to provide readers with a two-year duration "constructors sub-licence", giving them the right to construct a single receiving apparatus for amateur use without infringing the Baird World Patent Rights.

Fifty years ago

While we are in a reminiscent mood, here are a couple of items from fifty years ago. James McKeown, another early TVDXer, had little success with reception from either the Holme Moss or Sutton Coldfield transmitters at his jeweller's shop in Ballymoney, Co. Antrim. But he obtained almost perfect

pictures when Kirk o'Shotts opened – and put his TV set in the shop window!

A Danish TV service had opened in September 1951. It was so unpopular that after six months only 400 receivers had been bought. There was thought of closing the service down.

Early TV links

The possibility that a coaxial cable link might have been used at Beachy Head during World War II to relay to London the German TV signals received from Paris was discussed in this column last month. At the time, the technology was not up to it. But within eight years an extensive long-haul coaxial-cable network was being laid as the BBC extended its TV activities beyond London.

The first London (Museum) to Birmingham (Telephone House) circuit involved a run of some 121 miles, via Watford, Aylesbury, Daventry and Coventry. There were 43 repeater stations, one every twelve miles, and two 0·975in. coaxial "tubes" were used. The link provided two-way transmission of 405-line TV with a bandwidth of 3MHz. Apparently the bandwidth capability extended to 26MHz to cater for possible future needs. A quad coaxial feed was provided for telephony only.

The subsequent Birmingham to Manchester route used six 0·375in. coaxial cables for TV with repeaters every six miles. There was repeater station monitoring, and control via sixteen paper-insulated quad wires. The extension to the Holme Moss transmitter involved further 0·375in. coaxial cables for TV and music circuits.

The funeral of King George VI accelerated completion of the next stage, to Kink o'Shotts in central Scotland. This involved different technology, a two-way microwave link at 6GHz covering 250 miles. There were seven unattended repeater stations, though full remote control and monitoring were provided. The link was completed four weeks ahead of schedule.

Reception from Southampton's RSL-TV station, which transmits on ch. 29 with horizontal polarisation.

Test Case 481

If there is one thing that Television Ted does not like, it's having to go out on the road. But Doc Colin was covering for staff holidays in the shop, and some of the others in the workshop had been struck down by a mystery bug – or perhaps it was their Christmas shopping. So Ted was nominated for the outside work. To add to his woes, our firm has recently taken over a small competitor with satellite interests: some of the calls on this chilly day related to satellite problems. Grumbling about the cold, the van, and the map he had been given, TT finally departed at about ten in the morning. It was not going to be a good day . . .

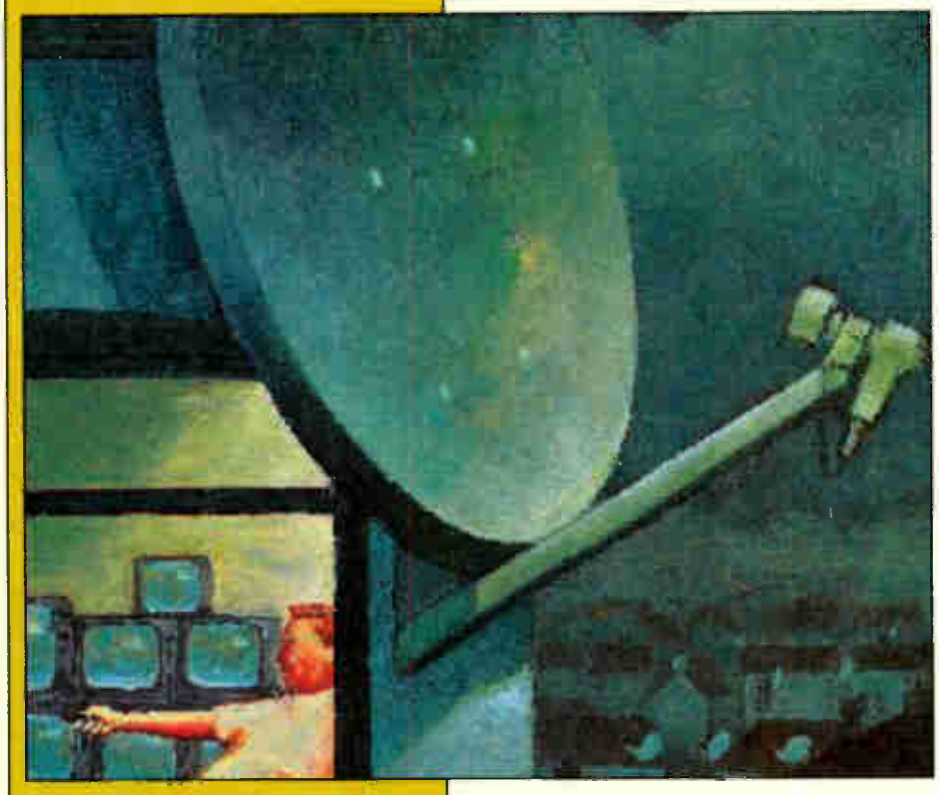
Ted is not too familiar with satellite reception and receivers, and his troubles in this respect started with his very first call. The patient was a Sky digibox that had to be exchanged because it had failed – a strange buzzing noise came from within it. The designated loan box was an Amstrad one. There was no trouble with installing it, and of course no tuning-in was required. But many of the channels were missing: there were none from the BBC, and no subscription channels. In fact only a handful came up on the screen. Why was that? Ted didn't know, but the shop staff did. Do you? Not Einstein stuff really.

On to the next call then, via a frustrating and traffic-choked journey of fourteen miles to Stoke-Wannabe, where the customer had a relatively trivial fault: the digibox had a programme stuck in its Personal Planner memory. "X Files 18/ 9pm it said, and no amount of yellow zapper button keying, in the programme-planner mode, would get rid of it. Ted disconnected the box from the mains supply, then went to the van to work out his route to the next customer. Five minutes later he returned to the digibox, plugged it in again, and once more tried to delete the offending caption – without success. Was there a solution to this? Yes! When Sage was called up on the phone he was able to help. Mr Johnson's personal-planner screen was clear when Ted, turning the big white van around, struck his gate a glancing blow.

Thank heavens the next job was a TV one. Ted found that the 3·15A mains fuse in the set, a rental Panasonic TX28PK2, had blown. The service record showed that it had been replaced twice before on site during the past eighteen months. The one that Ted took out was neither shattered nor blackened, just soft blown. This time Ted had the answer in his head, and an item that provided a cure was in the van. What was it? Over to you again!

The final call that morning (to describe Ted's afternoon would be really too much!) was another legacy from the now-defunct Satellite Sam shop. The Higgins family had recently bought a new Dolby Digital 5.1 surround-sound decoder/amplifier, and were thrilled with the results they obtained in this mode when playing a DVD. The Odeon right there in Kitchener Close! The audio from the disc player was connected to the audio box via an optical cord. They had acquired and fitted another one between the audio box and the output from their older Sony satellite receiver, Model VTX-S560U. But, they told Ted, the surround-sound field was not nearly as good as with disc playback. What ailed?

If you need to look up the answers, you'll find them on page 187.



SATELLITE NOTEBOOK

Reports from
Christopher Holland
Hugh Cocks
Donald Jenkins
and
Michael Dranfield

More cable problems

Last month I reported on a digibox reception problem caused by coaxial cable degradation. Hot on the heels of that one we had a complaint about an Amstrad digibox. Mrs Smythe had been using her DRX100 digibox for a number of years. Every so often the picture would break up into squares, though the signal-strength/quality display was normal. Since the DRX100 has a reputation for tuner trouble, I decided to take the box back to the workshop. It worked without trouble there, even when the ambient temperature was raised by covering the top, during a test period that lasted for several hours. This made me feel that a new tuner might not cure the problem, so I decided to install a temporary digibox at Mrs Smythe's house.

We have a number of old 'loan' digiboxes, so I phoned Sky and arranged for Mrs Smythe's card to be paired with a Grundig GDS200. I then delivered and installed this, and asked her to report any strange effects seen on the picture. Next morning she was on the phone to say that exactly the same thing was happening with the Grundig digibox.

A check with our spectrum analyser on what came out at the receiver end of the cable showed that the top of the high-band IF range (approximately 1,900MHz) was about 10dB down on the low end (1,100MHz). This was well below normal, particularly with the shortish cable run involved. The digibox signal-strength and quality displays remained OK because transponder 4 (11·778GHz) is used as the reference: it has a low-end IF of 1,178MHz.

When I headed up to the roof I found that the outer sheathing of the cable had several nicks in it near the dish. This had allowed ingress of water. Once the cable had been replaced the IF response at the digibox was much flatter across the band, and several dBs up even at the low end.

I left the Grundig digibox in place as I wanted to replace the tuner in the Amstrad box in any case. It was the original one, and might have failed at any time. There were no more problems with the Grundig digibox that evening, or indeed subsequently when the Amstrad box with its new tuner was back in place. **C.H.**

Digital channel update

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

Eurobird transponder D8S (11·604GHz V) has been activated and is carrying a duplication of the Disney Channels via Astra 2D transponder 51 (10·862GHz H). Interestingly the Eurobird transmissions use the Astra 2D symbol rate of 22,000 and FEC of 5/6 rather than the 27,500 and 2/3 with other Eurobird transmissions.

Icelandic TV tests are being carried out via Astra 2D transponder 48 (10·818GHz V). The EPG no. is 48. See Photo 1.Open Access TV tests are being carried out via Eurobird transponder D2S (11·488GHz, V). The EPG no. is 687. See Photo 2. Hollywood Classics tests are being carried out via Eurobird transponder D9S (11·623GHz H). **C.H.**

C-band reception

This month attention is turned to NSS

Photo 1: Icelandic TV test transmission via Astra 2D.

Photo 2: Open Access test transmission via Eurobird.

Photo 3: Sur Peru transmission via NSS 806.

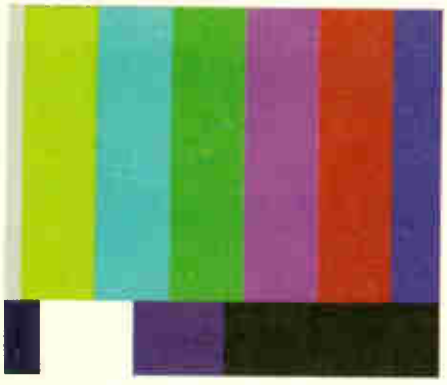


Photo 4: NTSC colour bars from Venezuela via NSS 806.

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

Channel and EPG	*Sat*	*TP*	*Frequency GHz/pol*
Chart Shop TV (663)	EB	D2S	11·488/V
TDC 2 (688)	EB	D2S	11·488/V
TGH (663)	2B	33	12·344/H
TX1 (689)	EB	D2S	11·488/V
UK Living* (113)	2A	2	11·740/V
UK History (582)	2A	6	11·817/V

*Plus one hour.
TP = transponder. 2A = Astra 2A. 2B = Astra 2B. EB = Eurobird.

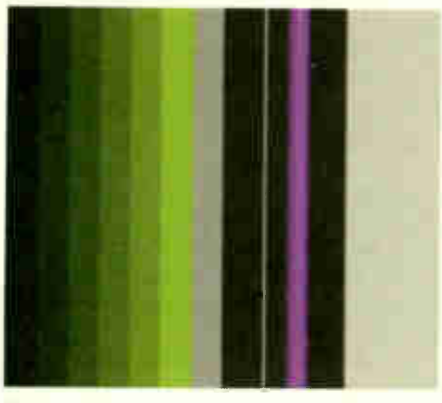


Photo 5: Pulse and bar transmission from Bolivia via NSS 806.

Photo 6: GlobeCast World TV transmission via NSS 806.

satellite 806 at 40·5°W. It carries many South American TV channels, being aimed primarily at cable headends on that continent, but the footprint extends to Europe. Fortunately a number of the signals are transmitted in the clear. The satellite is unusual in having no Ku-band capacity.

Many of the signals are 525-line NTSC. If the digital receiver has such a menu (not all do) it should be set to switch to 525-lines automatically. Alternatively the 525-line output can be set to RGB rather than NTSC, thus permitting colour reception with any TV set that has RGB inputs. When a 525-line digital signal is displayed by a 625-line receiver the picture will be shortened with jerky motion, and total dropout will occur every few seconds.

