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HIGHBURY BUSINESS

The strange story of liquid crystals

Much of what we regard as typical of today's world actually had its beginnings in the late nineteenth century, when amongst other things electricity was beginning to revolutionise life. For example quite a lot of work had been done on primitive electron tubes by 1890, and by 1897 Karl Ferdinand Braun had developed a recognisable CRT, with plates for deflection. He went on to develop the Braun-Wehnelt CRT in 1906: it included a grid (wehnelt) that enabled the beam to be modulated, thus making picture displays possible.

Strangely, knowledge of liquid crystals dates from the same period, though little was done with the phenomenon for several decades after that. The liquid-crystal effect was first observed by an Austrian botanist, Friedrich Reinitzer in 1888. He had been studying cholesteryl benzoate and discovered that the substance had two distinct 'melting points', changing first to a hazy liquid then into a transparent liquid, something that had not previously been seen. The first commercial production of liquid crystals started a hundred years ago, in 1904, when the German company Merck began to manufacture them for research purposes. Merck continues to be one of the largest manufacturers of the liquid crystals used in today's TV and PC screens.

A huge amount of research work on various liquid-crystal materials has been carried out over the years. But by the Thirties interest had fallen to a very low level, as no one could envisage a commercial use for them. They continued to be studied mainly as curiosities. Interest was revived in the Sixties when James Fergason at Westinghouse in the US and George Heilmeier at RCA proposed their use for a variety of applications. Central to their proposals was that fact that a change of state occurred when a voltage was applied, and that this could be used to control reflection or the passage of light. This led to electronic liquid-crystal displays. George Heilmeier devised such a display in 1968, its main drawback being an operating temperature of about 80°C. Nevertheless it didn't take long for commercial applications to follow: calculators and then watches with liquid-crystal displays became available in the Seventies and early Eighties.

Various liquid-crystal mechanisms were investigated and adopted or dropped, but the real advances for TV and PC display technology came when charge-coupled device (CCD) and thin-film transistor technology were integrated with panels to provide scanning and pixel control. Today's high-performance screens are the result of huge R&D investment by the likes of Sharp, LG and Samsung. Nanotechnology is playing a part, making brighter screens possible by using minute prisms to adjust the light-beam paths through a display.

Sales of LCD monitors are expected to exceed those of CRT types for the first time this year. For TV, the crossover point is still likely to be a few years hence. Of some 140m TV sets sold worldwide last year, only 3m had LCD screens. Predictions are for 9m this year, 15m in 2005 and 30m by 2007. At present LCD displays are still more expensive to produce, by quite a margin, than CRTs. But production is expanding rapidly, which means reduced prices. Somewhere along the line there could be commercial problems: the huge investment being made won't pay off if price competition means negligible – or no – profit.

However that might be, the history of liquid crystals to date has been quite remarkable.

Online TV

Most of us can pay attention to only one screen at a time, and there's a limit to the hours any of us can devote to TV or online activities. So an increase in broadband use is likely to mean less TV viewing. This has been confirmed by some research carried out by Strategy Analytics. The study, based on 800 broadband users in seven countries throughout Europe, found that 56 per cent said they spent a lot less time watching TV since subscribing to broadband services.

David Mercer, principle analyst at Strategy Analytics, concludes that "TV is clearly suffering most from the rapid growth of broadband. A growing number of people are choosing to spend their spare time communicating online and finding entertainment via the internet rather than sitting in front of a TV set".

So the broadcasters will have to sit up. For its part the BBC is to launch a three-week pilot project that could eventually lead to all its TV programmes being made available via the internet. The pilot project, called iMP (internet media player), will involve 500 of the Corporation's staff who will be provided with PDAs and access to a range of programmes. It's expected to be followed by an external trial involving 1,000 people selected from subscribers to AOL, BT and Tiscali's broadband services. Those taking part will be able to scan an online guide and download any programme, which could be viewed on a PC screen or recorded on a DVD and then watched via a TV set.

Ashley Highfield, the BBC's director of new media and technology, commented that "if we don't enter this market, then what happened to the music industry could happen to us".

The trial will investigate whether people watch more TV with iMP and whether they alter their viewing patterns.

NEWS

Philips demonstrates 13in. polymer OLED TV

At the Society for Information Display's International Symposium in late May Philips demonstrated a 13in. TV set that uses a polymer OLED (organic light-emitting diode) display. It has been produced as a prototype to show the feasibility of using a multi-nozzle, multi-head ink-jet printer to manufacture large-screen polymer OLED displays.

According to Philips polymer OLED technology has a number of advantages in comparison with current LCD displays, including a wider viewing angle and a faster response time. The latter makes it ideal for the display of moving video. It also has excellent black-level performance and picture contrast, because this type of display is emissive. Thus no backlight is required, and the displays can be manufactured with a very thin form-factor – the display can be as thin as a pane of glass.

Philips Research has developed an inkjet printing process that uses a four print-head machine equipped with 256 piezo-driven nozzles. Working with polymer OLED print-head manufacturer Spectra, Philips has developed inks, print heads and substrate processes to enable large-screen polymer OLED displays to be produced. The process uses a printing method in which each sub-pixel (R, G or B) is built up from multiple droplets fired from different nozzles. It's capable of producing displays of up to 24 inches. Philips says that larger displays would be possible simply by increasing the size of the printer.

The PolyLED TV display uses a number of video processing techniques to enhance picture quality, including a drive arrangement that varies the duty cycle for each display line depending on the image load: in dark scenes a high local peak brightness is combined with the black state of the OLEDs, while in bright scenes the brightness is kept at an average value. Colour processing is used to improve further the overall image quality.

Philips is already using polymer OLED displays in various new products, including its 639 mobile phone.

Analogue switch-off trial

The government is to ask residents in two Carmarthenshire villages to take part in a trial that would involve switching off the local analogue transmitter at Ferryside, which provides services for about 400 homes in parts of the villages of Ferryside and Llansteffan. If the residents agree, those without digital TV equipment would be given Freeview set-top boxes free – one for every TV set owned or rented. It has been estimated that 2·35 STBs would be required per household. A government spokesman has stressed that there is no intention to make such an offer at the national level.

If the trial goes ahead, it will begin in November and last for three months. Afterwards the residents would be polled about switching the analogue signals off permanently.

Hauppauge Digital's DEC1000 Freeview receiver is now, incidentally, being sold by WH Smith for £49.99.

The government has taken a step towards setting a date for the switch to digital-only TV by inviting broadcasters for talks to agree on a timetable.

Bench multimeter from TTi

Thurlby Thandar Instruments (TTi) has launched a new auto/manual ranging bench digital multimeter, Model 1604, with extended resolution and numerous extra features. Price is £199 plus VAT. The new multimeter has a 4¾-digit scale length (40,000 count), provides true RMS AC measurement, and has a resolution down to 10μV and 10mΩ. There are several 'smart' functions, such as relative measurement and minimum/maximum storage. The T-hold function enables readings to be held on the display automatically each time a new test point is probed.

Good AC bandwidth provides accurate measurement within the audio band and ensures that higher-frequency components of switching waveforms are included in the measurement. Frequencies up to 40kHz can be measured, with a maximum resolution of 0·1Hz.

The instrument incorporates an isolated RS232 interface that can be used to send readings to a PC. Data logging software for use with a PC is available, to provide full remote control of the multimeter with the display and keyboard duplicated on the screen. A data-logging facility enables readings to be stored at a timed interval.

For further details call 1480 412 451 or email: sales@tti-test.com

New optical disc format

A new optical disc format known as DualDisc is being test marketed in the US. The discs are dual-sided, with CD audio (16-bit, 44·1kHz sampled) on one side and DVD-Video or high-resolution DVD-Audio on the other side. Five major record companies – BMG, EMI, Warner Music Group, Sony Music and Universal – have been test marketing thirteen DD titles in Boston and Seattle.

A DD disc consists of two bonded half discs and is 1·5mm thick in comparison with 1·2mm for standard CD and DVD discs. As a result, older CD and DVD players and in-car CD changers could have problems with some DD pressings. There has been no suggestion so far of a UK launch.

First DVB-T/DAB chip

Frontier Silicon has started to supply in volume the first chip, called the Logie, that carries out both DVB-T and DAB signal demodulation and decoding. The device enables a low-cost set-top box for Freeview digital TV and DAB radio to be produced. Frontier Silicon designs and supplies ICs for digital TV/radio and multimedia consumer products, but outsources actual manufacture of the devices.

The first product to use the Logie chip will be an STB in the Goodmans range.

The Logie chip also provides multimedia operation through its ATAPI and AV interface. DVD playback capability can thus be integrated and pay-TV can be included, with dual smart cards.

WiFi jamming

Researchers at Queensland University of Technology have discovered that WiFi wireless networks are vulnerable to jamming with use of a low-powered Personal Digital Assistant (PDA) and a wireless network card. The research has been confirmed by the Australian Computer Emergency Response Team (AusCERT). Companies that have developed WiFi products for streaming digital music and video from a PC to TV and stereo systems around the home include Philips, Sony and Microsoft.

The jamming exploits a characteristic of WiFi known as "collision avoidance". WiFi networks transmit data via designated channels: collision avoidance is designed to prevent two devices transmitting data via the same channel at the same time. The researchers discovered that someone using a PDA and a network card could "flood" WiFi channels and thus prevent legitimate devices from transmitting. They found that the most commonly used WiFi networks are vulnerable though the high-speed one (above 20Mbits/sec) is not.

AusCERT adds that anyone who used this jamming system could not access the actual data or computer(s) in the WiFi network.

Fusion digital technology

Barry Rubery, co-founder of Pace Micro Technology, has set up a new company called Fusion Digital Technology. The Bradford-based company is to launch a series of products that will compete with those from his previous company. First is the Digifusion PVR, a personal video recorder designed for use with Freeview transmissions. It costs about £250 and can record up to 40 hours of TV programmes.

Fusion Digital Technology is a joint venture with Turkish TV set manufacturer Beko Electronik. Fusion designs the products while Beko manufactures them. There are plans to develop a portable PVR, also a media console that will provide pay-TV services, a video phone and internet connection for every TV set in the home.

Advanced sub-woofer design

B&W Loudspeakers has announced a new sub-woofer loudspeaker design, Model PV1, for which considerable advantages are claimed. It incorporates a pair of 8in. bass drivers that are mounted back-to-back in an almost spherical sealed aluminium-alloy enclosure measuring 13·2 x 11·4 x 13·7in. The unit is active, i.e. incorporates its own drive amplifier, in this case a 500W digital amplifier. The back-to-back drivers cancel mechanical reactances, while the spherical housing provides maximum stiffness. There should certainly be plenty of bass – at a price of about £900.

REPIC

Thirty six manufacturers have signed up with the recently formed Recycling Electrical Producers Industry Consortium (REPIC). The consortium has been set up, with help from AMDEA and Intellect (formerly BREMA), to enable manufacturers to meet their obligations under the Waste Electrical and Electronic Equipment (WEEE) Directive. This comes into effect in August 2005. REPIC claims to have signed up more than 70 per cent of major appliance, small appliance and consumer electronics manufacturers. Under the WEEE Directive manufacturers are required to finance the recovery and recycling of all end-of-life products.

REPIC is now lobbying for a separate environmental handling fee to be charged to consumers when they buy products.

Dr Philip Morton, REPIC's chief executive, points out that twenty-year old products are now entering the waste stream while some products made this year will need to be recycled in twenty years' time.

Trade news

Horizon Global Electronics Ltd., manufacturer of the digital signal meters reviewed last month (page 454), has moved to Unit 1, 8 Kinetic Crescent, The London & Office Science Park, Enfield, EN3 7HX. The new phone no. is 020 8344 8230, fax 020 8344 8235. The email address remains as before sales@horizonhge.com

Hayden Laboratories Ltd., which handles Denon equipment, has been renamed Denon UK Ltd. The company plans to launch a "huge range of new models". The address is Chiltern Hill, Chalfont St Peter, Gerrards Cross, Bucks, SL9 9UG. Phone no. is 01753 888 447, fax 01753 880 019, email address info@denon.co.uk

Sony technology

Sony has developed a three-wavelength record/playback optical head for use with Blu-ray (BD), DVD and CD discs. The head has an objective lens made of aspherical glass and a hologram lens for spherical aberration correction. Commercial production is expected to start within two years, making it possible to produce Blu-ray recorders, players and drives that are compatible with DVD and CD discs.

Sony has demonstrated a prototype palm-sized video player that can play streamed video downloaded from a PC or the internet. It can also transfer video to a domestic TV set. The company has not suggested a launch date, but is to start marketing a portable digital music player this year in Europe.

Top-Up TV reception

Thomson is expected to start supplying the first set-top boxes able to accept Top-Up TV cards at the end of June. The STBs will sell at about £80 and incorporate a smart-card reader, MediaGuard conditional access, twin scart sockets and an RF modulator to provide a UHF output. Prior to this only old ONdigital and ITV Digital boxes could receive the service.

Let's go DIGITAL

Ray Porter's installation of a Freeview digibox was not without its problems. The local signal conditions are not ideal, and there was a vision-on-sound buzz problem. After some experimentation satisfactory reception of most multiplexes was obtained

The price of Freeview digiboxes has fallen so low that I thought I would bring the benefits of digital television (there are some, aren't there?) to a corner of my house where a veteran TV set lives. It would be an interesting experiment, to see if there were any co-channel problems and signal drop-outs. I live to the east of The Wrekin transmitter and north of Ridge Hill. These transmitters both transmit Five TV on ch. 35, with the same polarisation. Sutton Coldfield is nearer, but is somewhat hidden behind a hill. The two aerials on the house have always pointed to The Wrekin, but one of them receives two channels from Ridge Hill better than from The Wrekin.

So, based on what has been said about digital reception, this would be a good, low-cost try-out for the day when the analogue switch-off comes.

First try

The first try-out with the Nokia Mediamaster 121T Freeview digibox I obtained and the TV set, an ITT Model TX3326 (Monoprint BNN chassis), proved that the aerial was a group A one and that a wideband aerial would be required to get more channels. Taking Bill Wright's advice (*Television*, January) about downleads, I replaced the thirty-year old coaxial lead that ran from the loft to the TV set on the ground floor with CT100 type cable. Then came the not-so-free part of Freeview.

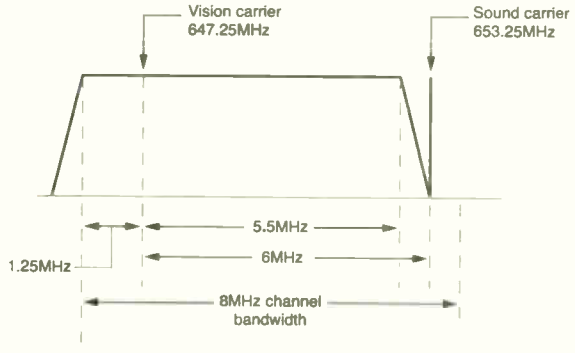


Figure 1: The normal signal-spectrum of a channel 43 transmission.

A local rigger recommended and installed a wideband Antiference XG10 array for me. He said the Sutton Coldfield signal wavered, the Ridge Hill signal was weak and The Wrekin gave the better results, but was reaching only just higher than red (i.e. poor) on the signal-strength meter built into the Nokia digibox. This useful tool is available via the 'manual-search' menu.

I decided to follow the rigger's recommendation and use the signals from The Wrekin transmitter – it's actually The Wrekin East transmitter. This has given me many years of good-quality analogue reception, except when the conditions that give Roger Bunney and his fellow DXers their best opportunities prevail. The ITV local news covers my area (Central), whereas Ridge Hill transmits Central News South.

