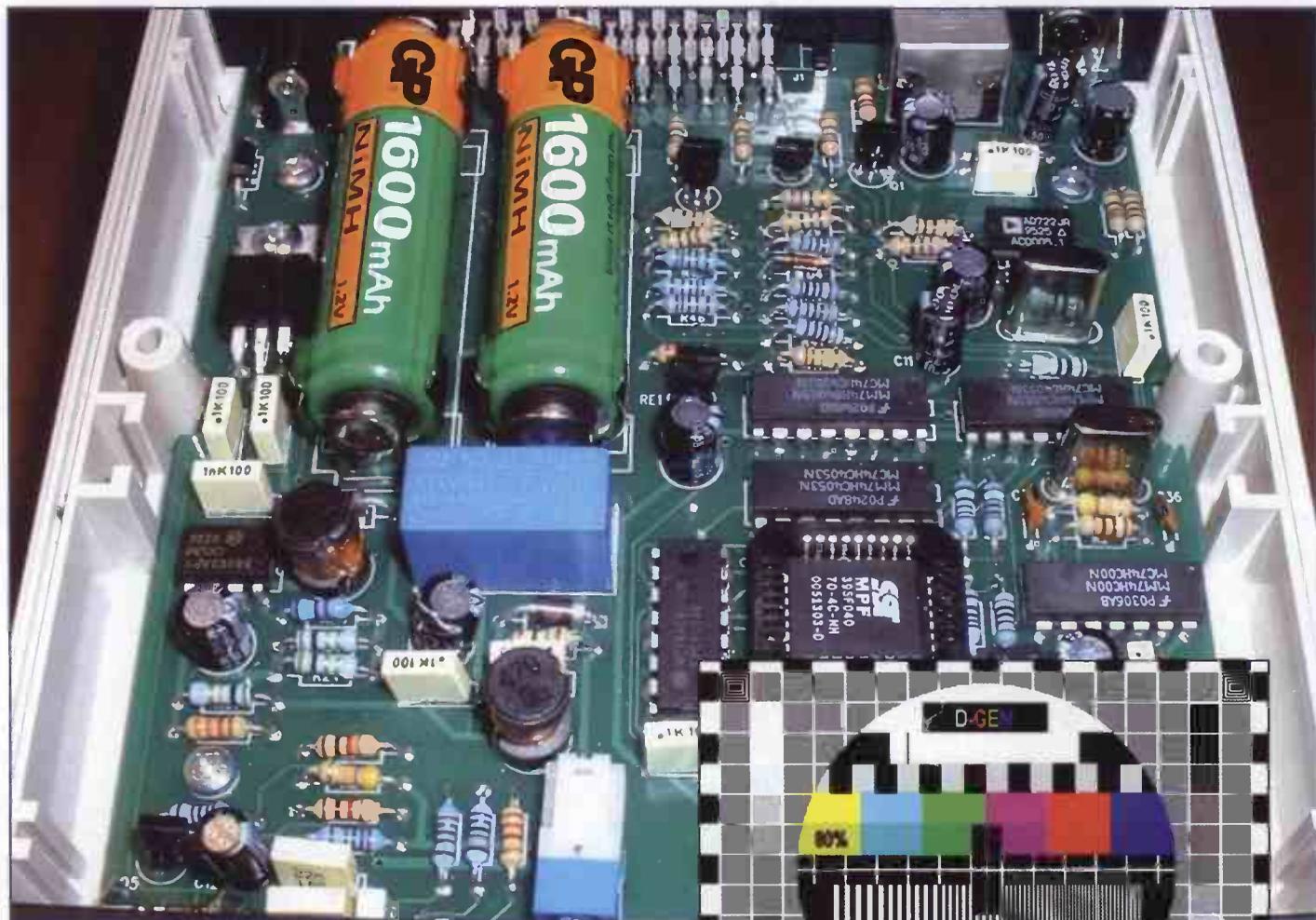


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TEST REPORT

The D-GEN pattern generator

Sky digibox RF2 checker

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Ofcom, the new regulator

There are times when it is difficult to get governments to take action about things that are obviously necessary and urgent. There are others when governments seem to want to fiddle about for no good reason. At the end of last year, on December 29 to be exact, Ofcom (the Office of Communications) officially came into being, taking over from five separate regulatory bodies – the Independent Television Commission, Oftel (the telecommunications regulator), the Broadcasting Standards Commission, the Radio Authority and the Radio Communications Authority. Is this another example of government fiddling? Possibly. It rather depends on how the new super-regulator works in practice. It has made a reasonable start, getting reviews under way and making the right sort of noises – “a fresh look at regulation”, “a light touch and value for money” for example.

Ofcom is the world's first combined media and telecommunications regulator. That gives it huge responsibilities. It was conceived three years ago when there had been much talk of the convergence of broadcasting, the media and telecommunications. A government white paper argued that this convergence should be reflected in the regulation deployed. The previous five organisations had been set up on an ad hoc basis as the need arose. Some had possibly reached the end of their useful lives, as technology and the media evolved. The ITC for example, initially the ITA, was set up in the heyday of ‘independent television’ when there were numerous commercial TV companies and an authority was needed to award and supervise franchises. With ITV reduced to a single main player, the detailed supervision that the ITC provided has become largely irrelevant. So, yes, it probably is a good idea to change the regulatory system. Whether giving a single authority such wide responsibilities in diverse fields is the best way of going about it is another matter. Can it be effective with such a portfolio of duties? It will depend very much on those at the top and how they decide to exercise their responsibilities. There is in particular a danger when a single authority has so much power, especially in a sensitive field such as broadcasting.

The new regulator has 263 statutory duties relating to the Communications Act and various Wireless Telegraphy Acts. It plans to meet these duties and responsibilities with a reduced staffing compared to the previous five separate regulators, a total of some 880 (down 23 per cent), and lower running costs, reduced by five per cent after the initial start-up costs. Is it being optimistic here? Possibly, especially if additional responsibilities are handed to it. This could well be the case, since communications is a fast-evolving technology.

Ofcom
OFFICE OF COMMUNICATIONS

Ofcom is the world's first combined media and telecommunications regulator. That gives it huge responsibilities.

Initially Ofcom has undertaken three major reviews: on public service broadcasting, spectrum requirements and supervision, and a strategic review of telecommunications. It's an ambitious start. The public service broadcasting review will bring it into an area of considerable political controversy, since the BBC's charter comes up for renewal when the review is due. But for the moment, according to Ofcom's chief executive Stephen Carter, the “majority of our resources will be involved with telecommunications and the spectrum rather than broadcasting”. Getting broadband to work effectively and dealing with the demands of those who want spectrum space will, in other words, be the initial priorities.

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The government is asking a lot of Ofcom, whose responsibilities will include the entire media, not just broadcasting. It will require firm direction. We shall have to be patient as it finds its feet – it will certainly not be possible to unscramble the regulatory omelette or think up something different in a hurry.

For those of us who have been involved with broadcasting, however tenuously, over the years it is particularly sad to say goodbye to the ITC, or the ITA as it originally was. It started in the mid-Fifties, with the advent of commercial TV, when broadcasters were still broadcasters, providing the full range of needs from programmes to transmission networks. The ITC had many outstanding technological achievements to its name, including the first all-electronic standards converter that, at the time, incorporated the fastest computer in the world. Now that transmission and broadcasting have been irrevocably separated, it is difficult to recall the spirit of those adventurous days, when the BBC and the IBA were vying with each other in the field of technological advance. Think of FM broadcasting, sound-in-synchs and teletext to name just a few examples. Ofcom inherits a different world, one that in particular has gone digital. In fact it seems that giving the digital bandwagon a push will be one of its duties.

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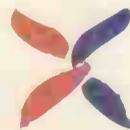
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TELETOPICS

Extended warranties

The Competition Commission took seventeen months to produce the latest report on extended warranties, the third investigation since 1994. It was accepted almost immediately by the government. The report concludes that the market is uncompetitive and that warranties are excessively expensive. But its recommendations on what should be done to improve the situation seem rather tame. Their main aim is to try to increase competition by giving purchasers more information and rights.

Purchasers of goods must be shown the price of an extended warranty alongside the

goods in both stores and advertisements. A written quotation valid for 30 days should be provided. Purchasers can cancel a warranty agreement, with full refund, within 45 days, and must be given a written reminder of their right to do so within this period. They can also cancel and ask for a pro-rata refund at any subsequent time. A standard information leaflet setting out consumers' rights must be provided at the time of sale. Retailers can however continue to sell warranties alongside the products being sold. The situation is to be reviewed within two years.

Retailers are unlikely to be too perturbed about all this – much of it seems to be standard practice in many organisations. It's a big market that could make a substantial difference to profits however. Dixons, the largest seller of extended warranties, is reputed to rely on them for about half its profits. The five largest electrical retailers made profits of £762m from warranty sales of £2.1bn over the five years prior to the latest report. With wafer-thin margins on the sale of new equipment, any further crackdown could have an effect on the price of goods.

Sky+ upgrades

During December B SkyB added several new features to the Sky+ hard-disk recorder, all via software downloads. The Dual Recording feature enables the box to record two programmes simultaneously. Recordings are made in the normal way but if the user wants to record two programmes whose times clash there is no longer an on-screen message to draw attention to this. In addition it's possible to watch a third pro-

gramme stored on the hard disk while the two programmes are being recorded.

The Instant Rewind feature was added last year, enabling viewers to rewind live TV by up to an hour, for example to see an action replay or catch the missed beginning of a programme. This must be enabled by users via the Sky+ set-up menu. A new upgrade enables viewers to both watch and save the programme.

The Series Link function can be used to record episodes of a TV programme or series automatically – Series Links are now available with nearly 3,000 programmes each week in more than sixty digital satellite channels. The new upgrade ensures that Links are maintained even when, for example because of one-off selection of another programme instead, an episode is skipped, and also when the next episode is up to four weeks away.

JVC has introduced a range of four LCD TV sets with 17, 23, 26 and 32in. screens and a 42in. model with a plasma panel display. The 26, 32 and 42in. models incorporate new-generation DIST (Digital Image Scaling Technology), Super DigiPure which uses an enhancer IC to adjust contour details to match the image, JVC's colour management



system which compensates for the characteristics of flat-panel displays, motion compensation, a digital comb filter and auto video-noise reduction.

There are also full-specification audio systems, including a surround-sound audio processor that provides frequency filtering for an accurate 3D effect, and BBE that detects phase delay and amplitude distortion and corrects it using feedback technology.

Plasma Model PD-42V31 provides a W-VGA (853 x 480 pixels) display and has full-range speakers and a built-in subwoofer. Audio output capability is 36W RMS. LCD Models LT-32C31 and LT-26C31 provide a W-XGA display (1,280 x 768 pixels) and have two front oblique-cone speakers that deliver 20W total RMS. The smaller-screen LCD Models LT-23E31 and LT-17E31 are designed for portability and include PC connectivity.

Interactive TV standard

DVB-GEM could become the first worldwide standard for interactive TV. It has been devised by the DVB (Digital Video Broadcasting) group, the GEM standing for Globally Executable Multimedia Home Platform. It's described as the first set of technical standards for interactive TV producers. The Multimedia Home Platform was designed to make digital video content compatible with set-top boxes of all kinds, digital TV sets and multimedia PCs. For further information check at www.dvb.org

New home networking system

Mitsubishi, Sharp, Sanyo and Toshiba are to develop a new standard for home networking and information appliances called iReady – the name is based on the terms IT ready, internet ready and 'I am ready'. The companies plan to invite other home appliance makers, computer peripheral device makers and internet service companies to join the venture. The iReady technology will include adapters, appliances and a common network transmission system that will enable products from different manufacturers to work together on home networks.

Devices will be able to plug into iReady adapters that are compatible with the short-range Bluetooth wireless system and wireless LANs (local area networks) like WiFi, as well as future transmission media.

Next-generation DVDs

The DVD Forum has agreed the specification for a new generation of DVD discs based on the use of a blue-violet light laser. The single-sided 12cm discs will be able to store five times more video data than existing DVDs, in high-definition or standard-definition form. The new format is provisionally known as HD DVD. So far the Forum has agreed the specification for version 0.9 (beta) of a read-only disc: agreement on a specification for rewritable discs is expected to follow shortly.

The new format has been developed by Toshiba and NEC. The competing Blu-ray format, which was the first to be announced, was developed by a consortium that includes Sony, Matsushita (Panasonic), Philips and Hitachi. It uses a thinner disc that's protected by a caddy but can store somewhat more data – 23.3-27GB per side in comparison with 15-20GB. This translates as

two hours of HD digital video compared with about three hours for Blu-ray. The advantage claimed by Toshiba and NEC is that HD DVD discs will cost some twenty per cent less than Blu-ray ones, because existing DVD assembly lines can be adapted to make them. The media side of the industry seems to consider this to be a major advantage.

There could be trouble ahead however (another format war), as the Blu-ray group is unlikely to back down quietly – Sony launched a Blu-ray recorder last April in Japan, at a price approaching the equivalent of about £3,000. It has a number of recording modes that give playing times from two to twelve hours.

NEC plans to launch PCs with HD DVD drives before the end of 2005. Toshiba has suggested that it might launch notebook PCs with HD DVD drives and an HD DVD recorder this year.



The Samsung Model PS-63P3H is understood to be the largest plasma TV model currently available in the UK, with a 63in. screen. It's costly however, at some £17,000. There are integrated twin tuners and the viewing angle is 160°.

Large-screen TV

It doesn't have to be all plasma panels in the large-screen TV market. Texas Instruments and Intel are amongst chip-makers that are to announce projection TV developments at the forthcoming (January 2004) Las Vegas Consumer Electronics Show. Intel, whose microprocessor chips are found in the majority of PCs, is to introduce an LCOS (Liquid Crystal On Silicon) chip that acts as a light modulator for rear-projection TV systems. This will be its first venture into the TV market. Intel claims that use of its LCOS chips (one for each primary colour) could reduce the price of a 50in. set by about a third. Other companies, including MicroDisplay Technology, which evolved from the Massachusetts Institute of Technology in 1995, are working on LCOS technology – the first set to use the technology was shown by Thomson (RCA) at the 2001 CES.

November had reached this level per week. According to the BBC 90 per cent of Freeview customers have no other digital system, and 67.5 per cent are completely new to digital TV.

Independent surveys indicate that Freeview has become a mainstream consumer product, with a consumer profile that reflects the general population. Freeview sales reached a million sooner than any comparable consumer electronic technology, including DVD and PlayStation 2.

Meanwhile Texas Instruments is to introduce new versions of its DLP (Digital Light Processor) technology at CES. The TI DLP chips use thousands of tiny mirrors mounted on the surface of the chip to modulate the light. Several manufacturers have launched sets that use DLP technology: TI claims to have supplied over 2.5m of the chips.

The advance of plasma TV nevertheless continues. In response to increasing worldwide demand Shanghai Matsushita Plasma Display, a subsidiary of Matsushita, is increasing its output. SMPD began production in December 2002 at a rate of 5,000 units a month. This has now been increased to 20,000 a month, mainly to cater for the Chinese market. The market for plasma sets in China is expected to exceed 300,000 this year, and SMPD expects to gain forty per cent. Worldwide, the demand for PDPs is expected to reach more than four million in 2005.



Daewoo has launched this combined VHS VCR and Freeview receiver, Model SV900, which enables viewers to record Freeview channels directly without having to remember to leave the STB on with the correct channel selected. It features one-touch recording directly from the EPG instead of having to set the channel and the start and end times. A seven-day Freeview EPG is expected to be launched shortly. For further details phone 0118 925 6700 or check at www.daewooelectronics.co.uk

Freeview success

The BBC reckons that digital TV penetration in the UK reached 50 per cent at the start of 2004. Its estimate followed record-breaking sales of Freeview STBs in the lead-up to Christmas, when weekly sales of Freeview boxes and IDTV sets exceeded 100,000 units. The BBC estimates that at the end of 2003 its Freeview services were available in 2.5m homes. Sales of Freeview STBs averaged 100,000 a month earlier in 2003, but by the middle of

Multi-TV STB

The latest range of EchoStar satellite TV STBs, just launched in the US, uses ICs from Broadcom to enable several TV sets to be operated from a single STB. The BCM7319 chip integrates the equivalent of two separate decoders, enabling programmes to be delivered to sets in several parts of the home. The more complex BCM7320 provides digital multi-TV or PIP and in addition digital video recording capability.



The current situation, with widescreen TV sets, software pre-settings and a complete lack of broadcast test cards, means that a comprehensive, portable test-pattern generator is virtually essential. Eugene Trundle has assembled, tested and assessed a new type of pattern generator that has only recently become available.

Test report

The D-GEN pattern generator

Photo 1: Above Internal layout of the D-GEN pattern generator.

Today's TV sets are very stable and reliable. They seldom need any setting up on delivery. But when a critical component has been replaced, for example the picture tube, line output transformer, a scan-drive component or, particularly, an EEPROM, precise setting up and adjustment are often required. Customers are understandably fussy about the pictures produced by a set that may have cost them a four-figure sum.

The weight and size of modern large-screen sets is such that on-site repair is often desirable. In this situation a pocket-sized test-card generator is a tremendous asset. A full-specification, broadcast-type pattern, generated right there at the bench, is also a great help in the workshop. Alternatively such a generator could be used with an RF modulator, perhaps a channel-programmable one from a discarded satellite box, to pipe its picture around the workshop on a selected UHF channel and, maybe, around

the showroom as well, complete with an audio test tone. In addition to setting up and adjustment, such a generator would be good for assessment and soak testing. Enter the D-GEN pattern generator.

Description

There have been many pattern generator types and designs in the past. But relatively few have provided 'full-Monty' broadcast-type test cards amongst their repertoire of patterns. Those that have done so have tended to be expensive, because of their complexity and high component count. New IC technology however has made possible a small and relatively simple test-card generator in which the patterns are pre-programmed into a flash memory – in this case a fingernail-sized, socket-mounted device with just 32 pins. The other seven ICs used in the D-GEN are a Scenix SX28 microcontroller, counters, a switcher, a video processor and a

DC-DC converter. The latter works in conjunction with diode and LC components to generate a 5V operating supply from the two internal AA cells. There's also an input socket for an 8-12V DC supply. This works with a 5V linear regulator that powers the instrument and trickle-charges its internal batteries. The total component count is about 100, which are mounted on an 11 x 12cm plated-through hole fibreglass PCB. Photo 1 shows the internal layout.

The generator provides two types of 4:3 test card and one with a 16:9 aspect ratio, along with a range of eleven other patterns. See the specification table for further pattern details. Output is primarily via a scart socket that provides composite and RGB signals, along with a 1kHz audio tone. The latter is also available via a front-mounted phono socket. In addition to the scart socket there are, at the rear, DIN S-video and phono composite video sockets. Power on/off and sequential up/down pattern-selector keys are provided on the front panel, together with 'on' and 'charge' LEDs. And the whole thing can be slipped into a jacket pocket or a small toolbox.

Photo 2: It's truly portable!



Construction

This instrument comes as a kit with illustrated assembly instructions, circuit diagrams and a user manual. All you need to build the electronic section is a small soldering iron. A small drill and a miniature file are required to make the openings in the

case's front and rear end-panels, for which stick-on templates are supplied. I found it best to use new watchmaker's screwdrivers, rotated by hand, to drill the holes, then break out and clean up the apertures. The front panel has a self-adhesive fascia. See Photo 2.

The PCB comes with one surface-mounted IC already fixed. I fitted all the passive components first, mainly resistors, and cut off their legs after donning an anti-static wrist strap and putting in the semiconductor devices.

After a careful check under an illuminated magnifier I switched the unit on. It worked first time for me. There are no adjustments whatsoever. I was greeted on screen with the D-GEN logo and, after a few seconds, the main test display – the 4:3 aspect-ratio pattern A, see Photo 3. From starting on the construction to seeing the pattern took about four hours.

Test

I found that the consumption with internal battery powering is about 320mA, which corresponds to less than 1W of energy, and that the instrument works at down to 2.33V. This gives a running time of about five hours with battery power, more than enough in practice.

In day-to-day use I found that test card A is the most useful pattern. It's a comprehensive, general-purpose 4:3 aspect-ratio pattern with a reasonably smooth-edged central circle that contains 1.5-5MHz frequency gratings, standard colour bars at 80 and 100 per cent saturation, gratings, a grey-scale in 20 per cent increments, a red/yellow colour-fit block, a needle pulse and a streaking-test bar. Outside the circle there are a 50 per cent grey background, two grey-scale stairsteps with 10 per cent graduations, and border castellations whose outer edges represent the broadcast picture limits. Each corner block contains concentric squares to check on the focus and sharpness here.

The on-screen display, and oscilloscope checks on the video waveform, showed that all parameters were correct – except that the whole image (I tried with many sets and checked against other references) is displaced very slightly to the left. Maybe I'm nit-picking here! There was no difference in image position in the S-video and RGB modes. The latter, which I have never seen on offer with any other pattern-generator design, gave

the cleanest-looking test card I've ever seen except on a high-definition PC monitor screen. Card A checks most aspects of a TV display.

The widescreen test card, see Photo 4, is what has become known as an anamorphic image: it has a horizontally-compressed appearance on a 4:3 aspect-ratio screen but correct proportions in a 16:9 aspect-ratio display frame. Photo 4 is largely self-explanatory – the image has many of the features of test pattern A. Near the top there are white and three primary-colour squares, with 90 per cent dots on them. This is useful when testing for white crushing and for setting the colour-saturation respectively. The standard WYCGMRBB colour blocks below are at 80 per cent saturation. The diagonal frequency gratings in the corners and the coloured edge castellations bring to mind early versions of broadcast test cards . . .

Test pattern B, see Photo 5, is another 4:3 aspect-ratio image, based on the layout of the widescreen one but containing in the centre a picture (of a dog!) with a full grey-scale tonal range. The multiburst gratings in this pattern correspond to video frequencies at 1.5, 2.5, 3.5 and 5MHz. The colour blocks on the left of the centre picture are pretty, but to get the standard colour bars you have to go to one of the other patterns.

The other patterns are simple ones, most of which have specific purposes. There are dots for colour registration and focus checks; cross and lines for centring (I found the test pattern better for this; a grey-scale (ten levels, black to peak white); colour bars, split horizontally into 80 and 100 per cent saturation levels; red, green and blue fields for purity checking; and black and white levels. They are all selected in sequence by the front-panel up/down keys.

There's also an unusual feature, a 100 per cent white field that flashes at a rate of 1Hz. This is mainly for checking EHT voltage regulation. I found that high-quality sets such as those produced by Bang and Olufsen don't bat an eyelid when presented with this, while supermarket cheapies are much disturbed! This test is best carried out with an on-screen marker to gauge the degree of ballooning present. Maybe a future version of the D-GEN could incorporate a constant-coloured square or border to help with this.



Photo 3: The 4:3 aspect-ratio test pattern A.

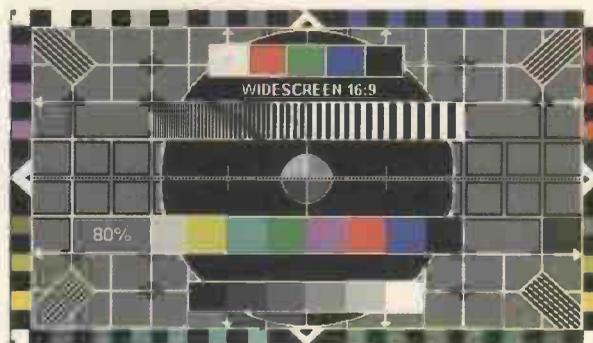


Photo 4: The 16:9 aspect-ratio test pattern WS.



Photo 5: The 4:3 aspect-ratio test pattern B.

During tests with a variety of TV sets and monitors I found the scart socket the most useful of those provided. Pins 8 (source switching) and 16 (blanking) are held high, with a current limitation of 20mA, to drive TV sets into the AV and, where relevant, RGB mode: most TV sets I tried played ball in this respect. The phono composite video and audio sockets are handy for use with TV and video equipment that has front-panel AV sockets (these are usually intended for use with a camcorder). The same can be said of the S-video socket. I found that the 1kHz audio output was reasonably correct in amplitude, but somewhat clipped in the negative-going direction, when checked at both the phono and scart sockets with the correct 600Ω termination. This, I'm told, is because of production spreads in the gain of the two transistors used in the audio oscillator circuit: it's not a big

Table 1: D-GEN pattern generator specifications

TV standard	625-line, 50Hz interlaced (512 x 288) PAL.
Patterns	Two 4:3 aspect ratio test cards; one 16:9 aspect ratio test card; red, green and blue fields; crosshatch; dots; grey-scale; centring grid; standard colour bars at 80 and 100 per cent saturation; black screen; white screen; flashing white screen.
Video output	Composite and RGB at scart socket; S-video at 4-pin mini-DIN socket; composite video at phono socket.
Video levels	RGB 0-7V terminated at 75Ω; Y/C and composite video 1V terminated at 75Ω.
Audio output	500mV RMS sinewave terminated at 600Ω via scart and phono sockets.
Power source	Two internal AA cells, disposable or rechargeable; or 8-12V DC from an external mains PSU (not supplied).
Consumption	1W battery, 1.75W external source.
Dimensions	13 x 13.5 x 14cm w/d/h.
Weight	300g with batteries.
Colour	Ivory or black.

problem with what is primarily an image generator.

I couldn't fault this little instrument in any other way during close scrutiny of its on-TV screen displays and its output waveforms with test instruments, checking amplitudes, timings, vector angles etc.

The D-GEN's trickle-charge capability when working with an external mains-to-DC power supply will fully charge NiMh cells for example over a period, but is not enough to present any risk to non-rechargeable/disposable batteries used in the unit. For the latter, I would recommend Duracell or Duracell Plus alkaline batteries. Of rechargeable types I believe that

NiMh are best suited – these are now available with up to 2Ah capacity.

While stashed away in my pocket or toolbox the instrument has accidentally switched on once or twice: a recessed on/off button or a clip-on protective front shield would solve this problem easily.

Conclusion

What a super little device! And what a bargain at £75! Other manufacturers of test-pattern generators, with their three-figure price tags and relatively limited range of patterns, will have to look to their laurels now.

Those who are in the market for this

instrument will find it very easy to build the kit, which offers tremendous value in a sector where money is very tight. Excellent indeed.

Availability

The D-GEN kit is available from CRH Electronics Design, 43 Jonathan Road, Trentham, Stoke-on-Trent, Staffs ST4 8LP. There are also other computer-orientated pattern generators and monitor testers. There's a website at www.videocorner.co.uk

The email address is roy@videocorner.co.uk

Cheques, postal orders and International Money Orders are accepted for payment.



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Low-cost CCTV recording system

Burglary and vandalism are all too common nowadays. Deterrence can be provided by using a CCTV camera, a sensor and a dedicated VCR. Most people don't want to go to the expense of an elaborate system, so Mike Rutherford has devised this low-cost system that can be easily built and installed

Burglary is common nowadays but is seldom regarded as a matter for urgent attention by the police. Yet the very fact that an intruder has violated one's privacy is enough to make some people move house, adding one stressful situation to another. Vandalism has also become more common: it's often perpetrated as a lark by those with time on their hands and insufficient intelligence to know how to make good use of it. The presence of a CCTV camera and a 'recording in operation' sign is usually enough to deter all but the most determined villains – and those will break in despite one's best efforts to make it difficult for them.

For many people the cost of a CCTV camera, a sensor and a dedicated VCR is excessive. The system described here is not a de-luxe affair but has the important characteristics of ruggedness, reliability and low cost. Much of what's required can be found in the workshop drawers and on the shelves. The trigger-unit circuit is not critical, and only mains-supply interruption will stop it working.

System description

Fig. 1 shows the overall system. Simplicity and flexibility are its main features. Photo 1 shows the outdoor items – camera, floodlight and PIR unit. The camera is a miniature colour model with sound. It costs about £60. A monochrome camera would cost less, reducing the overall cost. It's continuously powered by a small 12V, 300mA plug-top transformer and a separate twin flex. The sensor is a stand-alone, mains-powered PIR detector

unit that can be obtained from many DIY stores for about £10. It provides a switched mains output to operate the floodlight, and also supplies a small transformer and rectifier unit that delivers 16-20V. This 'operate voltage' is fed to a trigger unit that controls the VCR, either via its infra-red remote-control unit or directly via its front-panel keys. The very old 'piano-key' machines are not suitable for this application.

The need for mechanical contacts to interface with the VCR or remote-control handset means that relays have to be used. This makes the trigger unit easy to understand, without a degree in digital electronics being required.

When the PIR sensor detects movement it supplies mains power to the floodlight. This mains supply is also fed to a small power unit that in turn provides the 'operate voltage' for the trigger unit. When this voltage appears at the input to the trigger unit the record mode is initiated, putting the VCR into the record-pause mode. To do this the VCR should be switched on permanently and set to standby and the AV mode. The trigger unit then operates the play contacts and the VCR starts to record. As long as there is activity within the sensing area of the PIR the operate voltage will be present and the floodlight will provide illumination. When activity ceases the PIR unit will switch off after a pre-settable interval. At this point the trigger unit sends a stop signal to the VCR.

The system will work with a wide variety of VCRs, and could provide up to eight hours of recording in the LP mode with a four-hour tape.

The camera-VCR combination can also be used for monitoring purposes without recording: to do this, combine the RF output from the VCR with the off-air signals fed to a standard TV receiver or use a dedicated monitor if preferred. A switch is fitted at the operate-voltage input to the trigger unit to enable this option to be selected and prevent automatic recording. The switch also selects an optional sounder. The camera's output is fed directly to the scart connector at the rear of the VCR.