Table 2 shows the frequency allocations from 3·636-3·968GHz. Next month we'll list channels at the top end of the band.

TV Sur at 3·666GHz appears to link various Sur channels within South America. Photo 3 shows Sur Peru, but at times Sur Venezuela and Sur Bolivia logos are seen.

Some channels within some of the Venezuelan, Bolivian and Telefe multiplexes are, unfortunately, scrambled. But a number are in the clear. No exotic test cards are used. Photo 4 shows typical NTSC colour bars from Venezuela. Photo 5 shows a pulse and bar from Bolivia, used during the night there (up to about 11 a.m. in the UK).

GlobeCast links various European and Arab channels across the Atlantic for distribution in North America. Most of the channels within its three multiplexes are in the clear. See Photo 6.

Frequencies that are totally scrambled include 3·923GHz from TV Globo, Brazil (LH polarisation, SR 27,500, FEC 5/6). ESPN (3·640GHz, LH, 20,000, 5/6) is usually scrambled, though there are occasional unscrambled feeds in both 525- and 625-line format.

Photo 7 shows reception from Argentinisima, Photo 8 reception from Telefe Argentina and Photo 9 reception from Ser-Sat Argentina.

Next month we'll move to the top of the band. **H.C.**

Amstrad DRX100

When faced with the "no satellite signal" message on the screen, check capacitors C105, C110, C112, C113, C115, C122, C124 and C352 before you try a new tuner. They are all 47µF, 35V, 105° electrolytics, and are near the tuner. With the unit I had on the bench all these capacitors had ESRs that were well out of tolerance. It worked normally once replacements had been fitted. **D.J.**

Panasonic TU-DSB30

This digibox would return to standby when

Photo 7: Argentinisima Satelital transmission via NSS 806.

Photo 8: Telefe Agentina transmission via NSS 806.

Photo 9: Ser-Sat Argentina transmission via NSS 806.

Table 2: NSS 806 (40·5°W) lower frequency allocations

Frequency GHz/pol	*SR/FEC*	*Service*	*Country*	*Standard*
3·636/R	13,800 5/6	Argentinisima Satelital	Argentina	625
3·666/L	3,300 5/6	TV Sur	Various	525
3·737/L	8,890 3/4	Telefe	Argentina	525
3·803/L	27,500 3/4	GlobeCast	Various	525
3·803/R	25,357 3/4	GlobeCast	Various	–
3·847/R	18,800 3/4	GlobeCast	Various	–
3·878/R	14,333 5/6	Venezuelan multiplex	Venezuela	525
3·920/R	17,953 3/4	Bolivian multiplex	Bolivia	525
3·968/L	4,000 7/8	Ser-Sat	Argentina	625

L = left-hand circular polarisation, R = right-hand circular polarisation.

it was switched on. I found that it would stay on when the viewing card was removed. This problem is usually caused by out-of-date software rather than a card problem, and sure enough the operating system was about a year out of date.

When I tried to update the software nothing happened: the system software update message just stayed on the screen. I left the unit on overnight, but the message was still on the screen next day. The problem was cured by replacing the M29F800AB-70N1 flash-memory chips IC356/7/8/9. Make sure you fit the correct version, as different types are used. The suffix AB seems to relate to where the boot block is held in the memory. Fit the wrong chips and the unit will be stuck in standby. **M.D.**

Amstrad DRX100

A fault I've had many times with these digiboxes is intermittent picture freezing, usually when the box has been on for a while. So far this has affected only early models with the ST20TP2 micro chip and SRBP power supply board. The cause has been oscillation on the 3·3V supply to the BMC4200 channel decoder chip. This oscillation comes from the MC33269 3·3V regulator U104 – check its output with an oscilloscope. I use an LM1117DT-3·3 for the replacement as its price is about half that of the MC device. **M.D.**

Pace 2200

This digibox displayed the "no satellite signal received" message. The dealer who sent it to me had already replaced the tuner to no avail. Pins 12 (in phase) and 14 (in quadrature) of the dual ADC chip U404 were receiving the correct signals from the tuner, and the chip was producing digital outputs. The fault was cured by replacing the following L64704 channel decoder chip U403. **M.D.**

Amstrad DRX100

Power supply faults are beginning to show up in the very early versions of this digibox – the one with the dark-brown SRBP power supply PCB. This one was stuck in standby. The cause was not the modem voice processor chip this time. C15 (330µF, 25V) on the power supply PCB had fallen in value. To date I've not had any failures with the later power supply PCB, which is made of fibreglass. **M.D.**

Pace 2200

This digibox worked OK when scart outputs were used but there was no output via the RF sockets. The usual cause of the problem is water getting down the aerial lead and entering the modulator, but not on this occasion. This time the cause was failure of the RF carrier oscillator because the 8·2µH coil L640 had never been soldered properly from new.

Other items to check for this problem are the 4MHz crystal X640 and the varicap diode D640. And don't overlook possible loss of the 33V tuning supply. Check these items before condemning the TDA8822T chip. **M.D.**

Amstrad DRX100

If one of these digiboxes is slow to come out of standby, replace C9 and C10 (both 1,000µF, 10V) on the power supply PCB. They may be low in value, causing ripple on the 5V rail. So far this fault has affected only early models with the dark-brown SRBP power supply PCB. SatCure does a good range of upgrade capacitor kits that are well worth fitting. **M.D.**

Panasonic TU-DSB30

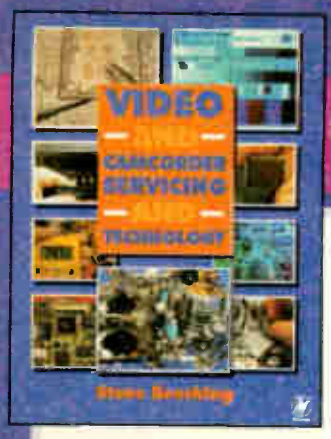
This digibox displayed the "no satellite signal is being received" message. The customer said it had gone off after a lightning storm. The cause of the problem was loss of the LNB supply. Checks in the LNB circuit revealed a short-circuit diode, D001, which is marked N610. As it's connected to a large inductor, I assume it's part of a chopper circuit used to generate the LNB supply. Panasonic won't supply spare parts or circuit diagrams, so one has to guess. I decided to fit a fast-switching BA157 diode, which cured the problem. No other damage had been done. **M.D.**

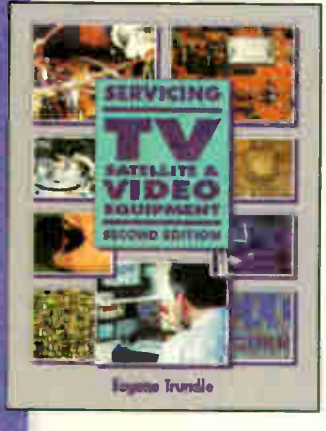
Amstrad DRX100

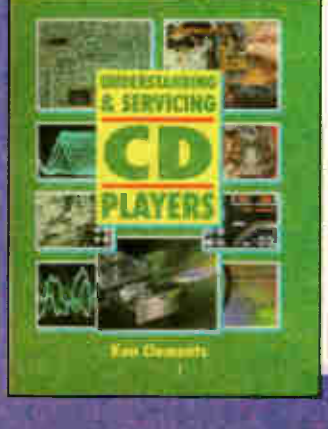
This digibox was the early version with the ST20TP2 micro chip. It wouldn't move from the searching for listings page, and no clock time appeared in the corner. In addition the red LED inside, which seems to light up when a signal is being received, was not lit.

Scope checks on the in-quadrature and in-phase outputs from the tuner confirmed that it was working correctly. But there were no digital inputs at the multiplexer chips U13, U14 and U15. I then discovered that by pressing the internal reset button S1 the box would reboot up and work correctly – until it was unplugged from the mains supply.

This led me to suspect that the BCM4200KEF channel decoder/DAC chip U100 was faulty, but a replacement made no difference. Still convinced that the cause of the fault lay in this area, I spent some time scoping waveforms and comparing the results with those from a working box – until I spotted a missing component, R133. This is a zero-ohms link, and was present in the working box. Fitting the link restored the faulty box to full working order. How it had ever worked is a mystery. But it must have been OK until it was disconnected from the mains supply one day. **M.D.** ■







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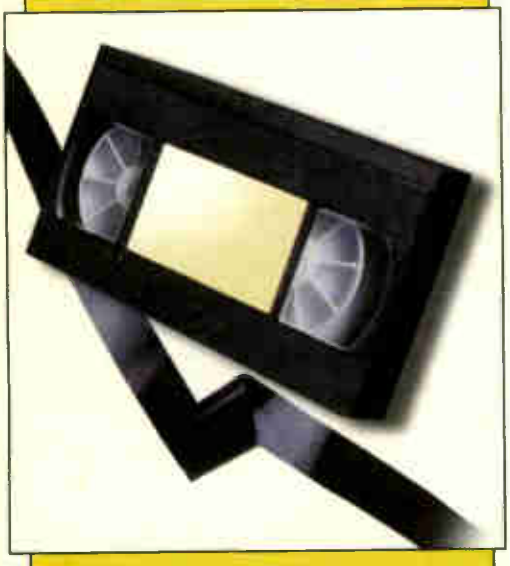

VCR CLINIC

Reports from
Eugene Trundle
Dave Gough
Bob Flynn
Peter Tennant
Bob McClenning
Bob Longhurst
Paul Flower
and
Jerry Fedorak

We welcome fault reports from readers – payment for each fault is made after publication. See page 172 for details of where and how to send reports.

Panasonic NVFJ610

We've had several of these and similar models with the complaint of static 'blips' on the playback picture. In some cases the cure has been to clean the PCB land that earths the metal bottom panel. Some however can be dealt with properly only by replacing the earthing brush that's buried under the upper drum. Panasonic has available a rather expensive conductive oil with which to anoint the shaft. **E.T.**

Goodmans VN9600B

Functions were intermittent or, as the customer said, the machine "had a mind of its own", with "error" shown in the display. Once I had removed the lid I recognised the mechanism and knew exactly what to do. Remove the white plastic frame that holds the mode switch, unsolder the switch, open it up and deal with the dreaded green gunge. Clean and replace the switch and you will have normal operation. **D.G.**

Panasonic NV870

Once a tape had been inserted this old-timer would refuse to release it. As I suspected, the loading belt was the cause. But inspection showed that further work was required. SEME has a service kit at a very reasonable price. Once I'd fitted this and given the machine a good clean it worked very well. These are well-made machines that provide excellent pictures and sound. It's a pleasure to work on them. In addition I had a happy customer! **D.G.**

Bush BTV14

I'm not too keen on these cheaply-made combi units. This one was ticking and did nothing else. Fortunately the cause was simple, a dry-joint at the ceramic insulated wire link next to the line output transformer, on the LOPT panel. Once this had been resoldered there was normal operation. **D.G.**

JVC HRJ755EK (1998 deck)

Tapes couldn't be inserted because the top plate, item 274, had come adrift. It's held in place by two flimsy plastic clips, one at each side, on the side holders. Both had become weak. Charles Hyde can supply the left-side holder under order code 22007MZ and the right-side holder under order code 22007PA.

The manual tells you to remove all the gears on the side, but this isn't necessary. Unclip the two plastic assemblies at the left of the deck, move the mechanism so that the drive arms are upright, and lift the holder out. **B.F.**

Hitachi VTF150E

Sometimes a loop of tape would be left inside the VCR when a tape was ejected. The cause appeared to be erratic movement of the half-loading arm. In fact it was because the back-tension band had come apart, exposing the sticky part to the supply spool. **B.F.**

Panasonic NVF55B (G deck)

When this machine was asked to play or record it would lace up, freeze then turn off. The cause of the trouble was the plastic retainer for the pinch roller. It had split, allowing the roller to slip down and jam the mechanism. **B.F.**

JVC HRS7500EK (1998 deck)

This VCR tried but failed to unload the tape from the play position. It's the third time I've had the problem with this deck. Each time the cause has been a piece of white plastic about 1·5in. long that jammed the tape arms. It looks as if it might have come from the large control plate, but comparison with another deck failed to show where it had come from. As with the previous cases, removing this piece of plastic restored full working order.