The compromise involved is that The Wrekin East transmits only four of the six digital multiplexes. Two of these are transmitted on the same channels and with the same polarisation that Ridge Hill uses for the multiplexes missing from The Wrekin. Even though the viewing is "free", I am disappointed that the frequency allocation planning has put me in this one-third digital darkness.

Using the controls

The Nokia digibox's remote-control unit is straightforward, but the software could be much better. It is annoying that it resizes the screen before settling at the default size each time a channel change is selected. The time delay that occurs when changing channels shows that much faster processing in the hardware/software would be required to get anywhere near the seemingly instantaneous analogue channel changes I have been used to. I have crashed the software several times when changing channels or selecting the interactive parts of the BBC transmissions. I can't repeat this at will yet: more practice is required! On one occasion I had to power the digibox off for a few minutes for the software to recover. Perhaps a front-panel master reset will be provided with later models, as you get with some other consumer electronics equipment.

Viewing and recording programmes

Most readers will know that to record a programme you are not watching live, the TV set must use the Nokia digibox's UHF output in order to bypass the VCR's scart output. This led to a problem that reminded me of words in the magazine several years ago. A reader's letter complained about buzz with peak-white captions on Channel Four Racing. Peak-white captions from the Nokia digibox, in the on-screen interactive menus and information banners, caused buzz on sound – but only when the UHF output was used.

A performance shortfall in the ITT TV set's tuner or IF stage was suspected. I then noticed that a buzz on sound was apparent with Five TV analogue reception when there was a peak-white caption at the bottom of an on-line insurance company adver-

tisement which features a white-haired celebrity. It was time to check other TV sets for their susceptibility to caption buzz.

Chasing the buzz

Three more sets were tried. None of them were made in this century, and all buzzed to some extent with Freeview digibox captions. The sets all used analogue demodulator input filters, and intercarrier sound. A spectrum analyser was used to check the Nokia digibox's UHF output, which was set to channel 43, to see if it produced an analogue signal that complied with the normal broadcast-signal specification. Figure 1 shows the expected normal signal spectrum. Figure 2 shows the Nokia digibox's output signal spectrum, with and without caption transmission.

You can see that when captions are present the video envelope at each side of the sound carrier has moved up by 10dB, which means that the vision signal has 'smudged' across the sound carrier. A similar effect was seen at the output from the vision demodulator, where the envelope moved up by 7dB. This shows that the IF stage filtering in the ITT set did little to reduce the unwanted HF vision signal. For this test the Nokia digibox's sound output was muted by means of the remote-control unit, to remove the FM from the sound carrier. This made it very easy to hear the buzz and see when the vision signal 'wrote over' the bandwidth allocated to sound.

Buzz mathematics

Captions consist of letters that resolve as a rectangular wave of luminance data. Fourier analysis breaks down rectangular waves into a series of odd and even harmonics that coexist with the fundamental frequency concerned. At their smallest on a 410mm wide screen the white vertical lines of the caption characters are 2mm wide, with a 1mm gap between them. The forward screen scan time is 52μsec. Thus the time period of the rectangular pulse is

$$(3 \times 52)/410 = 0{\cdot}38\mu\text{sec}$$

and its fundamental frequency is therefore 2·62MHz. The second harmonic will be present at 5·24MHz, the third harmonic at 7·86MHz and so on. Larger sizes and other caption letters will produce lower fundamentals, but harmonics above 6MHz may still be present.

The vision signal bandwidth should allow only signals up to 5·5MHz to be present, see Figure 1.

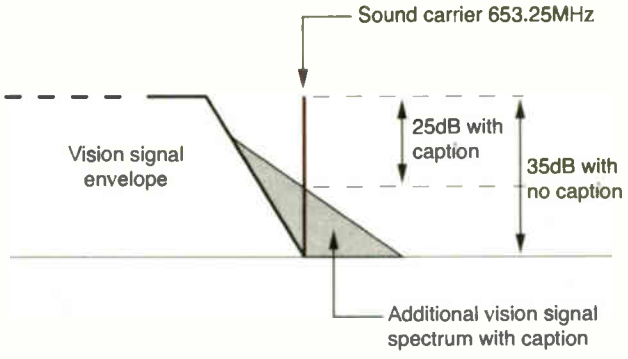


Figure 2: With the Nokia digibox, captions spread the vision signal spectrum across the sound carrier.

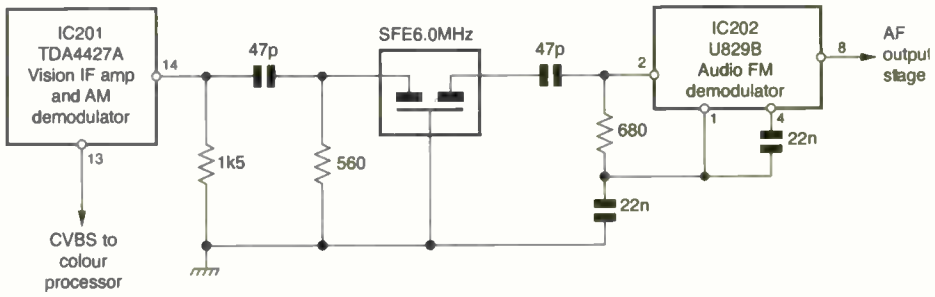


Figure 3: The filtering between the vision and sound demodulators in the ITT TV set (Monoprint BNN chassis).

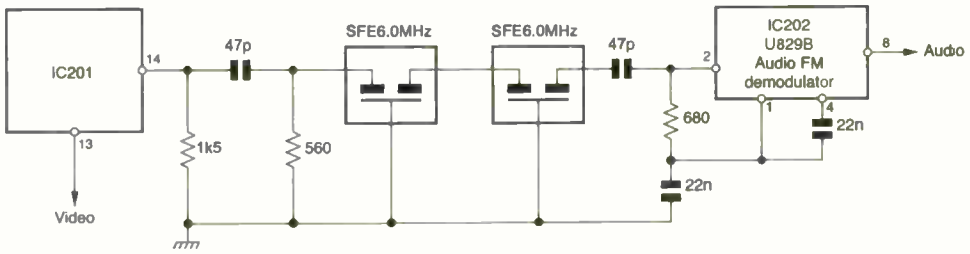


Figure 4: Addition of a second 6MHz SAW filter in series with the first one cured the vision buzz.

As Figure 2 shows, the Nokia digibox produces a spread of vision-modulation frequencies that go higher than 6MHz, with the result that vision AM overlaps the FM sound carrier.

Curing the buzz

An oscilloscope check while the Nokia digibox's sound was muted showed that during each frame period a few 'bumps' that were coincident with peak vision-signal bursts disturbed the quiescent output level of the sound demodulator (IC202, type U826B). The level of and/or high frequencies contained in these bursts was thus disturbing the sound demodulator, producing a few 'clicks' each frame. This sounded like a 'mains buzz', but at a lower frequency.

Figure 3 shows the sound demodulator input filtering circuit used in the ITT TV set. There are two high-pass *RC* filters with a cut-off at about 6MHz. One of these was changed to provide a cut-off at 12MHz, so that signals at about 6MHz were reduced by 3dB. This provided no improvement. But when a second 6MHz bandpass SAW filter was added in series with the original one, see Figure 4, the buzz was no longer detectable. I assume that the extra SAW filter further reduced out-of-band signals and stopped them disturbing the demodulator.

In conclusion

There's now no buzz from Five TV's insurance advertisement either, and the sound quality is the same as it has always been.
If only I could receive those missing multiplexes! ■

An aerial system for DAB reception

K. Rutherford found DAB reception via a receiver's vertical whip aerial very unsatisfactory. A correctly-proportioned dipole was therefore made, mounted in the loft and coupled to the receiver via the domestic signal-distribution system. The result is good, error-free reception in all rooms

Finding the services on offer via DAB very tempting, I purchased a Grundig Opus receiver from a local electronics superstore. Reception via the receiver's whip aerial was very disappointing however. After studying the predicted signal coverage for the area, I decided that remedial action was needed if good, error-free reception was to be available in rooms of the house other than the guest bathroom!

DAB is transmitted in Band III, at 215-230MHz, with vertical polarisation. The reliability of a moveable, unmatched vertical whip aerial is always dubious in Band III, especially in a 'fringe' area. What was clearly needed was a correctly-proportioned dipole, mounted in the loft and coupled to the domestic signal-distribution system. Use of an old Band III TV aerial, had one been available, would have made a trial run easy. Instead, a simple dipole screwed to a piece of wood was made and found to be suitable. It took only ten minutes to make, can be fixed to the wooden rafters in the loft and, being small, is easy to position for optimum reception.

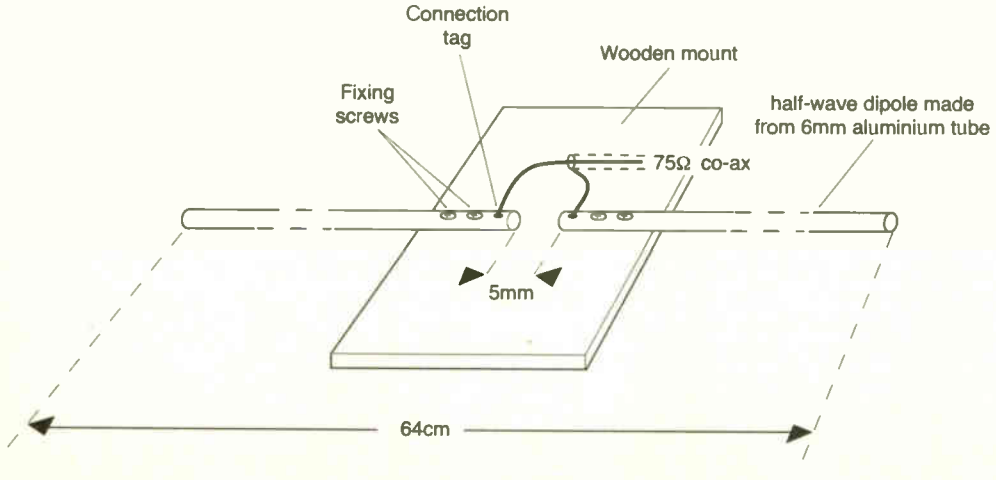


Figure 1: Construction of the half-wave dipole for DAB reception.

The dipole

The physical construction of the dipole is shown in Figure 1. It's made of 6mm diameter aluminium tube, which was surplus from an intruder alarm system. Other materials and diameters will work quite well, but the diameter of the rods does affect the bandwidth of the dipole: one made from a wire coat-hanger will work, but not very well. The length of the dipole corresponds to a centre frequency of 222MHz. The formula for calculating this is

wavelength = 300/222 = 1·35m,

so a half-wave dipole = (1·35 x 95)/200 = 64cm.

The physical length of the dipole is less than the true half wavelength because RF currents travel more slowly in a metal conductor than in free space. A close approximation is 95 per cent of the free-space value. The inner ends of the dipole rods are separated by a 5mm gap, with the braid and centre conductor of the matching 75Ω coaxial cable connected close to the ends.

The rods were mounted on a piece of wood, in this case a handy piece of deal floorboard approximately 15 x 10cm. Two through-

holes were drilled in each rod, about 1·5cm apart and 3cm from the end of each rod, to provide fixing to the wooden mount. Ordinary wood screws are used to secure the rods on the mount.

I made the cable connections by drilling and tapping a hole about 3mm from each end of the tubing. A solder tag was placed under the screw, and short soldered connections were made to the tags. Sealing lacquer was applied once the joints had cooled, to minimise moisture penetration and corrosion at the junction of dissimilar metals.

The completed aerial is small enough to move around in the loft. Once an acceptable position has been found it can be fixed to the rafters with a single wood screw. It is assumed that the aerial will not be disturbed, so minimal fixing is all that's required.

Coupling up

A wideband distribution system that handles analogue and digital UHF TV signals and Band II FM signals is installed in the house. The three signal sources are combined using a Televés UHF/VHF/DAB triplexer. This unit has a good specification, and a DC pass-through in the UHF circuit to enable a masthead amplifier to be powered, but is expensive at about £11. The price reflects the quality however, and a through loss of 1dB and out-of-band rejection better than 20dB are more than adequate for this application.

It had been my experience with DTT reception that the type of outlet plate fitted by builders and electricians is not suitable for digital signals, so all six outlets in the house had been changed to an F-connector arrangement that doesn't use a printed-circuit connector board, see Figure 2. A barrel connector is fitted to a blank plate. At the rear, the downlead cable is fitted with a right-angled F plug (to enable it to fit into the patress box). Crimped-on F connectors are also unsatisfactory for digital-signal applications, and screw-on or 'snap-lock' F connectors are preferred for making the flyleads to receivers. A lot of trouble, but worth it. In some cases it can make the difference between getting a usable digital signal or nothing.

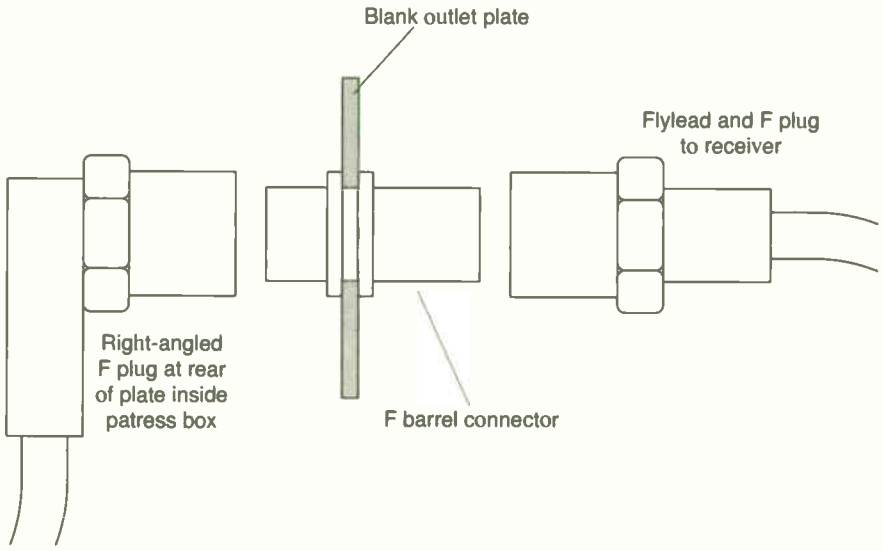


Figure 2: Outlet plate using F connectors.

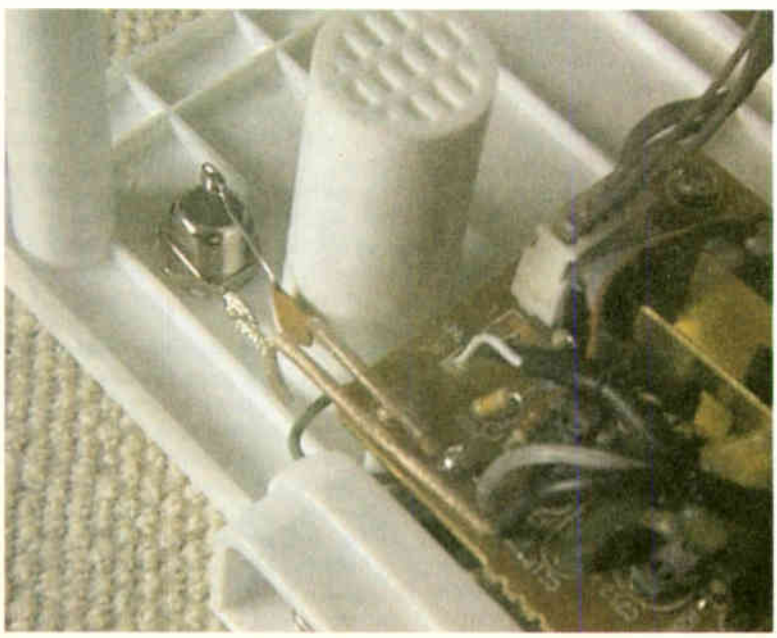
The receiver

The Grundig Opus receiver had to be opened up, a simple operation that involves the removal of four screws at the corners of the rear cover and one on the underside. Remember to disconnect the set from the mains supply before doing so!