The trigger unit

Fig. 2 shows the circuit diagram of the trigger unit. When the operate



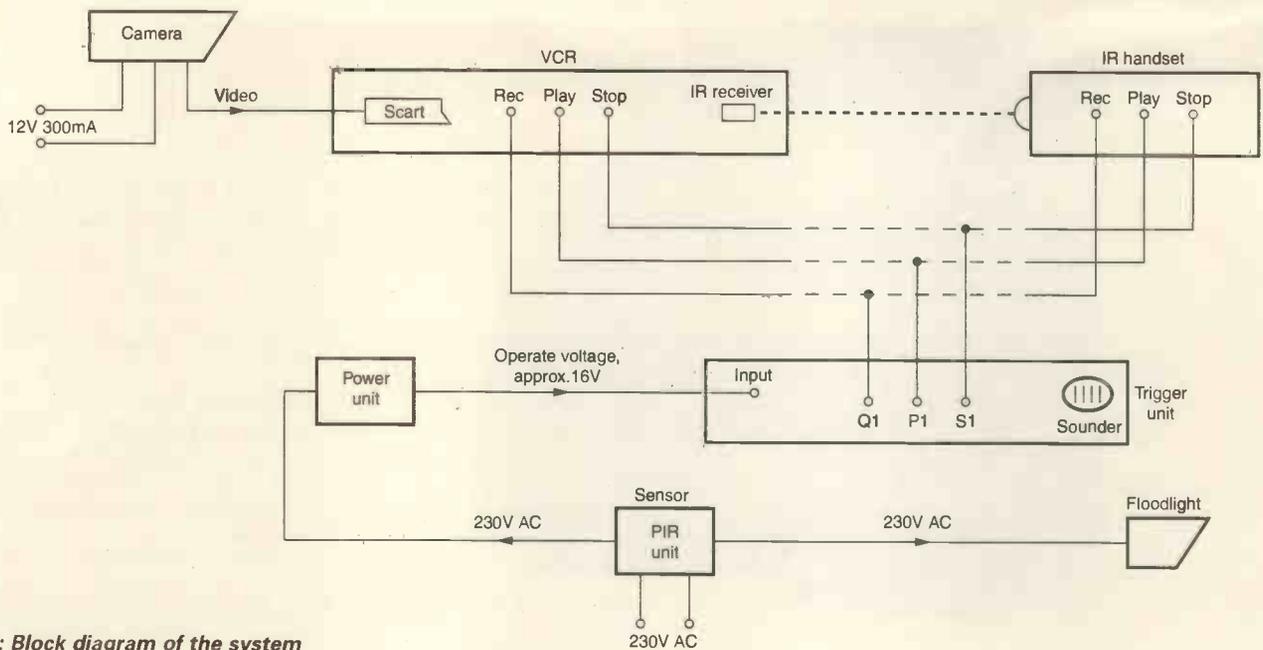


Fig. 1: Block diagram of the system

voltage appears at the input RLA/1 operates and contacts A1 change over. Capacitor C1 then charges via D1 and the coil of relay RLQ/1. This closes contacts Q1 momentarily as C1's charging current reaches a peak then falls away. Contacts Q1 put the VCR in the record-pause mode. At the same time C2 charges via D2 and R1. When the bias at the base of Tr1 is sufficient it switches on and operates relay RLD/1. Contacts D1 change over and C3 charges via the coil of RLP/1, contacts P1 closing momentarily to switch the VCR to record. This situation continues as long as the operate voltage is present.

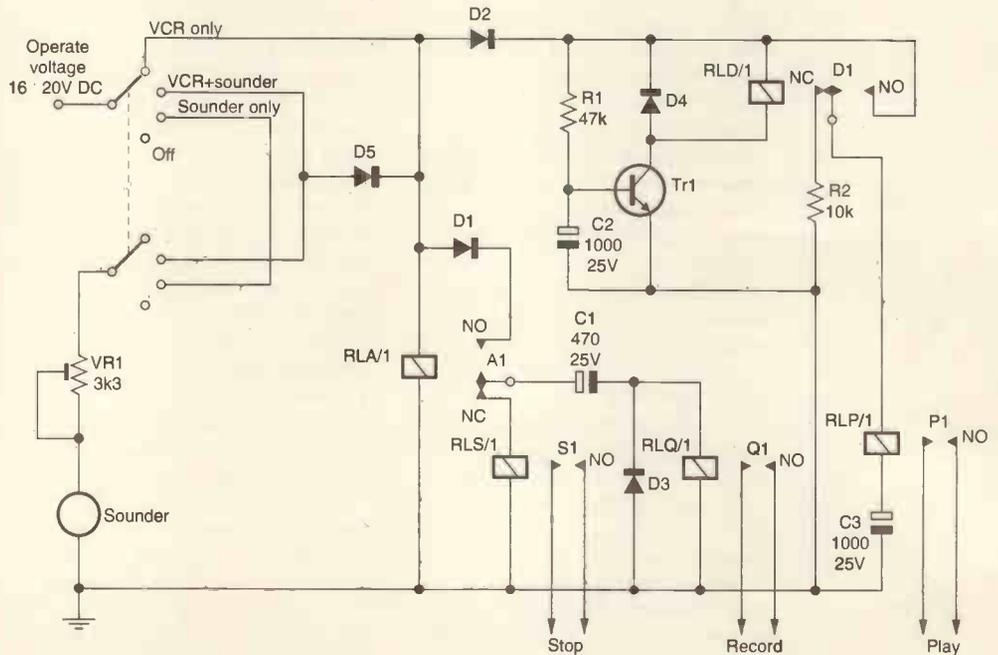


Fig. 2: Circuit diagram of the trigger unit

When the PIR switches off the floodlight the mains input to the power unit that provides the operate voltage is also removed. So the operate voltage disappears, relay RLA/1 is released and contacts A1 change back, connecting C1 to the coil of RLS/1 via D3. This diode prevents RLQ/1 operating. Contacts S1 therefore close momentarily and a stop command is sent to the VCR.

The relays are not critical. Those used in the prototype, see Photo 2, have coil resistances in the region of 400-500Ω and are designed for 12V operation. As they don't handle power, miniature types are ade-

quate. The five diodes are common silicon types of the 1N4001 variety. Transistor Tr1 is a 2N3053, but any npn type with an Hfe of about 50 will work. The three electrolytic capacitors are rated at 25V with an 85°C maximum operating temperature. Some adjustment to the values of C1 and C3 may be required to cater for different relay sensitivities and coil resistances. The rotary switch used to select VCR only, VCR plus sounder, sounder only and off is a double-pole, four-way type. The sounder is a 12V unit, with a variable resistor in series to adjust the volume. Constructors may wish to vary this arrangement.



Photo 1 shows the outdoor items - camera, floodlight and PIR unit.

External view of the trigger unit.



Power unit

The power unit that provides the operate voltage is very simple, see Fig. 3, consisting of a transformer and a bridge rectifier plus filter circuit. It provides a notionally smoothed DC output of about 16-20V. A voltage higher than 12V was chosen to allow for the voltage drops introduced by the link to the trigger unit and the diodes used in the latter.

The full load current depends on the relays used but should not normally exceed 60mA.

VCR control

Connection to the VCR or remote-control handset is easy. I used thin grey flat twin cable. If a remote-control handset is to be used to control the VCR, prise it open carefully and locate the record, play and stop pads. There are no polarity considerations, the flat twin wire ends simply being soldered across the contact pads. This option offers the possibility of using a handset

whose keypad is worn and is no longer usable normally.

If the VCR's control panel is to be used for direct connection the procedure is similar, the flat twin wire ends bridging the 'oilcan' switches most commonly found.

The use of a remote-control transmitter makes the system more flexible and could enable the VCR to be sited in a place accessible only to authorised persons. A wireless extender system offers possibilities here.

Setting up

The PIR sensor must be set up carefully so as not to operate with passing people and objects but detect intruders when they come within the edge of the protected area. This compensates for the time delay before a recording starts, and is most effectively carried out on a cool evening when the contrast between body heat and background heat increases. Many PIR sensors have an adjustment for the time

during which the mains supply output is provided. Set this to suit your requirements: a period of five minutes should be more than adequate. The floodlight power should be sufficient to illuminate any intruders properly without being over-bright, a condition with which many small cameras can't cope. Position the sensor, floodlight and camera so that they can't be reached from the ground without aid.

Daytime operation

Daytime operation is possible, but some means of disabling the floodlight is needed. Alternatively floodlight operation could be removed from the PIR sensor, a floodlight unit with its own PIR being used instead, operating independently.

There is a distinct possibility of false triggering during daytime, but this can be useful. After wondering whose dog was fouling the front garden I set the system to operate in daylight, captured the offending animal on tape and informed its owner. His disbelief evaporated when he was shown the CCTV footage.

Use

The trigger box has proved to be extremely reliable. It replaced one that failed catastrophically during a thunderstorm, and has responded dutifully to every entry by friend or stranger to the property.

With a four-hour tape and the machine set to the LP mode there's enough video-storage capacity for about three weeks' continuous surveillance of domestic premises. Playing back eight hours of CCTV footage until an undesirable event is seen is incredibly boring however.

It is a very basic system and doesn't have a facility to superimpose the time and date, though this may be possible with some of the more sophisticated VCRs.

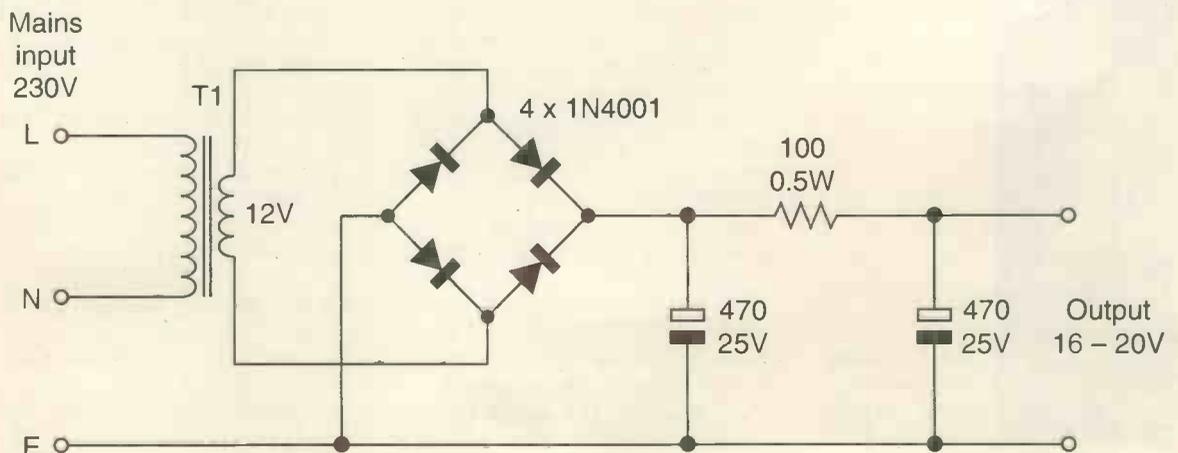


Fig. 3: Circuit diagram of the power unit that provides the operate voltage.

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Sky digibox RF2 checker

The ability to check the power output from a digibox's RF2 socket is a great help both in the field and on the bench. This simple checker has been designed by Michael Dranfield



There's a saying that the simplest ideas are the best. This project couldn't be simpler – there are just five components plus a case and a coaxial socket. It can be built for a couple of pounds, and you will wonder how you ever managed without it!

The problem

It all started a couple of weeks ago when I repaired an Amstrad DRX100 digibox for a customer. He collected the box but, later in the day, phoned to say that he couldn't change channels in the back room with his Sky Digilink. My first thought was that he had got the RF leads crossed over, as only the RF2 socket has power for the Digilink. I tried to explain what to do over the phone, but he didn't seem to understand and insisted that I paid him a visit to sort out the problem. He mentioned that the problem wasn't present when he brought his digibox to the shop.

When I made the two-mile trip to his home I discovered that the RF1 and RF2 leads were in the correct positions and that the red LED on the remote Sky

Digilink was not alight. As I had assumed I was calling round only to swap over the RF leads, I had neither tools nor a multimeter with me.

I tried plugging the Digilink directly into the back of the digibox. The LED then lit up, and the digilink worked correctly. So, with no multimeter, I decided that the only thing I could do was to retighten the coaxial plugs at each end of the cable and hope for the best. Hey presto, the fault had been cured. In the eyes of the customer it was all down to me anyway!

The solution

While I was driving back to the shop it occurred to me that it would be helpful to have a handy little pocket-sized tester to carry around, one that could be used to check for power at a digibox's RF2 outlet and also at the end of the remote cable run. Loss of power at the RF2 socket is common with the Panasonic digibox Model TU-DSB30, caused by failure of a chip. So a plug in tester would also be useful on the bench.

Most digiboxes provide a 9V, 50-75mA supply at the RF2 outlet. A simple LED would be no good for testing, as LEDs will light up at down to 2V. In the end I decided to use a single transistor with a 7.5V zener diode in series with its base, see Fig. 1. This ensures that the LED will not light unless the voltage at the RF2 socket exceeds 8V. In addition any poor connections in the cable run will add resistance and reduce the voltage available at the end. The tester is a lot more convenient than fiddling around with a multimeter.

Use of such a large LED might seem to be a bit odd. It was chosen for its high current consumption of 20-25mA. This ensures that, when tested, the RF2 output is loaded. The large LED also serves well as a means of demonstrating to a customer how to turn on/off the RF2 voltage in the installation menu. I always show this to customers who buy a Sky Digilink from me – it saves call-backs later.

Construction

Construction and layout of the unit are in no way critical. Almost any 100mA npn transistor can be used. I used a BC142 simply because I had a drawer full of them. The small piece of Veroboard also serves to hold the LED on to the box.

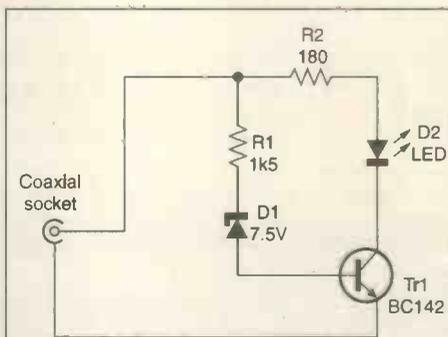


Fig. 1: The digibox RF2 power tester circuit. The LED is a 20mm type from Farnell, order code 637-002. The unit was housed in a case from Farnell, order code 645-680.



Internal view of the digibox RF2 checker

Introduction to computer networking

In Part 2 of his current series Fawzi Ibrahim* describes practical implementation of the Open-System Interconnection protocols

Implementation of the 7-layer Open-System Interconnection model described last month need not involve the full number of layers. Adjacent layers can be merged into a single layer, thus reducing the total number. Communication between layers is carried out in accordance with a set of rules, which are embodied in what is known as a protocol. Each layer has at least one and often more than one protocol. Protocols can be designed for a single layer or two adjacent layers, and the set of protocols for all the layers in a communication system is known as a stack or suite.

There are two main protocol stacks, the TCP/IP stack

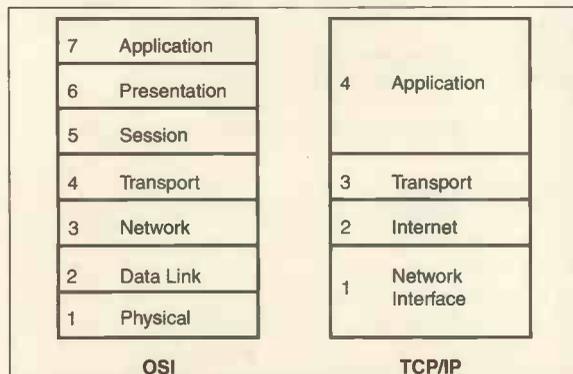


Fig. 1: Comparison of OSI and TCP/IP layers.

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

used for the internet and the IPX/SPX stack used by Novell's Netware. NetBEUI (NetBIOS Extended User Interface) is another stack. It was designed by Microsoft for use with Microsoft operating systems only and is very fast, incorporating the seven OSI layers into a single layer. It's a non-routeable protocol and is thus suitable for small local networks that have three or four Windows workstations.

IPX/SPX (Internal Package Exchange/Sequenced Packet Exchange) is a Novell protocol designed for Novell's operating systems but can also be used with Windows 95, 98, NT and 2000. Although not as fast as NetBEUI, it's a routeable protocol and is thus suitable for large networks.

TCP/IP (Transmission Control Protocol/Internet Protocol) is the one protocol that can be used with all types of computers and operating systems. It's slower than IPX/SPX but, like IPX/SPX, it is routeable. This makes it suitable for a network that incorporates a large number of different computers, such as the World Wide Web.

The TCP/IP stack

The TCP/IP stack has four layers – see Fig. 1 for a comparison with the basic OSI model. These four are the Application layer, which combines the three top layers of the OSI model; the Transport (sometimes known as Host-to-Host) layer; the Internet layer which corresponds with the OSI Network layer; and the Network Interface (sometimes known as Network Access) layer that combines the OSI Data Link and Physical layers.

It can interact with standards defined by other authorities for the corresponding OSI layers 1 and 2. The stack

does not distinguish between layers 5, 6 and 7 of the OSI model: the functions of all three layers are built into the Application/Process layer. Where it comes into its own is in the Transport and Internet layers. Two Transport layer protocols are available, TCP for reliable connection-oriented communication and UDP (User Datagram Protocol) for connectionless communication. Logical addressing is provided at the Internet layer, with the Internet Protocol (IP).

IP addressing techniques

With the TCP/IP stack each host or node on the internet is given a unique 32-bit IP address. The 32 bits are divided into four bytes, normally referred to as octets, which are separated by a dot. Each 8-bit byte may be presented in binary, denary or hexadecimal form. The most common is the dotted denary format, for example 159.28.45.22 (10011111.00011100.00101101.00010110 in binary form).

An IP address has two parts, one that identifies the network, known as the netid (network identifier), and one that identifies the host, known as the hostid (host identifier). The part that gives the netid depends on the class of IP address. There are three main primary IP-address classes, A, B and C. The primary class to which an address belongs can be identified from the first three most significant bits (MSB) of the address. Class A binary IP addresses start with 0, class B start with 10 and class C with 110. Once the IP-address classification has been established, the netid can be ascertained as follows:

Class A: 0xxxxxxx.xxxxxxxx.xxxxxxxx.xxxxxxxx – the first octet is the netid, the second, third and fourth octets forming the hostid.

Class B: 10xxxxxx.xxxxxxxx.xxxxxxxx.xxxxxxxx – the first two octets form the netid while the third and fourth form the hostid.

Class C: 110xxxxx.xxxxxxxx.xxxxxxxx.xxxxxxxx – the first three octets form the netid with the fourth octet as the hostid.

As it is the first octet (byte) of an address that determines its class, the classification can be ascertained by looking at the denary format instead of the more complex binary one, as follows:

Class A: Any address with the first octet in the range 0-127.

Class B: Any address with the first octet in the range 128-191.

Class C: Any address with the first octet in the range 192-223.

While the IP address of the host comprises both parts of the address, the network address is the netid with zeros used for the hostid part. For example the class B address 175.22.234.123 has a netid of 175.22, a hostid of 234.123 and a network address of 175.22.0.0.

All network addresses are available for use, but some are reserved. These include network addresses 0.0.0.0 and 127.0.0.0 – the latter is used for testing purposes. Other network addresses are reserved for private use. They include 10.0.0.0, 169.245.0.0 and 192.168.0.0.

Networks and hosts

The number of networks and hosts available with each class of IP address can be worked out from the number of bits allocated to the netid and hostid respectively. For class A 8 bits are allocated to the netid, giving a total number of networks of $2^8 = 256$. Similarly with 24 bits allocated to the hostid the total number of hosts for each network is $2^{24} = 16,777,261$. For the different classes this works out as follows:

Class	Networks	Hosts
A	256	16,777,261
B	65,536	65,536
C	16,777,261	256

Subnetting

To avoid excessive routing activities and thus increased traffic, when an organisation asks an internet service provider (ISP) for a number of IP addresses it will be allocated a network address that supports a number of host IP addresses. If the only network addresses on offer were primary class A, B or C a large number of IP addresses would be wasted. An organisation that needed fewer than 256 host addresses, say 100, would be given a class C address, wasting 156 host IP addresses. If it needed more than 256 host addresses, say 300, it would have to be allocated a class B network address, with 65,536 host IP addresses, wasting over 65,000 addresses.

In order to make more efficient use of IP addresses, networks A, B and C are subdivided into smaller networks called subnets. For example a class A network with an 8-bit netid may be subdivided into two subnets by increasing the length of the netid to 9, thus doubling the number of network addresses from $2^8 = 256$ to $2^9 = 512$. But by doing this the number of bits allocated to the hostid decreases from 24 to 23, reducing the number of host addresses for each subnet from $2^{24} = 16,777,261$ to 8,388,608. By borrowing 2 bits from the hostid, the netid would increase to 10 bits, quadrupling the number of subnets available to 1,024 while reducing the number of host addresses to 4,194,304 – and so on. A subnet mask (SM) is used to identify the number of IP-address bits that are allocated to netids.

A subnet mask is a 32-bit address that shadows the IP address bit by bit. Where the IP address bit is part of the netid, the corresponding SM bit is set at 1; otherwise, where the IP address bit is part of the hostid, it is set at 0. For example a class A IP address with an 8-bit netid would have a submask of

11111111.00000000.00000000.00000000 in binary

or 255.0.0.0 in denary.

Similarly, for classes B and C, the default (i.e. without subnetting) subnet masks are 255.255.0.0 and 255.255.255.0 respectively.

An alternative way of specifying the netid bits is to insert the number after a /. A class A IP address will thus have /8 bits, e.g. 100.23.45.67/8, a class B IP address will have /16 bits, e.g. 186.234.45.122/16 and a class C IP address /24 bits, e.g. 200.123.46.98/24. The dotted notation is normally required when configuring TCP/IP protocols.

If subnetting is carried out with the netid borrowing one bit from the hostid, the subnet mask would be

11111111.10000000.00000000.00000000 in binary
or 255.128.0.0 in denary.

If two bits are borrowed, the subnet mask becomes

11111111.11000000.00000000.00000000 in binary
or 255.192.0 in denary.

Similarly with a class B network with subnetting applied by borrowing say two hostid bits the SM mask will be

11111111.11111111.11000000.00000000

in binary or 255.255.192.0 in denary.

And with a class C network that subnets by borrowing three hostid bits the SM mask will be

11111111.11111111.11111111.11100000

in binary or 255.255.255.224 in denary.

As can be seen, each SM octet can have only one of eight different values:

10000000 = 128
11000000 = 192
11100000 = 224
11110000 = 240
11111000 = 248
11111100 = 252
11111110 = 254 and
11111111 = 255.

Let's consider some examples. Find the netid and network address of each of the following IP addresses:

- (a) 83.33.222.17/12
- (b) 140.39.46.68/22 and
- (c) 220.122.109.89/26.

(a) The SM in binary form is

11111111.11110000.00000000.00000000

which in denary form is 255.240.0.0.

To work out the netid, first convert the IP address from denary to binary form. 83.33.222.17 is

01010011.00100001.11011110.00010001 in binary form.

Take the first 12 bits for the netid, i.e. 01010011.0010, and insert 0 for the hostid bits to give a network address of

01010011.00100000.00000000.00000000

which converts to 83.32.0.0 in dotted denary.

(b) The SM in binary form is

11111111.11111111.11111000.00000000

which in denary form is 255.255.248.0.

To work out the netid, first convert the IP address from denary to binary form. 140.39.46.68 is

10001100.00100111.00101110.01000100 in binary form.

Take the first 22 bits for the netid, i.e. 10001100.00100111.001011, and insert 0 for the hostid bits to give a network address of 10001100.00100111.00101100.00000000

which converts to 140.39.44.0.

(c) The SM in binary form is

11111111.11111111.11111111.11000000

which in denary form is 255.255.255.192.

To work out the netid, first convert the IP address from denary to binary form. 220.122.109.89 is

11011100.01111010.01101101.01011001

Take the first 26 bits for the netid, i.e.

11011100.01111010.01101101.01 and insert 0 for the hostid bits to give a network address of 11011100.01111010.01101101.01000000

which converts to 220.122.109.64.

First and last IP addresses

A network or subnet provides a range of IP addresses. For example class C network 195.123.45.0/24 has the following range:

First address 195.123.45.0
Last address 195.123.45.255
Total number of addresses is $2^8 = 256$

But two of these addresses are not available for allocation to hosts: the first address is always used for the network itself, while the last address is used for broadcasting on the network. This leaves $256 - 2 = 254$ addresses available for allocation, the first being 195.123.45.1 and the last 195.123.45.254.

In general, the number of available IP addresses is $2^n - 2$, where n is the number of hostid bits.

Practical application of subnetting

Say you are the administrator of a company's network. It consists of 100 computers and the ISP address is 192.168.16.0/24. Your network requires 10 subnets with at least 10 hosts per subnet. Which subnet mask should you use to achieve this?

If one bit is borrowed from the hostid, it will provide 2 subnets. Borrowing 2 bits will provide $2^2 = 4$ subnets. With 3 bits borrowed you will have $2^3 = 8$ subnets. To get a minimum of 10 subnets, you will have to borrow 4 bits from the hostid, giving $2^4 = 16$ subnets.

This leaves four bits for the hostid, which will support $2^4 = 16$ computers.

The number of bits for the netid is $8+8+8+4 = 28$, giving an SM of

11111111.11111111.11111111.11110000

or 255.255.255.240 in denary form.

Supernetting

The supernetting technique is the reverse of subnetting, in that the netid gives away one or more bits to the hostid, thus reducing the number of networks and increasing the number of hosts.

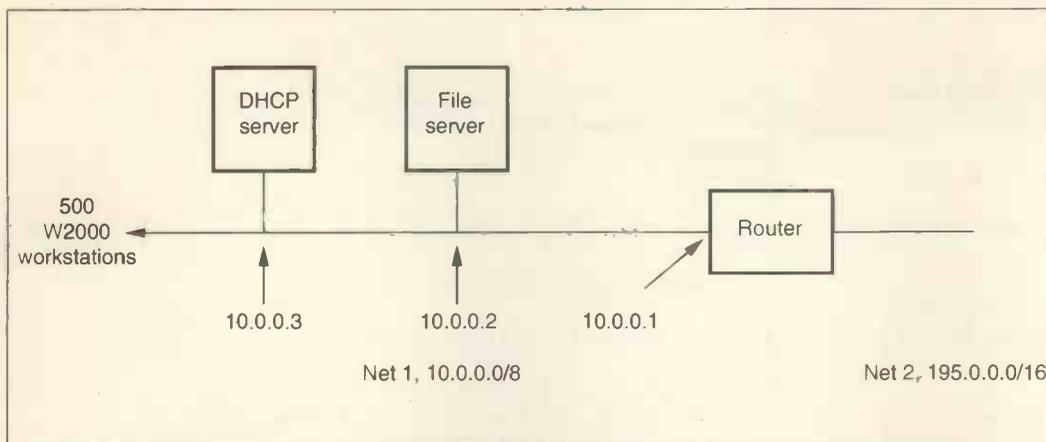


Fig. 2:
A network with DHCP server.

As an example, take a class C netid reduced to 23 bits instead of 24. In binary form the SM is

```
11111111.11111111.11111110.00000000
```

which in denary form is 255.255.254.0. The number of networks is halved to $2^{23} = 8,388,608$, and the number of hosts per network is doubled to $2^9 = 512$.

Practical application of supernetting

Corporation XX has a class C network, 195.193.78.0, subnet mask 255.255.255.224 (27-bit netid), using up to 30 workstations. It wants to expand the business, with up to 60 workstations. The ISP allocates another class C network, 195.193.78.32, SM 255.255.255.224 (27-bit netid).

The administrator is required to configure the network so that all workstations are on the same network, thus avoiding unnecessary routing. To achieve this, first convert both network addresses to binary form. The first network 195.193.78.0 =

```
11000011.11000001.01001110.00000000
```

The first 27 bits are the netid. The second network 195.193.78.32 =

```
11000011.11000001.01001110.00100000
```

with again the first 27 bits the netid.

Identify the netid bits of each network that are the same. They are the following 26 bits

```
11000011.11000001.01001110.00
```

which is the new netid for the supernet, giving a network address of

```
11000011.11000001.01001110.00000000
```

or 195.193.78.0, with an SM of

```
11111111.11111111.11111111.11000000
```

or 255.255.255.192.

Address Resolution Protocol (ARP)

As explained last month, the frame created by the physical layer has a header with the destination's physical or MAC address. This address is used for communication between hosts on the same network. Since the hosts are known by their IP addresses, some kind of conversion must take place.

This is carried out by the Address Resolution Protocol

(ARP). It consists of a look-up table of all IP addresses on the network and their corresponding MAC addresses. The table is built up by each workstation or host on the network broadcasting its MAC and IP addresses.

When a host receives such a broadcast it adds the information to a table kept in memory. All hosts do likewise. There are regular updates, which increase the network traffic.

When a host is rebooted, the ARP table will be built up from scratch. To see the contents of the ARP table, use the following command at the command-line prompt: ARP - a. Other commands include ARP - s to create a static entry and ARP - d to delete an entry.

If the destination of the frame is an IP address on a remote network, contact cannot be made as the ARP only contains a list of hosts on the local network. Communication with a remote network requires a router.

Static and dynamic allocation of IP addresses

IP addresses, together with the appropriate SM, can be statically allocated by manually entering the address in the TCP/IP properties table, or dynamically allocated from a specified pool or range of IP addresses. Dynamic allocation is carried out by a DHCP (Dynamic Host Configuration Protocol) server.

With DHCP allocation a host requests and is allocated an IP address, provided one is available from the pool, for a period of time known as the lease - typically eight days. The advantage of dynamic allocation is that the pool of addresses can be used more efficiently, as IP addresses that are not currently being used by particular hosts can be allocated to other ones. A static IP address cannot be allocated to another host even once, regardless of how often the host is active.

Fig. 2 shows a network with a DHCP server. Configuring the DHCP server involves creating a 'scope' with a first and last IP address from the range of available IP addresses. There is a facility for the exclusion of certain IP addresses within the specified range so that they can be used by devices that must have a static IP address. Such devices include the DHCP server, file servers and routers.

A DHCP server can be used for more than simply providing hosts with an IP address and an SM: it can be used to specify such things as routers (or gateways) and the IP addresses of other important network devices such as DNS (Domain Naming Service) servers.

If a workstation fails to get an IP address allocated to it for any reason, such as failure of a DHCP server, a default condition exists. With Windows 2000 professional workstations the default is an address on network, 169.254.0.0, SM 255.255.0.0. This continues until the workstation is able to make contact with the DHCP server for allocation of an IP address.

Next month

In the next instalment we will consider LANs and WANs.