Does anyone know where the plastic comes from and why it's not needed for the deck to work? **B.F.**

JVC HRJ670 (1998 deck)

There was no power with the 1·6A mains input fuse F5001 blown. Visual inspection revealed that Q5102 (2SD2144S) had blown apart. Further checks revealed that the chopper FET Q5101 (2SK2632-CB14) was short-circuit and R5106 (0·39Ω, 1W) was open-circuit. No reason for the failures could be found so, in addition to these items, I replaced the optocoupler PC5101 (ON3171) and C5104 (1µF, 50V). A long soak test proved that the machine was now OK **B.F.**

Panasonic NVHD620B (K deck)

A tape would sometimes jam in the play position with F03 shown in the display. It's not possible to unload the tape manually with the deck removed, but this can be done if the cassette housing is removed. On inspection there was no visible physical damage, and the loading motor coupling was OK.

I've had a similar problem with a Mitsubishi VCR that would continue to load past the correct position and jam up. As in that case, replacement of the mode switch cleared the fault. **B.F.**

Goodmans TX4000 (Daewoo FM)

This machine would accept a tape and go to the laced-up position, but the drum motor wouldn't turn. The VCR would then unlace, with the drum motor now turning though

the capstan motor didn't. So a loop of tape was left out as the tape was ejected. This unusual sequence of events was cured by cleaning the mode switch. **B.F.**

Sony SLVE40UX

This machine would intermittently die with no display at the front. If there was a tape inside it would be jammed, even if the power subsequently returned. It took a long time to trace the cause, but the cure was simple: resolder pin 1 of connector CN1 on the front display panel. **P.T.**

Toshiba V813C

Dead symptoms can usually be cured by replacing the 47nF, 250V capacitor next to the STRD6202 chopper chip. In some cases you may have to retune all the stations. **P.T.**

JVC HRD610

This VCR was dead because C12 (2·2µF, 50V) in the power supply had failed.

Another fault that's very common with these machines is recording only one programme in the timer mode. Any attempt to record further programmes (on timer) shuts the machine down. The cure is to replace the mode switch (carefully). Cleaning it does not usually provide a lasting cure. **P.T.**

Hitachi VTF550K

The usual cause of intermittent stopping and a cassette jam up is a clutch assembly that's parted company. Don't try to repair it as this will not last. The only cure is replacement **P.T.**

Ferguson FV91LV

The fault with this machine was no display. CP041 (220µF, 10V) in the 'boxed' power supply had failed. **B.McC.**

Sony SLVE700UX

As this machine was completely dead I had to unsolder the self-contained power supply from the main PCB. ESR checks then revealed that C204 (1µF, 50V) and C103 (1µF, 100V) were faulty. Once they had been replaced and the unit had been soldered back in place the VCR powered up OK. **B.L.**

Sanyo TLS942P (P90 mechanism)

The problem with this time-lapse machine was that tapes snagged as they were ejected. I soon discovered the cause: the supply spool was just wobbling around inside the back-tension band. On closer investigation I found that its centre shaft's retaining plastic 'socket', which is held in place by four plastic spokes, had broken away from the mechanism's chassis. I could find no repair kits, which meant that in theory this was a dustbin job. The same plastic parts on the take-up spool were cracked.

I used epoxy resin glue to carry out repair, the result being much stronger than the original fixings. I couldn't decide whether the damage had occurred as a result of misuse or not. Over the years I've repaired dozens of P90 mechanisms but have never before had this problem. **B.L.**

Sanyo VHR289

The fault with this terror was leaving old audio on new recordings. After many hours checking around I found the cause to be a small capacitor under the head drum, circuit reference C2015 (47µF, 6·3V). A replacement solved the problem. **P.F.**

Toshiba V709B

If there is only a flashing red LED with the power supply pulsing, replace CI5535 (2,200µF, 10V). **J.F.**

MONITORS

Fault reports from
Ian Field
and
Bob Bradley

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

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Elonex XV17

This was the square-case version, like the Digital VRC16. The complaint was intermittent picture distortion. Experience has taught me that the switch-mode power supply electrolytics can fail and can mean an expensive return. So this is where I started. The electrolytics were all more or less OK however. I replaced a couple of marginal ones, but this made no difference to the symptoms. The soldered joints at some of the TO220 devices were beginning to pull, so these were attended to.

Once I was satisfied that the power supply board was in good condition I moved over to the timebase panel. The soldering here left much to be desired – say a new reel of solder! The main culprit was the 'hot' pin of the scan plug connector. There were visible signs of arcing here. Most of the solder joints on the panel needed at least a touch of fresh solder. Once this operation had been completed there was no further trouble. **I.F.**

Project LM1564

The complaint with this monitor was "big 'comet tails' on any contrast changes in the display". The symptom suggested that there was failure of the decoupling electrolytics for the supplies to the RGB output stages. These electrolytics are mounted more or less locally at each output stage, but are in parallel. They are C766, C746 and C786, all 4·7µF, 160V. Their ESR values were not too bad a for small, high-voltage type, but I nevertheless fitted replacements. After that I traced the 96V supply back via L701 to C720 (10µF, 160V), which was also OK.

As the RGB drive presets are connected to the LM1203 chip, the video output stages are DC coupled to the CRT. Had coupling capacitors been used, they would have had to be in a pretty bad state to produce a fault of this severity. The LM1203 chip seemed to be rather warm, so a replacement was tried, again to no avail.

The culprit turned out to be Q761 (2SC3953-O), which was short-circuit base-to-emitter. The bias for this common-base transistor is not decoupled, as the blanking pulses are applied here. This explains why the fault affected all three RGB output stages. The LM1203 chip ran cooler once the faulty transistor had been replaced. **I.F.**

Compaq 450

The customer brought me a Compaq 440 (15in.) and a 450 (17in.) monitor, which both had faulty power supplies. He wanted one working monitor, and hoped that the other one would provide the replacement parts required. His preference was for the 17in. version.

The 15in. monitor had a short-circuit HT rectifier. The trouble with the 17in. monitor was rather more serious. For a start IC3700 had split in two! In this chassis IC3700 and IC3703 are both type UC3842, instead of the usual 221-466E house-coded parts. R3702 (1·8kΩ), R3703 and R3727 (both 4·7kΩ) were burnt beyond identification, making it necessary to check with the other monitor for the values. Q3700 had exploded, leaving little more than its legs sticking out of the PCB. So I assumed that QX3701, a Motorola STG4020 MOSFET, had also been destroyed. The sub-panel that sticks up from the PCB is connected to pins 4 and 8 of IC3700. I didn't fancy its chances!

In view of the customer's preference, I decided to repair the power supply in the 15in. monitor and fit it in the 17in. one. Contrary to my earlier impression, there are connectors: it's just that they are buried under heaps of hot-melt glue! The power supplies are identical. When I fitted the repaired 15in. one in the 17in. monitor it worked.

Once a display had been obtained it was apparent that there was still a problem. The display was slightly green at one side and slightly purple at the other. In addition there were comet tails from any points of sharp contrast change. The culprit was C409, a 2·2µF, 100V non-polarised electrolytic in the green-drive coupling circuit. It hides in a small space between the inside of the heatsink and the plastic CRT neck clamp. The clamp was missing, and it looked as if C409 had been squashed in the struggle. This plastic clip is often removed. I think people take it out because the rigid fixing stresses and breaks the CRT first anode spark gap and earth pin.

The two companions to C409 are C209 and C309. The use of these non-polarised electrolytics for video coupling came as a surprise, as I've yet to see a monitor with a better video bandwidth than this one. Use of 2·2µF, 100V PETP-MKT capacitors makes it even better. To be able to see the lines of the test card's highest bandwidth grating is a sight to behold! But these capacitors are rather larger than the originals, so they have to be mounted on-end, with the extension lead insulated. With careful lead forming they fit comfortably.

A point to watch with the 17in. version of the monitor is that CX2119 (4,700µF, 25V) on the timebase PCB is sometimes assembled so that it touches the degaussing coil. This pushes it over, pulling one lead partly out. When this happens the capacitor is obviously unreliable. Either

move the degaussing coils out of the way, or stand the replacement capacitor up on slightly longer leads so that it can be pushed over without being damaged. **I.F.**

Samsung CQA4147L

This monitor was dead with problems in the line output and +B regulator stages. D406 (RU4DS), Q408 (IRF9610) and Q406 (KSE800) were all short-circuit. The 2SC5149 line output transistor Q403 checked OK, but this device usually does. What tends to happen is that Q403 latches up, destroying Q408. This seldom damages D406 however, and Q406 is almost always dry-jointed. It's possible that in this case the IRF9610 had made a 'pre-emptive strike'. This would apply the full 150V odd HT to the line output stage. It's also possible that D406 simply failed, producing a line output stage short-circuit that destroyed the IRF9610.

I obtained a replacement RU4DS from a scrap Compaq 476 (manufactured by Samsung) and mounted it on a heatsink fin assembly twice the size of the original one. There were no clearance problems. I decided to replace Q403 with the more reliable 2SC4742 plus insulator kit. The faulty KSE800 was not discovered until the rebuilt line output stage was tried and produced excessive, uncontrollable width. The Samsung KSE800 is similar to the Motorola MJE800 but has different encapsulation, so it's as well to keep to the Samsung device. Some care will be needed if a substitute has to be found for the RU4DS, as its specification is Vrm 1·3kV, Io 2·5A (with fin), Ifsm 50A, Trr 0·4µsec.

Any severe overload in the line output stage will destroy Q408. It's possible to confirm whether the line output stage functions by temporarily powering it from the 70V supply. To do this remove Q408 and connect a suitably rated diode, e.g. UF5404, 30DF4 or 30DF6, between D619/C627 and D409/C403. The setting of the first anode preset may have to be advanced to produce a visible display. Anything greater than 60 per cent of full scan shows that the line output stage is functioning.

Once the repairs to the PWM B+ regulator stage had been completed the monitor was ready for final setting up and a soak test. **I.F.**

CTX 1565D

This one, part of a batch, had been designated for parts salvage but proved to be the easiest to repair. Most of the CRT base pins had 'let go' and simply needed resoldering. The scribbled job card had an added note which said "EHT swap with another unit". This would explain why the sealed B+ adjust preset, which is hidden in the EHT enclosure, needed adjustment.

It had a revised CRT base layout in comparison with previous 1565Ds I've come across, including the use of a complementary emitter-follower pair for each of the video amplifiers. This makes the use of non-electrolytic 1µF coupling capacitors worthwhile. Incidentally I've been coming across monitors with 0·1µF, 250V video coupling capacitors with no obvious deterioration in the LF response. I'll be keeping an eye on this. **I.F.**

Ast LR14

This monitor came in without any fault report. When I queried this I was told that it was one of several that had been found in a little-used storage area and they had decided to have it serviced. The soldering was poor to say the least. One of the two screws that hold the line output stage heatsink had vibrated out completely, being held in its hole because it fouled the edge of the print-side screening can. These screws are usually well-tinned and secured during the flow-soldering process, to the extent that their removal requires some dexterity. The frame output chip was barely holding on, and fracture rings were clearly visible around the connections to the heavier components.

Once I'd dealt with all that I took a look at C322, which often fails. It was OK but, being of the moulded-plastic 6·1nF, 1·6kV type, I decided to replace it, fitting a resin-dipped 8·2nF component. The slightly altered alignment could be adjusted with the user controls. Some customers ask for this modification, complaining of line under-scanning with the original capacitor value.

I found that the line output transistor was type 2SC3892A (1·4kV, 7A, with damper diode). You commonly find a 2SC3885A in this chassis: it's the same but without the damper diode. The 2SC3892A transistor fitted continued to run reasonably cool despite the changed value of C322. Occasionally this modification results in a noticeable temperature rise, which can usually be cured by fitting a 2SC3886A transistor (8A). In the unlikely event of this being inadequate, select a 10A transistor such as the 2SC3897 or BU2520. It doesn't matter whether the transistor has a built-in damper diode, as this is provided separately. Some early versions of the chassis have a rather flimsy on-board damper diode. In this case a transistor with integral damper diode makes a good substitute. **I.F.**

Dell P790

The customer said that this two-year old 17in. monitor was dead apart from the flashing green power LED at the front. I removed the back cover and the metal screen, then unclipped the plastic insulating plate from the underside of the chassis. What I found was a Nokia-style chassis with a Sony CRT.