Once inside, I found that the layout is straightforward with the aerial connection points and an earth point easy to see. I drilled a 9·5mm hole in the rear cover to accommodate a bulkhead F connector. As the cover is plastic this is not difficult. Disconnect the whip aerial wire from the PCB and in its place connect a 1,000pF disc ceramic capacitor to the centre pin of the F connector, see Figure 3. An earth connection also has to be made of course, between the receiver's PCB and the shell of the F socket. It's a good idea to use some coaxial cable braid for this, to provide a solid RF connection.

If occasional use of the whip aerial is envisaged, a short wire can be brought out through the rear cover with a suitable pin soldered to the outer end for insertion in the F socket.

Figure 3: The modified aerial input connection.



Results

The modification to the receiver requires only basic mechanical and soldering skills. When connection is made to the dipole aerial the results are superb. Signals from two main transmitter sites are well received at my location near Mansfield, Nottinghamshire, with very low bit-error rates. The reward is a vast selection of radio signals of excellent clarity with a wide appeal to all members of the household.

Stereo signals for feeding a larger audio system are available at the Opus receiver's rear panel via two phono sockets. ■

The Sale of Goods Act

In this second, concluding installment Michael Maurice deals with customers' obligations, guarantees, 'distance selling', second-hand goods and various practicalities, including possible court action

Part 1 last month dealt mainly with the basic rights of consumers under the Act and the Regulations that came into force early last year, and the remedies available when goods are deemed to be defective at the time of sale. We continue the sad saga to the point where court action may be contemplated.

If a customer decides to allow the retailer to repair a product that's faulty... he does not lose the right to reject the product if, after repair, it still doesn't conform to contract...

Suspended right to reject

If a customer decides to allow the retailer to repair a product that's faulty, especially when it is fairly new, he does not lose the right to reject the product if, after repair, it still doesn't conform to contract.

Let's say for example that a customer takes delivery of a new car and discovers, after a couple of days, that the car drives correctly but some things don't work as they should, e.g. the radio or the courtesy lights. He might ask the dealer to put these defects right. If, a short time later, the gearbox or some other major item fails, the customer is still within his rights to reject the car as not conforming to contract.

Manufacturers' product guarantee swap-out system

Some manufacturers (notably Toshiba) run a swap system for products that fail during the first year of the manufacturer's warranty. In this event the customer is advised by the retailer to phone the manufacturer's 'under-guarantee replacement service'. On sight of the sales receipt the manufacturer will exchange the product for a new or refurbished one, bypassing the retailer. The product supplied will be guaranteed for the remainder of the original product's guarantee period. Thus if a product fails after nine months, the manufacturer will deliver a new product to the customer's home with a three-month guarantee.

How this affects the retailer, and what the customer's rights are after such a swap, are not clear. Personally, I don't see how a retailer could be held responsible for a product he didn't actually sell. How would he know if he had sold it or not? The retailer should record the serial number of all products he sells, the serial number being unique to that product. If a customer returns a product with a different serial number, the retailer would be under no obligation to offer a remedy, as the contract was not for that product.

Minimising damage

English law puts an onus on consumers or complainants to minimise or mitigate any loss. A consumer should always report a fault as soon as possible. For example if a TV set's field output stage fails, leaving a bright white line across the centre of the screen (unlikely with modern sets), and the consumer continues to use the set in this condition (the sound could still be present), thereby allowing a line to be burnt on the screen, he could expect the original fault to be put right but would have no legal redress for the burnt CRT screen. Similarly if a car driver continued to drive a car after the oil warning light or 'stop' light appeared on the dashboard, he would have no legal entitlement to a replacement engine, because he should have stopped immediately.

Consumers are expected to use products in accordance with the manufacturer's handbook. You could not expect legal redress if, say, you use a camera under water and it fails because of this – unless the camera was specifically designed for under-water use.

Consumers cannot expect any legal remedy if they have damaged a product, either accidentally or intentionally, misused it, tried to repair it or arranged for a third party to carry out a repair, unless that party is appointed by the retailer or the manufacturer. If for example a customer takes his VCR to a local repair shop which, because of its lack of skills, damages the video heads beyond repair, the customer loses his right to legal remedy against the retailer.

Free guarantees/warranties

Despite what has been said above, neither retailers nor manufacturers need to give any guarantee on products sold. If they do, they do so voluntarily, and any guarantee or warranty given does not invalidate the customer's legal rights. But free guarantees or warranties are now legally binding on whoever offers them. The duration of a free guar-

antee is totally dependent on the company that offers it.

Internet and mail-order purchases

These are covered by the Distance Selling Regulations. If a consumer buys a product via the internet or by mail order he has the right to return it within seven days of delivery should he find that it is not to his satisfaction, whether or not the goods conform to contract. The Act implies that the responsibility for collection and payment of carriage charges will be borne by the seller.

This legislation was introduced because it was considered that such consumers don't have the opportunity to examine products and check on their suitability, the only time when they can do so being after delivery. Personally I find this unfair, as the internet purchaser will usually have done his homework and is buying purely on price. Furthermore products taken back are no longer new and thus cannot be resold as such.

Second-hand goods

Customers have exactly the same rights with second-hand goods as they do with new goods, i.e. the product must conform with any description given, must be fit for the purpose it is intended for, and must conform to contract. As a product gets older however the ability to prove that a fault was present at the time of purchase becomes increasingly difficult. There is no legal obligation to give a guarantee on second-hand goods, any guarantee or warranty provided being entirely voluntary.

When does a product become second-hand? Legally it is after it has been used for the first time or after it has had power applied to it. However I generally advise people that they should consider a product to be second-hand when the box has been opened, as you would normally have no way of telling whether the product has been used or not. I find it difficult to trust many retailers on this point, so I suggest that customers check that all the original manufacturer's tapes and seals are intact. Furthermore most electrical and mechanical products are powered up on the production line, to set up the various parameters and check that the product actually works. They may be given a soak test to check for any 'burn-in' faults. A motor manufacturer will always start a car on the production line, and it will be driven off the production line. It will usually have a few miles on the clock before it is delivered to the dealer, but you would be hard-pressed to argue that a car with ten miles on the clock, and which has never been registered, is second-hand.

Pursuing a legal remedy

It is important that a customer pursuing a legal remedy through the courts uses the correct Act or Regulations to do so. The law basically requires the 'i's to be dotted and the 't's to be crossed! Thus making a mistake when taking legal action could lead to the consumer losing the case. I would also advise defendants (usually retailers in this case) to check that what is being claimed is relevant to the Act under which the claim is being made.

Practicalities

So far I have discussed the theory regarding the Sale of Goods Act 1979 and the additional Regulations that came into force on 31 March 2003. What does all this mean for us traders? They give customers protection and rights that they had previously not enjoyed, but doesn't help us as retailers or repairers.

It might appear that customers are entitled to a six-year guarantee on any products they purchase. This is not the case. The Sale of Goods Act states that consumers are entitled to a legal remedy if they can prove that a product was defective at the time of sale, and gives them a time limit of six years to seek redress.

For example a two-year old 20in. Bush TV set had stopped working. The cause was found to be that the chopper transistor's emitter lead had not been pushed through its hole in the PCB. Instead, it had gone through the isolating cut-out on the board and had been making sufficient contact with the pad to enable the set to work for a couple of years. This was without doubt an inherent fault that was present at the time of sale. The customer could have successfully claimed a legal remedy from the retailer had he decided to do so.

...neither retailers nor manufacturers need to give any guarantee on products sold. If they do, they do so voluntarily...

It is known that some electronic products suffer from dry-joints. It could often be argued that in this event the manufacturer did not solder the component correctly. This doesn't mean that the component wasn't soldered during manufacture, but rather that the amount of solder applied was inappropriate for the component's use in the circuit involved. A good example is C613 in a number of Sharp TV sets. It could be argued that because of the way in which C613 was soldered during manufacture there was an inherent or latent fault. In fact one of my customers, on submission of a report from myself, successfully obtained recompense from the retailer for both the cost of the repair and my report.

At a recent Brown Goods Servicing conference considerable concern was expressed about the new laws and regulations, and in particular how they relate to the Philips ESF/ECK range of CRTs. In trying to negotiate what could be a legal wrangle, the consumer has to prove (unless the fault occurs during the first six months, during which the product will be covered by the manufacturer's guarantee) that the fault was present at the time of sale or that there was some inherent latent defect. In practice I think that the consumer might be hard pressed to do this. The CRT would obviously not have been faulty at the time of sale, but failed somewhat prematurely.

The customer might be able to demonstrate, especially with upmarket sets such as those from Bang & Olufsen or Loewe, that an inferior component had been used during set manufacture. Some manufacturers have shown considerable

concern about the fact that these CRTs have been failing prematurely, and supply new ones to customers either free of charge or at a substantial discount. There is no obligation on the setmaker to do this, but it does go a long way in showing good will. One of my customers was very impressed when I obtained a 28in. widescreen CRT completely free of charge from the manufacturer: he was delighted to have to pay only my labour charge.

If faced with a prematurely failed CRT and the customer insists on repair, it might be practical to suggest to him that he pays the cost price of the CRT with fitting free of charge. While this might not be exactly what he wants, if you point out that he has had good use of the set for a number of years he might be agreeable to this, in which case you will have lost only your labour charge and will have shown some good will to the customer.

It is important to note that whereas the customer may have a legal redress against the retailer, the retailer does not have a similar redress against the manufacturer, importer or supplier of the goods. In such cases it would be best for the retailer to try and negotiate recompense from the manufacturer or supplier.

We are at present seeing an increase in sales of TV sets with plasma and LCD screens. These work on entirely different principles to conventional CRT sets. One aspect that can cause complaints is when a customer claims that a set is faulty because of missing or dark pixels. The manufacturer lays down stringent specifications as to what is acceptable and what is not acceptable in this respect. This includes the section of the screen where the pixels have failed as well as the number of failed pixels. But what the manufacturer may consider technically acceptable may not be acceptable to the customer. If you are faced with a claim that is likely to lead to court action, my advice is to seek the assistance of the manufacturer, possibly calling a Technical Liaison Officer as an expert witness. In such an extreme case, faced with the possibility of adverse publicity, the manufacturer may well back down and repair or replace the product.

There is no legal obligation to give a guarantee on second-hand goods, any guarantee or warranty provided being entirely voluntary...

Further legal remedies

Where a dispute between a customer and a retailer cannot easily be resolved, the last legal option is to take the matter to court. Here the case will be heard by an impartial judge who, after hearing evidence from both sides, will decide on a specific course of action. This will be legally binding on both sides. In such a case the customer is known as the plaintiff and the retailer the defendant. The case will be heard in the Small Claims Court, which is part of the County Court (this may be different in Scotland).

There are set fees that apply with such hearings. Both parties can represent themselves, without the need for legal (and often costly) representation. In England and Wales legal expenses will not be awarded for representation in court where the sum claimed is up to £1,000, though they might be for preparation work. Between £1,000 and £5,000, legal expenses may be awarded for representation in court. Where the money claimed is over £5,000 the claim is referred to the High Court. Should the claimant be successful, the defendant will have a County Court Judgement (CCJ) registered against him.

My own personal experience of the Small Claims Court is where I have taken action against customers in cases of non-payment for goods or service. In one case where I was successful, collecting the debt proved to be impossible and I just ended up with higher costs.

In conclusion

More and more customers are becoming aware of their legal rights and are prepared to fight their case. The advent of consumer programmes and 'no-win, no-fee' lawyers has exacerbated the situation. Often the only way of establishing whether a customer has a legal right of remedy is through the courts, but this can be a very costly and impractical way of going about things.

In the past I have found that Local Trading Standard officers are of immense help to both the customer and the retailer. When there is a dispute, it might be advisable to seek an opinion from the local office. But bear in mind that Trading Standard officers will give you only an opinion: they are not lawyers, and their opinions are just that.

Hopefully you will find that the number of these complaints is few and far between. But be prepared to fight in some instances and, if you are certain of your case, stand your ground – as long as the costs can be kept within reasonable limits.

A thank you

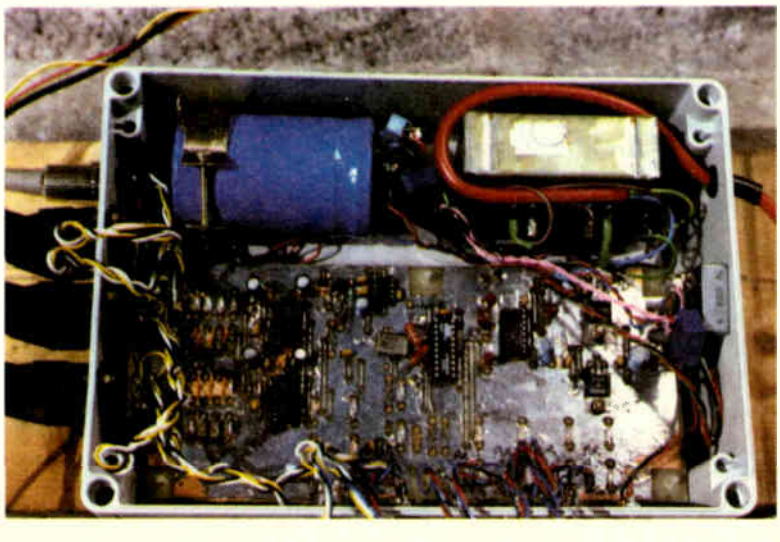
Finally a big thank you to the Trading Standard Department officers who provided invaluable help in the preparation of this article. ■

A microcontroller-based CCTV switching system

John Young describes a microcontroller-based video switching system that uses four CCTV security cameras. These monitor activity in and around a garage that's sixty yards from the house, so a method of transmitting video signals is used. The microcontroller switches from camera to camera every three seconds

The following article describes a microcontroller-based video switching system for four closed-circuit TV security cameras. It was designed, constructed and installed some three years ago. The cameras monitor activity in and around my garage. This occasionally includes humans, but normally consists of assorted cats, dogs, foxes, badgers and, on one memorable evening, a bat.

The garage is sixty yards from the house, so a method of transmitting video signals is used. This consists of a 2·4GHz video link – these are widely available at prices from about £40. I selected a transmitter and receiver with 'directional' patch aerials. Tests proved that the units worked successfully. A 2·4GHz Yagi array would extend the range under more difficult conditions.



External view of the switching unit, transmission end.

The system consists of four low-cost (less than £30) monochrome video CCTV cameras, with audio, which are linked to a central control unit. Each camera has a separate PIR (passive infra-red) sensor. The controller switches from camera to camera every three seconds: the PIR sensors are not triggered.

A three-second switching time allows the VCR servos to stabilise before another camera is selected. This is necessary because the cameras are not locked by a common sync generator and thus have a random sync phase relationship. The most obvious symptom would be the appearance of the head-switching point in the playback video, with some display hooking in the fast picture-search mode.

When a PIR sensor is activated, the system selects the appropriate camera and generates a 500Hz con-

trol tone in the right-hand audio channel of the video link. The receiver control system detects this tone and starts a video recording. The system controller then dwells on the camera associated with the activated PIR for about six seconds, after which camera-to-camera switching is resumed. The record tone lasts for about fifteen seconds, which is just long enough to scan all four cameras. The control system at the receiver end stops the video recording when the control tone ends.