The first Eastern Europe Broadband Conference and Exhibition was held at Kiev, Ukraine, late last year. It was staged at the new International Conference Centre, alongside an IT show, a white goods show and a custom car show.

One problem for foreign visitors was the language, a near relative of Russian that uses a modified Cyrillic alphabet. The organisers thoughtfully made the services of several translators available to Western exhibitors: they were mostly language students from the University, and were a great boon. Few visitors spoke English.

Coverage

The internet, CATV and satellite TV have taken off well in Eastern Europe, and there is a considerable thirst for knowledge on these subjects. Digital technology is still largely new to those in this area.

Some thirty exhibitors took part, including Pace Micro Technology plc, Fusion Digital Technology Ltd., Technetix plc, BBC World Service TV and the Society of Cable Telecommunication Engineers. SpinHalf from Kilmaree, Ireland had a stand and contributed to the papers.

The keynote speech was given by Dr Roger Blakeway, president of the SCTE. He mentioned the roller-coaster ride endured by many UK and Western European telecommunications companies in recent years, and hoped that the lessons learned would be heeded in the East. Simultaneous translation was used throughout the proceedings.

Pace showed its full range of terrestrial, cable and satellite TV set-top boxes and the Home Networking gateway. It was a spacious and well-appointed stand. The main items on the Technetix stand were hardware for coaxial and fibre-optic networks and a signal-level meter. Fusion, a new company in the set-top box market, showed a digital STB and was ready to discuss 'specials' to meet the specific requirements of cable operators. Philips Cryptoworks, the conditional-access systems arm of the Dutch company, was present. Tratec, a Dutch company that supplies equipment and know-how to the CATV industry, had a large and well-staffed stand.



EEBC 2003 Report

J. LeJeune reports on the first Eastern Europe Broadband Conference and Exhibition

But innovation was largely absent: this wasn't the place to baffle brains with the latest gear. While academic institutions are keen to learn about the latest technology, the cable TV operators are only part-way up the learning curve. They need to be brought up-to-date to be able to generate better revenues from their networks. They should do well in the Eastern European cities however, where enormous apartment blocks that couldn't possibly support a mass of aerials are common. At present transmissions are mainly PAL and Secam. Korean manufacturers dominate the domestic TV market, closely followed by the Japanese.

In conclusion

The city of Kiev is ancient and interesting. People describe it as a city built within a park. Unfortunately the remnants of

Soviet concrete architecture remain, coated in drab grey paint that's peeling off. Nevertheless there is much that is beautiful to see. One hopes that EEBC 2004 will be a great success.



The main items on the Technetix stand were hardware for coaxial and fibre-optic networks and a signal-level meter.



Service Casebook

Michael Maurice

There is nothing more frustrating than the intermittent fault that shows up only once in a while and whose cause is difficult to detect.

The first three items in this Casebook illustrate such faults and the repair methods used.

JVC AV29SX1EK (JA chassis)

The fault with this set was intermittent loss of the picture, the sound and on-screen graphics remaining OK. I tried to solve the problem in the customer's house, and it didn't take long to find that there were dry-joints at the connectors on the AV selector PCB. Dealing with these seemed to be the end of the matter, but when I reassembled the set the fault was still present.

I then found that flexing the main PCB slightly made the fault come and go. After resoldering loads of suspect dry-joints I decided to take the set back to the workshop, where I studied the circuit diagram carefully. Checks showed that video was present at the input to the jungle chip IC101 when the fault was present, so clearly something was blanking the video output. But what? Further checks in the fault mode, which was not easy to implement, revealed that pins 1-4 of the BU4066BC switching chip IC802 were at 2V instead of 0V. In fact pin 7 (chassis) was also at 2V!

The cause was an invisible dry-joint at link 100, which connects the earthing of IC801/802 to the main ground. Resoldering this link cured the fault.

Sony KVM2131U (BE1 chassis)

Very intermittent loss of sync was the fault with this elderly set, which was nevertheless in good condition. I first resoldered all the common dry-joints in the IF module (this is often the cause of such faults), then attended to dry-joints at the field output and sync/deflection generator ICs. The regulator circuit connections on the text board also looked suspect, so these were resoldered. On test the set then worked well, but after a couple of hours the fault returned.

The cause of the trouble was on the text module, where the output from the 12V regulator transistor Q802 was low at about 8V. I decided that the best course of action would be to replace this surface-mounted transistor, and found that a 2SD1207 works well here. There was no further trouble after this.

Goodmans WS288NS (F16 chassis)

The initial fault was a dead set. The line output transistor had been short-circuit because of dry-joints in the associated

circuitry. A replacement transistor and some resoldering weren't the end of the story however. When I switched the set on there was sound but no picture with off-air reception, though text and scart operation were OK.

As all the video processing is carried out in the TDA8361A jungle chip it seemed sensible to fit a replacement. This failed to cure the fault, which appeared to be thermal because the picture became grainy at the top and top left-hand side as the set warmed up. I took the set back to the workshop, but scope checks there were inconclusive while flexing the board made the fault come and go.

I decided to cover the board with flux and resolder every joint within three inches of the jungle chip. All was well after cleaning the board and reassembling the set. Don't ask me what had caused the fault: I've no idea as to which joint it was!

Panasonic TC2160 (U5 chassis)

The customer phoned and said that there was a very dark picture with too much colour. Or, to put it another way, there was no luminance. I was lucky in finding that Cricklewood Electronics had the TDA3562 decoder chip in stock, and confidently took one along on my visit to the customer. Fitting it cured the fault, much to our delight.

Bush 2874NTX

Sound was OK but there was no picture. Checks showed that the first anode and focus voltages were missing. Unusually, the cause of the fault was within the line output transformer – a replacement provided a complete cure.

Panasonic RX-FT510

There were tapes stuck in this portable radio-cassette machine, which belonged to the proprietor of the local ballet school. I wondered whether it would be worth repair, as the cost would surely outweigh that of a new machine. Then I noticed an unofficial modification. Someone had fitted a switchable variable pitch (speed) control. These machines usually sell for between £40-£60, but because of the modification over £200 had been paid. A new set of belts cured the trouble, and I advised the owner to have another similar machine serviced as well.

I copied out the circuit of this modification, which consisted of a switch, a potentiometer, a preset potentiometer and a few fixed resistors.

The modification to the second machine was even simpler. It consisted of a preset potentiometer and a potentiometer with a centre click position. Someone is making a hefty profit here. Perhaps there's a new line of work for me!

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1452T	PSU	ONWAKIT	F16	PSU	GOODKIT1	CT25A4STX	TDA 8178S	MITSKIT1	CI5944	FRAME	SAMKIT2
1427T	PSU	ONWAKIT	F16	VIDEO	GOODKIT1	CT25A6STX	TDA 8178S	MITSKIT1	CI6844	FRAME	SAMKIT2
1402	PSU	ONWAKIT	GRUNDIG			CT25AV1B	PSU	MITSKIT3	VIK310	PSU	SAMUNGKIT
1455T	PSU	ONWAKIT	CUC 2050	PSU	MODKIT48	CT25AV1BS	PSU	MITSKIT3	VIK320	PSU	SAMUNGKIT
1456T	PSU	ONWAKIT	CUC 2051	PSU	MODKIT48	CT25AV1BD	PSU	MITSKIT3	VIK350	PSU	SAMUNGKIT
1458T	PSU	ONWAKIT	CUC 2058	PSU	MODKIT48	CT25AV1BDS	PSU	MITSKIT3	VI375	PSU	SAMUNGKIT
1459T	PSU	ONWAKIT	CUC 2059	PSU	MODKIT48	CT28AV1B	PSU	MITSKIT3	VI395	PSU	SAMUNGKIT
1499Y	STANDBY	MODKIT37	CUC 2080	PSU	MODKIT48	CT28AX1BD	PSU	MITSKIT3	WINNER 1	PSU	SAMUNGKIT
14SLTX	STANDBY	MODKIT37	CUC 7350	GRUNDIGKIT1		CT28AV1BDS	PSU	MITSKIT3			
1799Y	STANDBY	MODKIT37	CUC 7301/3	(BUZ90)	PSU	GRUNDIGKIT2	CT29A51	TDA 8178S	MITSKIT2		
2002	PSU	ONWAKIT	CUC 7301/3	(M.J.F18004)	PSU	GRUNDIGKIT3	CT29A4	TDA 8178S	MITSKIT2	SHARP	
2009B	PSU	ONWAKIT	HINARI			HIT14RC	PSU	ONWAKIT	51CS03H	PSU	SHARPKIT1
2052T	PSU	ONWAKIT	JVC						51CS05H	PSU	SHARPKIT1
2152T	PSU	ONWAKIT	AV29SX1EK	FIELD O/P	JVCKIT1				56FW53H	PSU & DOLBY	MODKIT45
2099TX	STANDBY	MODKIT37	AV29SX1EN	FIELD O/P	JVCKIT1				59CS03H	PSU	SHARPKIT2
BTV17	STANDBY	MODKIT37	AV29SX1EN1	FIELD O/P	JVCKIT1				59CS05H	PSU	SHARPKIT2
CTV501	PSU	ONWAKIT	AV29SX1PF	FIELD O/P	JVCKIT1				59CSD8H	PSU	SHARPKIT2
CTV701	PSU	ONWAKIT	AV29TSIE1	FIELD O/P	JVCKIT1				59DS03H	PSU	SHARPKIT3
CTV840	PSU	ONWAKIT	C14E1EK	PSU	ONWAKIT				59FW53H	PSU & EW	MODKIT49
CTV841	PSU	ONWAKIT	C14T1EK	PSU	ONWAKIT				66CS03H	PSU	SHARPKIT2
CTV485	PSU	ONWAKIT	C21ET1EK	PSU	ONWAKIT				66CS05H	PSU	SHARPKIT2
AKAI			CS21M3EK	PSU	ONWAKIT				66CS08H	PSU	SHARPKIT2
CT1417	PSU	ONWAKIT	MATSUI			1455	PSU	ONWAKIT	66FW53H	PSU & DOLBY	MODKIT45
CT2159U	PSU	ONWAKIT	1496R/T (H3N90)	PSU	MODKIT43	1496R/T (BUZ90)	PSU	MODKIT44	66FW53H	PSU & EW	MODKIT49
CT2162UNT	PSU	ONWAKIT	1498	PSU	ONWAKIT	2086	PSU	ONWAKIT	66FW54H	PSU & DOLBY	MODKIT45
CT2863UNT	PSU	ONWAKIT	2086	PSU	ONWAKIT	2096R/T (H3N90)	PSU	MODKIT43	66FW54H	PSU & EW	MODKIT49
DECCATATUNG			2096R/T (BUZ90)	PSU	MODKIT44	2098	PSU	ONWAKIT	76FW53H	PSU & DOLBY	MODKIT45
F SERIES	PSU	MODKIT30	2098	PSU	ONWAKIT	21V1N (BUZ90)	PSU	GRUNDIGKIT2	76FW53H	PSU & EW	MODKIT49
TVC563	STANDBY	MODKIT37	21V1T (M.J.F18004)	PSU	GRUNDIGKIT3	21V1T (M.J.F18004)	PSU	GRUNDIGKIT3	76FW54H	PSU & DOLBY	MODKIT45
GOLDSTAR			TVR180R/208	STANDBY	MODKIT37	TVR185T	STANDBY	MODKIT39	76FW54H	PSU & EW	MODKIT49
CF25A50F	FRAME	MODKIT36	MITSUBISHI						DA-100 CHASSIS	PSU & EW	MODKIT49
CF25C22C	FRAME	MODKIT35	AV1 SERIES	PSU	MITSKIT3				SONY		
CF28A50F	FRAME	MODKIT36	CT1M5B	PSU	MITSKIT3				SLV715HB	VCR - PSU	MODKIT40
CF28C22F	FRAME	MODKIT35	CT21M5BT	PSU	MITSKIT3				SLV777UB	VCR - PSU	MODKIT40
CF28C28F	FRAME	MODKIT36	CT25M5BT	PSU	MITSKIT3				THOMSON		
CF29C42F	FRAME	MODKIT35	CT21A2STX	TDA 8178S	MITSKIT1				35029400	PSU	THOMKIT2
GOODMANS			CT21AX1B	PSU	MITSKIT3				35065920	PSU	THORNKIT1
147TT	PSU	ONWAKIT	CT21A3STX	TDA 8178S	MITSKIT1				FV70	PSU	THORNKIT1
149T	PSU	ONWAKIT	CT21AV1BS	PSU	MITSKIT3				ICC7 CHASSIS	TDA 8178FS	THOMKIT1
1430RA	PSU	ONWAKIT	CT25A2STX	TDA 8178S	MITSKIT1				ICC8 CHASSIS	TDA 8178FS	THOMKIT1
1430RS	PSU	ONWAKIT	CT25A3STX	TDA 8178S	MITSKIT1				ICC8 CHASSIS	FRAME	THOMKIT3
1430RW	PSU	ONWAKIT							ICC9 CHASSIS	EAST/WEST	THOMKIT4
1450T	PSU	ONWAKIT							ICC17 CHASSIS	PSU	MODKIT41
1455TS	PSU	ONWAKIT							ISS20 (TV-DVD)	PSU	MODKIT46
2019R	PSU	ONWAKIT							R3000	PSU	THOMKIT2
2029T	PSU	ONWAKIT							R4000	PSU	THOMKIT2
2029TA	PSU	ONWAKIT							TX92R CHASSIS	EAST/WEST	THOMKIT4
COMPACT 11	PSU	MODKIT47									
F16 CHASSIS	FRAME	GOODKIT1									
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33uF ...CAP122...£0.35.....10				
47uF ...CAP123...£0.35.....10				
100uF ...CAP124...£0.60.....10				
150uF ...CAP168...£0.65.....5				
220uF ...CAP125...£0.80.....10				
330uF ...CAP30...£1.75.....10				
470uF ...CAP31...£1.75.....10				
680uF ...CAP32...£2.10.....5				
1000uF ...CAP33...£2.10.....10				
1200uF ...CAP169...£1.50.....5				
1500uF ...CAP170...£1.50.....5				
2200uF ...CAP34...£5.25.....10				
3300uF ...CAP35...£5.00.....5				
4700uF ...CAP36...£6.10.....10				
6800uF ...CAP171...£4.50.....5				
25 Volts				
10uF ...CAP37...£0.45.....10				
15uF ...CAP172...£0.45.....10				
22uF ...CAP38...£0.45.....10				
33uF ...CAP126...£0.40.....10				
47uF ...CAP39...£0.48.....5				
68uF ...CAP127...£0.55.....10				
100uF ...CAP40...£0.70.....10				
120uF ...CAP128...£0.85.....10				
150uF ...CAP41...£0.95.....5				
220uF ...CAP42...£1.20.....10				
330uF ...CAP43...£1.40.....5				
470uF ...CAP44...£1.90.....10				
680uF ...CAP45...£3.15.....5				
25 Volts...continued				
1000uF ...CAP46...£3.65.....10				
1500uF ...CAP47...£3.90.....5				
2200uF ...CAP48...£2.00.....2				
3300uF ...CAP49...£2.20.....2				
4700uF ...CAP50...£3.65.....2				
6800uF ...CAP51...£3.90.....2				
35 Volts				
1uF ...CAP130...£0.40.....10				
3.3uF ...CAP131...£0.40.....10				
4.7uF ...CAP132...£0.45.....10				
10uF ...CAP52...£0.50.....10				
22uF ...CAP53...£0.45.....10				
33uF ...CAP54...£0.50.....5				
47uF ...CAP55...£0.85.....10				
68uF ...CAP133...£0.55.....10				
100uF ...CAP56...£0.85.....10				
150uF ...CAP57...£0.95.....5				
220uF ...CAP58...£1.45.....5				
330uF ...CAP134...£1.60.....10				
470uF ...CAP135...£1.75.....10				
680uF ...CAP59...£6.50.....10				
1000uF ...CAP60...£4.35.....10				
1500uF ...CAP173...£4.00.....5				
2200uF ...CAP61...£2.45.....2				
3300uF ...CAP62...£10.00.....5				
4700uF ...CAP136...£3.50.....2				
40 Volts				
2200uF ...CAP174...£1.80.....2				
2200uF ...CAP175...£2.00.....1				
50 Volts				
0.47uF ...CAP176...£0.35.....10				
1uF ...CAP137...£0.35.....10				
2.2uF ...CAP138...£0.35.....10				
3.3uF ...CAP139...£0.35.....10				
4.7uF ...CAP140...£0.35.....10				
6.8uF ...CAP177...£0.45.....10				
10uF ...CAP63...£0.50.....10				
22uF ...CAP64...£0.70.....10				
33uF ...CAP141...£0.85.....10				
47uF ...CAP65...£0.85.....10				
68uF ...CAP142...£0.90.....10				
50 Volts...continued				
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				
0.33uF ...CAP178...£0.35.....10				
0.47uF ...CAP73...£0.35.....10				
1uF ...CAP74...£0.35.....10				
1.5uF ...CAP179...£0.35.....10				
2.2uF ...CAP75...£0.35.....10				
3.3uF ...CAP76...£0.50.....10				
4.7uF ...CAP77...£0.35.....10				
6.8uF ...CAP180...£0.50.....10				
10uF ...CAP78...£0.50.....10				
15uF ...CAP79...£0.95.....5				
22uF ...CAP80...£0.75.....10				
33uF ...CAP81...£0.85.....10				
47uF ...CAP82...£0.95.....10				
56uF ...CAP181...£1.10.....10				
68uF ...CAP83...£1.30.....5				
100uF ...CAP84...£1.20.....10				
150uF ...CAP85...£2.80.....5				
220uF ...CAP86...£2.80.....10				
330uF ...CAP87...£4.00.....10				
470uF ...CAP88...£5.25.....10				
680uF ...CAP89...£5.00.....10				
1000uF ...CAP90...£5.40.....5				
2200uF ...CAP182...£2.20.....1				
4700uF ...CAP183...£4.00.....1				
100 Volts				
0.1uF ...CAP184...£0.80.....10				
0.22uF ...CAP185...£0.80.....10				
0.33uF ...CAP186...£0.80.....10				
0.47uF ...CAP91...£0.50.....5				
1uF ...CAP92...£0.85.....10				
1.5uF ...CAP93...£0.70.....5				
100 Volts...continued				
2.2uF ...CAP94...£0.50.....5				
3.3uF ...CAP95...£0.50.....5				
4.7uF ...CAP96...£0.50.....5				
6.8uF ...CAP187...£0.80.....10				
10uF ...CAP97...£0.95.....10				
22uF ...CAP98...£1.05.....10				
33uF ...CAP99...£1.55.....5				
47uF ...CAP100...£1.75.....10				
68uF ...CAP188...£1.30.....5				
100uF ...CAP101...£2.10.....10				
220uF ...CAP102...£6.00.....5				
330uF ...CAP189...£3.00.....2				
470uF ...CAP103...£6.00.....5				
680uF ...CAP190...£3.00.....2				
1000uF ...CAP191...£3.00.....1				
150 Volts				
0.47uF ...CAP192...£0.45.....10				
1uF ...CAP193...£0.45.....10				
2.2uF ...CAP146...£0.45.....10				
3.3uF ...CAP194...£1.00.....10				
4.7uF ...CAP195...£1.00.....10				
10uF ...CAP147...£1.40.....10				
22uF ...CAP148...£1.80.....10				
33uF ...CAP149...£2.30.....10				
47uF ...CAP196...£2.20.....5				
100uF ...CAP150...£3.25.....5				
220uF ...CAP197...£3.00.....2				
470uF ...CAP198...£3.25.....1				
200 Volts				
22uF ...CAP199...£1.60.....5				
100uF ...CAP151...£3.25.....5				
220uF ...CAP200...£2.50.....1				
330uF ...CAP201...£2.50.....1				
250 Volts				
0.47uF ...CAP202...£0.60.....10				
1uF ...CAP152...£0.60.....10				
2.2uF ...CAP203...£1.30.....10				
3.3uF ...CAP104...£1.75.....10				
4.7uF ...CAP204...£2.00.....10				
10uF ...CAP105...£2.60.....10				
22uF ...CAP153...£2.30.....10				
250 Volts...continued				
33uF ...CAP206...£1.75.....5				
47uF ...CAP106...£4.35.....10				
100uF ...CAP154...£4.50.....5				
220uF ...CAP155...£2.00.....2				
330uF ...CAP206...£2.50.....1				
350 Volts				
1uF ...CAP156...£0.70.....10				
2.2uF ...CAP207...£1.20.....10				
3.3uF ...CAP157...£1.50.....10				
4.7uF ...CAP208...£1.10.....5				
10uF ...CAP158...£2.25.....10				
22uF ...CAP159...£3.40.....10				
33uF ...CAP209...£2.60.....5				
47uF ...CAP210...£1.50.....2				
100uF ...CAP211...£3.00.....2				
330uF ...CAP212...£5.00.....1				
400 Volts				
0.47uF ...CAP213...£0.60.....10				
1uF ...CAP107...£2.15.....5				
2.2uF ...CAP108...£2.25.....5				
3.3uF ...CAP214...£2.25.....5				
4.7uF ...CAP109...£3.15.....5				
10uF ...CAP110...£4.00.....5				
22uF ...CAP111...£2.50.....2				
33uF ...CAP215...£2.50.....2				
47uF ...CAP112...£3.50.....2				
68uF ...CAP216...£3.50.....2				
100uF ...CAP210...£4.00.....2				
150uF ...CAP167...£3.20.....1				
220uF ...CAP161...£7.00.....2				
560uF ...CAP162...£4.00.....1				
450 Volts				
1uF ...CAP113...£2.80.....5				
2.2uF ...CAP114...£3.20.....5				
3.3uF ...CAP218...£3.20.....5				
4.7uF ...CAP115...£4.95.....5				
10uF ...CAP116...£5.50.....5				
22uF ...CAP117...£4.15.....2				
33uF ...CAP219...£3.00.....2				
47uF ...CAP220...£2.00.....1				
100uF ...CAP221...£3.00.....1				

Aerial & Satellite Installation Accessories

SLx Aerial Amplifiers

Now with built in Digital ByPass Operates with Sky™ DigiEye

Class leading noise figure of 4dB or less

6dB signal amplification on all models

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

SLx Satellite Finder

Allows the user to find the best azimuth / elevation settings for a satellite dish, resulting in the best signal reception / picture and sound quality

- Compact design
- Backlit meter scale
- Audible signal strength reading
- Adjustable level control
- Adjustable sensitivity adjustment
- Frequency Range : 950 - 2250MHz



Order Code : 27860R Price : £ 10.00 + vat

Grandata Ltd

distributor of electronic components

Transistors / Linear IC's

Part No.	Price	Part No.	Price	Part No.	Price	Part No.	Price	Part No.	Price	Part No.	Price	Part No.	Price	Part No.	Price		
BU208A	£0.75	IRF5450	£5.00	MJE350	£0.80	STK4191	£9.00	STK5464	£3.00	STR371	£4.00	TDA2450-3	£10.00	TDA4665	£2.50	TDA8138	£2.00
BU2506DF	£0.90	IRF5740	£3.00	MJF	£0.00	STK4191 X	£14.00	STK5466	£5.00	STR380	£3.50	TDA2460-2	£0.70	TDA4670	£4.75	TDA8138A	£1.30
BU2506DX	£1.00	IRF5840	£3.00	MJF16206	£4.50	STK419-130	£15.00	STK5467	£4.00	STR381	£3.90	TDA2501	£3.00	TDA4671	£5.00	TDA8138B	£2.00
BU2508A	£1.10	IRF610	£0.80	MJF18004	£1.75	STK419-140	£16.00	STK5468	£3.00	STR383	£4.10	TDA2506T	£8.00	TDA4680	£3.50	TDA8139	£2.00
BU2508AF	£1.10	IRF611	£1.20	MJF18006	£2.00	STK4192	£7.00	STK5471	£9.00	STR384	£3.50	TDA2507	£4.50	TDA4681	£4.50	TDA8140	£2.00
BU2508AX	£1.30	IRF620	£1.00	MJF18008	£1.75	STK4197 II	£9.50	STK5472	£3.75	STR40090	£3.50	TDA2510	£4.50	TDA4685	£2.75	TDA8143	£1.60
BU2508B	£1.30	IRF630	£0.75	MJF18204	£2.50	STK4199 II	£10.50	STK5473	£4.80	STR40115	£6.00	TDA2514A	£5.00	TDA4686	£5.00	TDA8145	£1.20
BU2508DF	£1.20	IRF634	£1.25	STK0025	£4.20	STK4199 II	£10.50	STK5474	£5.00	STR4090A	£6.50	TDA2515	£4.50	TDA4687	£5.00	TDA8146	£2.00
BU2508DX	£1.50	IRF640	£1.50	STK0039	£5.00	STK420	£4.00	STK5476	£3.50	STR41090	£3.30	TDA2520-1	£9.00	TDA4700A	£7.50	TDA8153	£10.00
BU2520AF	£1.70	IRF640F	£2.00	STK088	£10.00	STK4204 II	£10.50	STK5477	£4.50	STR4142	£4.50	TDA2521	£8.00	TDA4710H	£7.00	TDA8170	£1.70
BU2520AX	£1.40	IRF630S	£2.00	STK1039	£4.60	STK4204II	£10.50	STK5478	£2.50	STR4211	£3.15	TDA2522	£12.00	TDA4714C	£3.50	TDA8171	£2.30
BU2520DF	£2.25	IRF642	£2.00	STK1040	£6.40	STK4211 II	£10.00	STK5479	£3.00	STR43111	£9.50	TDA2523	£8.50	TDA4716C	£4.50	TDA8172	£2.00
BU2520DX	£2.00	IRF644	£2.00	STK1049	£7.00	STK4211 V	£8.00	STK5481	£4.70	STR440	£8.00	TDA2525	£4.50	TDA4720	£6.60	TDA8173	£1.75
BU2522AX	£1.50	IRF650	£2.00	STK1050	£6.50	STK4221 II	£12.00	STK5482	£2.85	STR441	£9.50	TDA2530	£3.00	TDA4725	£7.50	TDA8174	£2.00
BU2525A	£3.25	IRF710	£1.50	STK1060	£7.00	STK4231 II	£10.50	STK5483	£4.40	STR44115	£4.75	TDA2548	£2.00	TDA4780	£6.00	TDA8175	£7.00
BU2525AF	£2.20	IRF720	£0.85	STK2025	£6.20	STK4241 V	£14.00	STK5486	£4.50	STR442	£16.00	TDA2549	£3.00	TDA4800	£3.00	TDA8177	£3.00
BU2525AX	£1.90	IRF730	£1.25	STK2028	£5.00	STK4241 V	£10.50	STK5487	£5.25	STR450A	£7.00	TDA2558	£4.00	TDA4810	£5.00	TDA8177F	£3.50
BU2525D	£2.40	IRF740	£0.90	STK2029	£6.00	STK4241 V	£12.50	STK5488	£4.80	STR451	£8.00	TDA2560Q	£7.00	TDA4850	£4.75	TDA8179S	£7.50
BU2525DF	£1.75	IRF740F	£3.00	STK2030	£10.00	STK4272	£5.00	STK5490	£4.50	STR45111	£5.50	TDA2560-3	£14.00	TDA4851	£3.25	TDA8180	£12.50
BU2527AF	£4.00	IRF820	£0.90	STK2038	£7.00	STK4273	£5.50	STK561	£4.00	STR4512	£4.00	TDA2574V	£3.50	TDA4852	£3.25	TDA8205	£12.50
BU2527AX	£2.50	IRF830	£0.85	STK2048	£9.50	STK4274	£5.00	STK563	£4.15	STR452	£4.75	TDA2576A	£9.00	TDA4854	£5.00	TDA8212	£3.50
BU2527DF	£2.00	IRF830F	£1.60	STK2058 IV	£16.00	STK4274	£5.00	STK5632	£3.00	STR453	£5.00	TDA2577A	£2.00	TDA4855	£6.00	TDA8214B	£10.50
BU2527DX	£2.00	IRF840	£0.85	STK2101	£10.50	STK430	£5.00	STK5720	£4.00	STR454	£13.00	TDA2578A	£7.00	TDA4856	£5.00	TDA8215H	£3.00
BU2532AL	£3.25	IRF840F	£1.75	STK2110	£5.50	STK4301	£5.00	STK5725	£3.50	STR455	£5.50	TDA2579A	£2.10	TDA4858	£3.50	TDA8217	£2.25
BU2708AF	£2.00	IRF9140	£10.00	STK2139	£6.75	STK4311	£6.50	STK5730	£3.00	STR456	£4.70	TDA2579B	£3.25	TDA4860	£2.00	TDA8303	£2.50
BU2708AX	£2.00	IRF920	£4.00	STK2155	£9.00	STK433	£4.00	STK583	£4.00	STR457	£6.00	TDA2652	£48.00	TDA4861	£3.50	TDA8304	£4.00
BU2708DF	£2.00	IRF9510	£1.50	STK2230	£4.70	STK4332	£3.65	STK6316	£3.00	STR470	£3.00	TDA2653A	£4.50	TDA4866	£2.75	TDA8305	£5.00
BU2708DX	£2.00	IRF9511	£1.50	STK3102 II	£5.30	STK4335	£3.75	STK6324B	£5.00	STR50020	£3.50	TDA2710-1	£4.50	TDA4880	£4.50	TDA8305A	£5.00
BU2720AX	£2.00	IRF9520	£1.50	STK3106	£25.00	STK4352	£5.00	STK6327	£12.00	STR50092	£5.50	TDA2820M	£1.00	TDA4918A	£17.00	TDA8310	£6.00
BU2720DF	£2.00	IRF9530	£1.25	STK3122 III	£7.25	STK436	£4.30	STK6328A	£4.00	STR50103A	£2.60	TDA2822M	£0.60	TDA4930	£5.00	TDA8350Q	£2.75
BU2720DX	£2.00	IRF9531	£2.00	STK3152 II	£9.00	STK4362	£4.50	STK6431	£6.00	STR50112A	£6.50	TDA3190	£2.00	TDA4935	£3.00	TDA8351	£2.00
BU2722AF	£3.30	IRF9540	£1.75	STK3156	£5.00	STK437	£6.00	STK6607	£4.00	STR50113	£5.00	TDA3301B	£16.00	TDA4940	£2.00	TDA8354Q	£2.75
BU2725AF	£2.00	IRF9541	£2.00	STK350-030	£7.00	STK4372	£4.90	STK6712BIV	£5.50	STR50115	£5.00	TDA3303	£7.00	TDA4941	£2.00	TDA8356	£2.00
BU2725DF	£2.00	IRF9610	£0.95	STK392-040	£12.00	STK439	£5.00	STK6722	£6.50	STR50213	£4.00	TDA3501	£7.00	TDA4942	£2.00	TDA8360N3	£8.00
BU2725DF	£2.00	IRF9620	£0.85	STK401-050	£8.00	STK4392	£5.00	STK6732	£10.00	STR50330	£4.75	TDA3502	£3.60	TDA4950	£1.00	TDA8361AN3	£8.00
BU2727AF	£2.00	IRF9622	£2.00	STK401-080	£9.00	STK441	£6.80	STK6822	£7.50	STR51041	£5.00	TDA3504	£3.60	TDA4951	£4.50	TDA8361AN3	£9.00
BU2727A	£2.00	IRF9630	£1.30	STK401-120	£10.00	STK4412	£4.50	STK6875	£6.50	STR51213	£5.00	TDA3507	£4.50	TDA5010	£3.00	TDA8362AN	£12.00
BU2727AF	£2.00	IRF9640	£2.30	STK401-140	£12.00	STK443	£7.00	STK6922	£10.00	STR51424	£7.00	TDA3521	£7.50	TDA5040	£6.00	TDA8362AN3	£7.50
BU506DF	£1.00	IRFBC20	£1.10	STK4017	£4.00	STK4432	£7.00	STK6932	£4.50	STR53041	£4.00	TDA3560	£6.00	TDA5500	£9.00	TDA8362BN3	£8.50
BU508AF	£0.60	IRFBC30	£1.20	STK4019	£4.80	STK4457	£4.70	STK6962	£2.75	STR54041	£3.20	TDA3561	£3.00	TDA5600	£4.50	TDA8362N3	£12.00
BU508APH	£0.60	IRFBC40	£2.10	STK402-040	£7.00	STK4459	£5.60	STK6972	£3.00	STR5412	£2.80	TDA3561A	£3.00	TDA5610-2	£7.50	TDA8362NA	£9.00
BU508AXI	£0.90	IRFBE30	£2.25	STK402-070	£7.00	STK460	£6.00	STK6981B	£5.00	STR54504	£4.50	TDA3562A	£2.60	TDA5620	£4.50	TDA8362N5	£12.00
BU508D	£0.75	IRFD120	£1.00	STK402-070	£7.00	STK461	£6.00	STK6982	£6.00	STR56041	£5.50	TDA3563	£3.00	TDA5620	£13.00	TDA8366N2	£15.00
BU508DF	£0.85	IRFD9120	£1.20	STK402-071	£7.00	STK463	£9.50	STK6982H	£6.00	STR5641	£2.50	TDA3563A	£4.50	TDA5830-2	£11.00	TDA8366N3	£11.50
BU508DR	£1.30	IRFD9220	£1.00	STK402-090	£8.00	STK465	£9.00	STK7216	£4.20	STR59041	£3.00	TDA3564	£3.25	TDA6100Q	£1.50	TDA8370	£1.50
BUH1015	£4.25	IRFF120	£3.00	STK4021	£3.80	STK4673	£8.20	STK7217	£2.50	STR60001	£5.25	TDA3565	£2.20	TDA6101Q	£1.20	TDA8372A	£16.50
BUH1215	£4.00	IRFIBC40	£1.00	STK402-100	£9.00	STK4793	£8.00	STK7225	£5.00	STR6008X	£5.75	TDA3566	£2.80	TDA6103Q	£2.25	TDA8374	£10.00
BUH515	£2.50	IRFIBC40G	£2.00	STK402-100	£9.00	STK4803	£10.00	STK7226	£17.00	STR6020	£2.70	TDA3566A	£2.80	TDA6106Q	£1.25	TDA8375A	£12.50
BUH515D	£2.50	IRFP054	£4.00	STK402-120	£9.00	STK4813	£8.00	STK7233	£7.00	STR61001	£4.75	TDA3567	£3.50	TDA6107Q	£3.00	TDA8376	£15.00
BUH517	£2.75	IRFP064	£5.00	STK4024 II	£5.50	STK4823	£8.50	STK7251	£5.00	STR7001	£6.00	TDA3569	£3.00	TDA6108F	£3.00	TDA8380	£2.00
BUH517D	£1.75	IRFP140	£2.50	STK4025	£5.30	STK4843	£7.20	STK7253	£6.50	STR80145	£4.75	TDA3570	£3.75	TDA6111Q	£2.25	TDA8424	£4.00
BUH715	£4.25	IRFP150	£2.40	STK4026	£4.80	STK4853	£17.00	STK730-060	£6.50	STR81145	£3.75	TDA3576B	£7.00	TDA6120Q	£5.50	TDA8425	£5.00
BU1310	£1.25	IRFP240	£3.00	STK4028II	£4.80	STK4863	£7.00	STK730-080	£6.00	STR8159	£4.00	TDA3580	£6.75	TDA6160-2S	£4.75	TDA8432	£5.50
BU1381	£1.50	IRFP250	£2.80	STK4028V	£5.00	STK4873	£11.00	STK7308	£7.00	STR8214	£10.00	TDA3581	£6.00	TDA6160-2X	£2.50	TDA8433	£6.00
BU1381D	£1.25	IRFP340	£2.50	STK4032	£5.50	STK488-010	£8.00	STK7309	£4.00	STR83145	£5.00	TDA3581A	£3.50	TDA6160-2X	£4.75	TDA8440	£3.00
BU1T11A	£0.35	IRFP350	£3.25	STK4032 II	£5.10	STK488-050	£8.00	STK7310	£3.20	STR83159	£7.00	TDA3582	£5.00	TDA617052	£1.20	TDA8443	£3.50
BU1T11AF	£0.35	IRFP360	£8.00	STK4034 X	£9.25	STK4893	£10.00	STK73405 II	£5.50	TDA1420	£8.00	TDA3582A	£8.00	TDA617283	£3.25	TDA8451	