Some preliminary checks in the line output stage, using a DVM, showed that there were no short-circuits in this area. When I moved to the chopper power supply I discovered that D121 (BYW98-200) was short-circuit. It's on the secondary side of the transformer, providing a 15V output that's fed to a 12V regulator. F102, which is in series with D121, had also failed. This is a Wickman-style fuse rated at 3·15AT, 250V. Normal operation was restored once these two items had been replaced.

Note that the mains bridge rectifier's reservoir capacitor holds a full charge for a long time after disconnection from the mains supply. Discharge it safely before carrying out any checks. **B.B.**

Acer JD144F

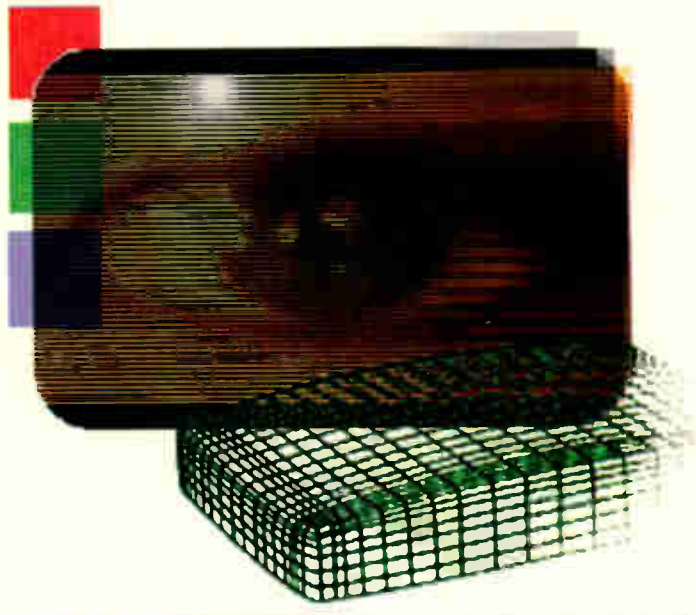
The trouble with this ageing 14in. monitor was excessive width and no EW adjustment. As the CRT appeared to be in quite good condition for a monitor of this age (built in December 1996) repair seemed to be worthwhile. The culprit was C432 (4·7µF, 250V), which is situated near Q411. A replacement restored normal operation.

This chassis suffers from numerous dry-joints, including the connections to the on/off switch. **B.B.**

Hewlett-Packard D2825

When this 15in. monitor's green mains LED blinks there is usually trouble in the line output stage and B+ regulator. Check the 220pF, 2kV ceramic capacitor C335. The first symptoms when this capacitor starts to fail may be intermittent loss of line sync or line drift – the screen may even go blank from time to time. If the problem is allowed to continue the BU2520AF line output transistor Q310 will fail and in addition L304 (0·72mH) may develop shorted turns, knocking out the K2161 FET Q317. If this device is not available, type IRFI640G can be used. The inductor may be a bit more difficult to obtain. If necessary, try contacting a local transformer rewind company.

Normal service should be resumed once these three items have been replaced. If there's an EW fault, replace the 2SD669 EW modulator driver transistor Q383. **B.B.** ■



TV FAULT FINDING

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Denis Foley and
Robin Beaumont

We welcome fault reports from readers – payment for each fault is made after publiation. See page 172 for details of where and how to send reports.

Toshiba 2812DB

The problem with this great monster was severe line tearing with bands down either side of the screen. Checks on the EW module showed that C424 (4·7μF, 100V), which is under the screening can, was open-circuit. All was well once a replacement had been fitted. **D.G.**

Matsui 1476

The customer said "I think the tube's gone". He said there was a flashing red screen and weird colours. Visual checks on the PCB revealed the cause of the trouble. One leg of the posistor in the degaussing circuit, TH501, had burnt off. Once a replacement had been fitted there was a nice picture. **D.G.**

SEG CT7951 G3 (11AK19P chassis)

This monster had been sold by the Lidl group of stores some time ago as a one-off during a promotion. The customer said it was dead. Cold checks showed that the 5W, 2·2Ω ceramic surge-limiter resistor R817 was open-circuit. Replacement of the 2SK2545 chopper transistor Q802, also the BA159 diode D805 and a UF5407 diode, was also necessary. After that the set was OK. **D.G.**

Toshiba 2500TB

This set had a very red screen. Cold checks on relevant circuitry failed to reveal anything amiss so the CRT was suspect. As it's a Philips tube I decided to take my BK467 CRT tester out of the mothballs and assess it. One gun had low emission. After a good clean and balance with the BK467 a very nice picture was displayed. **D.G.**

Hitachi C2118R

The customer complained that the picture was unstable with horizontal lines. From experience I went to the LA7835 field timebase chip IC601 which, as I suspected, was dry-jointed. After resoldering it there was a very stable picture. **D.G.**

Philips 21PT166B (AA5 chassis)

This set appeared to be dead but there was HT at the line output transformer's primary winding. Further checks brought me to protector 1571, which was open-circuit. It's in series with the 11V supply from the chopper transformer, in the feed to the 8V regulator chip IC7567, which had a short-circuit across its output. The 8V supply goes via L5565 direct to pin 10 of the multifunction chip IC7015. This pin was short-circuit to chassis.

Be careful when providing an estimate for this repair, as the cause of IC7015's demise can be insulation breakdown in the line output transformer. It was in this case, and has been in every other set I've had with the fault. **A.J.**

Ferguson T14T (TX805 chassis)

This set produced a very dark picture. Checks on the tube's heater and first anode supplies showed that the voltages were correct, but its cathode voltages were very high. The cause of this was RT40 (68kΩ, 0·5W) which provides base bias for the RGB output transistors TT01/2/3. It had gone very high in value – the reading was over 2MΩ. **A.J.**

Philips 28/32PW6005 (A10E chassis)

We have had a number of these sets recently with either no or intermittent sound, or switching to Ext (1), when warm. In every case the cause has been the microcontroller chip IC7064. It can change the state of the audio mute line and shut down the audio amplifier chip IC7702. Headphone sound is still present, as a separate amplifier is used for this and muting is not applied here.

The part no. for IC7064 in this ET version is 3111 250 54511. **A.J.**

Thomson 28WF25U (ICC17 chassis)

We recently had two of these sets in on the same day with the same fault, randomly switching to standby with the red LED flashing. If the set was switched on again it

might run for five minutes or a couple of hours, then fail again. There was a clue: a slight arcing sound from the CRT base panel just prior to the failure. In both cases the cause of the fault was leakage in the focus spark gap. A replacement CRT base socket, part no. 80298800, provided a complete cure. **A.J.**

Philips 28ST2781 (GR2.2 chassis)

This set was supposed to be dead, but a slow tripping sound came from the power supply. Checks showed that there was a dead short across the HT line. The cause was the flyback tuning capacitor C2545 (1·5nF, 2kV), which was short-circuit and badly burnt. A replacement and general service completed the repair. I've noticed that the replacement capacitors are now rated at 3kV. **A.J.**

Sony KV1400UB

Although this little set is 24 years old it produced an excellent picture. The complaint was no sound. I found that R254 (390Ω) in the 105V supply to the audio output stage was open-circuit. No other fault was found, and a long soak test proved that all was now well. **A.J.**

Philips 29PT727B (GR2.4 chassis)

If one of these sets is tripping and there are reports or suggestions of a burning smell, the line output transistor Tr7545 is probably short-circuit. The cause is usually the scan coupling capacitor C2550, whose failure can be intermittent. This blue block-type capacitor seems to suffer from a poor connection at one of its legs. The overheating effect can be clearly seen down the component's side wall when it is removed.

The transistor type and capacitor value used in this chassis depend on tube type/size. With the 29in.tube, Tr7545 is type BU2520AF and C2550 is 680nF. **A.J.**

Fidelity CTV3228NF (SM2 chassis)

The customer said that the colour faded out. A TDA8361A chip is used for video processing in this chassis. I replaced the 18pF fixed-value capacitor in the colour reference-oscillator circuit with a 56pF trimmer. Colour run-through could then be seen when the aerial plug was pulled out and loosely reinserted. Further checks led me to the burst phase-detector circuit, where R332 and C325 (0·1µF) provide a time-constant of 10msec. They are connected to pin 33 of the chip. When I checked C325 I found that its capacitance wandered upwards like a fruit machine. With my LCR meter on the 120Hz range there was a momentarily-high dissipation reading. Clearly the APC circuit was too unstable to be able to lock the reference oscillator. Everything was OK when I replaced C325 – I used a 100V polyester type. **M.J.A.**

Sharp DV51083H (D3000 chassis)

There were one or other of two fault conditions when this set was switched on. Either a faint raster that looked like low tube emission was produced, and the set couldn't be turned off using the remote-control unit; or the set came on displaying horizontal bars. The cause of the trouble was traced to C1485 (47µF, 50V) and C1442 (10µF, 16V) on the digital video panel: they decouple the reset chip IC1416 and the clock oscillator chip IC1408.

In the interests of reliability it's as well to replace decoupling capacitors C732 and C710, which are associated with the 5V regulator chip IC703, and C719 (1,000µF, 6·3V) in the 5VM supply. **M.J.A.**

Goodmans GTV288 (11AK19 chassis)

The only response I got when I switched this 28in. set on was that the green LED at the front started to flash. After a few checks I convinced myself that the line output transformer was faulty. Wrong! There was frustration when I ordered a replacement transformer and was sent the wrong type. This was my fault for not quoting its serial numbers – several different transformers are used in this chassis. There was abject misery when I obtained the correct transformer, fitted it and found that the LED still winked at me!

At this point it was necessary for me to start to use the engineering skills I had been taught many years ago. When I carried out checks on the various supplies obtained from the chopper transformer I found that the tiny 0·33Ω, 0·5W resistor R867 was open-circuit. I did get some consolation, as it's not shown in all the circuit diagrams. Amongst other things the supply concerned feeds pin 1 of the optocoupler IC801. Lesson learnt: check supply voltages first! **L.M.**

Philips 32PW962B/05 (FL2.24 AA chassis)

This monstrously heavy set's red LED gleamed but it wouldn't start. I gave it a quick clean to remove the mountain of accumulated dust, then went in with the meter. Normally with a dead set I begin by carrying out resistance checks on the line output and chopper transistors. In this case there was a dead short-circuit across the former. Out it came, but it was free of any shorts. There were still shorts at its socket however. Further checks brought me to C2504 (2·2nF, 3kV), which was cracked and shorted. A replacement restored normal operation. **L.M.**

Hitachi C2125T (11A19K chassis)

"Set went pop" was the fault description that accompanied this Vestel-made set. Some quick meter checks seemed to indicate that it was in a protection state. Because Hitachi's CD-ROM-based circuit diagram is so hard to read, I decided to carry out cold-resistance checks between all the diodes on the secondary side of the chopper transformer and chassis. There was a dead short at the cathode of D812 (BYD33D), which was itself short-circuit. The part no. is VS3000315. It's the rectifier for the 14V supply, and had simply died of its own accord. A replacement restored normal operation. **M.S.D.**

Panasonic TX33AK10 (Euro-5 chassis)

The reported fault was "water on the picture". The picture was bleary or pixellated, with trailers or a tracing effect after every movement. It looked as if the set was locked in some sort of weird digital special-effect mode. In my experience these sets are prone to EEPROM corruption, which can cause all sorts of strange effects. Thankfully resetting the EEPROM chip cured the fault.

To reset the EEPROM, hold down the volume minus control on the set and the status key on the remote-control unit, with the set switched on. The status key is the button just above the red text one, with a small + sign by it. The set then runs through a little routine and displays some data. After that it has to be reinstalled, i.e. tuned in. **M.S.D.**

Thomson 28DG35UD (ICC19 chassis)

The note with this set said it needed a new line output transformer. But after fitting a replacement I found that it still wouldn't come out of standby. When it was activated, all that happened was that the LED flashed continuously. Further investigation showed that the power supply seemed to be working and producing voltages at the right places on the secondary side. So maybe the set was in a protection mode, because of a short somewhere?