Circuit description

Fig. 1 shows a block diagram of the transmitter end of the system (the receiver end will be described in Part 2 next month) and Fig. 2 the circuit diagram. Microcontroller IC2 is a 20-pin DIL Atmel AT892051. This is an 8051 with 2K of flash, 128 bytes of RAM, a full duplex serial port and 15 I/O pins.

I used the serial port to write and debug the software. This requires the MAX202E TTL-to-RS232 converter IC1, which generates ±10V rails for the RS232 interface from the 5V supply. The ±10V rails also power the DG413DJ analogue switch chips IC6 and IC7, reducing their rds(on) – drain-source resistance when switched on – considerably compared with single 5V rail operation. With ±10V supplies the devices in the prototype measure 22Ω rds(on). The MAX202E chip must be fitted. The DG413DJ chips have a quiescent power consumption of about 1μA, which is easily supplied by the MAX202E chip.

The two quad analogue switch chips IC6 and IC7 carry out video and audio switching. With a maximum rds(on) of 35Ω a video buffer is not necessary, though there is some impedance mismatch. The quality of the video signals from the cameras is too low to make this obvious. The four video and audio inputs from the cameras are fed to the drains of the analogue switches: the sources are connected together to form the video and audio output signals fed to the video transmitter via CON4. Reverse-biased 1N4148 silicon diodes to 0V and 5V protect the inputs and outputs of the switching matrix from static discharges during connection and disconnection of the various parts of the system.

The TL7705 power supervisor IC3 drives the microcontroller's reset line and monitors the health of the 5V supply. The circuit around transistor Tr1 provides a

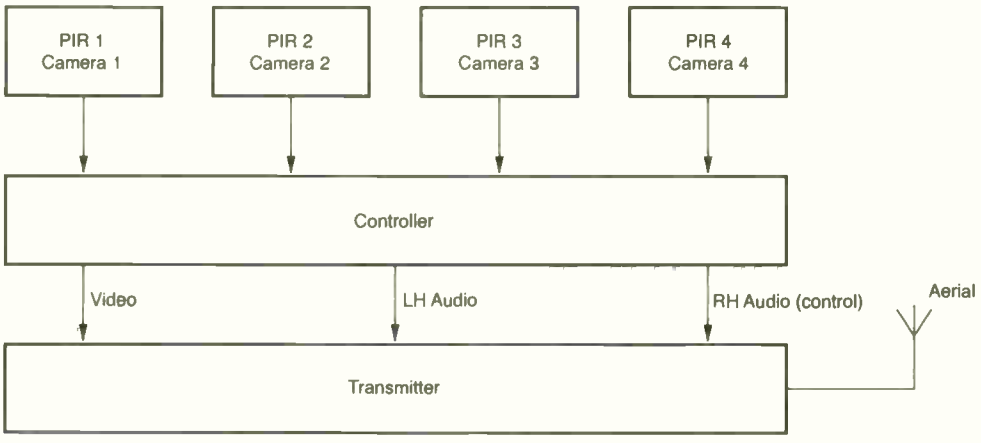
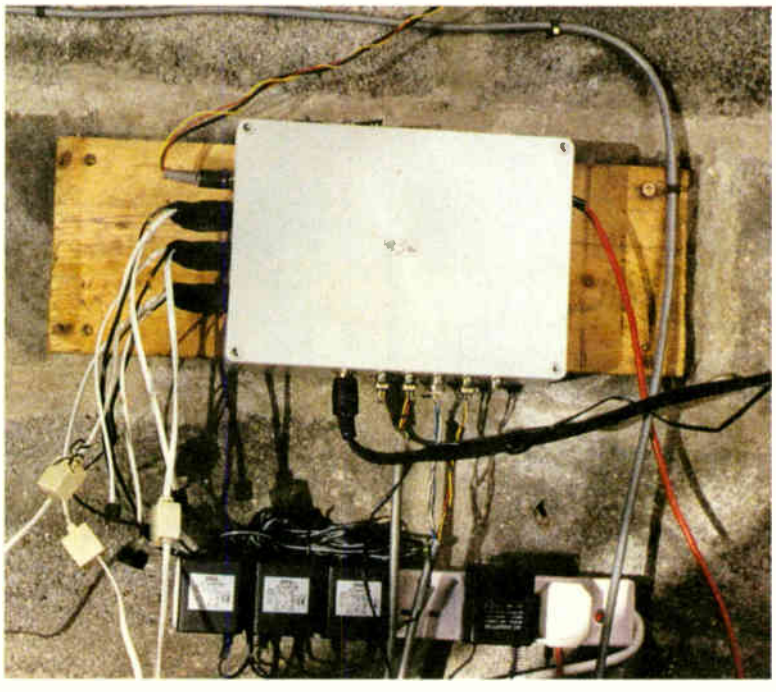


Figure 1: Block diagram of the transmitter end of the system.



Internal view of the switching unit, transmission end.

Sensor using the PIR housing from a defunct security lamp.

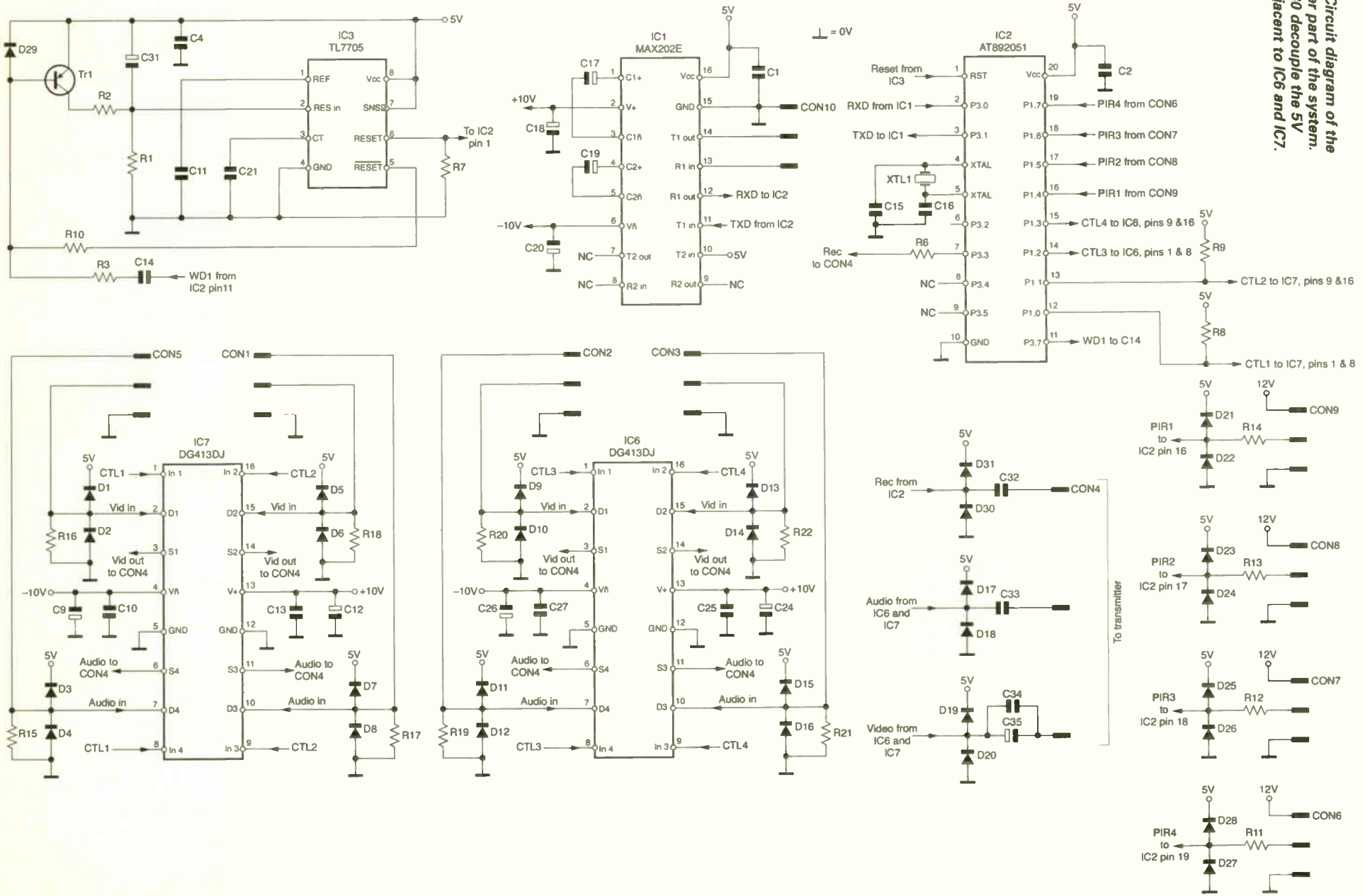


Figure 2: Circuit diagram of the transmitter part of the system. C3 and C30 decouple the 5V supply adjacent to IC6 and IC7.

watchdog timer. Normally port P3.7 (pin 11) of the microcontroller IC produces a continuous stream of pulses that turn Tr1 on, discharging C31 via R2 and thus inhibiting the watchdog. If the microcontroller doesn't produce pulses at port P3.7, the reset line is driven high for about 1·5ms to reset the device. The reset line then goes low for 700ms or so. This restarts the embedded software.

The presence of the watchdog means that software crashes and power-line glitches don't require the user to switch the system off to restart the microcontroller (unlike my Sky digibox . . .).

I/O pins P1.0, P1.1, P1.2 and P1.3 of IC2 are used to select a camera. IC2 monitors the states of the PIR sensors at I/O pins P1.4, P1.5, P1.6 and P1.7: the inputs are normally at 0V, going to 5V when a PIR sensor triggers.

Power supplies

The unregulated, smoothed DC from the mains power supply (see Fig. 4) is fed to the control PCB via CON12. There are three regulators on the PCB, see Fig. 3. IC4 provides a regulated 5V output, with the 6·2V zener diode D33 for extra protection in the event of a voltage surge or a shorted regulator. IC5 provides a regulated 12V output for the PIR sensors, with the 13V zener diode D34 for surge protection. IC8 provides a regulated 12V output for the fourth camera which, in my system, didn't have a wall wart PSU. Zener diode D32 (13V) provides surge protection. This output is available at CON13.

Signal connections

The audio, video and control tone outputs are fed to the video transmitter via CON4.

For camera 1 the input is at CON5 and the PIR input at CON6.

For camera 2 the input is at CON1 and the PIR input at CON7.

For camera 3 the input is at CON2 and the PIR input at CON8.

For camera 4 the input is at CON3 and the PIR input at CON9.

CON10 is the RS232 interface connection.

Construction

The circuitry was built on a double-sided Eurocard PCB, 220 x 110mm. A single-sided PCB with wire links would probably work, since most of the component side of the double-sided version is ground plane. There are no vias

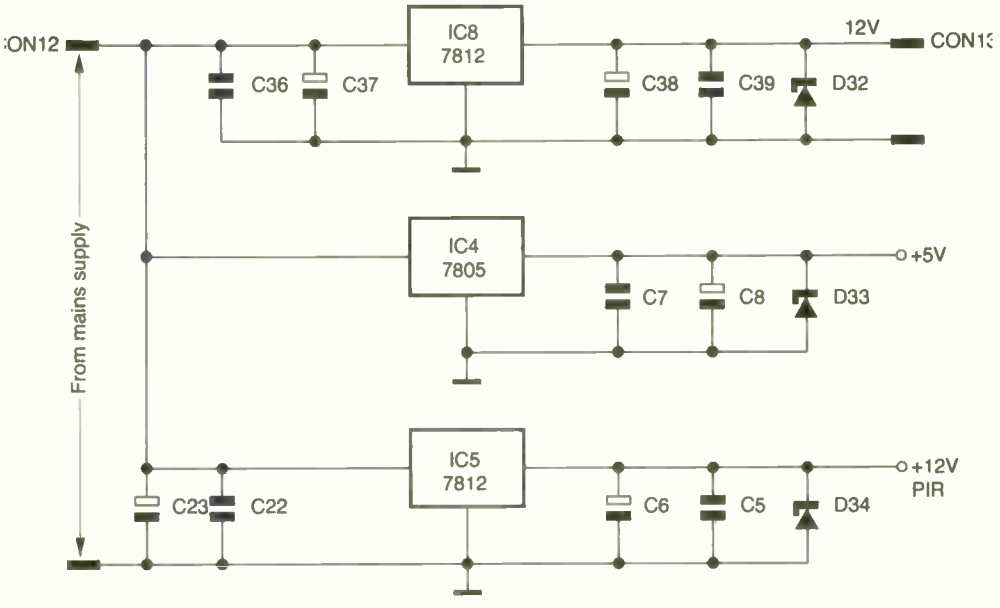


Figure 3: The regulators on the transmitter PCB.

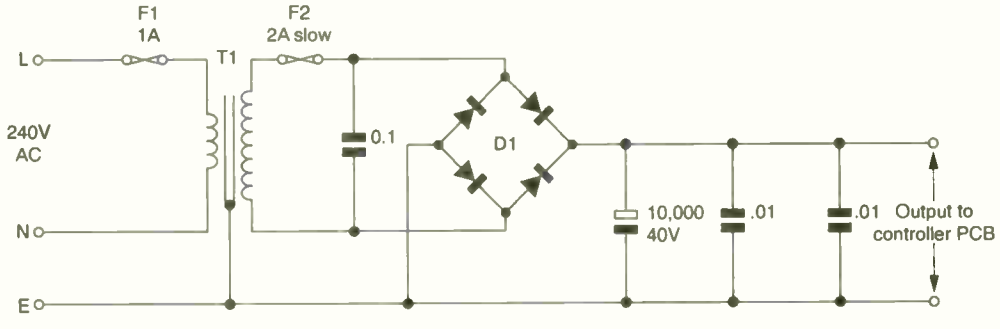


Figure 4: The mains power supply circuit.

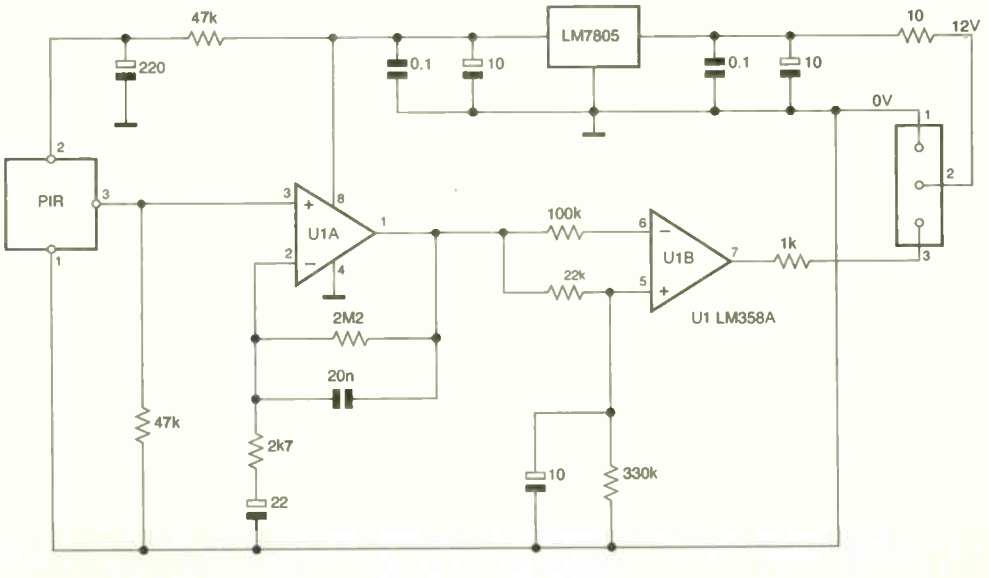


Figure 5: The PIR sensor circuit.