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Line Output Transformers

Part No	Code	Price	Part No	Code	Price	Part No	Code	Price	Part No	Code	Price			
ALBA			HITACHI..continued			PANASONIC..continued			PHILIPS..continued			THOMSON..continued		
3714002	LOT02	£12.00	2433453	LOT82	£12.50	TLF 14568 F	LOT40	£15.00	AT 2079 / 21	LOT395	£12.00	10588080.P2	LOT1505	£19.00
043714002J	LOT02	£12.00	2433751	LOT01	£13.00	TLF 14584 F	LOT41	£17.00	AT 2079 / 24	LOT392	£15.00	151128140	LOT1505	£19.00
43700000	LOT02	£12.00	2433752	LOT01	£13.00	TLF 14586 F	LOT42	£17.00	AT 2079 / 40	LOT73	£11.50	1512814	LOT1505	£19.00
AMSTRAD			2433891	LOT23	£12.50	PHILIPS			AT 2079 / 99	LOT276	£14.00	153144.6	LOT1505	£19.00
1810951	LOT55	£14.00	2433892	LOT84	£14.50	3119 108 31260	LOT90	£12.50	AT 2079/30 01	LOT106	£12.50	15314460	LOT1505	£19.00
3714002	LOT02	£12.00	2433893	LOT23	£12.50	3119 108 31290	LOT73	£11.50	AT 2079/30102	LOT106	£12.50	1531447 A	LOT1505	£19.00
043714002J	LOT02	£12.00	2433952	LOT33	£10.00	3119 108 31440	LOT433	£16.00	SAISHO			1532873 A	LOT1505	£19.00
43700000	LOT02	£12.00	2434002	LOT226	£14.50	3119 108 31441	LOT433	£16.00	3714002	LOT02	£12.00	3233500	LOT244	£14.50
AM152591	LOT55	£14.00	2434141	LOT33	£10.00	3119 108 31442	LOT433	£16.00	04370000J	LOT02	£12.00	3233900	LOT244	£14.50
FERGUSON			2434274	LOT44	£10.50	3119 198 62930	LOT57	£11.00	43700000	LOT02	£12.00	40011200	LOT244	£14.50
00 D-3-508-002	LOT381	£15.50	2434393	LOT405	£22.50	3122 138 10246	LOT111	£15.00	7140021	LOT02	£12.00	40148300	LOT244	£14.50
06 D-3-083-001	LOT82	£12.50	2434593	LOT44	£10.50	3122 138 36070	LOT111	£15.00	SHARP			TOSHIBA		
06 D-3-083-002	LOT82	£12.50	2435006	LOT401	£17.00	3122 138 36072	LOT111	£15.00	RTRNF 1220 CEZZLOT39	£18.50	1810951	LOT55	£14.00	
06 D-3-084-001	LOT23	£12.50	2435131	LOT251	£14.50	3122 138 36920	LOT57	£11.00	RTRNF 2001 CEZZLOT338	£17.50	2433751	LOT01	£13.00	
06 D-3-087-001	LOT23	£12.50	2436201	LOT90	£12.50	3122 138 36922	LOT57	£11.00	RTRNF 2006 CEZZLOT308	£13.50	23236098	LOT288	£14.00	
06 D-3-088-001	LOT84	£14.50	23236465	LOT392	£15.00	3122 138 37050	LOT132	£15.00	RTRNF 2023 CEZZLOT310	£15.00	23236198	LOT288	£14.00	
06 D-3-093-001	LOT204	£16.00	2433891H	LOT23	£12.50	3122 138 37620	LOT90	£12.50	SONY			23236201	LOT395	£12.00
06 D-3-508-003	LOT276	£14.00	45150504	LOT362	£16.00	3122 138 37771	LOT129	£14.00	1-439-286-00	LOT46	£13.00	23236245	LOT395	£12.00
06 D-3-512-001	LOT204	£16.00	MATSUI			3122 138 37992	LOT116	£19.00	1-439-286-11	LOT46	£13.00	23236255	LOT288	£14.00
29201-022-01	LOT63	£17.00	20070	LOT438	£16.00	3122 138 38040	LOT73	£11.50	1-439-286-12	LOT46	£13.00	23236427	LOT395	£12.00
473197	LOT304	£15.50	20071	LOT438	£16.00	3122 138 38123	LOT395	£12.00	1-439-286-13	LOT46	£13.00	23236428	LOT289	£15.00
D 059 / 137	LOT200	£14.00	20072	LOT438	£16.00	3128 138 20200	LOT433	£16.00	1-439-286-21	LOT46	£13.00	23236424	LOT129	£14.00
GOODMANS			20073	LOT438	£16.00	3128 138 20201	LOT433	£16.00	1-439-332-41	LOT100	£15.00	TFB 4090 AD	LOT395	£12.00
1142.5057	LOT1164	£15.00	20074	LOT438	£16.00	3128 138 20202	LOT433	£16.00	1-439-332-42	LOT101	£14.50	TFB 4124 AE	LOT392	£15.00
1142.5077	LOT1164	£15.00	20075	LOT438	£16.00	3138 108 30100	LOT106	£12.50	1-439-332-52	LOT100	£15.00	TFB 4124 AP	LOT392	£15.00
1142.5079	LOT1164	£15.00	3714002	LOT02	£12.00	3138 108 30101	LOT106	£12.50	1-439-363-11	LOT268	£14.00	We are stockist of both		
1142.5081	LOT1164	£15.00	3221008	LOT438	£16.00	3138 108 30103	LOT106	£12.50	1-439-363-21	LOT268	£14.00	Konig		
1152-5016	LOT1934	£19.00	043714002J	LOT02	£12.00	3139 128 30400	LOT90	£12.50	1-439-387-11	LOT311	£14.50	and		
1179.0387	LOT1147	£16.00	043221088P	LOT438	£16.00	40348-08	LOT1577	£18.00	1-439-387-21	LOT311	£14.50	HR Diemen		
1192.0527	LOT1147	£16.00	43700000	LOT02	£12.00	40348A-09	LOT1577	£18.00	1-439-416-11	LOT255	£16.00	LOPT's		
1352.5008	LOT1167	£15.00	7140021	LOT02	£12.00	4812 140 10246	LOT111	£15.00	1-439-416-12	LOT255	£16.00	This is just a selection		
1352.5008E	LOT1167	£16.00	mitsubishi			4812 140 10349	LOT106	£12.50	1-439-416-21	LOT255	£16.00	of the LOPT's that we		
1352.5016	LOT1934	£19.00	731003	LOT51	£15.50	4812 140 10369	LOT90	£12.50	1-439-416-23	LOT255	£16.00	stock....Please call on		
1352.5027	LOT1270	£16.00	334 P 18506	LOT51	£15.50	4812 140 10421	LOT90	£12.50	1-439-416-41	LOT255	£16.00	020 8900 2329 for copy		
1352.5033	LOT1270	£16.00	OREGA			4822 140 10246	LOT111	£15.00	1-439-416-51	LOT255	£16.00	of our LOPT catalogue		
HINARI			40153201	LOT349	£17.50	4822 140 10274	LOT123	£14.50	THOMSON					
3714002	LOT02	£12.00	ORION			4822 140 10306	LOT57	£11.00	105009.8	LOT1505	£19.00			
043714002J	LOT02	£12.00	3714002	LOT02	£12.00	4822 140 10349	LOT106	£12.50	10500980	LOT1505	£19.00			
43700000	LOT02	£12.00	043714002J	LOT02	£12.00	4822 140 10381	LOT128	£13.00	10500980.P1	LOT1505	£19.00			
CF 124 B	LOT67	£14.50	43700000	LOT02	£12.00	4822 140 10384	LOT127	£15.50	10531460	LOT1505	£19.00			
CF 124 E	LOT67	£14.50	PANASONIC			4822 140 10406	LOT73	£11.50	105660.6	LOT1505	£19.00			
HITACHI			TLF 14512 F	LOT39	£18.50	4822 140 10544	LOT433	£16.00	105660060	LOT1505	£19.00			
2424593	LOT44	£10.50	TLF 14520 F	LOT40	£15.00	4822 140 10566	LOT433	£16.00	10566060	LOT1505	£19.00			
2432461	LOT169	£15.00	TLF 14521 F	LOT39	£18.50	AT 2076 / 10	LOT57	£11.00	10566060.P2	LOT1505	£19.00			
2432761	LOT169	£15.00	TLF 14567 F	LOT39	£18.50	AT 2077 / 81	LOT121	£15.00	105880.8	LOT1505	£19.00			
						AT 2078 / 21	LOT395	£12.00	10588080	LOT1505	£19.00			
						AT 2079 / 15	LOT129	£14.00						

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KSS 210A Original	£11.00	KSS 213 F	£12.00	RCTRTH8112	£14.00
KSS 210A Replacement	£9.50	KSS 240 A	£30.00	RCTRTH8147 Mech	£ 10.00
KSS 210 B	£15.00	NKS 240 A			
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In the concluding instalment in this series Alex Towers deals with the picture-rotation and scan-velocity modulation circuits and provides general servicing guidance



Servicing

the Sharp DA100 (50Hz) and DA50W chassis

Previous articles in this series have covered most of the basic circuitry used in these chassis in some detail. Two sections remain, the picture-rotation and scan-velocity modulation circuits.

Picture rotation

Because of the width of a 16:9 CRT the picture can be tilted horizontally by external magnetic fields. An extra coil is fitted around the bowl of the CRT to overcome this problem. It is driven by a DC amplifier that's controlled by a signal from the microcontroller chip IC1001. Fig. 51 shows the circuit.

The microcontroller chip provides a PWM correction signal at pin 55. This is low-pass filtered by R1620 and C1608 and then fed to the error-amplifier chip IC1601. The output from this IC swings between a positive and a negative voltage depending on the mark-space ratio of the PWM from IC1001.

Under normal conditions, when the CRT is not affected by external magnetic fields, there will be no output from the error-amplifier IC. Q1603 and Q1604 are therefore cut off and no current flows through the tilt coil. If the output from IC1601 is positive, Q1603 turns on and current flows through the coil via the +13V supply. Conversely when IC1601's output is negative Q1604 turns on, current flowing

from the -13V supply via the coil.

The user can adjust the output from IC1001 via the picture menu.

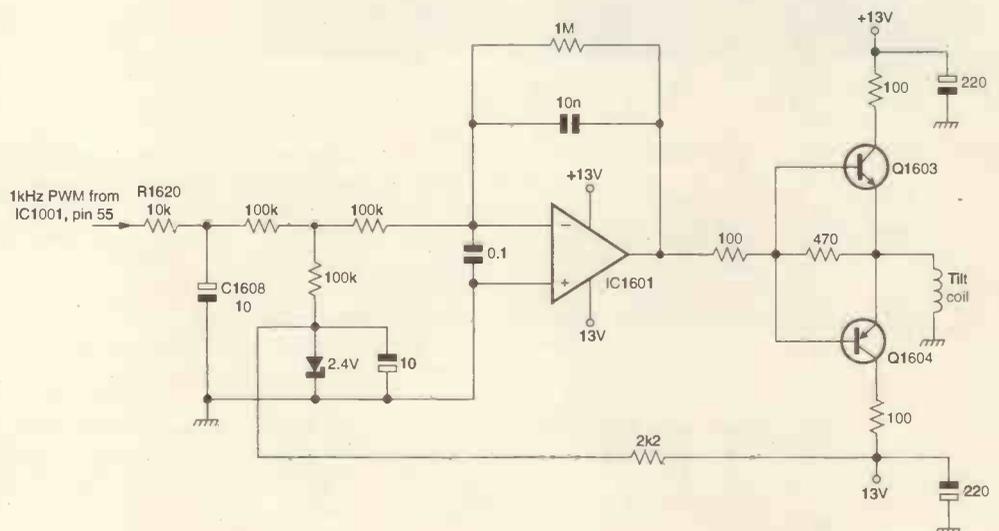
Note that the location of this circuit can vary between 66cm models, where it's on the CRT base PCB, and 76cm models where it's on a sub-PCB. This circuit is not fitted in HW series sets and Model 56FW53H.

Scan-velocity modulation

The purpose of scan-velocity modulation is to maintain the luminance level as the electron beams scan across the face of the CRT. The distance that the beams travel from the electron guns to the CRT screen is

greater at the outer edges than at the centre. This distance difference is emphasised with 16:9 CRTs. As a result, the intensity of the beams varies as they travel across the face of the CRT. To overcome this effect a coil is placed around the CRT neck, close to the gun assembly. Its purpose is to vary the speed of the beams as they scan across the screen, thus maintaining correct luminance transitions. Fig. 52 shows the scan-velocity modulation circuit.

The signal that's used to provide scan-velocity modulation is derived from pin 34 of the video/deflection processor chip IC801: the amount



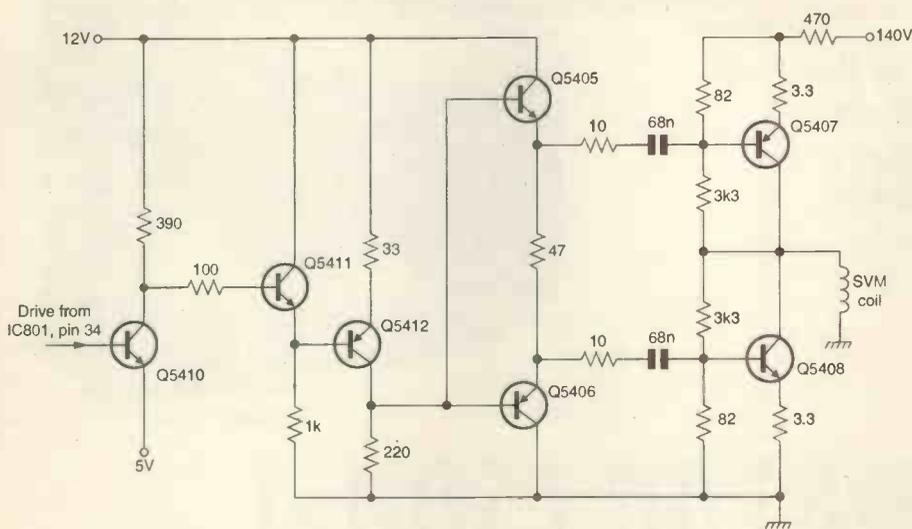


Fig. 52: The scan-velocity modulation circuit.

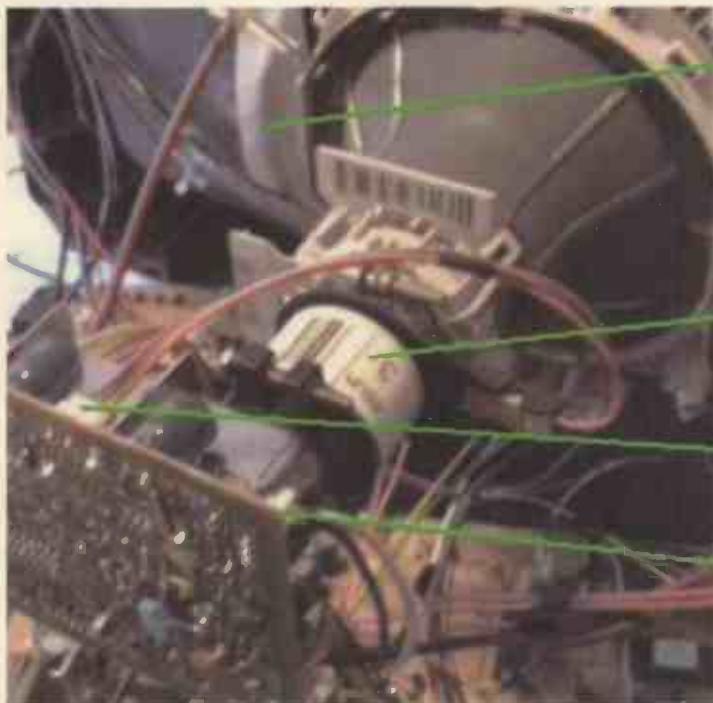


Fig. 53: Positions of the tilt and SVM coils and connectors.

of correction applied can be adjusted by the user via the picture menu. The drive signal is based on the luminance signal and controls the conduction of Q5407 and Q5408, depending on the intensity of the luminance at any point during the scanning. If there is a bright area at the edge of the picture, the current in the SVM coil will be increased to accelerate the scanning. The result is a brighter picture at that instant. If the scene is dark, the coil is not energised. As the picture

information changes all the time, so does the SVM signal. When viewed on an oscilloscope the SVM output signal looks like an inverted luminance signal.

Fault-finding

One of the most common problems in this area occurs when a receiver has been serviced. The plugs for the scan-velocity modulation and picture-rotation coils are the same, so it's easy to mix them up. If no adjustments are made to either of

these features there may be no noticeable change to the picture. But if the set is left in this condition for a number of hours the rotation-output transistors will fail prematurely.

Fig. 53 shows the positions of the tilt and SVM coils and connectors.

Preventive maintenance

The following points should be checked and attended to as necessary whenever one of these sets is serviced.

(1) A 170V avalanche diode, D735, should be fitted across C720. The part no. is RH-EX0875BMZZ.

(2) C604 (330 μ F, 10V) should be rated at 105°C. The part no. is VCEAGA1AW337M.

(3) Resistors R713 and R714 (560k Ω , 0.5W) should be of the metal-film type, part no. VRC-MA2HG564J.

(4) Resistors R1721 and R1722 (560k Ω , 0.5W) in the Pro-logic power supply should be of the metal-film type, part no. VRC-MA2HG564J.

(5) Two extra capacitors, C1826 and C1827, should be fitted on the CRT base PCB in Models 66FW53/4H and 76FW53/4H, see Fig. 54. C1826 is 4.7nF, 500V, part no. VCKYPA2HB472K. C1827 is 10nF, 250V, part no. RC-KZ0029CEZZ.

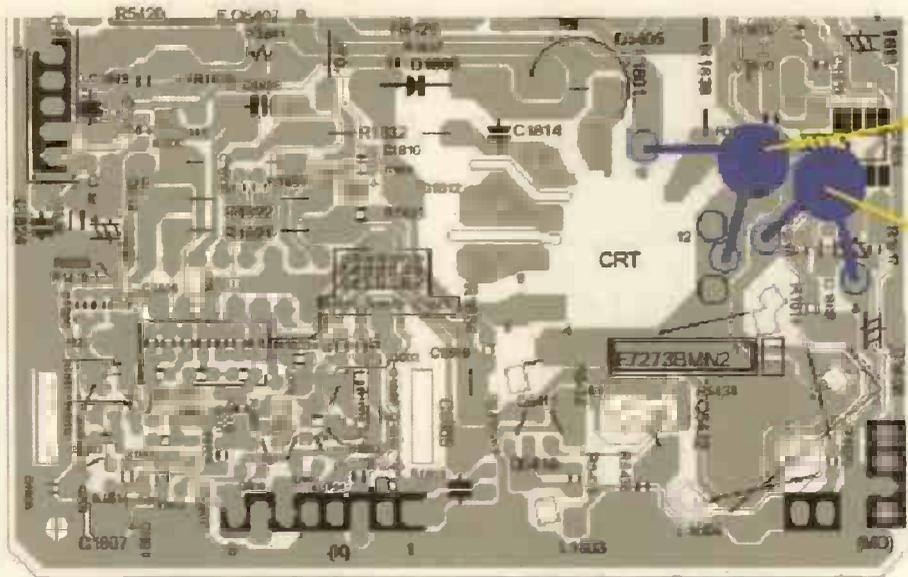
(6) Ensure that there are no dry-joints in the line output circuitry, especially at C613 and R613.

(7) Ensure that the EPROM fitted is correct for the CRT and circuit combination (see IC information in Part 1 of this series for more information on this).

Servicing tips

When servicing this chassis it's advisable to remove it from the plastic support frame by taking out the eight or ten fixing screws. This takes only about a minute and can save many more when searching for a component that's located under one of the bracing bars. It is not acceptable to remove any of this support frame, as this may result in the chassis cracking.

Note that the 56cm version of the chassis does not have a support frame, because the base of the cabinet and rear cover supports it. In



Position C1827 between pins 10 and 12 of the CRT socket

Position C1826 between the collectors of Q5404 and Q5411

Fig. 54: CRT base PCB modification, 66 and 76cm models only.

Model 56FW53H the front of the chassis fits into a slot at the front of the cabinet: if it is not correctly aligned, the PCB will crack when the rear cover is replaced.

When, with this model, pushing the chassis back into the cabinet take care not to damage IC705 on the bottom of the PCB: this device can catch one of the strengthening ribs at the bottom of the cabinet if the chassis sags when being pushed back into place.

It is possible to work on the chassis away from the cabinet and CRT. When power is connected to the chassis it will start up and respond to the remote-control unit just as when it is connected to the CRT and other peripheral components. It is important however that the chassis is not run in this condition for long, because of incorrect loading on the line and field output stages. This will result in excessive heat being generated in the driving semiconductor devices, which can lead to their failure. With some power supply faults this is the most convenient way of fault-finding. To ensure that the chassis can be worked on for a reasonable time, disconnect R623 in the HT feed to the line output stage.

The protection circuit may operate intermittently if the speakers are disconnected. This will shut the set down. It's therefore important to leave the speakers connected. This is not a problem, as the leads are fairly long and allow the chassis to be moved without restraint.

Error codes

Each chassis has a system of flashing the LEDs at the front of the set

to indicate whether various devices connected to the I²C bus are operational. These codes are shown in Table 1. Note that the boot sequence can be repeated six times before a fault code is displayed. The time taken for a reboot varies depending on which section is faulty.

EEPROMs are normally not faulty but simply need reprogramming: default data is contained in the EPROM. When replacing an EPROM, always blank the EEPROM first. Blanking information was provided in Part 5 last month.

HW sets don't have an OPC LED, so a jig will have to be made. This consists of a LED connected between pins 12 and 5 of a scart plug, with the cathode to pin 5.

Service mode

Except for focus, all adjustments with this chassis are carried out in the service mode. The service mode is provided to enable the engineer to set up the receiver correctly for the CRT fitted. These adjustments may differ from one receiver to another.

To enter the service mode, proceed as follows.

- (1) Connect a test pattern to the aerial socket.
- (2) Tune the receiver to this signal.
- (3) Turn the receiver off, using the mains on/off switch.
- (4) Press the volume down and channel up buttons at the front of the set at the same time.
- (5) While keeping these buttons pressed, use the mains on/off switch to turn on the supply.

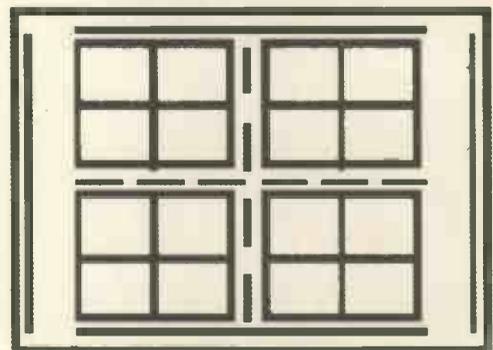


Fig. 55: The internally-generated geometry-adjustment test pattern.

(6) When the set starts up it will be in the service mode.

(7) Release the two buttons.

Use the channel up and down buttons to move between options. Use the volume control buttons to change data. To store the data, use the standby button on the remote-control unit. To exit the service mode turn off the receiver using the mains switch.

The following on-screen display appears when the service mode is entered

—SERVICE SOFTWARE AND
HEXADECIMAL COUNTER DISPLAY:
SW ON XXXX SW OFF XXXX
HOURS ON XXXX

The figures displayed in the XXXX locations are hexadecimal representations of the number of times an operation has been carried out. For example, if the hexadecimal number displayed after SW ON is 0E4A, this means that the receiver has been switched on

3,658 times.

The following adjustments can be carried out in the service mode: horizontal shift, EW width, pincushion phase, pincushion amplitude, corner amplitude, corner symmetry, vertical linearity, height, S correction, vertical shift, red gain, green gain, blue gain, red cut-off, green cut-off, blue cut-off, alter EEPROM page, alter EEPROM position, alter EEPROM value, teletext mix-mode contrast, teletext contrast, OSD contrast, DVCO adjustment (NTSC), DVCO adjustment (PAL), AGC adjustment, AFT adjustment, OPC value and auto-installation on/off.