At this point I noticed a rather large Dolby module at the rear of the set. Knowing the sorts of things that customers can do, I decided to unplug the module. The set then sprang to life, though without sound. A quick investiga-

tion showed that the TDA2615 power amplifier chip IS450 had a smoky hole in it. All was well once a replacement had been fitted. The part no. is 10257880. All that remained was to educate the customer on external speakers and how to use them! **M.S.D.**

Philips 25PT4103/05 (L6.2 chassis)

This set had been in a couple of months previously because a sudden short-circuit had occurred in the deflection module. Capacitor C2912 had failed, and a replacement had restored normal operation. It was now back with a rather strange fault. The set would work correctly for about ten minutes then the chroma would gradually fade out, leaving a perfect monochrome picture with sound. After that the set would trip to standby. If it was switched off and on the cycle of events would be repeated.

It seems that the trauma of the original fault had damaged the TDA8361 'bimos' (Philips word) jungle chip IC7100. Fortunately a replacement cured the fault. The part no. is 4822 209 13047. **M.S.D.**

Ferguson T59NB (TX92F chassis)

There was a field fault with this set – foldover at the top of the picture. The cure was to replace the flyback boost capacitor CF30 (47µF, 50V). It's connected between pins 3 and 6 of the TDA8177 field output chip IF01. **M.S.D.**

Hitachi C24W410SN

Stuck in standby is a common fault with these sets. The usual cause is dry-joints at the LT regulator IC951. It was a common problem with older Hitachi models. **P.S.**

Panasonic TC14S3R (Z7chassis)

This portable produced a weak, negative picture. It gave the impression that the set was working to the wrong TV system. In fact the EEPROM IC1205 (part no. XL24D02P-AA1) had become corrupted and had to be replaced.

After replacing it you will need to carry out the self-check. Press the F button and the volume down button on the TV set and the status button on the remote-control unit simultaneously. The screen will then go to the self-check mode. Switch the TV set off then on again to confirm that the check has been done. When the self-check has been completed, switch off at the mains. When you switch on again the set will go into auto-search. You just have to be patient! **P.S.**

Bush WS6674

Tube faults were virtually unheard of until couple of years ago. There was arcing in the neck of this set's tube, causing no sound or picture. Fortunately the set was only three months old. The entire set was exchanged. **P.S.**

Philips 32PW6615/025 (MG1.1EAA chassis)

This set usually worked when it was switched on but sometimes it was dead with the red LED blinking. A phone call to Philips Technical produced the suggestion that I should replace the relay in the power supply, circuit reference 1002, part no. 2422 1320 7405. This cleared the fault. **P.S.**

Bush 2850NTX

Line collapse is a common problem with these sets. The line scan-coil socket normally catches fire and burns a hole in the board. Fortunately in this case just one pin was burnt, and a good clean up and resoldering put matters right. **P.S.**

Toshiba 43PJ93B

The trouble with this projection set was caused by the fact that the customer hadn't read the instruction book. He complained about a 5cm line from left to right at the top and bottom of the screen. The set had been used mainly with 16:9 transmissions, and the fault showed up when a 4:3 transmission was viewed. With a 16:9 transmission the contrast level should be set at 50 per cent. Instead, the set had been operated at 100 per cent contrast level. As a result all three tubes had to be replaced. **P.S.**

Sony KV14FV1U (BC5 chassis)

When this new TV-VCR combi set was switched on all that happened was that the LED blinked four times. As I didn't have a circuit diagram I made a beeline for the BU4508DX line output transistor Q802, which was short-circuit. Its part no. is 872905182. In addition the N75 circuit protector PS602, part no. 153268621, was open-circuit. **P.S.**

Beko NR28416NDS

A number of these relatively new sets have come in because of insulation breakdown in the line output transformer TR502. The part no. is 058834-TR2. **P.S.**

Philips 21PT166B/05 (AA5 AB chassis)

This set was dead with the 630mA Wickman fuse F1571 blown. When a new fuse was fitted there was sound and the front LED lit. EHT was heard rustling up, and the CRT's heaters were alight. But there was no picture. Checks on the CRT base panel revealed that the A1/G2 and focus voltages were incorrect. A new line output transformer restored normal operation.

The fuse had probably been blown by the protection circuit thyristor Thy7481. It didn't blow after replacing the LOPT. **D.F.**

Ferguson D14R (TX80 chassis)

This set would die after about half an hour, when the excess-voltage protection diode DP50 (ZPU150) would go short-circuit. After replacing CP08 (100µF, 35V) and checking several other components in the combined line output/chopper transistor TP10's base drive circuit, also DP50, the fault was still present. I finally traced the cause to a dry-joint at the wire link from pin 5 of the line output transformer LP04. This obviously removed the 104V +B supply temporarily, and the feedback to the primary side of the circuit. The supply would then be restored at a higher level, killing DP50. There was no more trouble once all suspect joints had been resoldered. **D.F.**

Bush 2868NTX etc (11AK19 chassis)

Dead with the line output transistor short-circuit is a common fault with these sets. To prevent a recurrence, it's worth taking a look at the plug and socket that provide the connection to the scan coils. If there are brown stains on one of the pins, remove the plug and wire the connections to the PCB directly **D.F.**

Philips 32PW6305/05 (A10 chassis)

A pattern of vertical lines floated behind the picture. It looked like cross-modulation, especailly as the fault would sometimes go when the aerial was disconnected then reconnected. Unfortunately the fault was still present with a scart input, so further thought was required. Careful checks with the oscilloscope, using a colour-bar pattern via the AV input, showed that the signals were clean when they entered the TDA9181 comb-filter IC but noisy when they came out. A new TDA9181 cleared the fault. **R.B.**

Thomson 20CB25UT

This TV-VCR combi set sometimes worked correctly but more often than not there was no response to operation of the remote or local controls. Sometimes it would come on with no sound or picture. A previous dealer had replaced the microcontroller and EEPROM chips without changing the situation. I managed to catch the fault for long enough to discover that the microcontroller chip's clock wasn't running. A new crystal made no difference, which left only the two surface-mounted crystal tuning capacitors. Replacement of these cleared the fault. **R.B.**

Bench Notes

More on microwave oven servicing. Adrian Gardiner provides diagnostic flow charts for basic faults and notes on some specific problems

As promised last month, here are some flow charts that should provide quick diagnosis of most of the microwave oven faults you are likely to encounter. I have assumed throughout that the microwave oven has an electronic control panel, mainly because manually-controlled microwave ovens are so cheap they are not usually worth repair. Should you find one of them on your bench however, the same procedures apply – a couple of timer units replace the control panel, one to control the operation and the other to adjust the power level. Note that the power output from a magnetron is fixed: the 'reduced power' settings with a typical oven are achieved by a timer circuit that switches the magnetron on and off for varying times.

The diagrams, Figs. 1-4, are self-explanatory. Select the appropriate one and follow it through. The flow chart in Fig. 4 is for combination ovens that have a convection fault.

Specific faults

I've had a large number of Daewoo microwave ovens with a 'blown up' magnetron. Any model that's fitted with magnetron type 2M218 seems to be affected. You will usually find that the end of the magnetron has burnt very badly. As a result, there is arcing in the cavity. In addition to replacing the 2M218 magnetron you should also replace the mica waveguide cover. Use genuine Daewoo parts: while other varieties of the 2M218 are the same electrically they have different fixings. The part numbers are 3518002400 for the magnetron and 3511403800 for the waveguide cover.

Another batch of Daewoo ovens has problems with the control panel. A bizarre fault, random changing of the time settings, occurs with the KOR series. The control panel has a multi-jog dial for setting the time. Its contacts can become intermittent: replace the 'sub PCB assembly' with part number PKBPMSZY00. I've also had a completely dead control panel because of an open-circuit supply transformer. The part number for the main board is PKMPMSZY00. These part numbers are very similar, so take care when ordering.

A recent complaint with another Daewoo microwave oven was that the unit would, after about ten minutes' use, shut down and display "Error 4". A discussion with the customer revealed that the fault occurred only when the convection oven was used. Various attempts by another dealer had failed to provide a cure.

On investigation I found that the fault occurred when the oven's temperature reached 190°C. The cause of the trouble was that the temperature sensor went open-circuit when hot. A replacement sensor cured the problem. ■

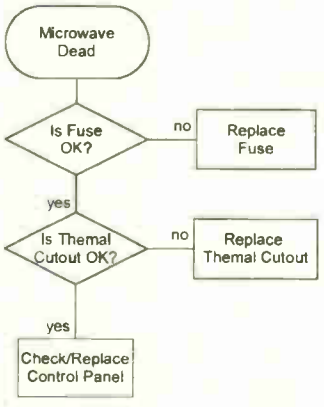

Fig. 1: Diagnostic flow chart for the dead microwave oven condition.

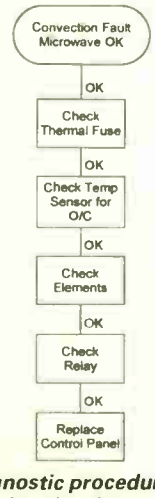

Fig. 2: Diagnostic procedure to follow if the main fuse has blown.

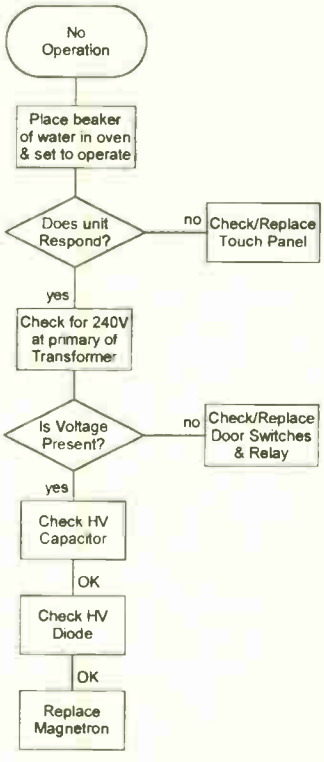

Fig. 3: Diagnostic flow chart for the no-operation condition.

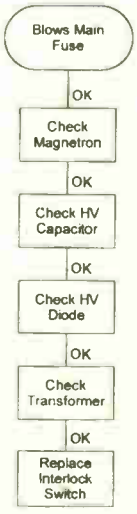

Fig. 4: Diagnostic flow chart for combination ovens with a convection

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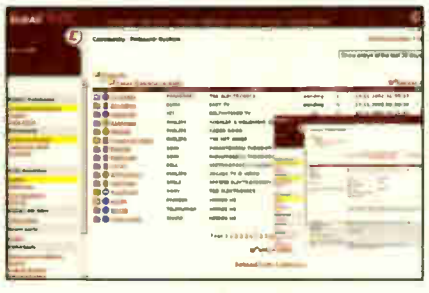

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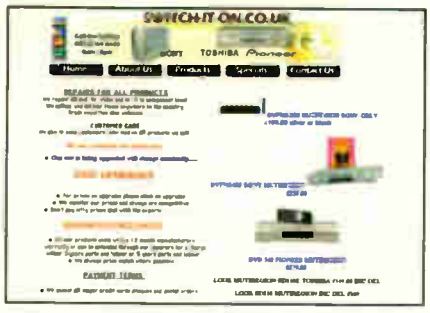

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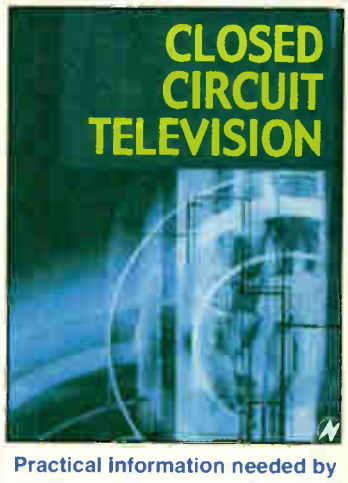

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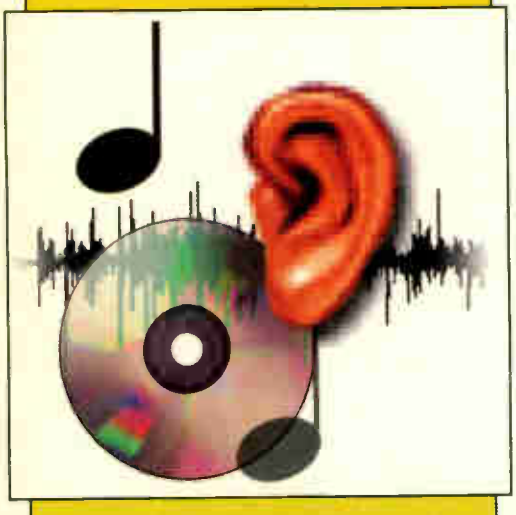

AUDIO FAULTS

Reports from
Geoff Darby
Graham Boor
S. Roberts
Roger Burchett and
David I. Scott

We welcome fault reports from readers – payment for each fault is made after publication. See page 172 for details of where and how to send reports.