Component details

Circuit ref.	*Type*
C1-5, C7, C10-11, C13-14, C21-22, C25, C30, C32, C34, C36-37, C39	100nF
C6, C8-9, C12, C24, C26, C35, C37-38	10µF
C15-16	22pF
C17-20	1µF tantalum bead
C31	4·7µF
D1-31	1N4148
D32, D34	BZX79C13
D33	BZX79C6V2
IC1	MAX202E
IC2	AT892051
IC3	TL7705
IC4	LM7805
IC5, IC8	LM7812
IC6, IC7	DG413DJ
Tr1	ZTX721, 2N2907 etc.
XTL1	11·05MHz
R1, R10, R15-22	100kΩ
R2, R11-14	1kΩ
R3-9	10kΩ
CON1-3, CON5-10	3W Molex
CON4	4W Molex
CON11	Not fitted
CON12-13	2W Molex
Bridge rectifier	RS 183-4258 (200V, 15A)
Reservoir capacitor	10,000µF, 40V, 11·8A
Mains transformer	RS 805-136 (50VA, 2 x 12V)

Hardware

Fuseholder (mains)	Farnell 248-447
Fuseholder insulating boot	Farnell 152-231
Fuseholder (secondary)	Farnell 152-233
Triple scart connector	CPC AV02221
5-way latching DIN plug	RS 478-172
5-way latching DIN socket	RS 478-633
9-way D sockets (4)	Farnell 698-106 (PIR interface)
9-way DIN plug	Farnell 698-064 (RS232 interface)
Plastic box	Farnell 110-408
Baseplate for box	Farnell 195-008
Four mono CCTV cameras	As available
Four PIR sensors	As available

Sensor based on a modified Sensorguard battery-operated lamp.

beneath components, making PCB production and assembly easier. Standard through-hole mounted components are used, and the ICs are fitted in sockets.

The prototype was fitted in a grey plastic box (Farnell 110-408), with a baseboard mounting plate (Farnell 195-008). The box is rated as IP65 before holes are drilled in it. It's just large enough to contain the PCB, with a small cutout next to the scart connectors. The PCB and power-supply components are fixed to the mounting plate.

The prototype system uses three cameras fitted with scart plugs. They came with a 12V output plug-top 'wall wart' power supply – one for each camera. The cameras use scart pin 20 (video/sync in) for the video signal, pin 6 (audio in left) for the audio signal and pin 17 (video ground) for the common ground.

The prototype unit uses a modified three-socket scart PCB extracted from a module obtained from CPC (part no. AV02221). The modification involves cutting the tracks between the sockets at pin 6 (audio left in) and pin 20 (video/sync in). Solder three wires to the AV02221 PCB for each video/audio channel. One wire goes to each scart pin 17 (video ground), one to each scart pin 20 (video/sync in) and one to each scart pin 6 (audio in left).

Cut three holes in the side of the plastic box for the scart sockets (use the lid of the AV02221 case as a template). A much less fiddly alternative is to bolt the AV02221 case to the side of the plastic box and pass the nine connecting leads through one nice, simple hole.

The fourth camera in the prototype system uses a 180° latching five-pin DIN connector for the 12V supply and the audio and video outputs from the camera (plug RS 478-172, socket RS 478-633).

The mains power supply, see Fig. 4, is based on items found in my junk box. T1 is an RS 805-136 50VA mains transformer with two 12V secondary windings – chassis mounting, clamp construction. D1 is a 200V, 15A bridge rectifier: RS 183-4258 is equivalent. Reservoir capacitor C1 is 10,000µF, 40V with an 11·8A ripple current rating. Mains fuse F1 is in a 20mm panel-mounted fuseholder while the secondary fuse F2 is in a 20mm open fuseholder attached to the loom with tie-wraps (this is known as a design afterthought). A 2A plug-top power supply would be a safer and possibly cheaper option.

The power supply components and the PCB are fitted on the baseboard mounting plate. The connectors are fitted to the box: ensure that the PCB does not touch the rear of the scart connectors.

0·1in. Molex headers can be fitted to the PCB, with Molex sockets in the wires from the external connectors. This makes assembly of the unit a little easier. In the prototype the wires from the external connectors are soldered directly to the PCB.

Software

The software was written in Keil 8051 C, using the special Atmel 2K demonstration version of the compiler supplied with the Equinox Technologies MP51 programmer. The Atmel AT892051 is programmed out-of-circuit with the programmer.

The software consists of an idle loop with interrupt routines for the serial port and timer0. The idle loop checks (1) for characters in the serial port receive buffer, (2) for timing flags from timer0 and (3) for inputs from the PIR sensors. It sets the video and audio switches to select a camera, and toggles the watchdog circuit at P3.7 to prevent the program from restarting.

When a PIR sensor triggers, the signal at the processor port goes high, the tone generator in the timer interrupt is enabled, and a character is transmitted from the serial port to indicate which PIR sensor has activated. A 0 indicates camera one, a 1 camera two etc.

A character sent to the serial port selects a camera for three seconds: 0 selects camera 1, 1 selects camera 2 etc., enabling the user to override the internal camera selection. The user can select a camera from a remote location if a 418MHz (or 433MHz) low-power radio receiver that provides an ASCII output at 9,600 baud is connected to the serial port.

PIR sensors

Fig. 5 shows the PIR sensor circuit. In my system one sensor uses the plastic PIR housing from a defunct security lamp, with rebuilt electronics. The other three sensors are modified Sensorguard battery-operated lamps. These were available from CPC for a time, were discontinued but have on occasion appeared in Lidl. They have the advantages of being cheap, using discrete components and being easy to modify. Security PIR alternatives are shown in the CPC catalogue and elsewhere, but have not been tested with the system.

Performance

System performance is reasonable. A tree branch triggered a PIR sensor on sunny days (the sun does shine in Wales sometimes, if not often). The problem was cured by covering the upper part of the PIR lens with masking tape.

The PIR sensors have limited range and sensitivity, and are sensitive to white light. This is probably caused by the Fresnel lenses. Security PIR sensors have better performance in this respect. The night-time performance of the cameras is disappointing, even using 24 infr-red LEDs.

Three 200W PIR security lamps (mostly) come on as the system starts to record, so this is not a great problem.

To be continued...

HELP WANTED

Wanted: PCB, part number 1-678-186-21, for the Sony Model KV28FQ75 (AE5 chassis). Justin Johns, 28 Woodland Road, Neath, SA11 3AL. Phone 01639 638 629 or email justinjohns340@hotmail.com

Wanted: Front control button assembly (vol ± and prog ±) for the Thomson Model 14MS15UT. Type 393r/TX807. Please email avrs01@eircom.net

Wanted: Line output transformer, new or used, for the LG Model WF32A22D1. The number on the transformer is 6174Z-6100J. 5TC23. R. Webb, KTV Electronics, 47A Pendarves Street, Tuckingmill, Camborne, Cornwall, TR14 8NP. Phone/fax 01209 718 043.

Wanted: Operator's manual for the Lyons Interlab D10 distortion meter. Phone Colin on 01915 870 502 or email sornelltd@hotmail.com

Wanted: A suitable remote-control unit and if possible an instruction manual for the Nokia Nicam VCR Model 3786UK. Phone Philip Bearman on 020 8446 2534 (Barnet, Herts).

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) 9 a.m. to 10.30 p.m.

For disposal: Copies of *Television* from 1975 to 2003, U-View circuit books, service manuals, spare parts and test equipment. Phone David Miles on 0151 932 1419 (Merseyside).

Wanted: Used but working EHT splitter for the Philips Model 41GR8841/05B portable TV. The Philips part no. is 4822 218 20809. A working item from a scrap set would be OK. Phone/fax Bob Peters on 00 34 96 671 9902 or email bob.pbravo@tiscali.es

Wanted/for sale: Does anyone have a reel motor, part no. 25791358, for an ancient Toshiba cassette deck, Model PC-G2T, or alternatively a complete mechanism? Offers please for an Akai 4000D tape unit with 100+ tapes, in cabinets; also a Goldring GL75 turntable (in plinth) plus stylus/cartridges (new). Would need to be collected. Phone Ray Payne on 01425 617 786 (New Milton, Hants).

Wanted/for disposal: Require an unused A66-120X colour CRT, can collect. Have for disposal several boxed unused Mazda CME1520/A38-160W and Brimar M38-160W monochrome CRTs and a solid aluminium 1·5m satellite dish on an adjustable ground mount – needs centre-feed LNB and holder. Phone Geoff Turner on 01684 567 444 (Worcestershire) or email gctturner@hotmail.com

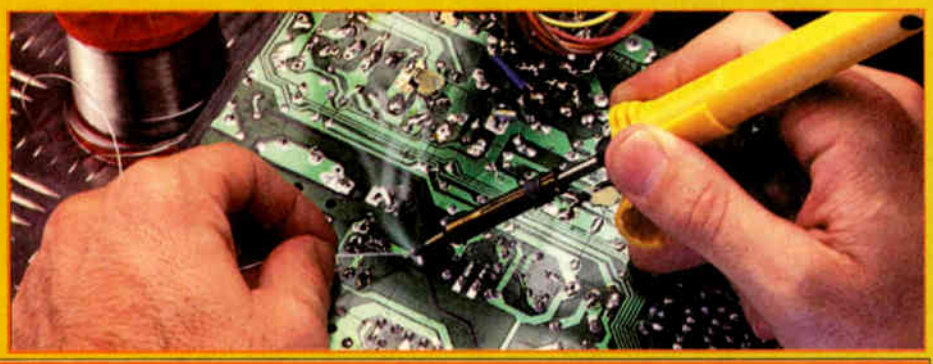
Wanted: Passive radiator (baffle) for the B&O speaker Model 5700. Also any old AM CB radios, multi-channel, with sidebands, working or not. Phone Norman Simpson on 020 8692 2748 (Deptford, London) or 07836 753 492 (mobile).

For disposal: Following retirement I have a small quantity of spares to dispose of, from Philips, LG and various other manufacturers. They include some of the more difficult parts that are now obsolete. Would anyone interested contact K.V. Cunliffe on 01746 718 406 (phone/fax) or 07970 764 154 (mobile). Any parts not disposed of by the end of the year will be thrown away.

Wanted: Tuning gang for the Roberts Radio Model R24. The set is part of a collection of working Roberts Radio sets. Phone Stewart (CUTV) on 01316 672 426.

For sale: *Television* magazines from July 1975 to 2000, one issue missing. Phone Joe Lafferty on 01397 772 562 (Fort William, Inverness-shire) or email laffertyj@aol.com

Wanted: I am looking for any LaserDisc players, e.g. the Philips VLP600 etc. Condition is unimportant, as I require them for spare parts to renovate other vintage machines. All costs will be met. Phone Ritchie on 01294 823 550, mobile 07837 337 150 or email Rlasers@aol.com



Bench Notes

Adrian Gardiner on a troublesome Beko set and more madness – a crateful of small monochrome TVs

A troublesome Beko

I recently had a Beko set, Model 28416ND, in for repair. It's fitted with the 14.1 chassis, with which I'm sure many of you are familiar. The fault seemed straightforward enough: a blow-up had occurred in the power supply. The chopper control chip IC601 had blown its top off, the chopper FET T601 was short-circuit, and several other components had been damaged. IC601 is type MC44608P. I used a 2SK2545 FET, which has proved to be reliable in this position. D601, the supply rectifier for the control IC, and D607 in the snubber circuit needed replacement. So did R605 (39Ω), R606 and R607 (both 0·47Ω).

Whenever one of these power supplies requires repair I always improve the reliability by adding a 4·7kΩ resistor in series with the diode that provides the chopper control IC's supply, in this case D601. In some makes a resistor is already fitted in this position, but quite often its value is 1kΩ: increase it to 4·7kΩ.

Once these items had been fitted I applied power and was rewarded with good results. So, after a reasonable soak test, the set was returned to its owner.

Unfortunately it came back two days later, but this time it was stuck in standby. Expecting to find a short in the line output stage, I quickly checked around the output transistor. But nothing seemed to be amiss. Checks on the other supply rails also failed to reveal any shorts. At this point I turned my attention to the original problem, the power supply blow-up. Checks around the optocoupler revealed the cause of the trouble: the optocoupler was very leaky at both the primary and the secondary side. In addition D614 and ZD603 in the standby switching arrangement were short-circuit, and R617 (47Ω) in the feed to the optocoupler on the secondary side had suffered. So I fitted replacements, using a PC123 optocoupler. I then applied power, expecting the set to start up. There was a just brief rustle of EHT, after which the set died. Checks on the secondary side of the power supply showed that the voltages were normal, with the HT at 145V.

Further checks revealed that the line drive was missing. I traced through the circuitry back to the source, jungle chip IC101, where it was also absent. A common cause of this is the surface-mounted decoupling capacitors C132 and C125, at pins 1 and 39 of the IC. They tested OK, but to be sure I fitted replacements. This made no difference. All the other outputs from the IC were correct, so I suspected the chip itself, a TDA8843.
Unfortunately the problem was still present when a replacement had been fitted. The only other clue was that the I^2C bus seemed to be particularly busy. To rule out software problems, I blanked the EEPROM. The problem was still there however, and by now I was beginning to think that the skip in the back was the best solution!

In a desperate attempt to find more clues, I did what I should perhaps have done at the beginning: I connected a scope to the HT rail. The voltage was correct and stable at 145V, but there was a problem when power was first applied to the set. The scope revealed that immediately after power up there was a brief but very marked dip in the HT voltage. At this point I disconnected the feed to the line output stage and connected a dummy load. When power was restored the HT supply rose normally and remained stable.

So it seemed that there was a substantial overload when the line output stage attempted to start up. Although it tested OK, I fitted a new output transistor. This made no difference. At a loss as to the cause of the trouble, I decided to replace the line output transformer. When power was reapplied, there was the sound of EHT and the set sprang to life.

A long soak test proved that all was now well. Needless to say I was more than glad to return the set to its owner!

More madness

I recently bought a crate of 5·5in. monochrome TV sets. Although such sets are generally uneconomic to repair, they can be quite profitable if you get them at the right price. These compact units combine a 12V TV set with a dual-band radio, and are popular with caravanners and lorry drivers. You find various brand names on them. Most use the same chassis however, which is based on a CD5151 IC. Here's a round-up of common problems I've come across.

General: These units are hand-soldered. Many faults are caused by either poor soldering or bridged connections. Start with a thorough general inspection, as this can often solve a lot of problems.

Dead set: Check for cracked print around the DC input and aerial sockets. It seems to be a common problem with these sets.

TV dead: Check Q702, Q703 and D702.

TV unstable with excessive width: The primary supply transistor Q701 was short-circuit collector-to-emitter. A TIP42C works well in this position.

Field collapse: R519 (10Ω) open-circuit.

Bright white screen and no sound: IC202 defective.

Radio dead: C104 (100μF) short-circuit.

No tuning: Check R206 (10Ω).

Low gain: The usual cause is a defective tuner, but Q201 in the AGC circuit can also be responsible.

Very dull, washed-out picture: CRT faulty.

Poor focus: CRT faulty.

No sound: IC301 faulty.

No sound with R307 (22Ω) burnt up: C317 (470μF) short-circuit.

Buzzing on sound: Carefully adjust the IF discriminator coil L301.