All geometry adjustments are based on an internally-generated test pattern, see Fig. 55. Use this for guidance when carrying out any of the above geometry adjustments.

Proceed as follows to set the A1/G2 voltage and grey-scale.

- (1) Tune the set to the output from an RF signal generator.
- (2) In the user menu, set the picture levels to the 'factory' settings.
- (3) In the user menu, set the tint control to its centre position.
- (4) Enter the test mode.
- (5) Set the ABL levels in the EEPROM by adjusting positions 60-65 on page 00 to read 80. Store each location by pressing the standby button on the remote-control unit.
- (6) When the ABL levels have been set, adjust the A1/G2 and grey scale (if necessary) as follows.

After setting the ABL levels as above, go to the red cut-off adjustment. Six boxes will appear on the screen, indicating red/green/blue gain and (below) cut-off. Using a crosshatch pattern, set the A1/G2 control on the line output transformer so that the reading in the red cut-off box (bottom left) reads between 60 and 80.

Important! After setting the A1/G2 control at least one of the RGB adjustments must be reset to

Table 1: LED fault code table

Fault indication	Green LED (Nicam)	Orange LED (OPC)
Main reset or EPROM	Off	On
EEPROM	2 flashes/pause	Off
MSP	3 flashes/pause	Off
Video/deflection IC	4 flashes/pause	Off
I2C 1 locked Keeps repeating the boot sequence		
I2C 2 locked (EEPROM)	On	On
MegaText/M3 bus	On	1 flash/pause (1:3)
Boot sequence	On	On
	On	Off
	Off	Off

force the software to reset the correct ABL levels. All you need do is to adjust one of the grey-scale gain or drives by one point. There is no need to press the standby button to store this adjustment.

Grey-scale adjustment is then as follows. Using a grey-scale pattern, set the red cut-off value to 32 and the red gain to 50. Next, adjust the green and blue cut-off and gain for correct grey-scale tracking. As with all grey-scale adjustments, it will be necessary to readjust the settings to achieve good tracking.

Note that when adjusting the grey scale the figures displayed in the boxes are an indication of the CRT's performance only.

These adjustments are for guidance only. If any problems are encountered, the adjustments should be carried out using a colorimeter, as explained in the relevant service manual.

Part changes

During the three-year production run of this chassis there were a number of parts changes. This can cause problems when referring to parts lists in service manuals should the parts not tie up. Changes normally relate to CRT types, use of the power-factor module and the introduction of the double-copper chassis. An alternative manual is available for the latter. Other changes can be noted at the Sharp Technical Web (account holders only). Non account holders can obtain this information from Alan

Dyson's Techline Services (0906 861 5915). Service literature can be bought from Willow Vale Electronics or CPC.

A number of different types of CRT were fitted in certain models (see lists in Part 1, September 2003). It's very important to match and quote chassis and CRT types. Because of this, Sharp has a special ordering procedure when account holders need a CRT.

Three different remote-control unit battery covers are available for these sets, depending on the type of remote-control unit. These are as follows.

Remote-control unit part no RRMCG1060BMSA, RRMCG1070BMSA, RRMCG1071BMSA and RRMCGA006WJSA, use battery cover part no. GCOVHA009WJSA. Remote-control unit part no RRMCG1059BMSA, use battery cover part no. GCOVHA013WJSA.

Remote-control unit part no RRMCG1073BMSA, use battery cover part no. GCOVHA010WJSA.

A four-pin optocoupler is supplied, part no. RH-FX0113BMZZ, to replace the original six-pin types. Pins 1 and 2 remain the same while pins 4 and 3 of the 4-pin type correspond to pins 5 and 4 of the 6-pin types, see Fig. 56. As a result the replacement optocouplers have to be fitted diagonally, so that the pins align correctly. When IC705 is replaced, R724 and R750 must also be replaced. When IC703 is replaced, R711 must also be replaced. When IC704 is replaced, R1017 must also be replaced. No resistors need be replaced when IC1703 on the Dolby Pro-Logic PCB is replaced. Change only the resistor(s) associated with the optocoupler being replaced. The required parts are available in a kit (part no. GF/FWOPTOKIT) that contains one optocoupler and all the resistors that might be required.

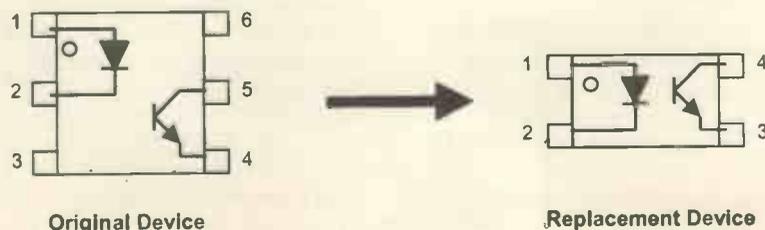
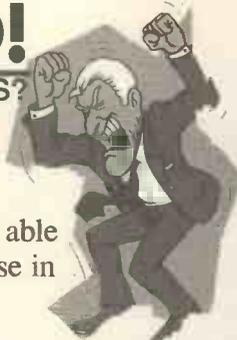


Fig. 56:
Six- and four-pin
optocoupler
connections.

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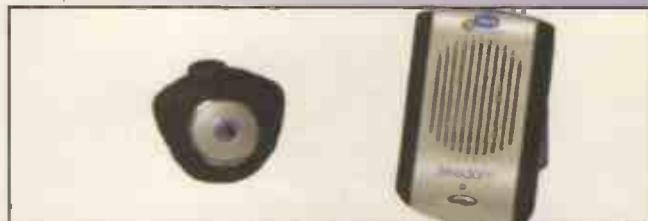
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Once upon a time the TV trade went about its business peacefully. There were Bush, Murphy, HMV, Ekco, Pye and other nice sets. What went wrong with them was well known and easy to deal with. Then the invasion started. Things were never to be the same again, as Gerald Gutteridge recalls

Dawn of the Rising Sun

Leslie Burke felt a tear well up in the corner of his eye as his right hand caressed the burnished mahogany cabinet of the adjacent Dynatron console TV set.

"This is just about the end" he protested, "Matsitachi, plastic cabinets and remote controls".

Gordon Burke eyed him coldly. "It's what the customers want. They are reliable, and they're good value". With that he turned and walked purposefully out of the show room.

Leslie heard his footsteps disappearing down the stairs. It was some time before he could bring himself to look up and face the new oriental addition to the upstairs showroom.

Downstairs, Gordon opened the front door of the shop and stepped out on to the pavement. He smelt the fresh morning air as he looked up at the green and red neon sign. 'Burke Brothers (Leicester) Ltd' glowed brightly above his head. He walked along the pavement, nodding to passers-by as he inspected the window display. The front displays were of large colour television consoles. Around at the side window, audio units and smaller TV sets were lined up beneath a large Matsitachi banner. Further along the TV sets were less impressive, being mainly

ex-rental and monochrome.

Behind the displays Gordon could see Leslie, having ventured downstairs, studiously avoiding his gaze. Gordon took his generous frame slowly back inside, glanced at his nephew disapprovingly, then opened the door next to the sales counter. Negotiating an antique coffee machine and assorted detritus, he turned into another doorway with the legend 'Service Department' in bold red lettering above it.

Service matters

A small dark-haired man turned to greet him. "Don't much like those Matsitachi sets" he said brightly.

Gordon groaned audibly. "Derek, I pay you to repair them, not like them" he replied.

"Ah, but when they go wrong, who gets the hassle?" the smaller man continued. "Take them new-fangled silicon chips. They can have up to twenty eight legs you know."

"Yes, but do they go wrong? Not often. Not every week like some of the sets we rent out." Gordon took a deep breath, ready for further debate, but at this point Derek was distracted by an old man who carried a food mixer. Gordon was able to

pass on to the service manager's office without further distraction. Once there he greeted his brother David.

David stood up as Gordon entered. He was taller and slimmer than Gordon, and had considerably more hair. "Hi big brother" he said, smiling through a cloud of cigarette smoke.

Gordon nodded to him. "They took it quite badly" he said.

"Yes, I heard" David replied, "but it's not my problem, is it? Look" he continued, "we're in the nineteen seventies, not in the nineteen fifties. Things are changing fast. We have to keep up to stay in business. We have to keep up with the times."

Gordon nodded again, this time in agreement. "Just what I told them. Fancy a coffee?"

"Not that sump oil in there" grimaced David, gesturing in the direction of the staff coffee machine.

With that they both walked amiably outside into the adjacent precinct.

Dissent

Back in the service department Leslie had found a sympathetic ear. "Never going to catch on" he declared. "Might rent a couple on the housing estates in town,

but that's about it."

"Just hope they never go wrong, young Leslie" Derek interjected. "Alien technology you know. Some of the circuitry is bizarre, and getting spares could be a nightmare." Leslie nodded in agreement.

"Nobody wants plastic cabinets painted with wood grain, and cordless remote controls will never catch on" Derek continued, warming to his theme. But before he could get to the additional problem of Japanese service manuals a brisk voice intervened.

"Derek, get one of those new Matsitachi sets out and get it on the bench and set it up. Has to be delivered this afternoon." It was Leslie's father, Barry.

"Could be problem, Barry. Never set one up before, and the manuals are in Jenglish."

"Now Derek" came the sharp reply, "get it sorted. The Bull's Head wants it today. The landlord's brother has one and reckons they never go wrong. It's a cash job!"

Derek hurriedly grabbed a tall gangly youth who had been rearranging dust and cigarette ends on the floor with a sweeping brush then disappeared in the direction of the stock room.

Problems

Some minutes later Derek and the youth had the set unboxed on the bench. "Cheap looking thing, innit?" articulated the youth.

Derek frowned at the front of the set. "It's got no knobs on it" he growled.

Leslie reached across and pressed a plastic panel. A door opened quietly, revealing an array of buttons and knobs. Derek prodded one hopefully and the set came to life, displaying white noise. "Plug an aerial in lad" he said to the youth, who was hovering behind him.

"Can't. It don't fit" came the reply.

Derek further narrowed his already narrowed eyes and peered at the aerial socket. "'S right" he gasped.

Leslie reached for the instruction book and packing and took out a small piece of plastic. "Needs an adaptor for the UK" he volunteered helpfully.

Derek took the adaptor grudgingly. "What country was it designed for then?" he asked.

"They were designed for Europe in general, according to the sales rep" Leslie replied, "should work almost anywhere in Europe."

Minutes later they had the set displaying an acceptable picture. "Always look washed out to me, foreign sets" grumbled Derek, "can't beat the picture on a Bush or Murphy set."

"I always like the pictures on the ITT-KB sets" commented Leslie, "probably just got the edge on the Bush sets."

"Problem is no valves" continued Derek, "can't drive a tube very hard with transistors, just not robust enough."

"Is the set working, Derek?" enquired Barry, businesslike, from the doorway.

"After a fashion" Derek replied.

"Then get it across the road sharpish. We could have some good business with this new landlord. And while you're over there, tune his old television to the local channels. It's in the kid's room."

Half an hour later Derek and the gangly youth were inside the pub demonstrating the relevant controls to the set's new owners. "Sorry about the instructions" Derek commented, "seem to have been translated into English by Stanley Unwin." He chortled to himself, amused by his impromptu joke. "Where's the set you want tuned in then?"

Help

The landlord led them down a corridor to the next room, then left them to tune the set in.

Derek peered anxiously at the large television in the corner. "Not seen one of them before" he muttered to his youthful assistant. "Grundig. Never heard of them."

"German I think" said the youth, bursting into life, "seen 'em in town."

"Do you know how to tune them in then?" Derek asked, starting to perspire copiously.

"No."

Derek investigated the front of the set, switched it on, then pressed each channel-change button as if he was disarming a land mine. Learning nothing from this and managing to display only white noise, he peered round the side and then underneath the set.

The sound of the door opening interrupted his concentration. A small girl entered. She glared at the two men round the television set and walked purposefully to the dolls' house in the corner.

After more judicious prodding Derek found a control panel at the side of the set. There were four brightly-coloured buttons inside. Derek prodded each button in turn and watched the white noise change. Presently a faint, noisy channel swam into view. Derek pressed the buttons again, and the white noise returned. "Damn, thought I'd sussed it just then" he said to the awestruck youth.

"Can I watch *Playdays* now?" an impatient voice came from behind Derek's shoulder.

"If you can tune this thing in, young lady, you can" Derek replied.

The little girl reached past Derek and pressed two buttons in quick succession. The BBC2 globe appeared clearly on the screen.

"You couldn't find BBC1 and ITV could you?" Derek asked desperately.

The girl tutted, pressed the buttons again and marched round to the settee theatrically.

Derek gently pressed the control door

shut, then quickly dragged the youth out into the corridor. "Won't charge you just for tuning the set in" he called down the corridor, which brought the landlord out in response.

"Nice of you" he said, "fancy a quick pint before you go?"

Ultra what?

"Wouldn't mind, thanks" Derek said, mopping his brow liberally as they made their way to the bar area.

"How does them cordless remote controls work then?" the landlord asked amiably while pulling the pints.

"Ultrasonics" came a voice from above Derek's head, "we done it at college."

"Ultra what" said Derek, looking up over his shoulder tentatively.

"Ultrasonics" repeated the gangly youth, "it's sound waves only too high in frequency for the human ear. My grandma's friend's got one. It attracts bats and dogs into the garden."

"Don't you mean cats and dogs?" the landlord asked.

"No, bats and dogs" the youth repeated sagely. "They can hear the high frequencies. In fact bats use high-frequency radar technology to see with, instead of their eyes. These new televisions have a microphone inside and interpret the sounds as control commands."

Derek stared at the youth. "Amazing what they teach 'em at colleges these days, innit?" he finally blurted out. "We'd best get back to the workshop."

One-eyed gods

"What sort of television do you own Gerald?" asked Derek as they waited to cross the road back to the shop.

"Dunno" replied the youth.

"What do you mean, dunno?" Derek snorted impatiently.

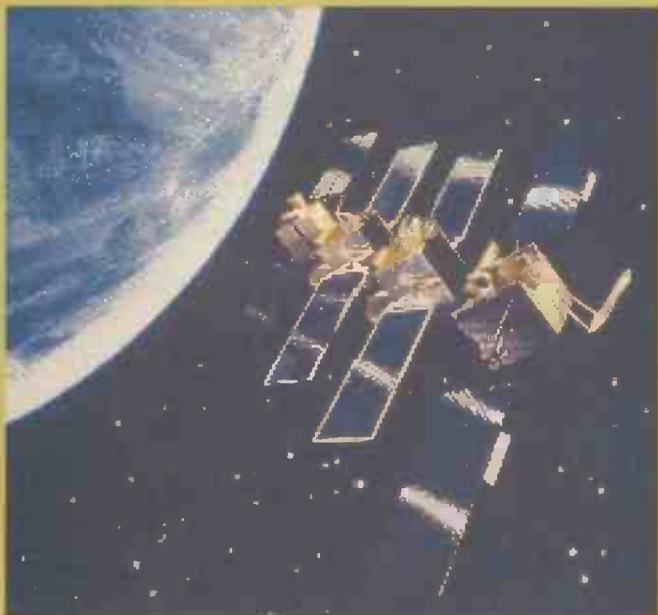
"Don't watch it, 'cept on Cup Final day. Besides, Dad reckons it rots the brain - turns it to chocolate blancmange. He says they're just one-eyed gods waiting for us to worship them."

Derek stared at the youth, transfixed by this revelation. "You are about to start a career repairing these one-eyed gods" he said with deliberation, starting to feel quite dizzy.

"But I don't have to like them as well, do I?" asked the youth defensively.

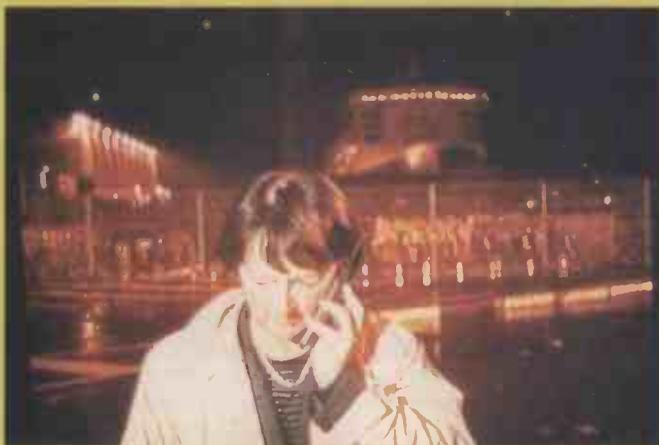
"No, I suppose not" conceded Derek, feeling quite out of touch with current youth. He had enjoyed the Sixties and to some extent the start of the Seventies, but had somehow started to lose his way. Too many things were changing too fast. As for not watching television, where would we be without it? He might have to talk to his wife instead. Derek shuddered visibly.

They crossed the road back to the shop without further discussion.



DX and Satellite Reception

Terrestrial DX and satellite TV reception reports. Broadcast, satellite and digital TV news. Meteor-shower dates for 2004. Phasers for interference suppression. Roger Bunney reports



Tragedy at St. Nazaire dockyard. The reporter is speaking to the studio, with the Queen Mary 2 in the background. Reception from Telecom 2D at 8°W.

A massive solar disturbance that produced noteworthy auroral effects occurred on October 29-30, just after I had written the last column. Here in south Hampshire there were visual displays in the northern sky and 'noises' in Band I. A river mist was rising in late evening of the 30th, following earlier rain, clouding the otherwise clear sky. To the north a white glow that faded up and down, with moving 'windscreen-wiper' effects, managed to penetrate the mist. When I checked with a scanner, from 2130 hours, I heard auroral noises in all European Band I channels, though only rolling hum bars – a characteristic of auras – were visible on-screen. When heard on AM, the effect is a rumbling, tumbling noise with, if you are lucky, video buzz. It's a very distinctive noise that, once heard, will always be recognised thereafter.

Auroras usually have two phases. When I checked after midnight, there was no auroral activity in the European Band I TV channels but the effects were present in the North American channels A2 and A3. At 2145 I had managed to lock a 'rough-looking' picture in channel R2, but apart from that only the auroral effects were present.

Iain Menzies (Aberdeen) reports reception of pictures from Scandinavia in Band I during the period. Cyril Willis (King's Lynn) noted further auroral activity on November 11 and 20, the latter across Bands I and III.

The Leonids meteor shower in mid-November was a non-event, but there was tropospheric reception on several days, with strong Band III/UHF signals from France and the Benelux countries on the 5/6th, including a very strong ch. E7 signal from RTL (Luxembourg). By the 7th the high-pressure system responsible for this 'lift' had moved, favouring reception from NRK (Norway) and DR (Denmark) across Band III.

There was more Sporadic E reception than usual this November. The log is as follows:

11/11/03	NRK (Norway) chs. E2-4.
19/11/03	TVE (Spain) E2-4; TVE Izana (Canary Is) E3.
25/11/03	RAI (Italy) IA, B; SVT (Sweden) E2-4; unidentified ch. R1 and R2 signals.

Hugh Cocks in the Algarve, Portugal reports that Band I activity has been quietening down, though there is still TE (TransEquatorial skip) propagation, with Brazilian ch. A2 TV often received in the evenings. Auroras have yet to be seen in the Algarve!

So this November was, unusually, an active month.

Satellite sightings

On November 15 there were sad pictures via Eutelsat W1 (10°E) from an Italian military airfield. A Hercules aircraft had landed, and fifteen coffins were solemnly marched with full military honours to awaiting transport. The soldiers had been killed by yet another suicide bombing in Iraq. The pictures were transmitted by European TV networks, from W1 at 10.961GHz V (SR 4,167, FEC 5/6) and also from Telecom 2D (8°W). They were uplinked by the Italian satellite truck Sky Italia Satnet 1.

There was tragedy in France when, at the St Nazaire dockyard, Alstrom employees and their relatives were paying a social visit to the soon to be named cruise ship Queen Mary 2. A connecting gangway collapsed, causing a number of deaths. The France 3 regional satellite truck F3.OEST/6MBT was soon on site, relaying pictures of the scene. These were linked to French TV via Telecom 2D, at 12.733GHz H (4,214, 7/8). Media coverage increased on the following day, when further reports were transmitted to the networks.

The US military suffered several helicopter losses in Iraq during the month. CBS News Baghdad for the US networks provided live reports via Eutelsat W2 (16°E) of the Chinook lost early in the month. The CBS news crew is based at the Rimal Hotel, identified with colour bars. Its NTSC downlinks were first observed at 12.525GHz H (5,632, 3/4), which is a favoured

downlink frequency for Sky News. Later that day CBS moved to 12.533GHz H to provide more outbound news feeds.

Fox News is another prolific provider of newsfeeds. It was active on a dark night in mid-November with a reporter near the Houses of Parliament, also via W2 but lower in Ku band at 11.53GHz H (same SR and FEC). The uplink company was a new one for me, 'Links n Things'.

There was lots of football during the month. On the 8th, while checking out Europe*Star-1 (45°E) for any activity, I found Telemedia Teleport RSA linking the Nigeria v. Ghana match for the All Nations Cup, before a small but enthusiastic crowd. This was at 11.515GHz V (6,109, 3/4). GI GlobeCast UK was busy on the 15th with Scotland v. the Netherlands from Hamden Park, in the clear via Eutelsat W1 (10°E). A few days later football was really humming with W1 used for more coverage, this time Wales v. Russia at the Millennium Stadium and Scotland v. the Netherlands at the Amsterdam Arena. Coverage was in the clear, in the lower Ku band, via GlobeCast capacity – ntl UKI 590 was at the Millennium Stadium.

President Bush's state visit received extensive coverage by Sky News via W2 at 12.563GHz H (5,632, 3/4) and W1 at 10.967GHz V (4,167, 5/6). SisLink's SIS-12 truck was on duty outside Buckingham Palace at 11.041GHz H (5,632, 3/4), also SisLink 5.352 PAL at 11.647GHz H (same SR and FEC): these uplinks both used the Eutelsat 2F3 bird, in inclined orbit at 21.5°E. Sky News also reported live from outside the Old Bailey on the Soham murder trial: this was via W2 at 12.525GHz H (5,632, 3/4).

Sesat out at 36°E tends to be ignored, but Alan Richards checked it out in mid-November and found that an old friend, Non Cat Thailand, was running a PTV (Pakistan) national news feed. It's not known who the feed was for, but it was present at 11.512GHz H (6,111, 3/4). The interesting thing was the teleport identification, Nintaburi Earth Station Bangkok.

There was major coverage for the MTV Awards in Edinburgh. SisLink used two satellite trucks, SisLink29 and SIS 15, operating at 11.001GHz V and 10.984GHz V (both 10,851, 3/4) via Eutelsat W1.

On November 17 there were several live reports via Eutelsat W3 (7°E) of the unrest in Georgia. The first parliamentary demonstration was seen in clear MPEG 4:2:0 form from CHEVC-2 at 11.090GHz V. The increasing hostility was reported by TRBBA-EBU 12D, with parallel transmissions at 11.084 and 11.078GHz V (all 4,433, 7/8). W3 was also used by Fox Istanbul to transmit footage of the synagogue bombings, in the clear from TUR009 at 11.609GHz H (5,632, 3/4).

A beautiful test card is to be seen via Arabsat at 26°E: the State of Eritrea is now present at 11.747GHz V (27,500, 3/4).

A busy month, with unfortunately much far from good news.

Broadcast news

UK: The latest RSL-TV station, York TV, went on air on November 15, using ch. 54 H with an ERP of 5kW to provide coverage of the city and the surrounding area. Programming is to consist of news, local affairs and entertainment.

Namibia: One Africa TV has reopened in Windhoek, with local TV programming, following a temporary closure of its parent company Africa Media Group, formerly TV Africa.

Iraq: The US-funded Iraqi Media Network (IMN), which transmits AM and FM radio programming and a TV channel and covers sixty per cent of the country, has proved to be unpopular – locals say it consists of US propaganda. The BBC and ITN are both seeking contracts to provide TV and radio services in Iraq and to operate IMN.

Switzerland: A new commercial German-language TV service, channel U1, is being received in parts of the country. It uses the old TV3 Zurich studios as a production base. U1 is an offshoot of



Eritrean test card received from ArabSat at 26°E.

the Austrian Kanal 1 operation, and plans to achieve profitability by 2008.

Digital TV news

The Chinese government is encouraging the take-up of digital terrestrial TV, with all cable systems to be digital by 2010 – 25 main cities are already providing FTA and subscription TV services via cable. Off-air DTT should be well established within four years, but the analogue shut-down is not expected to take place in all areas until 2015.

Nearly fifty licence applications have been received by the

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BUT11AF X 5 47p ea	TDA3654 X 5 82p ea
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Philips type 2.4 volt Back up battery	X 5 120p ea
Scart - Scart lead 1.5m Fully wired	X 2 89p ea
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Dr. Dish TV is transmitted via Intelsat 707 at 1°W.

Swedish broadcasting authorities to run DTT services across the country. They include the existing national broadcasters and others such as BBC Worldwide, Walt Disney, Discovery and Turner. Several regional broadcasters have been offered licences.

US public broadcaster PBS, saddled with the cost of dual analogue and digital terrestrial transmission, may go digital only. The US government has decided that all TV sets on sale, except small-screen ones, must have digital capability by 2007. The proposed analogue switch off in 2006 is considered to be unrealistic.

The Canadian government has decided that analogue and digital terrestrial transmissions should operate in tandem until 85 per cent of the public has digital sets, when a date for the analogue switch-off will be announced. Availability of more US TV channels has been refused to Canadian cable groups as the authorities feel that this could threaten the Canadian broadcasting industry. Many Canadians use domestic satellite systems to receive US programming, though this has been deemed illegal.

Doordarshan, India, is installing more digital transmission equipment.

Starting this year (2004), a nationwide digital broadcasting system is to be built in South Korea.

The Taiwanese government expects digital TV services to be available to at least fifty per cent of the population by 2006, though a decision on the standard has yet to be made.

The first DTT tests in Estonia are to be held this spring in the capital Tallinn, with five FTA channels – three nationals plus commercials TV3 and Kanal 2.

Satellite news

Feedback from the Amsterdam IBC provides insight into the current state of the satellite industry. There is now excess capacity in regions other than possibly the Atlantic and Europe. Satellite-

Table 1: Meteor shower dates for 2004

Shower	Overall period	Peaking dates
Quadrantids	January 1-6	January 4 (0400 hours UTC)
Lyrids	April 19-25	April 22
Aquarids	April 24-May 20	May 3-5
Cetids	May 7-June 9	May 14-15
Delta Aquarids	July 15-Aug 20	July 29 and Aug 6
Perseids	July 23-Aug 20	August 12
Orionids	October 16-27	October 20-22
Taurids	Oct 20-Nov 30	November 1-7
Leonids	November 15-20	November 18
Geminids	December 7-15	December 12-13
Ursids	December 17-25	December 22

linkers are now turning to fibre, which can provide quick hook-ups and complete security in most parts of the world – fibre costs no more than satellite. PanAmSat describes the US market as “flat”. There is growth in the DTH sector, and satellite news-gathering operations continue to flourish. Improvements in video-phone technology could have an impact on traditional carriers in terms of cost and instant access between remote sites and the news base.

The EBU has signed a renewal contract for AsiaSat-2 capacity for live news and sport and news exchanges between Europe, the Far East, the West Pacific and Australia. MPEG-2 in Band C will continue to be used, with Ku band used for pan-European distribution.

Iraqis seem to be turning to satellite sources for news and entertainment in preference to the Iraqi Media Network. Satellite dishes, formerly banned, are now widely installed throughout the country.

Check the www.DrDish.tv homepage for the next Dr.Dish@TV programme via Intelsat 707 (1°W) at 11.596GHz H (SR 6,110, FEC 3/4).

2004 meteor-shower dates

Table 1 shows the expected meteor-shower dates for 2004. Our thanks to Neil Bone, director of the Meteor Section, the British Astronomical Association (BAA), for the information. This year the Leonids shower should return to a more normal state, with the storms of recent years unlikely to be repeated until the 2030s. The Perseids and Geminids should provide good visual sightings with dark skies – if clear!

Phasers for interference suppression

I am a member of the Eddystone Users Group, which consists of enthusiasts who use, collect and have an interest in the wide range of receivers made by Eddystone before the company went totally high-end professional. There’s a regular magazine for members of the group, called *Lighthouse*. The October 2003 issue (no. 81) includes an article by Geoff Steedman, M0BGS on a subject of interest here, the use of phaser units for interference cancelling.

I’ve discussed the use of phasers on various occasions over the years, and developed a new design back in the mid-Seventies when I was troubled by interference from VDUs in a nearby office. More recently I described the results obtained using the Timewave ANC4 phaser. Geoff Steedman’s article describes a unit he has developed, called the Null Steerer, and discusses the principle of using a phase-shift arrangement to cancel interference. This is to use two receiving aerials, ‘main’ and ‘interference’, shift the phase of the signal picked up by the interference aerial by 180°, adjust its amplitude and combine it with the main signal to cancel the interference.

The military have used the principle for decades, antiphasing Harrier jet engine noise for example to reduce pilot headset/microphone pickup and make sensible communication possible. Geoff mentions the Marconi CR100 receiver that dates from about 1943 and had a red knob marked RIS (Radar Interference Suppression). This was an early antiphasing system for reducing headphone buzz with radar systems, by using phase-shifted noise from a second aerial nearby. The aim was to adjust the noise signals from two aerials for similar amplitude, shift the phase of one by 180° and, hopefully, achieve cancellation by adding the two signals together.

Geoff’s design is relatively simple and uses a single, small PCB. A couple of J310 junction FETs feed their paralleled outputs into the receiver. Their inputs come via a wideband step-up transformer that in turn feeds a phasing network. The design is intended for radio amateur use and includes various protective circuits for transmission – these wouldn’t be required for radio and TV DX use.

The Null Steerer requires a 12V, 150mA supply and should provide at least a 40dB reduction in noise interference. I intend to

carry out tests with one of these units shortly, but have achieved a measured interference reduction of 45dB at 63MHz with other phase shifters. The Null Steerer is effective for noise-cancellation across the spectrum from LW/MW to Band I. Geoff says that once the phasing and levels have been adjusted for optimum results it's like "plunging the noise into a very deep null and leaving an attenuated but clean wanted signal". The better the noise aerial is at picking up only noise, the greater the amount of wanted signal will be left after mixing.