Sony CDP-CX235

This rather large unit is a sort of domestic version of a CD jukebox. It holds 200 discs vertically, in a circular carousel. The owner's complaints were that the door didn't open, that discs jammed, and that they fell out in the 'shuffle' mode.

When I inspected the action of the mechanics it was immediately apparent that something was amiss. The discs are picked from the carousel by a sort of mechanical finger-and-thumb that grabs the disc at its edge, then lifts it towards the vertically-mounted deck behind. The action is assisted by various guide and pusher bars, until the disc is clamped. The fingers and other bits of mechanism then withdraw out of the way. This is all operated by two levers and a cam – items 171, 172 and 214 in the exploded view in the manual.

On closer examination it was clear that item 155, lever B, wasn't correctly located. It was disengaged from its driving pin at one end, and the picking fingers at the other. I found it hard to see how the lever could have become like this on its own, as it was necessary to remove the retaining circlip and slide the lever off its pivot pin to refit it correctly.

Once this had been done the action was correct. But the mechanism still wouldn't pick a disc, because the fingers closed early, before reaching the edge of the disc. I couldn't see why this occurred, as the mechanism is driven by two levers that run on a very solid looking nylon cam. After much head-scratching I noticed that item 156, the plate on which the picking fingers are mounted, had a slight twist – and I mean slight! Because of the amplifying action of the lever system involved in opening the fingers, the slight distortion became a major mistiming of the finger action.

This final problem was corrected by using pliers to reverse the twist. The whole system then worked as smooth as silk. **G.D.**

Kenwood RXD-M33MD

The problem with this unit was caused by an at best unthinking and, at worst, downright dumb bit of design engineering. If you had to position a control button that was going to be subjected to a lot of mechanical stress during its life, in this case the CD open/close button, would you put it at the very end of a thin finger of PCB material, barely any wider than the switch body itself, put the nearest support screw 10mm away, and connect one side of the switch to a print track barely thicker than a human hair and a solder pad just about big enough to take the switch's leg? Of course not! Neither would I.

The thin track had fractured where it joined the pad. A small piece of wire soldered across the track cured the trouble – and enabled the owner to remove his beloved Ministry of Sound disc. **G.D.**

Technics STX990L tuner

The reported fault with this standalone tuner, part of a complete hi-fi system, was no stations being received. Once it was on the bench it was clear that there was no AM or FM reception. Some quick checks proved that the relevant oscillator and audio preamplifier circuits were working, but when I checked around IC201 no IF signal could be detected and most of the voltages appeared to be incorrect. The cause of the trouble was eventually traced to the IF transformer Z202. There was normal reception once a replacement had been fitted. **G.B.**

Aiwa CX81MK

The customer complained that this audio system worked but he couldn't see the display. With all the lights in the workshop turned off you could just see the digits in the display module. When you get this fault the cure is to replace C107 and C108. **G.B.**

Sony HCD-XB500

The job sheet with this system said that the only thing the customer could get the display to show was "To protect push power", with nothing else working. Normal operation was restored by replacing the audio output IC. As in all cases of failure in this part of the circuit, we leave a note asking the customer to check the speaker wiring at the house for any damage before reconnecting the unit. We were later told that the unit had failed while being at full volume for a considerable time so that the owner could hear it over the noise made by his lawnmower while he cut the lawn. The word Walkman springs to mind here! **G.B.**

Marshall Valuestate Model 8008

If you get one of these stereo guitar amplifiers in for repair and find that fuses FS2 and FS3 (both 6·3AT) have blown, look no farther than TR1 (BDV65C) and TR14 (BDV64C). You will find that they are short-circuit. The driver transistor TR5 (TIP29C) usually survives, but should also be replaced to provide a reliable repair.

The usual cause of this blow up is when the two speaker outputs are accidentally connected together, which is surprisingly easy to do. The output jacks are next to

each other on the back panel. Most musicians are not interested in the electrical connections to their 'gear', only in playing their music, so it's not surprising that the problem arises quite often.

In most cases only one channel suffers damage. I am assured by Marshall that it is in order to replace only the faulty components in the damaged channel. The power transistors can be obtained from Marshall direct or from CPC. They are Darlington pairs. **S.R.**

Sony D240 personal CD player

I don't know whether it's a common problem, but the screws that hold the spindle motor had worked loose. Unfortunately one had been lost. There's no reference to their size in the manual, nor do they have a reference number, so it was up to me to find one that fitted.

A model engineer friend found that 10BA seemed to match the remaining original screw, so in one went. As I doubt whether Sony would have used BA threads, I consulted a guide to cutting tools to see what the metric size would have been. This suggested 1·8mm coarse (thread pitch the same, 0·35mm; tapping drill 1·45mm for metric, 1·40mm for BA). **R.B.**

Freeplay S360

I had not come across one of these interesting portable radio receivers before. Its AM/FM circuitry seems to be conventional, but the power supply is novel. The set isn't powered by dry batteries or by the mains supply. Instead it's powered by either a rechargeable battery, which is charged by an internal solar cell, or a clockwork-driven generator.

The complaint was that it didn't work. As it has a transparent case, I could see that the drive belt from the clockwork motor to the 'generator', which in practice is a small electric motor, had broken. But this didn't explain why the set wouldn't work from the rechargeable battery.

All became clear when I replaced the belt and wound the clockwork motor up. Although the 'generator' was turning, there was no voltage at its terminals. I then found that a small electrolytic capacitor across its terminals was short-circuit. The rechargeable battery and clockwork power supplies seem to be in parallel. Thus the short-circuit capacitor would drain the rechargeable battery, hence no operation.

I can't prove it, but I suspect that the short-circuited capacitor had the effect of 'braking' the generator, which may in turn have caused the demise of the drive belt.

This radio set's mode of operation was devised, developed and patented by Trevor Bayliss. It's intended for use in under-developed countries, where mains supplies and dry batteries may not be readily available. This particular set was made under licence in South Africa. As far as I'm aware, none of the main manufactures makes anything similar. **D.I.S.** ■

LETTERS

Send letters to "Television", Highbury Business Communications, Anne Boleyn House, 9-13 Ewell Road, Cheam, Surrey SM3 8BZ or e-mail tessa2@btinternet.com using subject heading 'Television Letters'.

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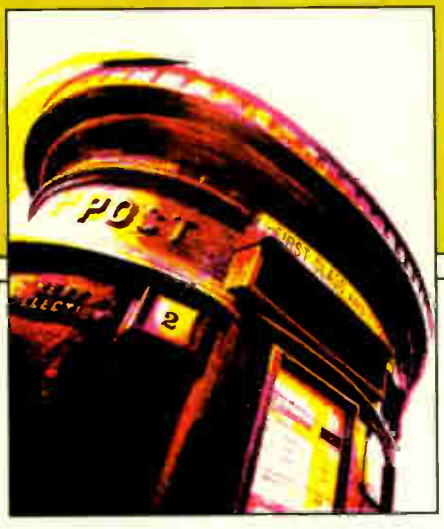

Monitor LOPTs

Although I read the monitors section of Television every month, I can't recall anyone mentioning problems with line output transformers in larger-screen models. Could it be that only reports of successfully completed repairs appear? Last week we had six monitors with screen size 17in. and above, all from different manufacturers. Five of them had faulty line output transformers, all of the dual focus supply type. This reflects our experience over the past couple of years, and makes me think that this type of transformer may be much less reliable than the single focus output type.

Anyone with experience of trying to locate monitor spares will have found that on the rare occasion when a source of supply for one of these dual focus supply LOPTs can be found the transformers turn out to be prohibitively expensive. Only on one occasion has the customer given us the go-ahead to complete such a repair. It was a 17in. LG monitor, and I only assume that it was of sentimental value: the repair cost nearly £80, and we had to wait six weeks for the transformer!

A couple of weeks ago we had a two-year old 28in. Toshiba widescreen TV set in for repair.It had a short-circuit line output transistor and a dual focus type LOPT. The replacement transistor, which cost £17, lasted two weeks. If, as I suspect, the LOPT is the source of the problem, and it becomes the norm to use twin focus tubes in widescreen sets, the pattern LOPT manufacturers had better get busy, because customers aren't going to pay the prices when original spares are used.

Steve Hague, TransVision, Redruth, Cornwall.

Microwave ovens

There are several points that require correction in the section on microwave oven repairs last month (page 113). First, the two magnets on the magnetron don't direct the radiated energy into a stream into the oven. Most magnetrons have twelve LC cavities that are coupled together in the correct phase to increase the energy generated. The purpose of the magnets is to accelerate the electrons emitted by the cathode and make them spin at high speed within the resonant cavities. The energy is taken from the cavities to the magnetron's antenna via a thick copper wire.

The heater is not operated at 6·3V: the normal average voltage is approximately 2V at some 14A. The high-voltage supply is typically at some –4 to –4·5kV, not 2kV. The capacitor (C1) forms a voltage-doubler circuit along with the diode (D1) and the diode-action of the magnetron.

The door switch arrangement shown in Fig. 2 is not accurate. Frankly I would not recommend anyone taking up microwave oven repair unless they have attended a recognised microwave oven servicing course. When I first started servicing microwave ovens no one would supply spare parts to those who didn't hold a relevant certificate. But now suppliers sell to anyone.

The article says that a PAT tester should be used if you have one. But if you service an earthed appliance you must carry out an earth-bond test using a PAT tester. With a microwave oven a leakage test must also be carried out, using a recognised microwave leak detector. The PAT and leakage testers must be recalibrated every twelve months by the manufacturer or a special company, who will provide a certificate to national traceable standards.

Never ever attempt to measure the high voltage. The components on the secondary side of the transformer can all be checked cold. The HV diode can't be checked with a normal multimeter because it consists of approximately twenty diode junctions in series.

One last point. Although the magnetron's heater runs at only 2V AC it's also the cathode, directly heated, so the voltage is 2V referenced to –4kV. And don't forget that this is DC. Keep your hands well away from the heater terminals when the oven is in operation.

Michael Dranfield, Buxton, Derbyshire.

Grundig digiboxes

In the October and November issues I wrote about Pace and Panasonic digibox faults caused by CPU chip overheating, and how the situation can be greatly improved by adding a heatsink and cooling fan. Jim Simpson tells me that the same problem arises with the BGA (Ball Gate Array) CPUs used in later Grundig Sky digiboxes, from Model GDS310/2 onwards. In Model GDS310/2 the CPU is U16, near the green LED – just behind the card-reader assembly. The following are typical symptoms caused by CPU overheating in these digiboxes: locks up; jumps to standby; white screen; does weird things if the mains supply is switched off and on. The problem can be cured by fitting a heatsink that's available from SatCure (http://www.satcure.co.uk).

Tuner problems with these Grundig digiboxes include: no signal; and good signal-strength, signal-quality and lock indication but no data stream. These are also typical symptoms when the dish is aligned with the wrong Astra satellite cluster, so check this first! MCES of Manchester provides a repair service for these tuners.

Jack Armstrong, Sandbach, Cheshire.

The mains supply

The mains-voltage problem with TV sets and other consumer electronics products, see letter last month, should have disappeared with the advent of switch-mode power supplies. A properly-designed switch-mode power supply should be able to cater for an input voltage range of 180-260V by adjusting the mark-space ratio of the drive to the chopper transistor.

When Ferguson sets were manufactured in the UK all were given a 24-hour accelerated soak test. The receivers were operated on a moving track close to the factory ceiling, where the temperature was almost constant at 80°F. They were operated at maximum rated mains voltage, 265V AC, and were hot-switched several times during the test period. When the receivers came off the end of the track they had been in operation for 24 hours but the stress placed on them was equivalent to a longer period. This procedure was valued as a means of weeding out any faults likely to occur during a set's infancy. Proper design means allowing for those living next to a lightly-loaded substation and those living at the end of a long run of low-voltage distribution.