Mirrored picture: I've come across several cases where the line scan coils were soldered the wrong way round. ■

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CT29A4	TDA 8178S	MITSKIT2
CT29A6	TDA 8178S	MITSKIT2
CT29B2	TDA 8178S	MITSKIT2
CT29B3	TDA 8178S	MITSKIT2
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66FW54H	PSU & DOLBY	MODKIT45
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Price : £ 18.00 + vat

New Arrival !!

Vestel 11AK31 Chassis PSU Repair Kit

Fits the following brands :

Bush , Goodman , Hitachi , Toshiba

Models BD2851S , BD2951S , BD2581S, BD3251S

Order Code : MODKIT51

Price : £ 10.00 + vat

K.P. House , Unit 15 , Pop In Commercial Centre , Southway , Wembley , Middlesex . HA9 0HB England

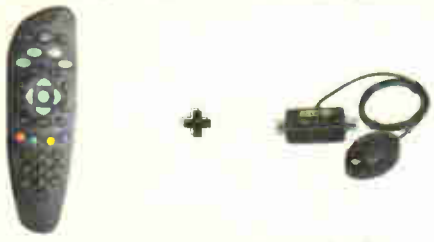
Tel: (020) 8900 2329 **Fax : (020) 8903 6126** **Email : sales@grandata.co.uk**

Grandata Ltd

distributor of electronic components

Digital Satellite Accessories

Sky™ Digital Remote & TV Link Eye Combination



Order Code : SKYPACK1

Price : £ 16.00 + vat each

5 +

£ 14.50 + vat each

Carriage Charged at £ 5.00 + vat

Sky™ Digital Remote Controls

Order Code : RCSKY

Price £ 7.95 + vat

5 or more £ 7.45 + vat each

10 + £ 6.95 + vat each

Carriage Charged at £ 5.00 + vat

Sky™ Digital Remote & SLx Link Eye Combination

Order Code : SKYPACK2

Price £ 13.00 + vat each

5 + £ 11.50 + vat each

Carriage Charged at £ 5.00 + vat

SLx Link Eye

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

Order Code 27833R

£ 5.80 + vat each

10 or more £ 4.80 + vat each

Sky™ Digital TV Link Eye

Order Code : TVLINKEYE

Price £ 10.00 + vat

5 + £ 7.99 + vat each

SLx Amp By Pass Kit

For use with aerial amplifiers and Sky™ Digibox

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

Order Code 27829R

Price: £ 5.00 + vat

Satellite Repair / Mod Kits

Amstrad DRX100

Tuner Repair Kit

Order Code SATKIT35

Price £ 1.40 + vat

Amstrad DRX100

PSU Reliabilty Kit

Order Code SATKIT36

Price £ 12.00 + vat

Amstrad DRX100

PSU Repair Kit

Order Code SATKIT37

Price £ 13.50 + vat

Grundig GDS200

Digital Satellite Receiver Repair Kit

Early psu
MODEL : DS0 - 0385 REV C

Order Code SATKIT34A

Price : £ 10.00 + vat

Grundig GDS200 / GDS300

Digital Satellite Receiver Repair Kit

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

Order Code SATKIT34B

Price : £ 10.00 + vat

Digital Satellite Receivers Fan Kit

Suitable for
Amstrad DRX100 , DRX200
Grundig GDR200 , GDS200
Pace Digibox
plus many more analogue makes and models

Order Code : FANKIT1

Price : £ 10.00 + vat

Panasonic Digital Satellie Receiver Fan Kit

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

Order Code : FANKIT2

Price : £ 15.00 + vat

Grundig Digital Satellitte ReceiversReliability Kit

These kits contain capactiors that are generally of higher specification than those fiited by the manufacturers.

GDS200

Early PSU
DSO0385 Rev C

Kit Contains 9 capactitors

Code :RELKIT34A

Price: £ 4.00 + vat

GDS200 / GDS300

Later PSU
DSO0375 Rev A
DSO0385 Rev F

Kit Contains 11 capactitors

Code :RELKIT34B

Price: £ 4.00 + vat

GDS200 / GDS300

Later PSU
Rev 03

Kit Contains 13 capactitors

Code :RELKIT34C

Price: £ 4.00 + vat

GDS200 / GDS300

Samsung PSU
PSSH370601B

Kit Contains 12 capactitors

Code :RELKIT34D Price: £ 4.00 + vat

GDS300

Samsung PSU
PSSH370603B

Kit Contains 13 capactitors

Code :RELKIT34E Price: £ 4.00 + vat

Grandata Ltd

distributor of electronic components

105°c Electrolytic Capacitors

VALUE	CODE	PRICE PER PACK
6.3 Volts		
220uF	CAP163	£0.70 10
470uF	CAP164	£0.80 10
10 Volts		
100uF	CAP118	£0.45 10
220uF	CAP165	£1.00 10
470uF	CAP29	£1.20 10
680uF	CAP166	£1.20 10
1000uF	CAP119	£1.50 10
2200uF	CAP120	£2.10 10
3300uF	CAP167	£1.60 5
16 Volts		
22uF	CAP121	£0.35 10
33uF	CAP122	£0.35 10
47uF	CAP123	£0.35 10
100uF	CAP124	£0.60 10
150uF	CAP168	£0.65 5
220uF	CAP125	£0.80 10
330uF	CAP30	£1.75 10
470uF	CAP31	£1.75 10
680uF	CAP32	£2.10 5
1000uF	CAP33	£2.10 10
1200uF	CAP169	£1.50 5
1500uF	CAP170	£1.50 5
2200uF	CAP34	£5.25 10
3300uF	CAP35	£5.00 5
4700uF	CAP36	£6.10 10
6800uF	CAP171	£4.50 5
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

VALUE	CODE	PRICE PER PACK
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

VALUE	CODE	PRICE PER PACK
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

VALUE	CODE	PRICE PER PACK
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
160 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

VALUE	CODE	PRICE PER PACK
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	CAP160	£4.00 2
150uF	CAP217	£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

Konig Replacement Remote Controls

Part No.	Code
AKAI	
CT2582E	IR9700
CT2585	IR9700
CT2885	IR9700
CT2885E	IR9700
IR16	IR9700
RC556	IR9397
RC85	IR9700
AMSTRAD	
SRD550	IR9386
SRX510	IR9386
AE6001	IR9352
B & O	
Beolink 100	IR9843
BEKO	
RC51321	IR9398
RC51331	IR9398
RC61331	IR9398
BLAUPUNKT	
8669493	IR9188
1532	IR9503
1570-46	IR9516
8627 105 463	IR9188
8688813000	IR9516
I555-46	IR9516
I563-46	IR9516
IB16	IR9504
IC16	IR9504
ID32	IR9503
IL32	IR9503
IM32	IR9503
IM55-16	IR9516
IM63-16	IR9516
IM70-16	IR9516
IP32	IR9503
IQ16	IR9504
IR32	IR9504
TC106	IR9406
TC110 PIP	IR9248
TC143	IR9406
TC144	IR9406
TC190	IR9529
TC192	IR9529
TC194	IR9529
CROWN	
RC51331	IR9398
RC61331	IR9398
2190T	IR9397
DAEWOO	
DMQ1414	IR9397
DMQ14A 1	IR9840
DMQ20A 1	IR9840
DMQ2195	IR9840
DMQ2595	IR9840
DMQ2895	IR9840
FERGUSON	
20H3	IR9594
22B5	IR9584
22H3	IR9594
2415	IR9584
2422	IR9584
2423	IR9584
2433	IR9584
2445	IR9584
2452	IR9584
2453	IR9584
2463	IR9584
2475	IR9584
28H3	IR9594
29132	IR9584
36K2	IR9584
41H3	IR9594
4233	IR9584
4414	IR9584
4415	IR9584
4423	IR9584
4433	IR9584
51A0	IR9584
51A2	IR9584
51A3	IR9584
51A4	IR9584
51A5	IR9584
51G2	IR9594
51G3	IR9594
51H3	IR9594
51H4	IR9594
51J7	IR9594
51K3	IR9594
5980	IR9584
59B2	IR9584
59B3	IR9584
59B4	IR9584
59B5	IR9584
59D2	IR9584
59D3	IR9584
59G2	IR9594
59G3	IR9594
59H4	IR9594
59H5	IR9594
59J7	IR9594
59LS2	IR9639
6223	IR9584
6245	IR9584
66B2	IR9584
66B3	IR9584
66H3	IR9594
66H4	IR9594
66H5	IR9594

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

Part No.	Code
HITACHI ..continued	
C24WS511T	IR9983
C2514	IR9476
C2546	IR9677
C2546TN	IR9677
C2547TN	IR9677
C2556TN	IR9983
C2566TN	IR9677
C2567TN	IR9983
C2567TN2	IR9983
C2586TN	IR9983
C2659H	IR9142
C2660	IR9142
C2661	IR9142
C2846TN	IR9677
C2847TN	IR9677
C2856TN	IR9983
C2866TN	IR9677
C2886TN	IR9983
C28W410TN	IR9983
C28W510TN	IR9983
CBP1476R	IR9142
CBP1646R	IR9142
CBP2067	IR9142
CBP2216	IR9142
CBP222	IR9142
CBP226	IR9142
CBP260	IR9142
CL2156TAN	IR9983
CL24W1TAN	IR9983
CL2556TAN	IR9983
CL2586TAN	IR9983
CL2856TAN	IR9983
CL2886TAN	IR9983
CL28W1TAN	IR9983
CL28WD2TAN	IR9983
CL32WD2TAN	IR9983
CLE871A	IR9602
CLE871B	IR9602
CLE874A	IR9602
CLE874B	IR9602
CLE876	IR9476
CLE876C	IR9477
CLE876D	IR9477
CLE876G	IR9477
CLE902A	IR9677
CLE902B	IR9677
CLE903A	IR9677
CLE921A	IR9983
CLE921B	IR9983
CLE922A	IR9982
CLE922B	IR9982
CLR876E	IR9477
CP2146TA	IR9677
CP2546	IR9677
CP2546TA	IR9677
CP2556TAN	IR9983
CP2841TA	IR9677
CP2856TA	IR9983
CP2856TAN	IR9983
CP2886TAN	IR9983
CP28WD2TAN	IR9983
CP32WD2TAN	IR9983
CPT1556	IR9576
CPT1557	IR9576
CPT1560	IR9576
CPT1561	IR9576
CPT2155	IR9575
CPT2164	IR9575
CPT2558	IR9575
CPT2564	IR9575
CPT2566	IR9575
CPT2669	IR9575
CPT2785	IR9575
CPT2870	IR9575
CST1430	IR9576
CST1435	IR9576
CST1560	IR9576
CT2116	IR9476
CTRM200M	IR9542
JVC	
AV21TS1EN	IR9698
AV25TS1EN	IR9698
AV25VM1EN	IR9698
AV28VM1EN	IR9698
AV29SX1EN	IR9698
AV29TS1EN	IR9698
AV32WZ2EN	IR9698
RC8072	IR9698
RC8074	IR9698
RMC530	IR9698
RMC682	IR9698
RMC761	IR9698
RMC7611E	IR9698
RMC770	IR9698
RMC771	IR9698
RMC7711E	IR9698
RMC793	IR9698
RMC7931E	IR9698
LOEWE	
FB300	IR9616
FB50	IR9514
FB52	IR9514
FB70	IR9514
FB72	IR9514
FB90	IR9514
FB91	IR9514
MATSUI	
076G047240	IR9490
076L067240	IR9490
2076R	IR9490
2092T	IR9490

Part No.	Code
NOKIA	
3126	IR9157
3126F	IR9157
C1	IR9161
C2	IR9161
C3	IR9161
C4	IR9161
CM 1	IR9569
D1	IR9161
D2	IR9161
E1	IR9161
E2	IR9161
EM2	IR9700
ES5	IR9701
FS10	IR9573
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TC1656PFR	IR9826
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TX28A1D	IR9826
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RC5300	IR9510
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RC7507	IR9710
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RC8205	IR9710
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RC9070	IR9434
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JXCL	IR9530
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JXFF	IR9457
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JXGE	IR9139
JXGT	IR9460
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JXGY	IR9460
JXLB	IR9460
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RC258	IR9530
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RC625	IR9457
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RC642	IR9530
RC645	IR9974
RC685	IR9457
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RC702	IR9139
RC710	IR9139
RC711	IR9460
RC901	IR9139
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51AM12S	IR9788
51AT15S	IR9788
54AM12S	IR9788
54AT15S	IR9788
54CS05SN	IR9711
5V2044	IR9487
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70CS03S	IR9711
72CS03S	IR9711
72CS05SN	IR9711
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CV2121	IR9487
CV3707	IR9487
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DV1706SN	IR9487
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DV2130EX	IR9487
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RRMCG0351CESD	IR9487
RRMCG0370CESA	IR9487
RRMCG0483PESA	IR9487
RRMCG0489CESB	IR9487
RRMCG0568PESA	IR9487
RRMCG0617PESA	IR9487
RRMCG0618PESA	IR9487

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RRMCG0739BM5A	IR9711
RRMCG0777PESA	IR9487
RRMCG0833PESA	IR9487
RRMCG0898CESA	IR9487
RRMCG1014BM5A	IR9711
RRMCG1023BM5A	IR9711
RRMCG1031BM5A	IR9788
RRMCG1036BM5A	IR9711
RRMCG1046BM5A	IR9788
RRMCG1048BM5A	IR9788
RRMCG1050BM5A	IR9788
RRMCG2799CESA	IR9487
SV2044G	IR9487
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SV2145G	IR9487
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SV2577S	IR9487
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RM684	IR9442
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RM698	IR9442
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RM820	IR9452
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RM828	IR9452
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RM839	IR9871
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1400RBN	IR9962
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1400RBW	IR9962
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1440RB	IR9852
1440RBT	IR9852
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1440TB	IR9852
1440TBT	IR9852
1450RB	IR9852
1450RD	IR9852
1480RB	IR9953
1480RBT	IR9953

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TOSHIBA ..continued	
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1480TB	IR9953
1480TBT	IR9953
1480TBW	IR9953
1480TBY	IR9953
1480TBZ	IR9953
1510RBT	IR9962
1510RDT	IR9962
1510RT	IR9962
155R9B	IR9962
155R9BT	IR9962
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155R9BZ	IR9962
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1720RB	IR9852
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2100RBT	IR9962
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2102RBZ	IR9962
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2163DB	IR9953
216R9B	IR9962
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2180TD	IR9953
2181TB	IR9852
2181TB	IR9953
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219R9B2	IR9962
2522DB	IR9953
2522DD	IR9953
2527DB	IR9953
2535DB	IR9852
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2537DD	IR9852
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2550TB	IR9953
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7053DD	IR9953
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3138 108 30101	LOT106	£12.50
3138 108 30103	LOT106	£12.50
3139 128 30400	LOT90	£12.50
40348-08	LOT1577	£18.00
40348A-08	LOT1577	£18.00
40348A-09	LOT1577	£18.00
4812 140 10246	LOT111	£15.00
4812 140 10349	LOT106	£12.50
4812 140 10369	LOT90	£12.50
4812 140 10421	LOT90	£12.50
4822 140 10246	LOT111	£15.00
4822 140 10274	LOT123	£14.50
4822 140 10306	LOT57	£11.00
4822 140 10349	LOT106	£12.50
4822 140 10381	LOT128	£13.00
4822 140 10384	LOT127	£15.50
4822 140 10406	LOT73	£11.50
4822 140 10544	LOT433	£16.00
4822 140 10566	LOT433	£16.00
AT 2076 / 10	LOT57	£11.00
AT 2077 / 81	LOT121	£15.00
AT 2078 / 21	LOT395	£12.00
AT 2079 / 15	LOT129	£14.00