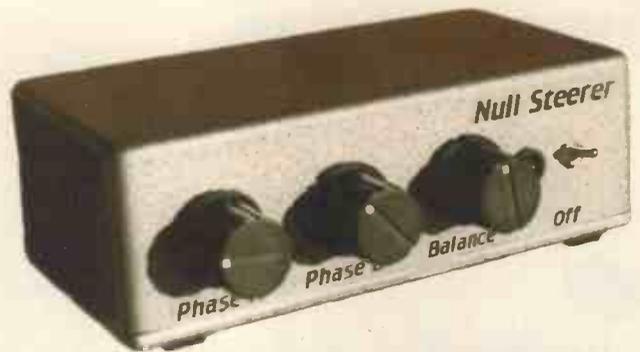
This is good news! Even better for budget-conscious DXers, a PCB with diagrams costs only £7.50 plus £2 post and packing, a full kit of parts £25 plus £3 post and packing, while a fully-built and tested unit costs £58 plus £3 post and packing. For the latter option you have to say whether you want SO329 or BNC sockets.

The unit, see accompanying photos, comes in a compact, grey hammer-finish alloy diecast box that measures 150mm wide, 80mm deep and 50mm high (excluding the front knobs, rear sockets and feet). It can be used with a radio transmitter or as a receive-only phaser. The radio amateur version (for use with a transmitter) includes additional components such as relays, diodes, two small light bulbs and sensing circuitry. If you want a ready-built phaser for reception only, which uses fewer components, contact Geoff directly for the price. The circuit diagram and other details that come with the kit or ready-built unit describe both the transmitter and receive-only versions.

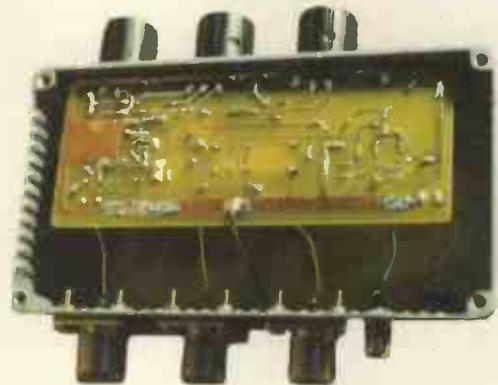
You can write to Geoff Steedman at 5 Allerton Grange Gardens, Chapel Allerton, Leeds LS17 6LL, phone him on 0113 2696 527, or email him at

100664.3417@compuserve.com

Written enquires must include a stamped, addressed envelope. If you phone, ensure that it's at a socially acceptable time!



Front view of Geoff Steedman's Null Steerer phasing unit.



Internal view of the Null Steerer phasing unit.

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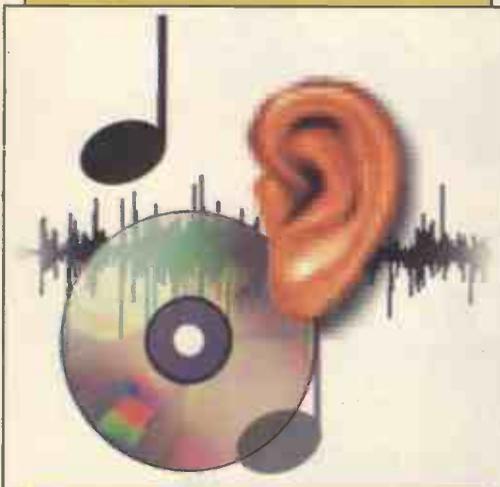
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and **Roy Blaber**

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Denon UD-M3

If the problem is that the CD drawer won't open you may well find that fuse PR003 (500mA) is open-circuit. Replacing it may solve the problem – temporarily! The only lasting solution is replacement of the traverse assembly, part no. 9280083806. This is expensive. E.T.

Sony HCD-CP33

Poor LCD panel illumination, or complete lack of it, is now common with this music centre. It can be cured by fitting four LEDs and a couple of surface-mounted resistors – details are available from Sony. Be careful when removing the old LED assemblies however. It's very easy, with a slip of the soldering iron, to damage the surface of the adjacent plastic viewing window or, worse, the LCD panel itself! E.T.

Sony STR-DB940

There was no audio from the digital inputs and the blue decoding LED remained lit even when the unit was connected to a DVD player in the pause mode. Checks around the digital board inside the unit with a voltmeter revealed that the pull-up voltage on the D0 line was missing. The cause was poor soldering at the 10k Ω metal resistor R1101. A quick resolder restored normal operation. C.B.

Sony HCD-EP303

There was no sound from the left-hand side of the main speakers. When I checked inside I found that the cause was poor contacts at the headphone connector board, i.e. the connections to CN301. Replacement of the board with five-stranded wire restored the left-hand audio to the main speaker system. C.B.

Sony HCD-EX5

There was no CD rotation with this unit. A look at the CD slot opening revealed the cause: the ornamental plate had become detached from the mechanical panel and was touching the back of the CD – in some cases the disc can also go behind the ornamental plate. The solution is to replace the ornamental plate and mechanical panel with the new mechanical panel assembly, part no. X-4955-731-1). This will restore normal CD operation. C.B.

Pioneer CT-F850

This cassette deck's reel motor had lost its power/torque. As the motor is no longer available but the deck was otherwise in good condition an alternative solution to straight replacement was required. So a capstan motor minus the speed regulator was fitted into the original housing.

The original motor was a constant-speed type with centrifugal speed control. Including a 3.9 Ω resistor in series with each feed to the motor kept the speed close to the original. P.R.

Rotel RA820

This unit worked but the smoothing capacitors showed signs of stress – bulging tops. I replaced them with 10,000 μ F capacitors, twice the original value but in the same-sized case. These Rotel units and others seem to suffer from use of 'cheap-make' capacitors. They benefit from having good replacements fitted. P.R.

Sony ST-5055L

This tuner, dating from the Seventies, required a blanket resoldering to restore operation of the tuning meter and reception quality. It was well worthwhile. P.R.

Rotel RA610

Horrendous switch-on thumps can be stopped by adding a delay relay in series with the speaker output. P.R.

Sony HCD-XB3

This unit came to us complete with a replacement laser – a genuine Sony part – and the complaint that it wouldn't play discs. I don't know why the owner had felt himself qualified to replace the laser but he had and, when he'd finished, the unit still wouldn't read discs. So he'd refitted the original laser and brought the lot to us.

The CD sub-deck in this model is accessible via a removable plate in the base pan. Once this plate has been taken off, removal of a single screw over one of the deck hinge pins enables the whole sub-deck to be withdrawn through the opening. It's connected to the main circuitry via a single flexiprint lead which is long enough for the assembly to be laid alongside the main unit on the bench. A disc can then be placed on the turntable and secured – I keep an old disc clamp magnet for this purpose. The CD player can thus be run in full view. When this was done I could see that the lens went up and down for focus search, but the laser didn't appear to be operating.

As a first move I decided to refit the new laser. This made no difference. I then removed the laser flexiprint lead completely to examine it, and found that two of the foil 'fingers' were folded back over themselves at the end that plugs into the servo board. I straightened these out and refitted the lead, but the results were still the same. So I decided to replace the

flexiprint lead as, in this model, the original is quite short and stiff and has a tendency to fracture at the sharp end, by the reinforcing strip. The replacement I use, part no. 1-757-055-11, is slightly longer and thinner and lays with a much more gentle curve. Once the lead had been fitted the unit read discs.

I refitted the original laser to see if it would work with the new lead. The disc spun, with much servo screeching, but the laser wouldn't read it and it eventually stopped with the 'no disc' message in the display. When the new laser was fitted again discs were read quickly and positively.

I've experienced a sequence of events like this before, and think that the owner probably 'double whammied' himself because of lack of experience. Almost certainly the original fault had been the defective laser but, when he had refitted the flexiprint, he probably hadn't pushed it home into the connector squarely, the result being the two peeled-back foil fingers. In removing it again and, possibly, refitting it several times, the flexiprint had fractured at the tight-bend point. After a few years these leads become fragile here anyway. From there on, with two connection problems and a faulty laser, he hadn't stood a chance.

He had actually cost himself a lot of money in his attempt at a DIY repair. According to the invoice that accompanied it, the replacement laser had set him back the better part of £60. If he had come to us in the first place the total price, including the laser, would have been little more. And he would have had a professional job done with a warranty. **G.D.**

Sony TA-VE150

This AV amplifier had been in the workshop a few weeks previously because of an intermittent 'protect' condition, indicated in the display. As usual, all five pins of all five output ICs had been completely dry-jointed, and a blanket resolder of the whole output area had seemed to provide a cure – as it usually does. I've repaired many, many of these amplifiers with this problem, and can't recall ever having had one back, especially if the fan modifications recommended by Sony to relieve certain heat problems have been carried out. But this was the exception that proved the rule!

It was fine when first powered, but a few minutes later there was an ominous click from the output relays and the dreaded 'protect' message appeared. Poking and prodding on the PCB was inconclusive. Unfortunately the PCB has

to be screwed down, and one rear panel screw has to be in place, to make the necessary ground connections, so it's not possible to retest between each board removal.

Much time was then wasted reworking the joints in the output area yet again. Eventually I decided to try to establish exactly what was making the protection circuit fire. When the fault occurred, all five output ICs had a DC offset at their output pins. This was in turn caused by an 'indicated' offset at the differential input pins. As I could see nothing that was common to the input circuitry of the five stages, I moved back to where the low-level signal processing takes place.

I found a spot close to IC100, the function control and volume IC, where the offset voltage could be made to come and go when gentle pressure was applied. After removing the PCB yet again I blanket resoldered this entire corner of the board. The problem had then been finally cured.

The reason why I said an 'indicated' offset earlier is because I don't think that the voltage was real. I believe that the cause of the trouble was a dodgy ground somewhere, allowing some point in the early stages of the amplifier to float up to an arbitrary level. **G.D.**

Technics RS-EH750

This cassette deck is part of a four-piece EH750 system. The fault was no audio from either deck, although CD, radio etc. were OK. I headed straight for the record/playback processor chip IC101, on the basis that no audio in either channel from either deck must have a common cause.

With Technics products you often find that small electrolytic capacitors mounted close to ICs go short-circuit. So, before you start to get too technical with the fault diagnosis, it's worth going around each IC pin with an ohmmeter to see if there are any shorts to chassis where they are not expected. On this occasion I found that there was a virtual dead-short reading at pin 34 of IC101. This pin is connected to the 9V rail via two 22Ω resistors, R118 and R119.

The 9V rail has many decoupling capacitors, but they all turned out to be blameless when one leg was unsoldered from the board.

Eventually I came to Q303 and Q304. These are the bias oscillator transistors, and are connected across the 9V supply via the oscillator coil L301 at the collector side and the shared emitter

resistor R307. Q303 was short-circuit.

I replaced both transistors for good measure, then reconnected all the unsoldered decoupling capacitors. But when the unit was powered again there was still no audio, because the 9V rail was at 2V.

The cause of this final problem was the 9V regulator transistor Q602. It had presumably failed as a result of the short across it caused by the faulty oscillator transistor. Curiously the 0.33Ω safety resistor R602 at the input to Q602 had survived. A new regulator transistor restored the full 9V supply and normal audio. **G.D.**

Aiwa CX-ZA20K

This was a bizarre problem. I never really got to the bottom of it, though the unit was fully working when it was returned to the customer. The owner's complaint had been "not reading discs in position 1, OK in position 2, intermittent in position 3".

I loaded a disc into position 1 on the carousel and, as expected, it didn't play. But it did spin up, and produced lots of squealing servo noises. Just for sport I then moved the disc to position 2. It played without a fuss. When I moved the disc to position 3 it played once and didn't twice during three attempts. I repeated the whole test and found that the unit behaved in exactly the same way.

Now this situation is basically impossible with a carousel player, where the disc is picked up by the deck rising up under it. The deck and the optical assembly neither know nor care about where the disc has been picked up from, though the system microcontroller chip does of course. Before everyone starts to reach for their pens to tell me about carousel mis-positioning with Aiwais, I've got the T-shirt on that one – many times over. This was not a mechanical or positional problem of any sort. The disc was in each case picked up correctly, sat flat on the turntable and rotated freely.

As the KSS213F laser is quite easy to change I fitted a replacement, though without much hope. This action completely cured the problem however. I am at a total loss to explain why. If anyone has any ideas, I would be interested to hear them. Write to the editorial department or send us an email. **G.D.**

Quad 33

This preamplifier produced an annoying crackle in the left channel. Careful scope checks led me to transistor TR400, which is on the plug-in board M12017 – it's the front panel of the two. A replacement BC109 transistor cured the fault. **R.B.**



MONITORS

Fault reports from
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Bob Bradley
and
Ian Field

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Wyse WinTerm WT3720E

This is a strange monitor. It's actually an extensively-featured colour terminal that incorporates the Microsoft Windows CE operating system normally found in hand and palm PCs. It powered up with a green LED on, but there were no other signs of life apart from a couple of clicks.

Fortunately all the logic circuitry is on a separate pull-out panel that has to be removed before the rest of the unit can be dismantled. The main board contains the power supply and deflection circuitry.

A quick visual inspection here revealed that the line output stage tuning capacitors C223 (4.3nF, 1.6kV) and C243 (1nF, 1.6kV) had split open and burnt the neighbouring mode-switching relay REL201. In addition the BU2520AF line output transistor Q202 was short-circuit. Once these items had been replaced the unit powered up and showed a splash-screen, followed by a message to say that it was unable to connect to the host. This indicates a functioning unit. **G.M.**

Elonex BP350 (MNO15CF)

This LCD-based flat-screen monitor was to all intents and purposes dead, but made a loud buzzing sound. It incorporates its own internal power supply, but quite a strip-down is required to get to this. Once I had done so a quick inspection revealed that the mains rectifier's reservoir capacitor C105 (100µF, 400V) had leaked electrolyte, and that one of its legs had literally corroded off. Fortunately there was no damage to the board, and a replacement cured the fault. **G.M.**

Dell M770 (Philips CM2400 chassis)

The customer said that there was no brightness-control operation with this 17in. monitor. There are five push-button switches at the front. Three of them, brightness, contrast and menu, give access to on-screen graphic displays; the other two, + and -, are used to make the actual adjustments. I found that it was not possible to bring up the brightness graphic display to carry out adjustment, though the contrast and menu displays were OK. I also discovered that the - button didn't operate.

Expecting to find either broken switches, broken track, liquid spillage or dry-joints, I set about stripping the monitor down to gain access to the front of the PCB, where the controls are located. As I stripped it down I didn't see any evidence of liquid spillage, dry-joints or broken track, so I used a DVM switched to resistance to check both suspect switches for continuity when pressed. Sure enough they were both faulty, giving very high resistance readings.

It's easy to find second-hand replacements, as the switches are of a type that's commonly used on the control panel in many types of monitor. Once these had been fitted the monitor operated correctly in all respects. **B.B.**

Taxan EV2100LR

At power up the LED lit green momentarily and you could hear the EHT rustle, but almost immediately the LED turned red and the EHT died. Over the years I've seen a number of these monitors with this symptom but have never found a cure – until now. Even monitors that have been sent to specialist vendors have very often been returned as being beyond economic repair, with no indication as to where the cause of the fault lay.

As with most large-screen monitors, this one is difficult to dismantle to enable fault-finding to be carried out. I found that it could be split down into about three sub-units: power supply, timebase/EHT, CPU controller board, etc. This would make fault diagnosis easier if one had a spare working monitor, but that's not usually the case.

During my diagnosis I did however have sight of a circuit diagram, though a poor copy. But it was good enough for me to be able to ascertain that the power supplies were about correct at power up, and that the timebases were starting to work, if only for the short time before shut-down. I don't usually like to make assumptions, but I figured that if this lot was trying to work maybe there was a CPU control fault.

At this point I removed the CPU controller board for inspection. I examined it thoroughly, using a high-power magnifier. Looking for anything unusual to start with, I noticed what seemed to be contamination (dried electrolyte) from a leaky capacitor on an area of the board near the HV sensing and control circuit, which includes IC118 (1358S). To investigate more closely, I removed a few electrolytic capacitors in this area. Then I carefully cleaned away the contamination, using a small, stiff brush and some PCB solvent. This revealed print that had been etched away by the electrolyte, damaging a number of PCB 'via' holes that provide connections between the two surfaces of the board and the legs of IC118. The fault was cured by repairing the damaged tracks and replacing the capacitor that seemed to have been the cause of the electrolyte leak. **B.B.**

CTX 1569S

This 15in. monitor was virtually dead. The LED came on amber, but there was little

other life. In my experience with CTX monitors the most common cause of this is failure of the B+ regulator and/or the line output transistor. So work began by sliding the PCB out for a full inspection, resoldering as necessary, and some cold checks. Neither of the items mentioned above was faulty.

I noticed that regulation takes place on the primary side of the chopper power supply – there's no optocoupler. So I decided to risk disconnecting the secondary feeds one at a time. When the 24V rectifier D110 (HER305) was disconnected the monitor sprang to life – or rather the power supply did! Once this rectifier had been replaced the monitor worked normally.

During my inspection I had found that the 4-pin PCB connector near the micro-controller chip, to link with the front-panel assembly, was in poor condition with lifted tracks. Someone had previously repaired a break in one of the tracks, using insulated, stranded wire. Now all four needed doing – but properly, with solid (20 SWG) wire carefully formed to solder along sufficient track length to restore mechanical strength. As this had been dealt with at the inspection and resoldering stage, no symptom had been present when the power supply was being repaired. I.F.

Compaq 140 (Series 473E)

The complaint was "squiggly verticals". This was accurate: any vertical line became a sort of ornate scrollwork. The cause was almost certainly a faulty electrolytic capacitor. It's not an easy monitor to work on, as the chassis cannot be removed without separating the bottom tray from the front surround/CRT assembly. This makes bench testing a hazardous exercise.

Despite the risk that failing electrolytics can cause a catastrophic blow-up, I decided to apply power and see if pressure on any of the electrolytic capacitors on the secondary side of the power supply affected the symptom. During this exercise I pressed the top of the mains bridge rectifier's reservoir capacitor (C804), just for luck, and found that the top was well rounded. A replacement cured the fault. The value and voltage rating are 150µF, 400V. I.F.

Cabinet cleaning

A monitor I had repaired was spoilt by felt-tip writing that someone had scrawled on the cabinet. I couldn't return it in this condition. A mixture that sometimes works is white spirit with a small amount of Teflon grease added. This will also reduce the 'stickiness' of the gum

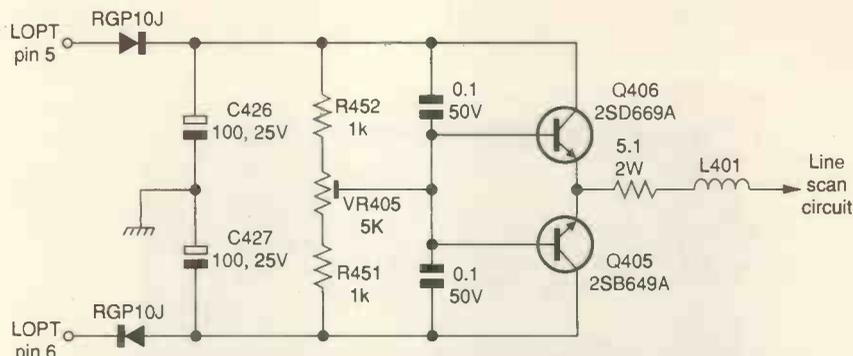


Fig. 1: Horizontal centring circuit adopted for the Elonex MN034P (similar to the Digital VRC16).

when labels have to be removed. A small amount of cellulose thinners can be added to increase the solvent strength, but the greater the amount the greater the risk of ruining the cabinet!

This mixture removed most of the ink, but the writing was still visible and unacceptable. A solution was eventually found. The magnesium oxide in heatsink compound is very mildly abrasive! Wetting the ink stains with white spirit, application of a small dab of heatsink compound with a stiff brush then lots of elbow-grease removed the last visible traces of ink – and left an impressive polished shine. I.F.

Elonex MN034P

This monitor had received previous attention! The problem was reduced height – in fact an otherwise normal display that was just 1.5in. high. It looked as if U301 (LA7837) had been replaced, and there was fresh solder on numerous peripheral components, suggesting that they had been tested. Q303 (2SC1815) was one of the components that had been checked, and the present fault was caused by an unsatisfactory attempt at resoldering its collector pin. After dealing with this I looked around for other dodgy soldering and found plenty – refitted components and original.

When the monitor was powered its convergence and purity were out and the display was shifted to the left. Readjusting the magnets restored correct purity and convergence. But efforts to correct the centring resulted in pincushion distortion at the right-hand side of the screen. A check on the line scan section of the main PCB showed that the horizontal shift circuit is an 'optional extra' that had been left out. The only solution seemed to be to add this 'option', but I didn't have the correct component values. Fortunately I found a similar monitor (Digital VCR16) on the scrap pile and was able to adapt the circuitry from it.

Fig. 1 shows the circuit I used, which is typical. But it still didn't provide sufficient horizontal shift adjustment!

Shorting out R452 achieved the shift required (at the right-hand side). I have no specification for L401, which I simply took from the scrap chassis. There's a good chance that a coil that serves this purpose in another chassis will be suitable, or perhaps an EW loading coil would do. Some care is required over the voltage rating for C426/7. Typical ratings are 25/35V. It depends on the pulse amplitude, which can vary with frequency. I.F.

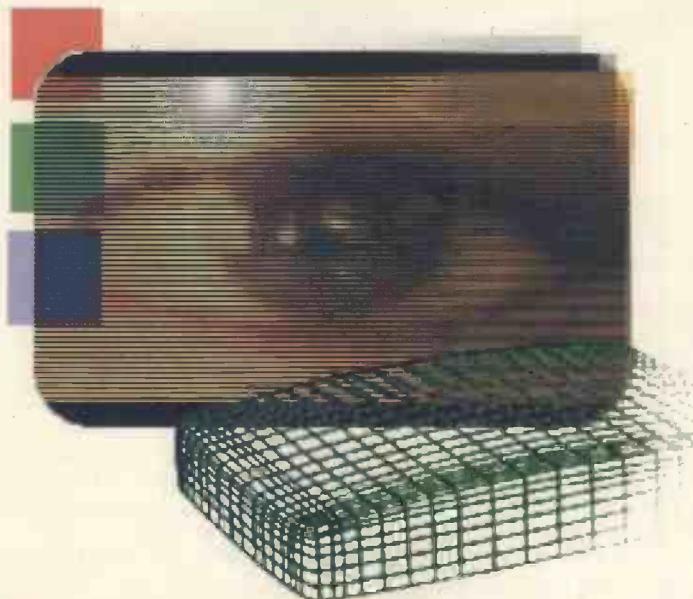
Microscan Model LM1764

The chassis used in this monitor is undoubtedly of Acer origin – it's very similar to the one used in the Compaq Model 171FS. The pollution deposits around the anode cap provided a clue to its age, as did the condition of the soldering. An unstable display, worse when warm, was the complaint.

Initially I had intended to carry out a general resolder of the main PCB, starting with the DIL ICs, modules and connectors with SIL pin layouts, any TO220 devices, especially those with heatsinks, and all the large, heavy components. This strategy takes you on a 'guided tour' of the PCB and makes it easy to spot poor soldering at adjacent components not on the original target list.

Once the tour was underway and a few such connections had been singled out it became apparent that more extensive work was required. With many of the joints reworked, including some that didn't look all that bad, the solder rolled into balls when it melted, separating from the component lead. There was clearly an oxide problem. Unfortunately there was no alternative to remelting every single joint to check that each was properly alloyed to both the component lead and the copper track.

In such cases RS555-869 red-jelly flux can be used to avoid wasting fresh solder. It's not a particularly aggressive flux, but with the high voltages and the sensitivity of the MOS circuitry to leakage it must be spotlessly removed. Cellulose thinners and a stiff paintbrush will do this. I.F.



TV FAULT FINDING

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Philip Salkeld
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Jim Lesurf
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Uel Harte

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Bush internet TV (Vestel 11AK20SAT chassis)

The power supply worked but the set was stuck in standby. A quick inspection revealed that R825 (100Ω) was getting very hot – which turned out to be a red herring. Not having seen one of these sets before, I decided to order a service manual. It then transpired that R825 drops the 16V supply to 5V, so it would naturally get hot.

Eventually, having checked almost everything else, I decided that the 24C08 EEPROM chip IC502 must be faulty, as in fact it was. The replacement you get is pre-programmed, so be sure to fit the right one. It's available from SEME. M.D.

Sharp 28HW-53H (DA50W chassis)

The fault symptom with this widescreen set was sound but no picture. When I advanced the setting of the A1 control I was confronted with a rainbow pattern on the screen. This indicates that the field output stage isn't running, and a scope check at pin 11 of the output chip IC501 showed that there was no field drive input.

The most common cause of this is a corrupted EEPROM chip. A new one costs about £18 and is supplied blank. The default data is downloaded from the OTP chip at switch on, and it's very important not to interrupt this process – the set will appear to be dead while the data is being sent to the EEPROM. The process takes

about a minute.

Sharp can however supply a special type of OTP chip that, when fitted in a set, blanks a corrupt EEPROM, after which new default data can be programmed into it. This special blanking chip costs twice as much as an EEPROM but can be used time and time again.

There are two different EEPROM-blanking OTP chips, one for use with a 3.3V supply and the other for use with a 5V supply. The blanking chip for use with the 27C4001 version of the microcontroller chip, which works at 5V, is part no. FW-SERV-JIG01; the blanking chip for use with the 37VF040 microcontroller chip, which works at 3.3V, is HW-SERV-JIG01. It is important to use the correct type. Once it has been fitted, leave the set on for at least one minute to erase the EEPROM. Then switch off, remove the blanking chip and put the original OTP chip back in. Switch the set on again and leave it alone. When the EEPROM loading process has been completed the set will come on. It takes about a minute.

When I carried out the above procedure with this set the fault had been cured. The only job left to do was to enter the service mode and set up the geometry, AFT and CRT drives. M.D.

Matsui 1496R

If the picture is shifted to one side and the volume can't be turned down, with no OSD volume bargraph, check whether line-frequency pulses are present at R606. They come from a winding on the line output transformer. In this case I found that their absence was caused by a hairline crack in the print. M.D.

Bush 3463NTX/4400

A word of warning about this 34in. model. To gain access to the chassis, do not remove the six screws that hold the back on. The back holds the set up: when you remove it the set will fall over on to the tube neck. I just caught this one in time.

To gain access to the chassis remove the two black screws above and below the panel, where the tube neck sticks out. This panel can then be removed and the chassis slid out. M.D.

Sony KV29F3U (BE3D chassis)

This set came on all right but after a few seconds there was loss of contrast and flyback lines appeared. The screen then flooded red with flyback lines, as if there was a heater-cathode short in the CRT. While checking voltages at the CRT base I realised that the first anode voltage was too high. The cause of the fault was R722 (680kΩ), which was open-circuit. It's at

the earthy end of the A1 divider chain. M.D.

Tatung T28NE51 (E series chassis)

This set's picture fluctuated, i.e. the width and height varied. Easy I thought, replace R814 (75k Ω , 0.5W, 2%) which is in series with the set-HT control. But it didn't work this time. When I contacted Tatung's excellent technical service a block replacement was suggested: CE550 (4.7 μ F, 50V), R435 (68k Ω , 0.5W), R436 (39k Ω , 0.5W) and D502 (1N4148) in the beam-limiter circuit. Was there any doubt about the outcome? Of course not! P.S.

Alba CTV5984 (11AK19E3 chassis)

This set worked perfectly except when it was put into standby. There was then a ticking noise from the loudspeakers, as if the set was tripping. I know about R816 (1.5M Ω), but it's not present in this version of the chassis. Nothing for it but to check with Bush technical. I was told to check R811 (820k Ω), R890 (2.2M Ω), R821 (470k Ω) and R826 (470k Ω). If the values of these resistors are correct, there's a modification to carry out: add an 0.1 μ F, 50V capacitor between the cathode of D814 and the anode of D815. This worked. My thanks to Bush technical. P.S.

Tatung T28NE51 (E series chassis)

The following information may be helpful if you don't have the service manual.

I've had two problems recently with these sets. First, volume lock. To cure this, press the remote-control unit's mute key and, at the same time, the volume + key at the front of the set.

The second set came in with the usual R814 problem (75k Ω , 0.5W, 2% in the set-HT control network), but when a replacement had been fitted there was excessive height. To correct this you have to go into the service mode.

Remove link 702 (next to the micro-controller chip IC701) then press volume + on the remote-control unit. Volume control + selects functions: brightness + and - provide adjustment. The height should be set at 09.

Press the mute key to store, then replace the link. P.S.

Bush WS6674

This set, just out of guarantee, came in dead with a smell of burning. The line scan plug on the main board was the cause. I gave the area a good clean up with isopropylene alcohol, then hard-

wired the scan coil leads. This got the set going, but the picture was narrow. Further investigation revealed that RV38 (2.2 Ω , 1W) was open-circuit. All was well once this item had been replaced. P.S.

Philips 25PT4101/05 (AA5 chassis)

This set was totally dead. As I've mentioned before, when I get this problem with a Philips set I always carry out a resistance check on the line output transistor. This one read 1k Ω between its base and emitter and the same between its base and collector, so it seemed to be OK. When the set was powered however there was a pulsing 25V supply at the line output transistor's collector. So I decided to remove it completely, to determine whether the fault was in the power supply or the line output stage. When I switched on again the 150V HT supply was present at the line output transistor's collector connection.

I checked the collector-base resistance again and found that there was a 50k Ω leak - so easy to miss when the transistor is in circuit. A check at the little scan-coil panel on the tube revealed a small burn-up here. I cleaned this and resoldered it, then fitted a new transistor. After that the set worked normally.

The line output transistor, Tr7445, is type BU1508DX (part no. 4822 13063569). P.S.

Hitachi C28WD2TN

This set puzzled me for a bit. The customer complained about poor terrestrial TV pictures, and indeed the whites looked crushed - a bit like AGC overload - and the colour was weak. The customer had a DVD player, so this was tried. All inputs to the TV set via the scart socket produced perfect results. It was 5 p.m. on a Friday and, getting a bit desperate, I decided to look at the tuner section of the board. There were four blobs of glue here. Off they came and, to my surprise, a good picture then appeared. G.L.