On the subject of CRT heater-cathode shorts, these were common in the days of round monochrome tubes. In those far-off days the solution was to fit a RadioSpares CRT isolating transformer. This had a low-capacitance secondary winding and, or course, smearing was less noticeable with a 2·5MHz video bandwidth. I still have one of these transformers for the old Mazda 2V heater tubes: it has a boost overwind to deliver a 20 per cent higher voltage to restore the tube's emission as it began to fall. Maybe some enterprising manufacturer should reintroduce this type of transformer. But as tube life is considerably affected by deviation of the heater supply from the usual 6·3V norm, a mains-derived 6·3V supply could mean an earlier fall in the emission.

Graeme Young,
Ravenshead, Nottingham.

The WEEE Directive

Just a thought but I wonder if, when the regulations for the disposal of electrical and electronic equipment come into force, manufacturers who, in the past, have refused to supply service data or demanded outrageous prices for it might realise that it will probably be more cost-effective to extend the service life of their products, by making spares and service data available at realistic prices, rather than be faced, an early stage, with the cost of disposing of their products in an environmentally friendly way?

Alan Jones,
Pontrug, Caernarvon.

Spares and faulty scan coils

In recent issues several contributors have drawn attention to the price of spares and the sorts of mark-ups that distributors add. Recently I needed a tuner for the Philips TV Model 32PW6322. I phoned two leading component distributors neither of whom listed the tuner, but they both made enquiries for me. I received same-day replies from them both, so well done. But one quote was for £26.03 plus VAT while the other was for £37.80 plus VAT, a difference of over 45 per cent. It's certainly worth making more than one enquiry.

I would like to thank Michael Dranfield for his letter, published in the November issue, in reply to mine in the previous issue about faulty scan coils. I note his point about the rubber wedges used for convergence adjustment being the usual cause, but unfortunately they were not the cause in either of the two Matsui 1409R sets I had with scan coil failure. In fact the wedges were nowhere near the point of breakdown and, as both sets were less than eighteen months old, no deterioration of the wedges had taken place. His advice about the wedges was welcome however, and will be put into practice!

Matthew Biddlecombe,
West Wight Vision,
Shorwell, Isle of Wight.

Monitor information and spares

I don't often get asked to look at computer monitors but have recently been asked to do so, the item concerned being a rather nicely-built Belinea 10 70 50 monitor. It will be a shame to chuck it in the skip just because it needs a new LOPT. Why do this? Basically because Belinea is in the "supply only our authorised repairers" camp.

When I first asked about service information I was told that it couldn't be provided because it was Belinea copyright material! When I persisted, Belinea fell back on the restrictive authorised-dealer practice long known to TV repairers.

The daft thing is the reason given, to "maintain the brand image". How is this to be achieved by making repair and maintenance difficult? I will naturally be telling my customers that if they buy a Belinea monitor I won't be able to repair it. Perhaps other readers should do the same.

A. Jaques,
Stretford, Manchester.

HELP WANTED

Wanted: Working video chroma PCB assembly for the JVC Models AV-21/25F1EK, or some help with a very elusive dry-joint type fault on this panel causing intermittent loss of colour. Please phone Nigel Stinton on 01905 453 414 or mobile 07736 854 188, or email nigel.stinton@btinternet.com

Wanted: Circuit diagram for the Philco washer-dryer Model WD2002S, including the control board. Also a maintenance manual for the Olivetti photocopier Model 8515. Please email Tony Rigby on 113670.225@compuserve.com

Wanted: An AV lead for the Amstrad camcorder Model YMC200 (1992), serial number D271236 22C. Bert Donald, 6 Dean Place, Crosshouse, Kilmarnock, Ayrshire KA2 0JZ.

Wanted: A driver and *.inf file for the CMC Magnetics D41039 (part no. 91.65D37.025) 40 x 12 x 48 CD-RW, either the files as attachments via email or the URL to download them myself. Also a data sheet for the ITT IRT1260 remote-control transmitter chip, again the URL to download it myself or a swap via email. I have a hoard of data sheets, so I could probably repay in kind for this file. Phone Ian Field on 01462 631 144 or email ian.field1@ntlworld.com

Wanted: A line output transformer, part no. FSR25A001, for the 28in. Decca Model D28NEE5 (E5N chassis). Or does anyone know of a supplier or an equivalent? Tatung says that spares are no longer available for this chassis. Also require a 420ERB tube – can collect. R.E. Norgan, 24 Hankinson Road, Winton, Bournemouth, Dorset BH9 1HJ. Phone no. 01202 778 069

For sale: Sony reel-to-reel videorecorder Model CV2100ACE, in working order. Phone R. Flitcroft on 0161 684 1214 (Manchester) for details.

Wanted: Service manuals for the Betacom PPF700 fax machine and Blaupunkt Arkansas de-luxe radiogram type 701511. G. Jones, Penybont Shop, Mountain Road, Brynamman, Dyfed SA18 1AA. Phone. no. 01269 823 197.

Wanted: Beta machine for playing NTSC tapes. Phone Alfy (The Audio Centre) on 020 8681 1964.

For sale: Complete library, box filed, of Television from January 1983 to December 2002 issue. Offers to view and collect to John Stacey, 3 West Park, South Molton, North Devon EX36 4HJ. 01769 573 382.

WHAT A LIFE!

Greet your customers with a smile! That was the recommendation in a magazine article, but the results were odd when Don tried it out. Some recently tackled TV faults, and the effect of airborne radar on the course of World War II. Donald Bullock's servicing commentary

The other day I read in one of Greeneyes' magazines that when you meet people it pays to greet them with a smile. "Try it!" chortled the writer, one Alice Mincer. "It always works! Smile when you greet the very next person you see, and watch them smile back as they treat you like an old and trusted friend. Life is easier when people take a shine to you!"

Never one to doubt the word of a lady, I decided to try it. Which is why I greeted old Mr and Mrs Lampwick so warmly when they meandered into the shop next day. She was clutching him, and he was clutching an ancient electric iron.

"Hello my dears!" I beamed. "You aren't going to ask me to repair that old iron, are you? Looks as though it came out of the ark!"

To emphasise my new-found pleasantness I gushed with laughter. Mr Lampwick stopped and eyed me soberly, wiped a couple of dewdrops from his nose, and turned to his wife.

"This is the chap who used to be Mr Bullock, ain't it, Agnes?" he asked her quietly.

"I don't think it can be, Edgar" she replied. "It might be his father or something. Mr Bullock was so polite and sensible."

Then, leaving the iron on the counter, they shuffled off out.

I went to the back of the shop, put the kettle on, and studied my face in the old mirror there. "Hello my dears" I cried out at it. As it looked back at me, unsmilingly, I turned and walked away, just as the Lampwicks had done. Oh well, better luck next time I thought. Sure to be.

Another try

I decided to tidy the shelves at the back of the shop, and had just about transferred their contents on to the counter when a large and round man, whose face I knew well, came puffing in with his arms around a 25in. Sanyo colour set.

"Hello Mr Waterfield" I cried, smiling broadly and stretching out my hand in greeting.

He saw my hand, darted his eyes about for somewhere to put his set, saw that the counter was crowded and struggled to put it down on the floor. As he did so I heard the seat of his trousers tear. I admired the speed with which he straightened up and turned to face me.

"The name's Bywaters, Mr Billhook, not Waterfield" he said rather coldly.

"What's the matter with it?" I asked, increasing my grin in the hope of getting a better response.

"Nothing" he replied, "I'm happy with Bywaters, that's if you don't mind."

I decided to behave as though I knew he was joking. "Ha, ha, very good, very good . . ." I beamed, "I meant the set of course, but that was really funny, all the same."

He gave me a straight look, and I grinned all the more.

"Stops suddenly, just when it likes" he said, "and always just as the programme gets interesting. I could have thrown it through the window last night. Made me mad it did. And all the missus did was grin. I gave the dog a wallop, and it's a miracle I didn't clout her as well."

Then he looked at my grinning face. "You might think it funny, but it bloody well wasn't" he continued, "perhaps you would give me a ring." He prepared to depart.

"Goodbye, er, Mr Millpool" I spluttered.

Thermal fault

I decided that Alice Mincer, the ace writer in Greeneyes' silly magazine, was a prat. I also decided to come off my experimental grinning at people, before I collected a clout myself. I connected Mr Waterworks' set – a Model 25BN2 – and switched it on. Later that day it cut out, just as Steven returned.

He took it on and started to check around in the power supply section, using a can of freezer and a hairdryer. After a few minutes he found he could control the fault. The culprit was transistor Q611, which had become thermally sensitive. A replacement cured the fault, confirmed by a subsequent soak test.

Line output transistor failure

As Steven was putting the back on the Sanyo set the phone rang. Paul answered it.

"That was Mrs Wallace" he said. "Lives at the top of the old folk's home. Decent type. Her Bush WS6672 TV has been a bit troublesome during the past six months or so. I've been there twice and replaced the BU508SAF line output

transistor, which was short-circuit each time. Now the set's tripping again. Anyone else might be making a bit of a fuss, but she's still as nice as ever. Who's going to go this time?"

So it was that, armed with a circuit diagram, some replacement line output transistors and a few more bits and pieces, I called on her and tapped at the door.

"Come on in doctor" she said.

I went in and explained that I wasn't the doctor. A people doctor anyway. Not smart enough for that. Then I checked her set and found that, sure enough, the line output transistor had failed again. Why?

I looked around the line output stage carefully for dry-joints, but they all seemed to be sound. I nevertheless resoldered several just to be sure. Then I fitted a new line output transistor and gingerly switched the set on. The new line output transistor immediately sailed off heavenwards. So I studied the line output section of the chassis intensely, and eventually noticed that the 560nF, 250V capacitor in the scan coupling circuit had a broken seal around one of its lead-out wires. When I removed it I found that I could, by flexing it slightly, make it read open-circuit on my meter. I replaced it and fitted another line output transistor. After that the set came on and stayed on.

"How much my dear?" Mrs Wallace asked, reaching for her bag.

"Nothing at all" I replied, "sorry you've been put to so much trouble. I think the set should be OK now."

The advent of airborne radar

When I was a boy Doris Hamer's fish and chip shop in Gloucester's Clapham district was the only one I knew that offered savoury patties with the chips. Later she broadened her range to include raw carrots. Unusual, you might think. Well, it happened like this.

During the early days of World War II there was a sudden, noticeable increase in the number of German planes shot down over the south of England. We didn't know this at the time, but it was because of a new and highly secret development known as airborne radar.

The man entrusted with the trial of the prototype was Group Captain John Cunningham, a dedicated and distinguished test pilot. The radar unit was fitted in his Blenheim fighter plane and his air-gunner, Jimmy Rawnsley, was swiftly trained to operate it. On the night of November 19, 1940, the secret invention enabled Cunningham to shoot down no fewer than three German planes.

His success continued and "Cats'-eyes Cunningham", as he quickly became known, achieved national recognition and was applauded for his exceptional abilities. Meanwhile the Ministry of Defence, anxious to avoid any inkling by the Germans of the radar development, ascribed his success to a hearty but fictional consumption of raw carrots which, it insisted, contained a substance that improved dramatically one's ability to see in the dark.

This notion was given a further boost when Lord Woolton, the newly-appointed wartime Minister of Food, was faced with the task of persuading British housewives to use home-grown vegetables, including carrots. He happily joined in exploiting the story.

Whether it fooled the Germans I never knew, but it certainly fooled the British all right. To counteract the blackout, we children were encouraged to eat raw carrots, even to take them to school for lunch. The result was a huge increase in the demand for carrots and, when Mrs Hamer bought in tubs of really large and tasty ones, her shop became our local carrot centre. We bought them at a halfpenny each, devoured them greedily and, we convinced ourselves, could shoot eagle-eyed.

To support this claim we would cite the sign that was painted high on the local Co-Op store. At the time a German invasion was feared nationally. To confuse any parachuted invaders about their whereabouts, all place-names on signs and fascias had to be painted out. But the Co-Op missed the Clapham one. The word Gloucester remained there.