Part No	Code	Price
PHILIPS..continued		
AT 2079 / 21	LOT395	£12.00
AT 2079 / 24	LOT392	£15.00
AT 2079 / 40	LOT73	£11.50
AT 2079 / 99	LOT276	£14.00
AT 2079/30 01	LOT106	£12.50
AT 2079/30102	LOT106	£12.50
SAISHO		
3714002	LOT02	£12.00
043714002J	LOT02	£12.00
43700000	LOT02	£12.00
7140021	LOT02	£12.00
SHARP		
RTRNF 1220 CEZZLOT39		£18.50
RTRNF 2001 CEZZLOT338		£17.50
RTRNF 2006 CEZZLOT308		£13.50
RTRNF 2023 CEZZLOT310		£15.00
SONY		
1-439-286-00	LOT46	£13.00
1-439-286-11	LOT46	£13.00
1-439-286-12	LOT46	£13.00
1-439-286-13	LOT46	£13.00
1-439-286-21	LOT46	£13.00
1-439-332-41	LOT100	£15.00
1-439-332-42	LOT101	£14.50
1-439-332-52	LOT100	£15.00
1-439-363-11	LOT268	£14.00
1-439-363-21	LOT268	£14.00
1-439-387-11	LOT311	£14.50
1-439-387-21	LOT311	£14.50
1-439-416-11	LOT255	£16.00
1-439-416-12	LOT255	£16.00
1-439-416-21	LOT255	£16.00
1-439-416-23	LOT255	£16.00
1-439-416-41	LOT255	£16.00
1-439-416-51	LOT255	£16.00
THOMSON		
105009.8	LOT1505	£19.00
10500980	LOT1505	£19.00
10500980.P1	LOT1505	£19.00
10531460	LOT1505	£19.00
105660.6	LOT1505	£19.00
105660060	LOT1505	£19.00
10566060	LOT1505	£19.00
10566060.P2	LOT1505	£19.00
105880.8	LOT1505	£19.00
10588080	LOT1505	£19.00

Part No	Code	Price
THOMSON..continued		
10588080.P2	LOT1505	£19.00
151128140	LOT1505	£19.00
151281.4	LOT1505	£19.00
15128140	LOT1505	£19.00
153144.6	LOT1505	£19.00
15314460	LOT1505	£19.00
1531447 A	LOT1505	£19.00
1532873 A	LOT1505	£19.00
3233500	LOT244	£14.50
3233900	LOT244	£14.50
40011200	LOT244	£14.50
40148300	LOT244	£14.50
TOSHIBA		
1810951	LOT55	£14.00
2433751	LOT01	£13.00
23236098	LOT288	£14.00
23236198	LOT288	£14.00
23236201	LOT395	£12.00
23236245	LOT395	£12.00
23236255	LOT289	£15.00
23236425	LOT288	£14.00
23236427	LOT395	£12.00
23236428	LOT289	£15.00
23236424	LOT129	£14.00
TFB 4090 AD	LOT395	£12.00
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Vintage radio repair

Pete Roberts tackles a couple of vintage transistor radios, an Ekco Nautilus Model PT310 that dates from the early Seventies and an original Roberts R700 that was built in 1968

Photo 1: External view of the Ekco Nautilus Model PT310.

Welcome again to the vintage page. Here's some real nostalgia from the days of the Light Programme, Home Service and Luxembourg on 208! I tend to concentrate on transistor radios from the Fab Fifties and Swinging Sixties, but table and portable valve receivers also grace my workbench, not to mention period hi-fi gear.

The Ekco Nautilus Model PT310

The first patient this time is an Ekco Nautilus Model PT310, see Photo 1, which was made in Japan and released by the Pye/Invicta group in the early Seventies. It has a complement of eleven transistors (a mixture of germanium and silicon types), six diodes (including one varicap) and a bridge rectifier. Power is taken from either four C cells or the AC mains supply. Band coverage is long, medium and short plus FM. Photo 2 shows an internal view.

Photo 2: Internal view of the Ekco Nautilus Model PT310.

Unusually, this model has completely separate IF strips for AM and FM reception, with only the audio stages being common to both. The FM section uses silicon transistors throughout while, with the exception of the mixer/oscillator, the AM and audio sections use germanium devices. There's a balanced push-pull output stage, with driver and output transformers. The varicap diode is used for AFC with FM reception. The chassis and ground rail are connected to the positive side of the supply.

The radio came in with very noisy volume and wave-change controls and, as I discovered later, intermittent FM reception. The first job was to clean the controls with a shot of switch cleaner. This was completely successful, and I was rewarded with clear reception on all three AM wavebands. I noticed a distinct background hum, which was cured by replacing the mains bridge rectifier's reservoir capacitor. Bearing in mind the age of the set, some thirty years, I thought it best to replace all the electrolytics. FM reception worked only intermittently, and it turned out that there were two faults.

Dismantling the set is a fairly complex job that involves removal of many unmarked screws. The FM aerial lead (blue) has to be unsoldered from the telescopic aerial, likewise the brown 'live' and black earth leads from the external aerial socket. After removing the knobs the chassis can be withdrawn, leaving the speaker leads connected. "Chassis" is the right word to use too – this radio is built like many TV sets of the time, with PCBs mounted on a metal framework. In fact there are two PCBs, an upper one that carries the FM circuitry and a lower one for the AM section, the audio stages and the bridge rectifier for the mains supply. Several wire links interconnect the panels. These are a possible source of problems.

The FM reception problem

Needless to say the VHF RF section of the PCB was all under the tuning capacitor's pulley, so I had to remove the tuning scale, the drive cord and the pulley. My first check was for IF strip operation, by holding a screwdriver blade and touching the tip on the FM mixer/oscillator transistor's collector pad, i.e. using myself as an aerial. Safety note: tests of this sort should not be undertaken with valve radios, as there is a risk of getting a nasty shock. There was silence initially, but by pressing lightly on the board I obtained the expected short-wave noise (the 10·7MHz FM IF corresponds to about 28m in the short-wave band). Further careful tapping narrowed the cause of the problem to a dry-jointed diode lead in the ratio-detector circuit. Once this and a few other dodgy-looking joints had been resoldered the IF section worked steadily.

But FM reception had now failed completely. If the RF amplifier fails, the characteristic FM 'hash' is present and the strongest stations will still be heard. A general absence of life, when the IF stages are known to be working, is almost always caused by failure of the local oscillator. I checked various voltages in the stage, then decided to replace the transistor.

A 2N2222 produced no joy, so I tried a BF180. Again no luck. Unfortunately, because of the current obsession with surface-mounted

devices, the range of leaded RF transistors listed by mainstream stockists is now quite limited. Of those listed the ZTX320, a tiny 'E-line' VHF transistor, seemed to be a good compromise between price and performance. It's a high-gain device with a cut-off frequency (ft) of 600MHz. I fitted one and, at last, had success. I also replaced the 5pF collector-emitter coupling capacitor, just in case. According to my Peak DCA50 component tester the original transistor was OK, with an Hfe of 55. That's what you would expect from a run-of-the-mill small-signal RF transistor. The ZTX320's measured Hfe of 150 is considerably higher.

After a few hours' soak testing I reassembled the tuning drive and refitted the chassis in its case. According to the tuning scale the alignment of the FM oscillator was way out. To restore Radio 2 to its correct position (88·9MHz from Holme Moss) I had to squeeze the turns of the oscillator coil closer together. Strangely, no adjustment was needed at the top end of the band: all my local radio stations were in their correct places. The new transistor's internal capacitances were obviously lower than those of the original device, requiring an increase in the inductance of the oscillator coil to compensate.

After that FM reception was every bit as good as with a contemporary receiver. To finish off, a small amount of paraffin was melted around the oscillator coil and the replacement transistor to prevent movement and possible microphony.

The Roberts Model R700, which is two receivers in one.

A Roberts R700

Next an original Roberts Model R700. Manufactured in 1968, this LW/MW/FM receiver uses 14 germanium transistors, including seven AF11X alloy-diffused types, and eight diodes including a varicap. The faults reported were loss of AM followed by FM failure. Again, this set is actually two receivers in one, with completely separate FM and AM sections and a common audio circuit. The output stage is of the transformerless complementary-symmetry type.

The FM front-end has an AF180 RF amplifier and an AF114 mixer-oscillator, both of which are operated in the common-base mode. This is followed by three IF amplifier stages that use AF114 transistors, and a conventional ratio detector. The AM section starts with an AF117 mixer-oscillator, which is followed by a module that contains a two-stage IF amplifier and a diode detector. Depending on the position of the wave-change switches, the output from the appropriate detector is fed via the volume control to the audio stages. Although more expensive to produce, this arrangement avoids the compromises inherent in the design of common AM/FM stages.

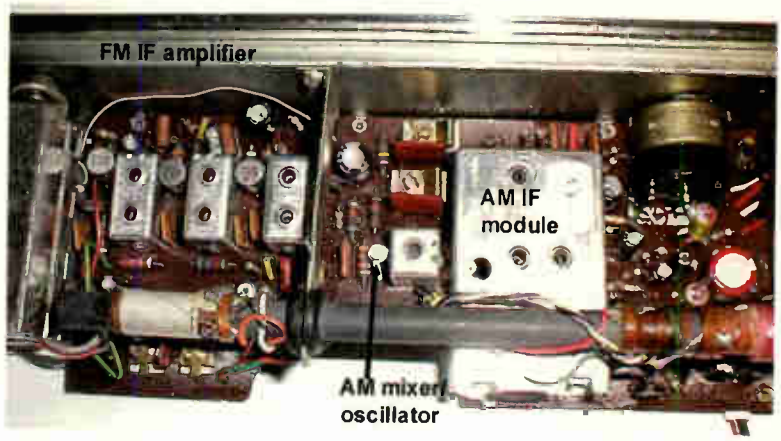


Photo 3: The IF section in the Roberts Model R700.

This model uses two PP9 batteries in series to provide an 18V supply. When I connected my bench power supply I was surprised to see a quiescent current consumption of 80mA. There was FM reception but it was very faint and distorted, as if one of the output pair of transistors was open-circuit. As nothing seemed to be suffering from any distress, and the heatsink for the output transistors was cool, I left the power on and started to poke around with the test leads – in a logical sequence of course!

Troubleshooting with these sets can be confusing, as the circuitry is 'upside down' – in most radios that use germanium pnp transistors the positive rail is chassis. However the chassis line with the R700 is negative, which means that DC-wise the emitters of most of the transistors are 'hot'.

Some of the plastic-cased Plessey electrolytics looked a bit iffy. So, taking into account the advanced age of the set, I decided to replace the lot. This was a wise decision as it turned out. After fitting the replacements the quiescent current was only about 20mA, but there was still faint, scratchy sound, and the mid-point in the output stage was at almost the full supply voltage. Suspecting a faulty transistor, I was prodding with my test leads when a sudden surge of volume frightened the life out of me. Yes, there was a poor connection, specifically a break in a small piece of print. After attending to this fault FM reception was excellent. But there was still no LW or MW reception.

IF transistor replacement

Voltage checks showed that the supply to the AM IF module and mixer-oscillator stage was very low. Photo 3 shows the physical arrangement. The cause couldn't have been the supply decoupler, because this had been replaced along with all the other electrolytics. To cut a long story short, the problem was the usual collector-to-case short in the AF117 AM mixer-oscillator transistor. Fortunately it was the one I could get at, not one of the pair in the AM IF module.

A word of warning here. The AF239S is often listed as a suitable replacement for the AF11X range. It isn't, as I found out the hard way. The AF239S is a UHF transistor and, like most transistors of this type, it has a low Hfe – typically 10. The Hfe of an AF11X type transistor is anything from 50 upwards. The AF127 is a suitable replacement – it's basically an AF117 in a small TO74 can (TO18 but with four leads).

If an AF11X transistor fails with a collector-to-case short, you can often get away with just snipping the case lead. In some sets however this can lead to instability.

Finally, don't forget that heat-shunt when soldering germanium transistors. If there's insufficient room to clip one on, make the joint with a hot iron applied for the shortest time required to make a sound joint. You could also pre-cool the transistor's body with freezer immediately prior to soldering it. ■

LETTERS

Send letters to "Television", Highbury Business, Media 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.

Filtering out TETRA

There have been several mentions of TETRA interference to analogue TV in recent issues. Elsewhere I have seen reference to some special Maxview filters for dealing with the problem. I live in Hayes, West London, and recently began to suffer badly from this form of interference on local channels below 26 – there was a lot of consistent herringbone patterning on them. When I checked at the Maxview website (www.maxview.ltd.uk) I found the MHF range of filters, which are described as "fully-screened masthead bandpass filters". The range is shown below.

Maxview seems to be perfectly happy to supply direct to private customers. I bought an MHF2137 for £17, which included post and packing and VAT. It arrived the next working day.

It's a properly-designed masthead filter, but I suspected that in my case the trouble could have arisen from the long runs of parallel down/up leads from/to the attic. I therefore decided to install the filter directly behind the TV set (before the various satellite receivers, the VCR, the cable box etc.!). It works brilliantly, and has cleaned up the low channels extremely well. Recommended! Maxview Limited is at Common Lane, Setchey, King's Lynn, Norfolk, PE33 0AT (01553 810 376).

You need a couple of screw-on F connectors, because the filter's input and output connections are of this type.

John Allen,
Hayes, Middx.

Maxview masthead bandpass filters

Type	*Bandpass*	*Group*
MHF2137	chs. 21-37	A
MHF3553	chs. 35-53	B
MHF4868	chs. 48-68	C/D
MHF3568	chs. 35-68	E
MHF2142	chs. 21-42	K
MHF2168	chs. 21-68	W

Analogue/digital picture quality

I agree with Geoff Thomas (letters, June) about poor current analogue terrestrial TV picture quality and the effects of studio digital processing. The quality of analogue terrestrial TV is getting steadily worse. I'll name some culprits. Here in Ireland we have the two national stations RTE1 and Network 2, the independent TV3 (now in Granada's hands, and very much a copy of ITV), and the Irish-language TG4. With a lot of material that has considerable movement, such as street scenes with moving traffic and sports programmes, there is loss of information rather than pixellation, though I haven't noticed this as much on the BBC channels: you can clearly see the juddering effect caused by missing frames. Some programmes are worse than others, but TV3 seems to be affected most often. TV3 also suffers from another weird effect, as if the luminance has been passed through a low-resolution ADC. There are distinct steps in the luminance with dark scenes and when there are slow luminance changes in the picture.

Some programmes (Home and Away on Network 2 in particular) are so weird and unnatural-looking that your eyes start to water as you try to adjust to the effect – it's like some sort of 3D cardboard cut-out vision. The end result is that some programmes are an unwatchable mess. Do any of the station engineers ever watch it? I'm sure they would be equally concerned if they did.

Owen O Reilly,
Mullingar, Co. Westmeath, Ireland.

Bush WS6671

A report on this model in the November 2002 issue mentioned an EW fault that was cured by replacing the S-correction capacitor C630 (390nF) and R620 (2·7Ω), which is in series with the EW drive. I had one of these sets in the other day with the same fault and, on checking, found that R620 was 27Ω and C630 470nF. They were correct for a wide screen tube.

Phil Cooke,
Sutton Coldfield, W. Midlands.

Editorial note: This set is fitted with the Vestel 11AK19 chassis, of which there are a number of versions. The values of R620 and C630 depend on the tube type and also its manufacturer. R620 is commonly 2·7Ω, 22Ω or 27Ω. Values for C630 include 390nF, 430nF, 470nF and 560nF. The important thing is to fit replacement components with the same values as the originals.