Black Diamond BDS32WS (11AK19 chassis)

We've had a few of these sets in recently with the tripping symptom. This one was no different. The line output transistor Q605 was short-circuit, R629 (2.7 Ω) was open-circuit and C617 had a dry-joint at one end. I assumed that the latter was the basic cause of the trouble so, after replacing Q605 and R629, I carried out the necessary resoldering and switched on. R629 then went up in smoke.

To cut a long story short, after check-

ing all the capacitors and silicon in the line output and EW correction stages I returned to C617 (1 μ F, 250V). It read perfectly when checked with a capacitance meter but, as a replacement cured the fault, it must have failed under load. The moral is: when a capacitor in this chassis is dry-jointed, replace it - don't give yourself a headache. G.L.

Amstrad CTV3128N

This set was dead and the pressure was on - it belongs to my brother-in-law. As I couldn't find any shorts or signs of distress I decided to carry out cold checks in the power supply. It didn't take long to discover that R103 (47k Ω) was open-circuit. A replacement cured the fault - and restored family harmony! G.L.

Ferguson 59J7 (TX100 chassis)

Field distortion was the complaint with this set. The usual culprits are C99 (100 μ F) and C98 (220 μ F), but this time they were both OK. Time to deploy the hairdryer and freezer, which soon led me to C101 (6.8 μ F). All was well once a replacement had been fitted. G.L.

Wharfedale CTV850

The customer said she heard what sounded like a pop and lost her picture and sound. This was followed by a burning smell. A visual inspection revealed the cause: the line output transformer TR701 had a hole burnt in the top. A replacement obtained from SEME, part no. FBT40864, restored normal operation. D.G.

JVC AV25S1EK (MX II chassis)

There was very bad vertical jitter, and a metallic ringing (oscillation) came from the set. The cause was not immediately obvious. It turned out, after some searching, to be a poor joint at pin 13 of the line output transformer. The reason why it was not obvious was that pin 13 is hidden under the plastic chassis-support framework. All was well once the joint had been resoldered. D.G.

Bush BTV14

The picture produced by this TV/VCR combi unit at first showed all the signs of what looked like faulty heads. There was also a second problem, a tendency to go off intermittently, leaving a slow, decreasing motorboating sound as it did so. After five-ten minutes it would start again.

While I was happily banging around the chassis with a hefty-handed screwdriver the picture, when I was in the

vicinity of the tuner, returned to normal. The cause was that C653 had a dry-jointed leg. Sad to say, as is the norm nowadays, I had to dismantle the unit to get at the joint. Once it had had been resoldered and the unit had been rebuilt all was well, with both faults cured. **D.G.**

Hitachi C32WD2TN2

The customer said that this set had for some time suffered from intermittent field collapse. Finally, the traditional bang on the set had proved fruitless. Checks showed that the field output chip IC601 was very badly dry-jointed. This had probably been the cause of failure of the BU2508AF line output transistor Q751. I fitted a BU508A in its place and resoldered IC601, after which everything was OK. It's one big, heavy set! **D.G.**

Toshiba 175T9B

The customer said he had been happily watching this set when it went off with a puff of smoke. A visual check quickly revealed the cause. The line output stage tuning capacitor C464 (680pF, 2kV) had blown a hole in itself. A replacement brought the set back to life. **D.G.**

Bush 1433 (11AK08 chassis)

I've had a couple of these sets in recently. The first would run for a few minutes then revert to standby. It would then restart and do the same thing again. Visual checks in the power supply area revealed the cause of the trouble: a dry-joint, though not immediately apparent to the eye, on the secondary side of the chopper transformer. A resolder cured the fault.

Field collapse was the problem with the second set. The TDA3653B field output chip IC701 had failed. **D.G.**

Philips 28PW5324/05 (A8.0E AA chassis)

This set had the classic L6.3 chassis fault, i.e. reverting to standby and changing channels. But with this set the standby LED flashed continuously. Before you tear your hair out, try unplugging the volume +/- and programme +/- panel. I found that one of the switches had a leak of about 20k Ω across it. **J.L.**

Matsui TVR185T

Stuck in standby was the complaint with this TV/VCR combi unit, though it did try to start when power was pressed. So I ruled out the memory IC. When I removed the rear cover I noticed a slight smell of burning. It was not the line output transformer but my first case of burnt

out scan coils in a combi set. Fortunately for the customer I had a scrap set to hand. And, just in case, I replaced those rubber wedges. **A.D.**

Panasonic TX25MD3

This set sounded as if it was tripping, but wasn't. There were no short-circuits on the secondary side of the power supply, so it was back to the primary side where I started to check the electrolytics. C807 (100 μ F, 25V) was found to be leaky. A replacement cured the fault. **A.D.**

Goodmans Compact 210

This set seemed to be dead though the standby LED was just visible. Checks brought me to the heatsink where the BU407 transistor lives. It was short-circuit, the cause of its demise being a dry-joint at capacitor CH08. Resoldering the capacitor and a replacement transistor brought the set back to life. **A.D.**

Philips 17PT1563 (L7.2E AA chassis)

This set was dead. The fuse was intact but the 4.7 Ω , 5W surge-limiter resistor R3506 had gone open-circuit. It wasn't difficult to find the cause: C2518 (470pF, 1kV) had blown itself in two. A new resistor and a replacement capacitor rated at 2kV restored normal operation. **G.C.**

Philips 29PT6773 (MD1.2E AA chassis)

This set came in dead with the mains fuse blown. Inspection of the chassis revealed a split blue capacitor, C2540 (330pF, 1kV), which was short-circuit. It's connected in parallel with the chopper FET, and as a result of its failure one of the mains bridge rectifier diodes, D6510 (1N5062), had gone short-circuit. Replacements restored normal operation. I upgraded C2540 to 2kV. **G.C.**

SEG CT7800

The job ticket said dead with the standby LED flickering. Not having seen this model before, I was relieved to find another version of the Vestel 11AK19 chassis in it. A quick check on the chopper circuit outputs showed that there was no 12V supply at the cathode of D811. The cause was R867 (0.33 Ω), which was open-circuit. This resistor is not shown in my circuit diagram. **R.B.**

Ferguson DSF68NX (IDC2 chassis)

There was no colour and the picture was shifted. I eventually traced the cause of

the trouble to the scart panel, where transistors TX04 (BC858) and TX06 (BC848) in the mute circuit were faulty. Replacements cured the fault. **R.B.**

Bush 1433 (11AK20 chassis)

This set was stuck in standby. As I couldn't find any short-circuits anywhere I suspected some sort of microcontroller problem. The clock and data lines seemed to be OK, but there was no activity at IC501's oscillator pins 31 and 32. A new 4MHz crystal cured the fault. **R.B.**

Thomson 24WK25EG (ICC17 chassis)

The reported fault was BBC1 (ch. 55) sometimes disappears. I tested the set for four days but no fault appeared. As I was about to book the set out I noticed tuner instability on all channels. So I raced to get the back off and found that the voltage at the cathode of the 33V tuning voltage regulator zener diode DH01 was only 14V. Disconnecting the feed to the tuner proved that the fault was in the supply line. A check on RP79 (18k Ω) produced a reading of 95k Ω . A replacement resistor cured the fault. **U.H.**

Philips 21PT4457/05 (L01.2E chassis)

When this set powered up the CRT's green gun was full on. The set then reverted to standby. Checks on the CRT base PCB revealed that the BF422 transistor Tr731 was short-circuit. I've had the complaint three times in one week – could be a stock fault! **U.H.**

LG CI20F80F (PC18 chassis)

An easy one for a change. The fault symptom was a bright screen with fly-back lines. Voltage checks around the TDA6107Q RGB output chip showed that there was no 185V supply at pin 7. The cause was L901 on the CRT PCB – it was open-circuit. **U.H.**

Thomson 24WS25EG (ICC17 chassis)

This set was dead with the mains fuse open-circuit and the chopper transistor TP50 short-circuit. Replacements failed to restore normal operation – the set remained in standby. As checks on the primary side of the power supply failed to reveal any obvious cause it was time for a phone call to Arthur, who suggested that TP44 (2SA1020Y) and DP42 (LL4148) in the chopper drive circuit should be carefully checked. They were both leaky. Replacements restored normal operation. **U.H.**



VCR CLINIC

Reports from
Eugene Trundle
Roy Blaber
Dean Ratcliffe
Peter Tennant
and
Martin McCluskey

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Reports can be sent by post to:

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

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

JVC HRJ665

This relatively modern VCR appeared to be completely dead. In fact it had gone into the overload protection mode because the 5V zener diode D5301 was short-circuit. It must have failed for internal reasons, because the 12V rail to which it is connected was, and remains, steady and correct. E.T.

Toshiba V711B

This solidly-built and easy-to-service machine is over ten years old and has served its owner well. It continues to do so after its first, minor, repair: it wouldn't accept a cassette because the contacts of the cassette-in leaf switch had become oxidised. I cleaned them thoroughly and also replaced the FL drive belt, which was slack though not yet slipping. E.T.

Samsung SV633B

This was a bit of a horror story as the VCR was less than four years old and, the customer assured me, had not had heavy use. A sound crackle, on its own recordings only, was caused by worn hi-fi heads on the drum. Repair was not viable economically, so the machine had to be scrapped. E.T.

Toshiba V429

The complaint was stops in the play mode. The tape was in fact looping out because of poor take-up spool rotation. So a new clutch was fitted. I then had poor rewind with a clicking noise. Closer inspection revealed a crack in the rewind gear assembly. A replacement assembly completed the repair. R.B.

Ferguson FV32

This oldie was owned by an elderly lady who insisted that I repair it. Dead with no display was the complaint. Fortunately I had the manual, and found that TK41 on the display panel was open-circuit. R.B.

Sony SLVE710

If one of these machines comes in with eject/loading problems because FL gear 261 is damaged, don't bother to fit a replacement on its own. Sony produces a kit, which is the best way to go as the gear supplied by the usual distributors won't work on its own. R.B.

GoldStar GSE1290IQ

If one of these machines won't accept or eject a tape, remove diode D521 and fit a link in its place. D.R.

Alba VCR7900

This VCR would load tape around the drum as normal then unload and switch off. The problem was worst when the machine was cold, but was intermittent. If

the drum flip-flop pulses at pin 3 of IC101 (head preamplifier) are missing, check the 4.8V supply at pin 1 of this chip. If it's low at about 4.2V, check the capacitors in the power supply, particularly C801 (2,200µF, 16V) and C301/303 (100µF, 50V). They tend to have high ESR readings. D.R.

JVC HRS7000

This machine was dead after having been unplugged. I found that C2 (2.2µF, 63V) in the power supply was open-circuit. D.R.

Daewoo V235

This VCR was dead. After a lot of time had been spent searching in the power supply I found that R52 was open-circuit. I decided to replace R51 as well though it measured OK. The value of both resistors is 390kΩ. It's always a good idea to check the electrolytics as well, as they can go low in value. P.T.

Aiwa HVGX35

A very dim display is a common fault with these machines. The cause is normally CP25 (1,000µF, 10V) in the power supply but, if you are unlucky, it can be the fluorescent display itself. P.T.

Akura VX150

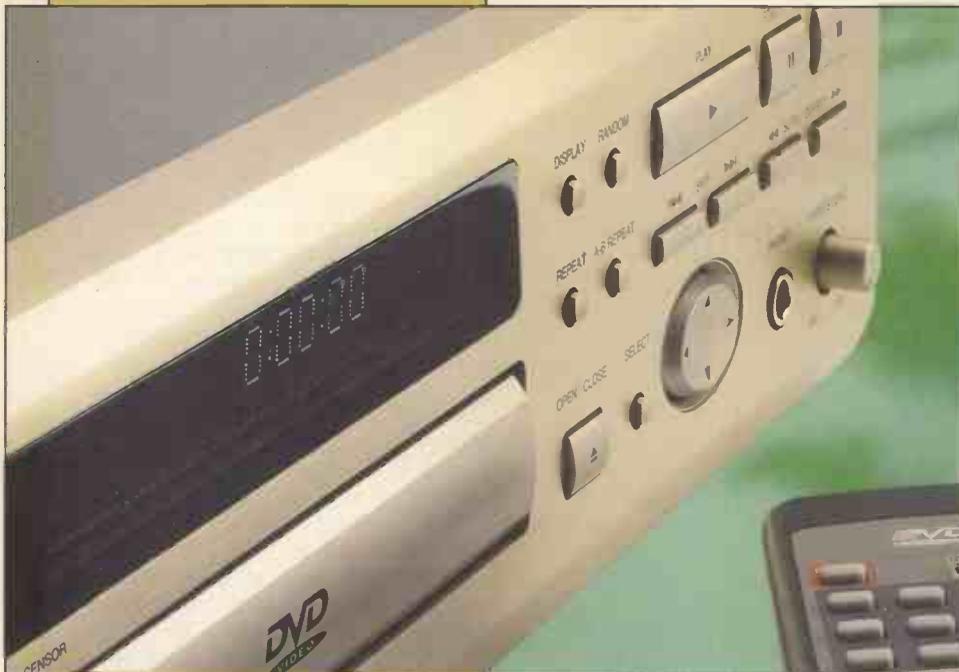
This VCR seemed to be completely dead. Checks around the regulator panel at the front revealed that the 6V supply was low at 3.7V. Replacing the reservoir capacitor C801 (2,200µF, 16V) brought the machine back to life but the drum and capstan speeds were way out. This was cured by replacing C802 (47µF, 16V) which is also on the regulator panel. M.McC.

Toshiba V703B

This machine had gone 'bang' when its owner had returned from holiday and plugged it in. There's a separate power supply can in this model, and the STRD6202 chopper IC had blown apart. I replaced it, along with the three electrolytics on the primary side of the power supply – C817 (0.47µF, 200V), C813 (47µF, 16V) and C810 (15µF, 10V) – and the current sensing resistor R805 (0.56Ω). This restored life to the VCR, but the clock display was very dim. This last problem was solved by replacing C825 (220µF, 10V) which is also in the power supply can. M.McC.

Sharp VCMH60HM

This machine had no display and no functions – the only sign of life was a twitching from the drum motor. Voltage checks revealed that there was only 3.7V at the cathode of rectifier diode D924 instead of 5V. Once its reservoir capacitor C925 (470µF, 10V) had been replaced everything worked normally. M.McC.



DVD

**Fault reports from
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and
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Sony DVP-S535D

When the power button was pressed this DVD player powered itself off. A look inside the unit revealed the cause of the problem: the optical block couldn't go to the initial position, because the sled motor was faulty (the sled motor is part of the optical block assembly and is not available separately). A replacement KHM220AAA/JIRP optical block, part no. A-6062-397-A, and an auto set-up restored normal operation. C.B.

Sony DVP-FX1

There was no power with this DVD player. Multimeter checks on board MB90 revealed the cause of the problem: IC652 (part no. 8-752-404-72) was faulty. A replacement restored normal power on. C.B.

Sony DVP-F5

This DVD player produced mechanical noise and would stop in the middle of playback. The cause of the problem was the mechanical deck/optical block AX202, part no. A-6066-015-A). A replacement and an auto set-up restored normal playback with reduced mechanical noise. C.B.

Sony DVP-FX1

This DVD player's LCD screen remained black when the brightness dial was adjusted. Multimeter checks revealed the cause to be the inverter, which was confirmed by a call to Sony Technical. Replace the inverter with the new type, part no. 1-418-888-11. Make sure that the inverter is marked with a black line and that the number on it is X0530 or higher. The voltages at the inverter are high, so take care when checking and installing it. C.B.

Pioneer XV-DV303

The complaint with this home cinema sys-

tem was "powers up intermittently, and the timer symbol flashing". When I tried to get it out of standby a relay clicked then immediately dropped back out again, leaving the flashing timer symbol on the front panel and nothing else. I thought that this might be some sort of auto-shutdown because of a fault condition, and initially suspected something like a faulty output IC. But the period during which the relay closed was so short that it was impossible to make any measurements.

Once again those very helpful Pioneer people came to my rescue. It turned out that the flashing timer symbol is indeed a system error indicator, and that the most common cause is a failed thermal fuse at the primary side of the main power transformer. The relay that clicks is the one which supplies this transformer with mains power. When the supplies don't immediately start to come up the system controller detects this as an error and shuts the unit down again, flashing the timer symbol to indicate the failure.

It is Pioneer's belief that the cause of this problem is units being housed in poorly ventilated cabinets. I was unable to check on this, as the unit was a trade job from another dealer, but made a note on the job sheet that this should be checked when the unit was reinstalled. A replacement transformer restored normal operation. G.D.

Panasonic NV-VHD1B

I had two of these DVD/VCR combi units from the same dealer. Both had apparently received recent attention at the manufacturer. The first was initially dead. I found that there was no mains voltage at the power supply because one leg of the mains connector was neatly folded under its plastic body. It wasn't even pushed through the board, let alone soldered. Once this had been put right power was restored, but the unit then showed F498 in the DVD display. This indicates the well-known flash-ROM problem, and a reflow of this device's pins (IC37001 on the underside of the DVD PCB) restored normal operation.

The second unit had no DVD sound though the VCR sound was fine. With some DVD models you can be misled by 'no analogue sound' faults because of menu settings. With this machine however there were no relevant settings in the audio set-up menu, and analogue sound should have been present at the scart and phono sockets at all times.

On the basis that the unit had apparently been looked at recently, I decided that the first thing to do was to check for missed connections or possibly bad

joints. There's actually not much in these units by way of conventional connectors. The DVD board is directly connected to the one beneath it by means of a pair of PCB-mounted 'knife-blade' connectors. This lower board is connected to the power supply and main board by short, stiff open-wire connectors, fixed at one end and removable at the other.

Nothing was obviously amiss with these, so I set about removing the deck to have a look at the DVD PCB. Once the deck is out, you can see that the board is screwed to a metal frame which is, in turn, screwed to the chassis. After removing the three screws that secure the board, you usually have to persuade it to come off its connectors by applying gentle leverage with a small screwdriver. In this case however it just lifted off with no resistance from the connectors at all.

On closer examination it was clear that the connectors on the lower board were not high enough for the mating parts on the DVD board to push home on when the frame was in place. With the frame temporarily removed, I was able to connect the boards together prop-

erly and retest. The sound was then OK.

The cause of the problem was a slight bend in the lower PCB. The solution was to assemble the boards and frame together on the bench, then screw the assembly back into the case as a whole. It was possible to do this as all the fixing screws are around the edge, where you can get at them. Before putting it all back however I decided to re-sweat the flash-ROM to avoid future trouble. It looked as if one side had been done, not very well at that. I cleaned it up and redid both sides. After reassembly everything worked fine.

It's a mystery to me how the unit got the way it was. I assume that the original problem had been the old F498 flash-ROM one. This would explain why the DVD board had been removed and why there was evidence of resoldering, though why down one side only is another mystery. What I really can't understand however is how anyone who had repaired more than one of these units could have failed to spot that the very firm pressure normally required to seat the connectors on the boards, which normally link together

with a good click, couldn't be applied with this one. G.D.

Ministry of Sound MOS DV006

It's amazing how biased you can become in this business. This unit appeared amongst a batch of other trade repairs. I glanced at it and condemned it in my mind as the sort of cheap and nasty 'boxy' hi-fi that you buy for kids at about £40 in the local supermarket. When I finally got it to the bench however, expecting to issue a write-off note after five minutes of wasted time, I was amazed to discover that it's quite a heavy little DVD player. Once inside it I was again surprised when it turned out to be of remarkably good build quality.

The basic problem was that it didn't come out of standby. Several of the front-panel buttons felt 'wrong', so I started by dismantling the front panel from the rest of the unit. After stripping apart and then rebuilding this section, the mechanical action of the buttons felt much better. All was well when power was applied and the standby button was pressed. In fact I was rewarded with a very good picture on the test-bench monitor. G.D.

Test Case 494

Being on the road is not much fun in the depths of winter. Maybe that's why Doc Colin swapped his van for the warmth and comfort of the shop! As they roll out from the yard, with wipers thrashing and hot-air blowers roaring, the likes of Todd and Cathode Ray must think enviously of those at the bench, drinking their coffee in the warmth of the workshop. Cathode Ray is the company's CEO (Chief of Electronics Outdoors), signified by the ladder atop his van. Shades of Granville in Open All Hours! How he hoped, on this horrible cold day, that his first call would be confined to EMI (Electronic Mechanisms Inside).

In fact the mechanism turned out to be a Panasonic TUDSB30 satellite receiver. It's an excellent digibox with a reasonably good record for reliability. The one at Mrs Webb's house was letting the side down however. She said it was sometimes impossible to get the BBC channels: when they were called up via the EPG, an on-screen caption that said no satellite signal being received would sometimes appear, sometimes not. And this wasn't only in bad weather. After a couple of attempts Ray saw the effect himself. He found that if he selected another channel, say Sky One, then went back to a BBC channel it would sometimes be missing. Banging and tapping the box inside and out (while Mrs Webb was in the kitchen) had no effect on the fault. Neither did wiggling and thrashing the downlead and its F connector. Ray had a spare digibox – an Amstrad one – in the van. He lent it to the lady and took the Panasonic one back to the warm workshop. The good thing

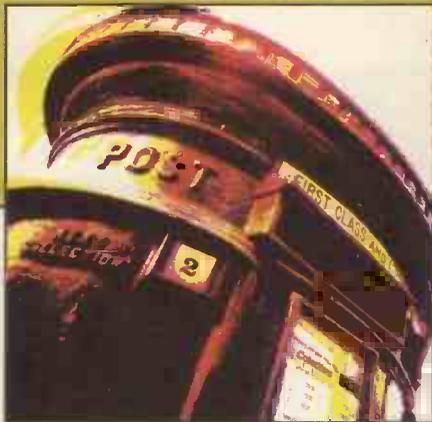
about digiboxes is that they all have the same remote control, so no driving lessons are required.

Back at the ranch the Panasonic unit was hooked up and run on soak test. Everyone who passed it was asked to switch it between Sky One and BBC1. During the next few days it gave no trouble at all. On day six another digibox came in to be tested, and it was proposed to send the Panasonic one back home. Maybe the LNB or the downlead was the culprit. When Mrs Webb was asked however she reported that the Amstrad digibox had given no trouble at all. Ray was upbraided for not trying a mains-power reset on site. It was assumed that this, after the digibox's arrival at the workshop, had removed whatever bug had been responsible for the trouble. So the box was returned to Mulberry Way, and that was that. Or was it?

Absolutely not! The lady was on the phone before lunch the following day. No signal received on the BBC channels though many others, when selected, always came up. Maybe Ray would have to climb up to the dish, in all the wind and rain, after all. In fact he didn't. But why had the loan box worked all right with the same cable and LNB? And why had the Panasonic box behaved itself at the workshop?

A solution was found, one that didn't involve any outdoor work. Yet the Panasonic box hadn't exactly suffered from a breakdown. Compatibility? Cussedness? These horrors fall to the service technician to sort out, don't they? For the solution, turn to page 249.

LETTERS



Audio servicing tip

While I was looking for a sweep generator to check cassette decks I discovered that an audio editing program on my PC has the facility to generate tones. It's called Cooledit 2001 and is from Syntrillium, which is now owned by Adobe instead of Shareware. I set the start and finish frequencies at 20Hz and 20kHz, which provides a nice sweep frequency in a 'wav' format, with a reasonably flat level and distortion at about 0.5 per cent. It's a very handy facility, as infinite frequency ranges can be selected and saved. Click 'log' to save in logarithmic format.

Philip Rosbottom,

Leigh, Greater Manchester.

Hoax

I would like to point out that the letter headed "Mobile phone warning" (January issue) is in fact a hoax. The sender was

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

Please send plain text messages. Do NOT send attachments. Be sure to type your full name, address, postcode, telephone and e-mail address (if any).

Your address and telephone number will not be published but your e-mail address will unless you state otherwise.

probably not aware of this, but the supposed scam that it warns about does not exist (for more details see <http://www.breakthechain.org/exclusives/90pound2.html>).

This type of email is common on the internet, and spreads very quickly because people seldom check whether the claim is true or not. The phrase "forward this to as many people as you can..." is often a sure sign of a hoax.

Paul Stone,
Shrewsbury.

I was surprised that you fell for one of the oldest hoaxes on the internet and circulated a warning about the supposed #90 telephone scam. The warning has been in existence for a number of years and applied only to a very few commercial telephone systems in the US in the early Seventies, where some prisoners found that they could make free calls using the police phone system!

Sussex Police Neighbourhood Watch recently fell for the hoax and sent an urgent warning to all local organisers. As one of my customers became very worried that she might get a high phone

bill, I contacted Oftel (now Ofcom of course) which confirmed that the warning was a hoax. You can read all about it at www.horstedkeynes.com/virus.html, where there is a link to the text of the Oftel reply to me.

A new hoax email warning that has also been confirmed as false by Oftel is now circulating. It concerns an automated telephone call, received on any sort of line, that tells of a "major prize win" and asks the user to "press 9 to confirm your prize". The hoax goes on to warn that pressing 9 automatically connects the line to a £20 a minute call with a minimum charge of five minutes. Again this is bogus, time-wasting nonsense – no £20 a minute line exists!

There is no way in which a modern fixed or mobile telephone system can be compromised in this way. A simple test would seem to be that if a warning says "pass this on to all your friends" it is probably best to simply delete the message.

Robert Philpot,
Haywards Heath,
West Sussex.

HELP WANTED

Wanted: UAF42 and UL41 valves for a rather old communications receiver. John Taylor, 1 Bridge Street, Kirkwall, Orkney, KW15 1LD. Phone 01856 878 694.

Wanted: DV (Digital Video) cartridge to fit a Philips CDi player, or any information on possible repair. Problem is that when playing DV titles the sound and/or picture freeze. The cause is not the optical block, as this has already been replaced. Please contact Darren at

darrenmjcky@aol.com

Wanted: Mains power supply/battery-charger unit and batteries for use with a Sony CCD-TR1100E camcorder. The handbook is not too clear about part numbers: they appear to be either AC-V316 or AC-V326 for the power supply and NP-F530 for the battery. The originals were stolen. Tony Gavin, 2 Greenland Court, Allesley Green, Coventry, CV5 7QY. Email address tony.gavin@cyberpass.fsnet.co.uk

Wanted: For spares, Quad 405 power amplifiers, also 34 and 44 control units. Boards and panels for these units also required. Phone Mike on 01758 613 790.

Wanted: Full workshop manuals for the following: the Finlandia Nican VCR Model V/WHSJP6/F and the Technics SL-DV170 audio/video stack system. B. Housley, 30 Arncliffe Drive, Weelands, Milton Keynes, Bucks, MK13 7LH.

Wanted: Information on how to unlock the four-number security code used with the Matsui CTV Model 2107T. J. Williams, THS, 10 Clapham Park Road, London, SW4 7BB. Phone 020 7622 7762.

For sale: A 10kV, 3mA power supply fully adjustable +/-; and a photomultiplier power supply, again fully adjustable, but at 5kV. The two units are in one 19in. rack mounting. They are very heavy, so would have to be collected or transport charges paid from Plymouth. Allan Lloyd, 237 Grenville Road, St Judes, Plymouth, Devon, PL4 9QE. Phone 01752 261 541 after 1500 hours.

Wanted: Old half-inch diameter ferrite rods. Must be six inches or more long. Will pay

very good money for them. Peter Tankard, 16A Birkendale Road, Sheffield, S6 3NL. Phone 07931 463 823 (mobile).

Wanted: 26in. Decca Bradford chassis or working A66 CRT for a renovation project. Best price paid and will collect. Phone Tim on 01722 327 391 (Salisbury, Wiltshire) or email tim@tw100.co.uk

Wanted: Can anyone suggest how to convert a colour set to a simple oscilloscope (three beams!) safely? I did it with a monochrome set over thirty years ago, but my memory isn't what it used to be! The scope would be used for checking various cables at frequencies of 1-50Hz, so a converted set would be adequate. Please email Ray Pressnell at rocks@postmanpat.org.uk

Wanted: A service manual or circuit diagrams and alignment instructions for a Panasonic Home Production Console model WV-J10E/B. It's quite old, but an essential piece of my ATV (radio ham) station. Beg/borrow/photocopy/buy. Please contact Geoff Darby e-mail monitech@ntlworld.com

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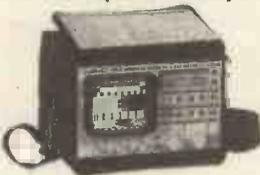
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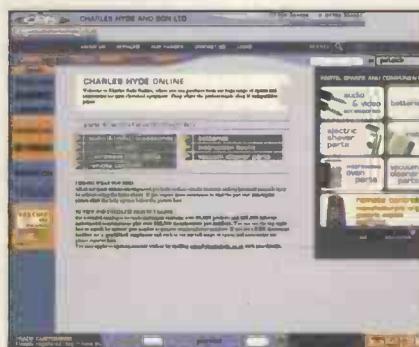
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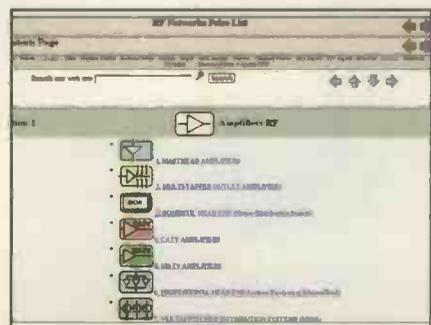
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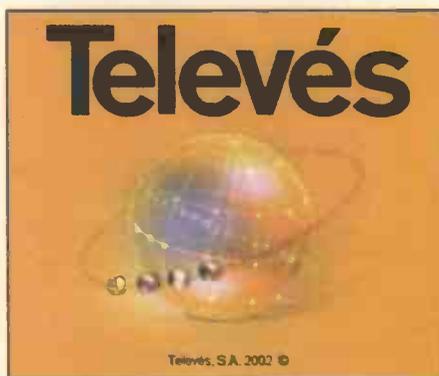
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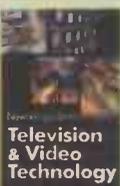
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SATELLITE NOTEBOOK

Reports from
Michael Dranfield
Christopher Holland
 and
Hugh Cocks

Amstrad DRX400

This digibox produced the "no satellite signal" message. The cause of the problem was a faulty front-end ZIF chip, U102 (CX24108-20). It's the same chip that's used in the earlier DX300 model, so it looks as if this may become a common fault.