No one noticed it until, a few days into our carrot-eating spell, we lads happened to look up and spot it. We jabbered about it to the first adult who chanced to come by, the excitable and voluble Mrs Wilde.

Fired by fear that the very heart of Clapham might become the centre of German activity, she hastily and noisily gathered an action group of patriots in front of it. We didn't take long to reach a conclusion. Gloucester was in grave danger, and something had to be done about it.

At that point the luckless George, of the fats counter, came out with a long billhook. He was tackled about the matter of the Co-Op making Gloucester's whereabouts known to the enemy, treated to a lecture on patriotism and the dire penalties in force for aiding the enemy, and all but accused of being a quisling.

All this was too much for the simple George, who maintained that he had no idea what we were on about and said he had only come out to pull the shop blind down. But when he went back into the shop he immediately told his colleagues about the incident.

It wasn't long before the management got someone round with a ladder, a red face and a pot of black paint. He did a good if belated job. After more than sixty years, his handiwork can still be seen there today.

Group Captain John 'Cats'-eyes' Cunningham lived a long and interesting life. He died last summer.

That book!

The above story has been borrowed from my recently published book *The Legend that was Clapham*. I had no idea when it was first brought out that it would sell so well, nor did I imagine the phenomenal response it would get when I first mentioned it in this column. Each of the many newspaper and magazine reviews has been favourable, and our local BBC radio station inflicted me on its listeners for a whole one-hour programme.

The Clapham in the title is not the better-known Clapham in London of course. It's the back-street locality in the middle of Gloucester where I was born, over a newsagent's shop, in the early Thirties. The book describes a level of poverty and an assortment of characters and happenings that are, by today's standards, barely credible. Some of the incidents are tragic, others uproariously funny.

Some reviews and a lot more can seen at the website

www.wheatleypress.com

The book can be ordered from there or from the Wheatley Press, 132 Cheltenham Road, Gloucester GL2 0LY at £8.95 plus postage. The telephone number for the Wheatley Press is 01452 529 806.

DVD

Fault reports from Geoff Darby

We welcome fault reports from readers – payment for each fault is made after publication. See page 172 for details of where and how to send reports.

Sony DVP-NS300

This unit seemed to be dead: there was no red standby LED illumination, and no action when it was asked to wake up by pressing any of the buttons. Scope checks showed that the power supply was tripping. The output from the B+ rectifier D311 was struggling to get much above zero, though the various other outputs were at least trying.

After removing the power supply and setting to work on the B+ rail with an ohmmeter I soon realised that the low-resistance was not across the rail itself but at the other side of the 68Ω resistor R301, which is connected between D311's cathode and the anode of the LED in the regulation feedback optocoupler PC101. The optocoupler's LED was in fact short-circuit, which is unusual.

With the optocoupler removed there was still an odd reading at its pin positions. The LED's cathode is returned to chassis via an adjustable zener, IC301, which was also short-circuit. Once PC101, IC301 and, for good measure, D311 had been replaced the machine worked normally.

A quick run through the auto set-up program to compensate for wear/component ageing completed the repair. **G.D.**

Sony HCD-S500

The complaint with this home-cinema DVD/amplifier was that its front-left channel output was intermittent. I found that the audio output from this channel could be made to drop to a thin reedy sound, then return with full bass, by pushing firmly on the 'Amp' PCB. The output ICs and sockets are mounted on this PCB.

A metal box goes from one side of this board to the other, behind the output ICs. It's secured by two of the three PCB-mounting screws. Once the three screws have been removed, the box can be lifted off. Then, after disconnecting the various plugs and ribbons, the PCB can be withdrawn from the chassis.

The box screens a line of hefty, ferrite-cored output chokes. The cause of the trouble turned out to be a whopping great dry-joint at the choke at the far end, L401. I remade the joint, also several others in the vicinity and the connections to the pins of all the other chokes. Once the PCB had been refitted there was good sound from all channels.

I've now had the problem on two more occasions. Each time L401 has been the one with the bad joint. **G.D.**

Philips DVD711

There was no display and no action in general with this machine, though there was some basic power supply activity. A quick scope check showed that the power supply was quietly tripping. Rectifier D6240 on the secondary side proved to be the cause – it was short-circuit. A replacement restored normal operation. **G.D.**

Sony HCD-S300

This home-cinema DVD/amplifier was brought into the workshop after a second field call because of the same complaint, "rear-right channel hissing". Our technician didn't hear the symptom during his first call, so he checked and reseated all the speaker cables.

Like him, I was sceptical. But when I quizzed him about his second visit he said he had, this time, heard the symptom. That was why he'd brought the unit and its two rear speakers back.

When I connected the equipment and switched it on it was fine. But the field technician is reliable, so I left the equipment running. After a while a hiss came from the rear-right speaker. Most of the time it was masked by the normal sound, but during quiet passages it was definitely there.

Once I'd removed the cover I found that a loud buzz came from the rear-right channel when the heatsink for IC301, the chip that provides the right-front and right-rear outputs, was touched. A meter check revealed a potential difference of several volts between the heatsink and chassis. To establish whether the cause was 'hard', or because of leakage from somewhere, I connected a 10kΩ resistor between the heatsink and chassis. The channel then ceased to work altogether! This suggested that there was some sort of connection between the heatsink and somewhere that shouldn't be connected to it.

An examination of the board showed that the heatsink was floating, so the only place I could see where things might be going wrong was via the metallic thermal-conduction pad set in the back of the IC. As I had the device in stock, I fitted a replacement. The new chip was not sensitive to having its heatsink touched, and a long soak test proved that the hiss problem had been resolved. **G.D.** ■

Solution to Test Case 481

– page 165 –

Television Ted was on the point of handing in his resignation at the end of that day, which had involved more horrible assignments in the afternoon and some engine trouble with the van.

The loan digibox at his first call produced only a limited selection of non-subscription channels because BSkyB pairs viewing cards electronically with the receivers in which they are generally used. When boxes are exchanged permanently, it's easy to arrange with Sky to pair the new combination. Whether it's worth doing this twice to cater for a short-term loan is a moot point.

The other digibox with which TT was involved had a long-forgotten 'event' stuck in its memory. The trick here, it seems, is not just to give the box a mains reset but to do this after removing the viewing card. When mains power is restored, select 'programme planner', key the yellow button, then insert the card. We don't know why this is – but it worked for Ted!

The Panasonic TV set simply needed its mains fuse to be uprated from 3·15A to 5A. This is an official Panasonic modification.

Finally, the surround-sound problem. Though they are fitted with an optical (digital) audio output port, the Sony satellite receiver Models VTX-S550U and VTX-S560U cannot provide Dolby Digital 5.1 sound. At the time of writing, only the VideoPlus box can do this.

Poor Ted. But at least he's now back beside his radiator in the workshop.

NEXT MONTH IN TELEVISION

AV accessories guide

Developments in TV, audio and video equipment have spawned a host of add-ons and accessories to cater for various customer requirements. Half a dozen boxes of one sort or another may be linked to the display unit, aerial, satellite dish, telephone socket and all those loudspeakers. And the lot can be remote controlled in various ways. This diverse field of accessories can add interest and profit to your business, whether you are a retailer or a service GP. Eugene Trundle provides a survey of what's available and how to use the various devices.

EEPROM reprogramming jig

For some time now setmakers have included an EEPROM in their TV receivers to store service adjustments (geometry, CRT drive characteristics, control data etc.) and customer preference data (tuning, picture and audio settings etc.). The data stored is vital to the working of a set. But when a fault occurs it can be difficult to determine whether the cause lies with the hardware or the software (data corruption). Engineers can adopt various approaches where data corruption is suspected. Bill Wilcock describes these, with particular reference to Sharp TV models.

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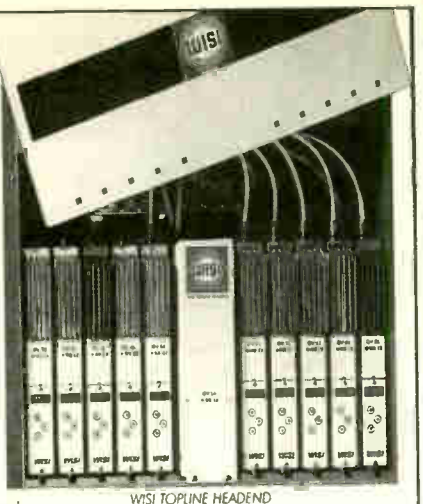

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Board cameras all with 512x582 pixels 8.5mm 1/3 inch sensor and composite video out. All need to be housed in your own enclosure and have fragile exposed surface mount parts. They all require a power supply of between 10 and 12v DC 150mA.

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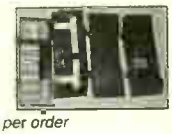

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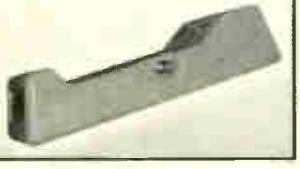

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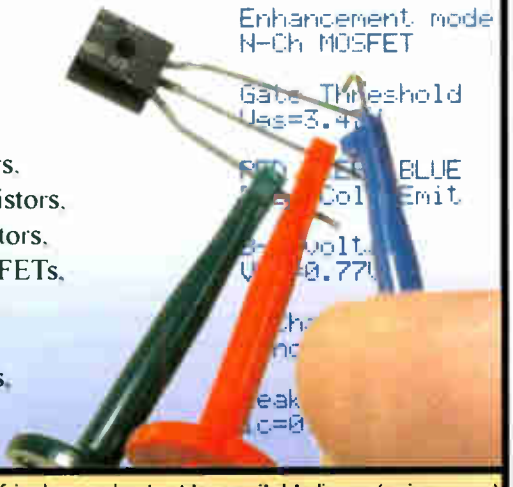

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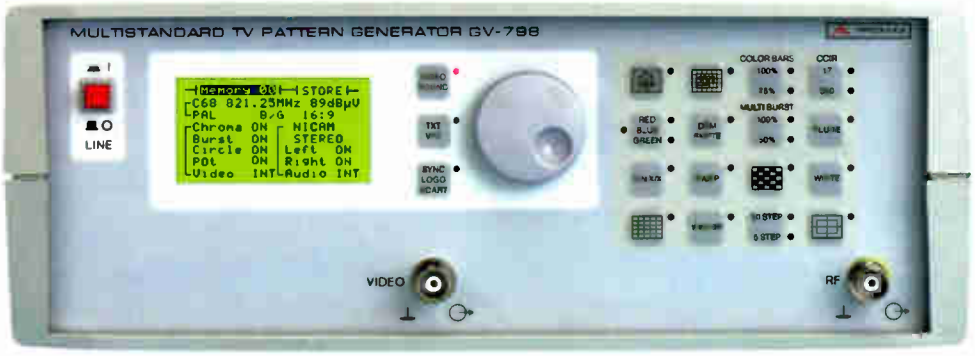

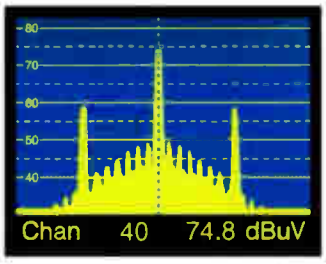

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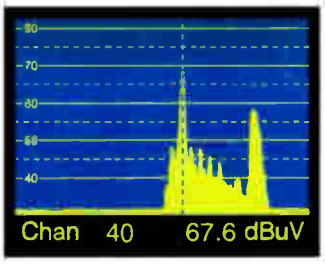

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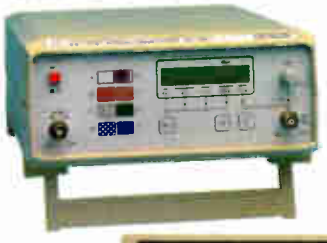

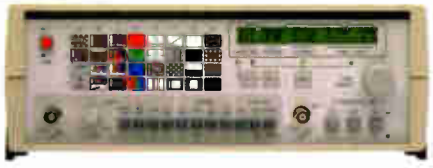

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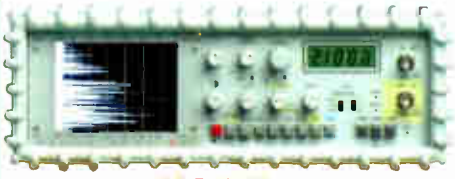

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