The DRX400 is better built than the DRX300, with all the component numbers screen printed on the PCB. The 300 has no screen print at all. Note however that the top cover on the DRX400 is very difficult to remove. Because it's such a tight fit, a dealer phoned me the other day to ask how to remove the lid on one he had in for repair. M.D.

Amstrad DRX300

This digibox was stuck in standby. It didn't take long to discover that the CX24110-11ES QPSK demodulator chip IC103 was getting hot, in fact very hot – it was running at over 100°C. I fitted a replacement, but this also became hot very quickly and I switched the box off. A

quick check at pin 9 revealed that the 3.3V supply was spot on.

The cause of the fault was eventually traced to a short within the CX24108-20ES front-end ZIF chip IC101. Fortunately the new CX24110-11ES chip hadn't been damaged.

Take care when replacing components in this model. As the PCB has no screen printing, it's easy to remove an IC and then not know which way round to fit the replacement. M.D.

Intelsat 801

We looked at the C band outputs from this satellite, which is in orbit at 31.5°W, a while back. This time we'll see what it has to offer in Ku band. The satellite's Ku-band transmissions are directed at two different areas: its vertically-polarised beam covers most of Europe, while the horizontally-polarised beam covers North and South America and the Caribbean. The latter does not concern us here in Europe – we can't receive the signals!

As Intelsat 801 has no permanent TV transmissions, finding it can be difficult without a spectrum analyser. Fortunately the Spanish Hispasat is just to the east, at 30°W, and can be easily identified. When, using a satellite alignment meter, you find a strong satellite here, tune the receiver to 12.090GHz V with a symbol rate of 27,500 and an FEC value of 3/4. The Spanish channel TVE International and the financial channel CNBC should appear at this frequency, along with some chan-



Photo 1: French LCI (24-hour news channel) feed via Intelsat 801.



Photo 2: French TF1 (first channel) feed via Intelsat 801.



Photo 3: French TF1 (first channel) feed via Intelsat 801.



Photo 4: French TF1 (first channel) feed via Intelsat 801.

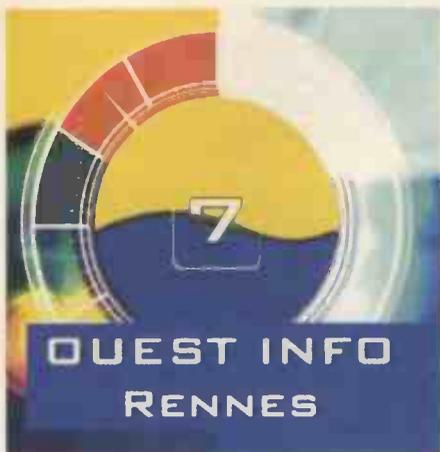


Photo 5: French TF1 (first channel) feed via Intelsat 801.



Photo 6: Start of German regional public TV service weather forecast, received via Intelsat 801.



Photo 7: Setting up a map for a German regional public TV service weather forecast, received via Intelsat 801.



Photo 8: BBC South West regional news feed via Intelsat 801.

Table 1: Intelsat 801 Ku-band feed frequencies

Frequency	Symbol rate	Service
10-990GHz	5,632	German weather feeds
10-990GHz	6,111	MTV Germany feeds*
10-999GHz	5,632	BBC feeds
11-008GHz	5,632	TF1 France regional feeds
11-017GHz	5,632	TF1 France regional feeds
11-026GHz	6,632	TF1 France regional feeds

Forward error correction 3/4 in each case.

*Uses 11-008GHz if German weather is on air.

nels (scrambled, not FTA) in the EPG list. Move the dish slightly westward from Hispasat and Intelsat 801 should be found. If a spectrum analyser is available, there is always activity (no TV unfortunately) at about 11.120-11.200GHz and above 11.450GHz, all with vertical polarisation. A narrowband beacon always seems to be present at about 11.030GHz.

Intelsat 801 was launched in 1998 and was used by ITV shortly afterwards for French Euro 98 football coverage, linking back to the UK in the good old PAL analogue format. For some years after that many ITV links for European Formula One motor racing coverage were to be found, plus French Canal Plus coverage of local football matches and Sky Sports News feeds. These all seem to have left, and as a result the satellite is somewhat quieter. But there are still interesting feeds from time to time.

Table 1 shows current Ku-band feed frequencies. French first channel TF1 regional feeds are very active between 11 and 12 a.m. (UK time) prior to their lunchtime news. I've also seen feeds for the French 24-hour news channel LCI (see Photo 1) at the same frequencies. Both MPEG 4:2:0 and 4:2:2 are used. To a lesser extent you also find feeds in the afternoon and evening (see Photos 2-5).

The weather forecasts for German regional public TV services such as WDR and SWF at 10-990GHz are mainly in the

morning and evening. The feed always starts with colour bars (see Photo 6) and may then show the setting up of satellite weather maps (see Photo 7) prior to the start of the actual weather information. The standard is always MPEG 4:2:0. The German version of the MTV music channel also uses this frequency, but with a different symbol rate (6,111). If weather transmissions are on air, MTV uses 11-008GHz, avoiding what appears to be exclusive BBC use of 10-999GHz.

The channels have clearly-defined 9MHz spacings: any channels below 10-990GHz will be at 10-981, 10-972, 10-963 and 10-954GHz.

UK feeds may be present but, so far, I've seen only outside broadcast inserts for the BBC South West regional news programme Spotlight at 10-999GHz. It's possible that other frequencies below 10-990GHz may be used. See Photos 8 and 9 – note the spelling mistake in the latter! But whenever I've seen them the BBC Spotlight feeds are several dBs weaker than the French and German feeds. They use MPEG 4:2:2 exclusively. H.C.

Digital channel update

The latest channel additions at 28.2°E are listed in Table 2. Where allocated, the EPG number is shown in brackets after the channel name. The Astra Information channel uses the symbol rate 27,500 with FEC 3/4, not the usual 2/3 with this SR.

Table 2: Latest digital channel changes at 28.2°E

Channel and EPG no.	Sat	TP	Frequency/pol
Apple FM (913)	EB	D7S	11-585GHz/H
Astra Information (see text)	2A	40	12-480GHz/V
Desi Radio (919)	EB	D7S	11-585GHz/H
Entertainment	EB	D4S	11-527GHz/V
GlobeCast test card	EB	D12S	11-680GHz/V
Kerrang Radio	2B	32	12-324GHz/V
Kingston Inmedia*	EB	C5	11-426GHz/H
Kiss FM	2B	32	12-324GHz/V
Smash Hits Radio	2B	32	12-324GHz/V
UCB TV (677)	2B	36	12-402GHz/V

*Colour bars. Uses Astra 2D symbol rate of 22,000 with FEC 5/6.

TP = Transponder. EB = Eurobird. 2A, 2B = Astra 2A/B.

Table 3: Free-to-view channels via 28.2°E

101 BBC1 (regional variations 941-958)	464 Classic FM TV
102 BBC2 (regional variations 960-962)	467 Channel U
103 ITV1 (see text)	501 Sky News
104 Channel 4 (see text)	507 BBC News 24
105 Channel 5 (see text)	508 BBC Parliament
115 BBC3 (from 7 pm)	513 CNN
116 BBC4 (from 7 pm)	525 ITV News Channel
181 Travel	528 Euronews
182 Travel Channel 2 (mornings only)	534 CCTV9 (Chinese Central TV 9)
184 S4C (see text)	616 CBBC
202 Life TV	617 CBEEBIES
208 Showcase TV	619 Pop
220 Fashion TV	620 Pop Plus
223 Game Network	630-700 Shopping and religious channels
229 You TV	805 PCNE Chinese TV
235 Avago	807 Muslim TV
238 Ben	824 Abu Dhabi TV
241 Reality TV	827 ATN
247 Classics TV	828 Vectone Urdu
259 Performance	829 SAB TV
265 Rapture TV	830 Record TV International (Brazil)
268 Friendly TV	831 Vectone Hindi
271 ACTV	832 Vectone Tamil
274 Live TV	833 Vectone Bangla
277 Nation	851-927 Radio stations including
280 OBE	851 BBC R1
283 Game in TV	852 BBC R2
327 TCM	853 BBC R3
416 Motors	854 BBC R4
422 Extreme Sports	855 BBC R5
429 Golf Channel	865 BBC World Service
431 I Sports TV	870 BBC R6
455 Chart Show TV	881 BBC R7
456 The Vault	

The channel can be found only by entering the information in the 'add channels' menu of the digibox.

Bravo + 1 (EPG no. 125) has moved to Astra 2A transponder 2 (11.740GHz/V).

I Sports TV, mentioned last month (EB transponder D7S), has been allocated EPG no. 431. Game in TV, also mentioned last month (EB transponder C5), has been allocated EPG no. 283. C.H.

Unusual test cards

More unusual test cards and captions. During President Bush's recent visit to the UK a Eurovision feed from outside

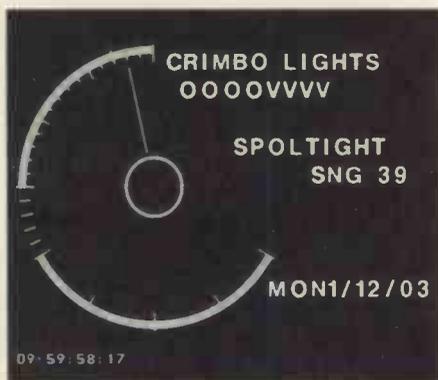


Photo 9: BBC South West regional news feed via Intelsat 801.

Buckingham Palace was present via Eutelsat W3 (7°E). A live picture could be seen at times, see Photo 10, switching to colour bars, see Photo 11. Two feeds were used for the many European journalists that filed stories during the three-day visit.

At the end of September PanAmSat-3R (43°W) carried feeds for coverage of the US Formula 1 race for ITV (see Photo 12) and RTL (see Photo 13). They were close to each other at about 12.7GHz V. The satellite, covered recently (October) in this column, is used by many European broadcasters for transatlantic feeds. H.C.

FTV channels

We are often asked which channels digiboxes can receive without a viewing card in the slot now that BBC reception doesn't require one. They are listed in Table 3, which was current at the end of December.

ITV1, Channel 4 and Channel 5 require a 'free to view card'. At present this can be obtained by phoning 0870 054 1800 and ordering one. The cost is a one-off payment of £23.50 – the card will last for several years.

If the viewing card is registered at a Welsh address S4C is at 104 and Channel 4 (in Welsh) is at 184. C.H.

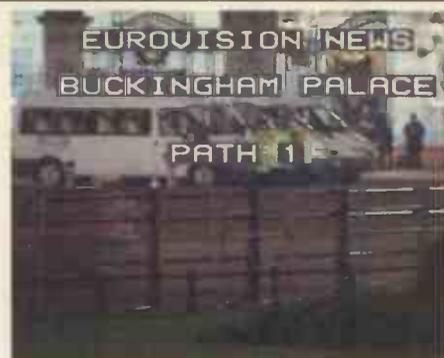


Photo 10: Eurovision newsfeed from outside Buckingham Palace during President Bush's visit, received via Eutelsat W3.



Photo 11: Eurovision newsfeed from outside Buckingham Palace during President Bush's visit, switched to colour bars.



Photo 12: ITV newsfeed for coverage of US Formula 1 racing, received via PAS-3R.



Photo 13: RTL newsfeed for coverage of US Formula 1 racing, received via PAS-3R.

Solution to Test Case 494

- see page 239 -

Well, the lads could hardly have been expected to work this one out for themselves! Maybe a lengthy session on site with test equipment would have revealed more about the fault but not, probably, its root cause. In fact it's a quirk of this digibox's design, one shared by the similar Panasonic Models TU-DSB20 and TU-DSB35. What seems to happen is that, with certain combinations of receiver and LNB, the receiver can 'stick' the LNB in the high-band mode, which normally requires the presence of a 22kHz tone via the download.

It might be possible to solve the problem by trial-and-error, using different makes or batches of LNB. But, since the fault really lies with the receiver, there's a simpler solution (Ray was glad to hear!) that involves a simple modification. It comes in the form of a little black wire-in module from SatCure: it's called Panafix, costs £11, and can be ordered from the webshop at www.satcure.co.uk

There's now a spare kit in the van, ready for fitting on site when required - it goes in quickly and easily.

TV and video hardware is seen by broadcasters and viewers simply as a means to an end, money and programmes respectively. But there has to be somebody around to sort out the problems and fix them as they arise, doesn't there? In the early days of TV there were all sorts of modifications, like changing the value of or adding a capacitor here or there. Some things don't change!

NEXT MONTH IN TELEVISION

Workshop equipment guide 2004

Eugene Trundle takes a look at what's good and what's new in the world of test gear and service aids for bench and field work. There's a whole armoury of equipment for testing, fault diagnosis, repair and setting up with today's digital and analogue circuitry and systems. Part 1 kicks off with traditional analogue equipment.

Servicing the Philips L01 chassis

The Philips L01 was designed as a global 50Hz chassis able to drive 14 to 32in. tubes with 4:3 and 16:9 aspect ratios. It's based on the Philips Ultimate One Chip (UOC), an 80-pin surface-mounted IC that acts as the microcontroller and signal processor (sound, video and deflection). Brian Storm describes the circuitry used, the service modes and lists some known faults.

Simple volume compressor circuit

Keith Cummins discovered that the car mobile-phone hands-free kit he bought was very loud and prone to howl-back. To overcome the problem he devised this simple volume-compressor circuit.

Extended fault reports

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

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WHAT A LIFE!

12-500
19-500
7-500
3-8-500
3-1-500
11-500
SS-SS

Odd customers and their sets. The role of batteries in the trade over the years. Points from emails. Donald Bullock's servicing commentary

"Hello Mr Bulmer!" sang the little chap who came through the shop door the other day, "it's me, Mr Leaky, couldn't it?"

I recalled Mr Leaky well, having repaired his old Pye television set not all that long since. When he paid he had made the amusing observation "funny how one moment you've got thirty powends in your pocket and the next it's in someone else's!" Well, yes! I eyed him anxiously, wondering whether he'd come to ask for it back or to pay me some more. It turned out to be the latter, and I was soon all smiles again.

"I recommended you to my neighbour, Mrs Hewitt" he continued. "Er set died on 'er last night, like. She's a widow. Rather fancy her, so I said 'let me take it to Mr Bulsome, 'e'll do it.' 'Clarence, you're so kind' she'd replied. Anyway, 'ere I am with it like. It's in the car, isn't it?"

It turned out to be a Sharp 56FH53H (DA100 chassis) and, when Mr Leaky had piped off, Steven got it on to the bench and started to make some checks with his meter.

"Trouble in the power supply" he announced, "the HT reservoir capacitor has blown its top clean off."

He replaced it and started to check associated components. In the process he found that the regulation feedback optocoupler IC705 was short-circuit.

When I looked his way a few minutes later he was still frowning. "Can't make it out" he commented, "my meter tells me there's an avalanche diode up the creek, but I can't see one!"

It turned out to be on the copper-print side of the panel – D735, type BZX04-145. He removed it, checked it and looked up the specification.

"Good thing I did" he said, "with a number like that you'd think the breakdown voltage would be 145V, but it's not – it's more like 170V. Bit of bright numbering, that!"

He replaced the optocoupler and avalanche diode and switched the set on. It's voltages were now normal, and it behaved perfectly.

Boozer's Beko

Boozy Bashford then stumbled in with a TV set that Paul seemed to recognise. Boozy runs a dockside pub, and is reckoned to be its best customer.

"I'm seething" he said thickly as he swayed about, rolling his bloodshot eyes around for somewhere to put his set down.

Fearing that he might drop it on to a few sets that had been done and were parked on the shop floor, Paul raced round, took it and placed it on the bench. "What's the matter then?" he asked.

"I've just had to throw a drunk out of the pub" he said. "Third time this week! If there's one thing I can't stand it's someone who drinks too much."

"Too true" said Paul.

The set was a Beko, Model NR28128NX. Boozy said it was dead, then staggered off.

Paul examined its chassis carefully before carrying out any tests. "Another burnt out R101" he commented, "that means a faulty line output transformer."

"How do you know that?" I enquired.

"Because we've had three like it recently" Paul replied.

He fitted a replacement, and asked Steven to add another one to the order that was being prepared for SEME. R101 also had to be replaced of course: it's 4-7Ω, 0-5W. The set then worked normally.

Old Fishy's Bush

As Paul stowed the Beko set under the bench Old Fishy appeared outside the front door, mouthing silently through the glass. He was carrying a Bush Model 2027T. Steven ran across and opened the door for him.

"Morning Mr Carp!" he said, "has your set failed?"

"Yes he bloody have!" said Fishy. "Once a year 'e goes west, allus about this time."

"Good!" Steven interjected, "if this goes on many more years we'll have to give you a quantity discount. Remind me about 2010!"

"It ain't good enough, you know" continued Fishy.

"Nah – every six months would be better!" said Steven.

When he tried the set the picture was too small and resembled a dome.

"Whatever could this be?" he muttered. Then he noticed that there was also a slight hum. When he checked the outputs from the power supply he found that the HT voltage was low, with AC ripple. The reservoir capacitor was low in value.

Tightwad Sceats

Our next caller was Tightwad Sceats. We weren't at all excited to see him, because there's no money at all in him. In winter he makes a living selling tripe, while in summer he sells ice-cream. He's also an undertaker, when he can get a client. Tightwad has never bought an envelope in his life. He simply crosses out his name and address on ones sent to him and reuses them to send out his replies and bills – sealing them with paper tape, and never putting enough stamps on.

"Will you test this battery at no charge?" he asked Paul.

Paul did so and told him it was flat.

"Right, give it me back will you?"

Tightwad said, "I know where to get 'em cheaper than you'd charge."

Batteries

While Greeneyes was out shopping the other morning she noticed that her watch had stopped. We had arranged to meet that lunchtime for something to eat. Because she couldn't bear the thought of missing me (or was it the food?) she popped into a jewellers to see if it needed a battery. It did, and she was charged £4.

Later we found ourselves in one of those 'Everything for a £' shops and

bought a card of about twenty similar batteries for £1. There's obviously something cockeyed somewhere. It set me thinking about the ever-changing battery scene.

When I first came into the trade so-called personal radios were mains-battery types that were full of valves. They were usually built into a rexine-covered box with an attaché-case type lid, and were big by today's standards – about four inches thick and a foot square. Battery manufacturers loved them, as each set used two hefty batteries that didn't last long. One was used to light up the valves, the other to provide an HT voltage.

Incidentally as these sets aged, those customers who used them with a mains supply would complain that the Light Programme (Radio 2 to most of you) had disappeared. The remedy was to replace the frequency-changer valve, usually a DK91 or DK96, or change the voltage tapping from 240V to 220V.

Then, quite suddenly, the reps started to prepare us for the advent of the transistor radio. Our Ever Ready man, a rather insecure fellow who used to call every week and top up our battery rack with new stock, became a very worried man.

"It seems that the batteries will last virtually for ever" he complained. "I'm going to have to keep my eyes open for another job."

Fortunately for him he didn't find one. While the first transistor radios were of similar size and shape to the valve models they replaced, the set-makers soon began to produce smaller and smaller radios that used smaller and smaller batteries which lasted no time. The rep's living standards rose visibly, along with his confidence.

Sales spiel

About that time I changed my job, going to work at a multiple shop that was managed by a chap we called Porky. The bench engineers told me he was the ninth manager that year. "They don't last long" one of them said, "they come and they go."

Like his predecessors, Porky's wages were set at peanut level so that he would be encouraged, or driven, to make them up with the commissions he earned on sales. I soon noticed that he was selling transistor radios at a phenomenal rate. We in the service department upstairs wondered how he managed it. I found out one day when I was in the showroom, replacing a valve in a stock set.

An old couple came in with a valve portable.

"Can you change the batteries?" he was asked.

"I can do better than that" breezed Porky, taking their set off them and putting it down. "I can sell you a set that's lighter, smaller and costs virtually nothing to run!" With that he led them to a display of transistor sets and started to deliver his spiel. The couple were impressed when he told them that the sets used just one tiny, cheap battery.

"And how long does the battery last?" he was asked.

"Last!" echoed Porky, "it lasts absolutely for ever! Once you buy one of these you've finished buying batteries for life."

And with that his till took another hammering and the set went from the shop in the arms of his beaming customers.

By coincidence I was in the shop a few weeks later when the same couple came back with the set. It was dead.

"Most unusual!" exclaimed Porky as he took the set into his hands. "By the way, there's a new machine on that stand over there. It makes your early morning cup of tea all by itself!"

"Eh?" they exclaimed as they turned to look at a Goblin Teas Maid. As they did so he swiftly replaced the battery and their set sprang to life.

"Ha, loose wire!" he exclaimed. "Sorry about that. The set will be all right now."

As the couple trundled out, beaming again, Porky casually popped the battery back into his stock behind the counter.

We were to discover that he had been doing a great deal of this. He solved his stock deficiencies by reselling the dud batteries. Of course it all caught up with him before long, and he was soon replaced with manager number ten.

I was reminded about all this by a letter from Mark Garton in the last issue. He referred to the AF117 type germanium transistors used in many vintage transistor radio sets. I recall them well, and the recurring short-circuit fault that would develop between the earthed internal screen and the collector. The result was a silent set and, very often, a flat battery as well by the time the set came to us.

The transistors had four leadout wires, the one for the base being apart from the other three, which were for the screen, collector and emitter. As Mark points out, all you have to do to bring the set back to life is to use a pair of

fine-nosed snips to separate the screen lead. We used a tiny dentist's mirror, or perhaps I should say a dentist's tiny mirror, to see what was what in some small, closely-packed sets.

Those AF117s made a good few bob for us.

Emails

Bill Wright, whose website address I gave in the January issue, says my mention generated a lot of website visits. He also mentions that he's getting a bit 'long in the tooth' for ladder work – "I run out of puff and have to pause on every second rung". Writing just before Christmas, he says "I'm sure you'll exercise moderation over the festive season". I wish I could share his optimism!

Alan Velden has sent me another email recalling the F.J. Camm days. Says he had always thought that the name was a pseudonym. Not so Al, there was an FJC all right – he made numerous appearances at shows, lectures etc.

Alan also says he agrees that TV engineers have always been absurdly underpaid – even in those far-off times when the sets themselves were sensibly priced. Alan, a youngster of 67, says he left the trade back in 1966 to become a postman, as that was a better-paid job.

He also recalls the then well-known, maroon-covered Newnes *Radio and Television Servicing* books that contained nothing but condensed service information for hundred and hundreds of receivers, with a separate volume issued each year. You could buy them as sets of books or separate ones.

My first set came as something of a surprise, as I hadn't ordered it! The accompanying bill seemed to be for rather a lot of money. I immediately contacted Newnes, which sent me an apologetic letter and a photostat of the coupon it had received, made out with my name and address. This was a hoax, and I recognised the handwriting. To save me the expense of returning the books, Newnes invited me to accept them at no charge.

By the time I discarded them years later every page was well worn from frequent use. They must have made me a fortune, enabling me to repair so many sets. I had every reason to be thankful to the hoaxer, who had set out to cause me trouble but had in fact done me one of the best turns in my life.

Keep the emails rolling in!
The address is
donald@wheatleypress.com



Colour CCTV camera, 8mm lens, 12V d.c. 200mA 582x628 Resolution 380 lines Automatic aperture lens Mirror function PAL Back Light Compensation MLR, 100x40x40mm. Ref EE2 E69

Built-In Audio .15lux CCD camera 12V d.c. 200mA 480 lines s/n ratio >48db 1V P-P output 110mm x 60mm x 50mm. Ref EE1 E99



Metal CCTV camera housings for internal or external use. Made from aluminium and plastic they are suitable for mounting body cameras in. Available in two sizes 1 - 100 x 70 x 170mm and 2 - 100 x 70 x 280mm. Ref EE6 E22 EE7 E26 multi-position brackets. Ref EE8 E8

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Self-cooking pistol plier 002 crossbow with metal body. Self-cooking for precise string alignment Aluminium alloy construction High tec fibre glass limbs Automatic safety catch Supplied with three bolts Track style for greater accuracy. Adjustable rear sight 50lb drawweight 150ft sec velocity Break action 17" string 30m range £21.65 Ref PLCR002

Fully cased IR light source suitable for CCTV applications. The unit measures 10 x 10 x 150mm, is 12V d.c. operated and contains 54 infra-red LEDs. Designed to mount on a standard CCTV camera bracket. The unit also contains a daylight sensor that will only activate the infra-red lamp when the light level drops below a preset level. The infra-red lamp is suitable for indoor or exterior use, typical useage would be to provide additional IR illumination for CCTV cameras. £49. Ref EE11



Mains operated and designed to be used with any CCTV camera causing it to scan. The clips can be moved to adjust the span angle, the motor reversing when it detects a clip. With the clips removed the scanner will rotate constantly at approx 2-3rpm. 75 x 75 x 80mm £23. Ref EE12

Colour CCTV Camera measures 60x45mm and has a built-in light level detector and 12 IR LEDs 0.2 lux 12 IR LEDs 12V d.c. Bracket Easy connect leads £69. Ref EE15



A high quality external colour CCTV camera with built-in infra-red LEDs measuring 60 x 60 x 60mm Easy connect leads colour Waterproof PAL 1/4in. CCD 542 x 588 pixels 420 lines 0.05 lux 3-6mm F2.78 deg lens 12V d.c. 400mA Built-in light level sensor. £99. Ref EE13

Colour pinhole CCTV camera module with audio. Compact, just 20x20x20mm, built-in audio and easy connect leads PAL CMOS sensor 6-9V d.c. Effective Pixels 628x582 Illumination 2 lux Definition >240 Signal/noise ratio >40db Power consumption 200mW £35. Ref EE21



A small colour CCTV camera measuring just 35 x 28 x 30mm. Supplied complete with bracket, microphone and easy connect leads. Built-in audio. Colour 380 line resolution PAL 0.2 lux +18db sensitivity. Effective pixels 628 x 582 Power source 6-12V d.c. Power consumption 200mW £36. Ref EE16

Complete wireless CCTV system with video. Kit comprises pinhole colour camera with simple battery connection and a receiver with video output. 380 lines colour 2.4GHz 3 lux 6-12V d.c. manual tuning Available in two versions, pinhole and standard. £79 (pinhole) Ref EE17, £79 (standard). Ref EE18



Small transmitter designed to transmit audio and video signals on 2.4GHz. Unit measures 45 x 35 x 10mm. Ideal for assembly into covert CCTV systems Easy connect leads Audio and video input 12V d.c. Complete with aerial Selectable channel switch £30. Ref EE19



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Beltronics BEL550 Euro radar and GATSO detector Claimed Detection Range: GATSO up to 400m. Radar & Laser guns up to 3 miles. Detects GATSO speed cameras at least 200 metres away, plenty of time to adjust your speed £319. Ref BEL550

The TENS mini Microprocessors offer six types of automatic programme for shoulder pain, back/neck pain, aching joints, Rheumatic pain, migraines headaches, sports injuries, period pain. In fact all over body treatment. Will not interfere with existing medication. Not suitable for anyone with a heart pacemaker. Batteries supplied. £19.95 Ref TEN327 Spare pack of electrodes £5.99. Ref TEN327X



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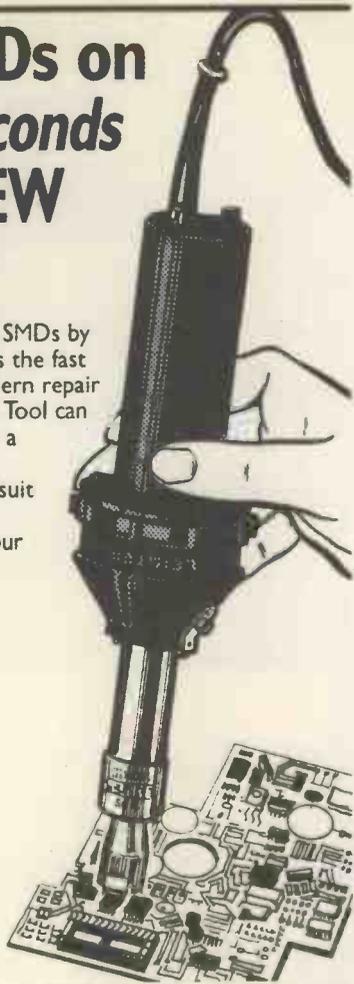
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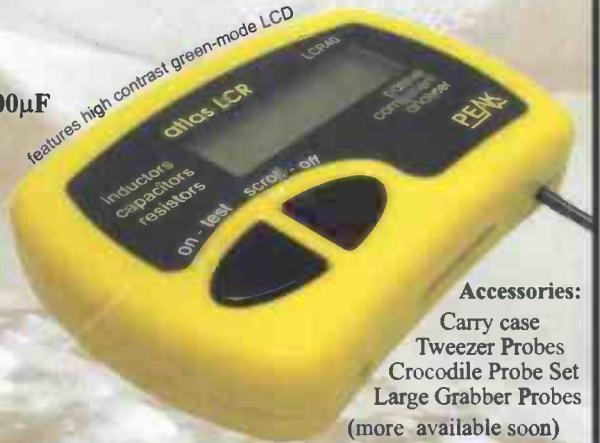
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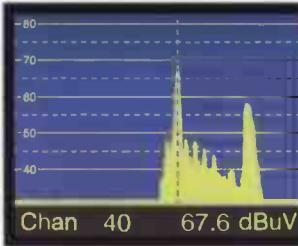
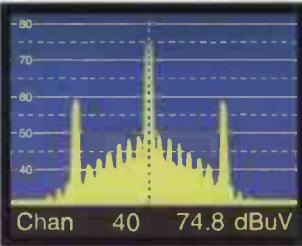
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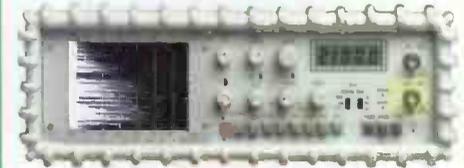
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