Confessions of a digi-sceptic

The area around the Stockland Hill transmitter is very hilly. As a result, the signal quality is patchy. I have to confess that in the past I have replied to enquiries about digital reception in these parts with "not a chance". Until, that is, I was asked to install a digibox in an area I thought was actually in sight of the transmitter. It would have been, but there was half an acre or so of trees in between.

The analogue BBC1 signal was very weak, ghosty and grainy. I connected the box anyway – just to show the customer that it wouldn't work. Can you imagine the colour of my face when it produced perfect BBC1 to Channel 5 pictures?! A few channels were missing, but my customer was so delighted with the quality of her "normal channels" that she didn't care. Let that be a lesson to you!

Peter Nutkins,
Charmouth, Dorset.

That Band I/III aerial

In his column last month (June) Roger Bunney showed an unusual Band I/III TV aerial that he had come across and asked for any comments on its operation – in particular the Band I dipole seemed to be shorted out. Here's my opinion, after a rummage through some old textbooks, though without any dimensions one has to guess to some extent.

First a bit of theory, see Fig. 1. A half-wave dipole has a nominal centre impedance of 75Ω. Adding directors and a reflector will lower this. The Band I dipole seems, in this case, to act as a Band III reflector as well. It is usual practice to have the reflector 0·25λ behind the dipole. The 'phasing system' appears to consist of a short-circuit matching stub. At 0·375λ the stub is low impedance at the shorted end and high impedance at the open end. Finally, if the feeder connections are moved from the centre of a dipole towards the ends, the impedance will be increased.

So there seems to be an 0·375λ stub that's connected to the Band III dipole to

increase its impedance, countering the effect of the directors and the reflector, and a T-match feeder connection to the Band I dipole to match to a 75Ω feeder.

I might be wrong, but it's the best explanation I can come up with!

Jim Littler,
Wigan, Lancs.

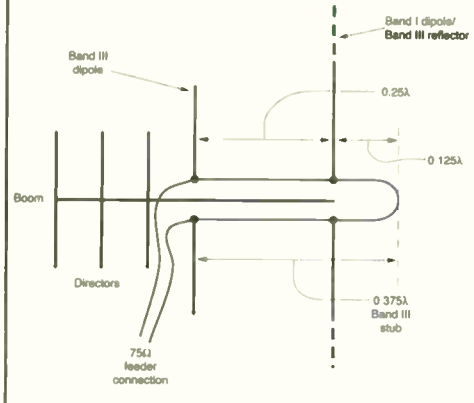


Fig. 1: A Band I/III aerial with 0·375λ matching stub.

Satellite ITV encryption

ITV's encryption contract with Sky is due to expire this autumn. The question is, will ITV then go clear? Indeed why don't all the terrestrial broadcasters follow the BBC's lead and drop encryption?

There are several reasons for them to retain it, not least because of regional advertising. ITV1 in particular has much regional advertising content; Channel 4 and Five have it to a lesser extent. The BBC is not troubled by this, though it is irritating for viewers outside London to be stuck with the London news if they don't have a viewing card. It's a different matter for the commercial stations, as advertising is their lifeblood. Local advertisers in the regions are not going to pay for TV adverts when a large proportion of viewers don't have viewing cards and can receive only Carlton.

Unless the backroom boys can come up with an alternative to the current viewing-card option, ITV etc. will be left with a choice between staying as they are and relying on people to pay a Sky subscription, or funding their own Solus card scheme. When the BBC went clear last year it was obvious that its technicians had been working on the problem for some time: the BBC knew exactly what it wanted and how to get it.

ITV will no doubt have been investigating the options over the past few months. One might be for ITV/C4/Five to discuss with Sky a menu that would enable non-subscribers to choose their own region. This would remove the need for an FTV card, but Sky would lose encryption revenue. It would hardly welcome that!

The other barrier to going clear is that C4 and Five in particular rely heavily on US imports, and the US networks believe that everyone throughout mainland Europe is busy installing dishes aimed at Astra 2!

It seems to me that a Solus card scheme is the only way forward, but it is clear that the broadcasters don't want to pay for one. It is also clear, from the number of people who tried for cards via eBay, that when there was such a scheme (Free2view) the vast majority of newcomers to satellite TV knew nothing about it. For the government to fund a scheme from the TV licence fee would require legislation because, as the law stands at present, the BBC is entitled to the whole of it.

In short the situation is a shambles. Any views?

Dave Sullivan.
de.sullivan@ntlworld.com

An expensive transformer

I had a problem recently with the power supply in a Linn Lingo record deck, which uses a brushless motor. The deck employs crystal-controlled logic to generate a conventional multi-phase stepper-motor drive with precisely-maintained frequency. The power supply itself is conventional, with a toroidal mains transformer, bridge rectifiers and linear voltage regulators that provide three DC outputs.

The reported fault was repeated blowing of the 200mA mains fuse. After isolating the transformer's three secondary windings I found that the fuse still failed at switch on, which proved that the transformer was faulty. An email to Linn produced the following quote for a replacement: "A replacement transformer (part no. MCAS 027) can be purchased through your Linn dealer, the suggested price being £393.65 inc. VAT". No, that's not a misprint! Nearly four hundred pounds for a small (no more than 20VA at most) mains transformer!

As the transformer is partly potted, no local rewinder would look at it. So the deck had to be boxed up and returned to its owner unrepaired. I must admit that I am not a great fan of toroidal transformers. My experience in industrial electronics has led me to believe that they are not as reliable as conventional clamp types, and that they are generally difficult if not impossible to have rewound if a suitable replacement is unavailable or, as in this case, is too expensive.

Pete Roberts,
Runcorn, Cheshire.

Mains supplies

I read Keith Cummins' article Days of DC (May issue) with interest, but have to point out that the EU has standardised on 230V AC for all member states. Countries that formerly had 220V AC supplies should now have nominally 230V AC + 6% –15%, while those that had 240V AC supplies should have nominally 230V AC + 15% –6%. At my house the supply is now normally something like 235V. The only piece of equipment that appeared to show any evidence of this change was a 35mm slide projector. Its very marginally rated 150VA transformer, which supplies a quartz-halogen lamp, seemed to run slightly hotter. Resetting the mains supply tap, which increments in steps of 10V, corrected this.

The adoption of AC mains supplies in the UK seems to have been remarkably slow. AC power generation started in about 1890 (Ferranti in Deptford SE London), and the National Grid was conceived in about 1927, yet DC continued to be supplied in places in 1960, a third of a century later.

In my opinion the worst aspect of DC for radio equipment was the use of high-wattage wire-wound resistors to obtain the required HT voltage and limit the current in the series heater chain. In addition to the problem of thermal drift, these resistors produced finger-burning heat while air convection seemed to draw a lot of dust into the cabinet. This dust accumulation exacerbated the excessive heating, and made servicing a very dirty job.

On the subject of rotating machinery used to convert from HV AC to DC for local use, I believe that the London Underground still does this for traction current. But I'm not going to say more about this, as I'm not too sure of the facts!

Steven Mugeridge,
Bexleyheath, Kent.

Corrections

There were two TV fault reports last month (pages 492/3) relating to the Bush Model WS6674, with different chassis types quoted. Both reports relate to the PT92 chassis. The BD680 EW driver transistor is TV06.

There was a typographical error in the Holiday at Murphys article: the full-wave rectifier valve in Model V114 is of course a UU8. The caption and text relating to this model disagree as to the tube size. We've not been able to check on this. Even the Iliffe/Trader service sheets don't go back as far as this model! And while we're about it, there was no LMS and LNER in the early Fifties, the railways having been nationalised in 1948. But the old liveries continued to survive for a time. Your editor was astonished to find GNR (Great Northern Railway) engraved on a mirror in a local train in the Lincolnshire area in the mid-Sixties – the GNR ceased to exist during the great railway amalgamations of the late Twenties. But enough of this!

WHAT a LIFE!

The True Story of a Goblin carpet shampooing machine, and a collection of TV faults. Donald Bullock's servicing commentary

Hello Boys and Girls! Are you all sitting comfortably? Then we'll begin! Today we are going to start with a Story! And it's a True Story! About a little boy called Donny who delighted in making people Happy!

The Goblin story

Now Donny spent a lot of time in Spain with his Very Best Friend, a pretty and vivacious little girl with Bright Green Eyes who loves doggies, chocolates, doggies, children, doggies, Spanish meals and doggies. She loved to play with her doggies on the nice marble floor of the villa where they lived.

But when the Cruel Winter came the nice marble floor became Very, Very Cold. Greeneyes cried some big, clear Tears and complained that it was not fair to her doggies.

This annoyed Kind and Thoughtful Donny, who slyly kicked the doggies but bought her a Nice Big Carpet to sit on while she fed them lots and lots of smelly bones and dishes of meat.

Donny didn't like Greeneyes' doggies much. In fact he didn't like them at all. But he did like to sit near her because she kept pouring him lots of little glasses of what he did like. While she had her back turned he would slyly jab his foot at Flashy, her Very Favourite Doggy. Whenever Donny caught Flashy in a sensitive spot, Flashy would leap up and fly out of the door, yelping his head off. Greeneyes would call him back and tell him he was being a silly boy, and that Donny wasn't like that at all.

One day Donny noticed that his pretty friend Greeneyes was crying again, and asked her why?

"Because my Lovely Doggies have accidentally played on the carpet So Much that it needs to be cleaned" she sobbed, "and I haven't got a Carpet Cleaning Machine."

Now Donny, always kind, didn't like to see his Greeneyes friend Upset. So he saved up all his beer-bottle pennies and drove to England to buy a big Goblin Shampooing Machine to take back to her in Spain.

This made her Very Happy, and in no time at all she had the carpet as Clean and as Fresh as New!

When Greeneyes had used her nice Goblin carpet-cleaning machine a few times, what do you think happened? It broke down!

Donny, kind as ever, took a look at it. He saw that the little plastic tube that projects from the cleaner's dome for the clean soapy water pipe to slip on to had broken at the elbow, because of a Big Big Bubble in the casing.

Repair

Now Donny knew how to mend such things and, while Greeneyes sat sobbing on her carpet, he telephoned Morphy Richards who make the clever Goblin machine.

"Morphy Richards Customer care!" sang the Friendly Lady who answered the phone. Donny felt that he was in Very Good Hands.

He told her about the faulty Goblin machine, said he was in the trade and that if she could arrange to send him the little spare part he could easily mend the machine himself.

But the Friendly Lady said she couldn't, because Morphy Richards didn't trust anyone in the Whole Wide World to mend their machines. He would have to take it back to the shop where he bought it, for sending to them.

"But the machine is in Spain, with me!" cried Donny.

"Then your guarantee is invalid" sang the Friendly Lady, "and we can't help you."

"I'm happy to pay for the spare part" persisted Donny.

"We can't supply it" she said, "not to anyone. You must send the whole machine to us, and we will charge you."

"But it's too heavy and bulky" Donny said, "I could fit the spare part in a minute if you'd send it to me."

But the Friendly Lady said "No. Why not make a spare part and mend it yourself?"

"Will you email me some dismantling instructions?" Donny asked.

"Certainly Not" said the Friendly Lady.

So Donny took the Clever Goblin Shampooer to his little workshop and turned it round and round to see how to open it. At last he flexed off two thin plastic wings that clipped the pretty blue cover to the dome, and undid a self-tapping screw under each one. Then he lifted the dome and the Clever Goblin Shampooer rolled on its wheels on to the marble floor and broke into lots of eggshell pieces!

Donny wondered how a company like Morphy Richards could have arranged for such a Very Heavy machine to hang by only two self-tapping screws to the shell that includes its carrying handle.

When he tackled the Friendly Lady again, she told him that because the machine wasn't guaranteed there was nothing to be done.

And now, Question Time. We

have Two Questions for you to answer.

First, would any of you buy a Clever Goblin Shampooer after reading this tale?

Secondly, where can Donny buy a Proper and Sturdy carpet-shampooing machine?!

A Sanyo 21BN1

Meanwhile back at the shop Charlie Rowe had bounced in, under the weight of a 21in. Sanyo set, Model 21BN1 (EB4-A21 chassis).

"And when you've done this one, boys, there's a big Goodmans in the boot. Belongs to my neighbour Ducky Gribble!"

Charlie's a live wire with a rich supply of yarns, some of which get less believable as he spins them.

"The Sanyo first" Steven said, "what's up with it?"

"He comes out of standby but he don't start up" Charlie replied. "Gives me missus the ab-dabs, but never mind 'er. By the way, did I ever tell you about my neighbour Ducky Gribble? He was certainly a boy."

But Steven wasn't paying attention as he opened the set up. A couple of 120kW resistors in the power supply in this chassis, R620 and R621, give trouble. They were both OK however. Some further tests showed that the HT rose momentarily at switch on, then quickly decayed.

Charlie was eager to continue with his spinning. "Yeah, Ducker liked his drink, but never had any money" he said, "yet he managed to stay half cut."

I looked at him. "How?" I asked.

"Well, take the other lunch time" Charlie continued, "he sauntered to the Spread Eagle at opening time and saw three old-timers waiting in the shade for Tom to open up. When he did, Ducker gave 'em time to go inside and order some drinks. Then he bawled out 'get yer cloths back on, yer brazen hussy!' After that he went in the back door and scoffed the drinks while the landlord and the old-timers were a running around outside looking for a woman as wasn't there!"

"Is that true now?" I asked.

"Absolutely true it is" said Charlie.

Sensibly, Steven had been concentrating on the Sanyo set. He had found that the line oscillator struck up then closed down. This was a protection mechanism. The cause of the trouble was failure of the LA7832 field output chip IC501. Once it had been replaced the set worked normally.

"Now who's a bringing the Goodmans outa my boot?" asked Charlie.

Paul and I went off to get it.

"Then there was the bowling for the pig at the Church Fete" Charlie resumed, "who do you reckon slipped the pig into the beer tent and scattered all the drinkers? And he got the Reverend Goode to run him home afterwards, on account of being a bit unsteady like."

The Goodmans set

The Goodmans set turned out to be a widescreen Model W282NS (F19 chassis). It was dead, but there was a clue that helped. Once the back had been removed there was a smell of smoke. D25 (BA157) had gone up because the line output transistor TR16 was short-circuit. When Steven tried the set after fitting replacements he found that there was picture breathing and EW bowing. The cause was a 400V capacitor, C69, whose value depends on tube size.

It wasn't too difficult to get Charlie on his way once his two sets had been done, though we had to listen to yet another improbable yarn.

A monster Hitachi

Later Ribby Ellis, another right nuisance, called in with a 28in. Hitachi set, Model C2867TN. It worked, but there was no remote-control operation and the product code C46TN was permanently present on the screen.

"Ribby" I said, "we're feeling a bit worn out this afternoon. Had Charlie Rowe in for the best part of a couple of hours. So none of your practical jokes, eh?"

Ribby grinned, pursed his lips and gave me a thumbs up sign.

"But I'll tell you about a chap I met the other day" he said, "name of Turpin, Dick Turpin actually."

I gave him a pained look, and Steven took on the Hitachi set. "Would you look out a TMP47C1637N-RA01 microcontroller chip if we have one" he asked me, "it's in circuit position IC001 and I don't like the look of it. Could well be the cause of the faults.

I managed to find one while Ribby stood there smiling to himself. Better be sociable I thought. "What's your trouble then Ribby?" I asked.

"Well I went for a spin in a stagecoach the other day" he began.

"And that's when you met this Dick Turpin fella I suppose" I broke in.

He nodded. "There were several of us. Suddenly we heard shots and Dick Turpin was there, spinning his gun on his second finger."

"As they do" I said understandingly. I noticed that Steven had managed to fit the microcontroller chip and had reset the EEPROM. This had removed the product code, but there was still no remote-control operation.

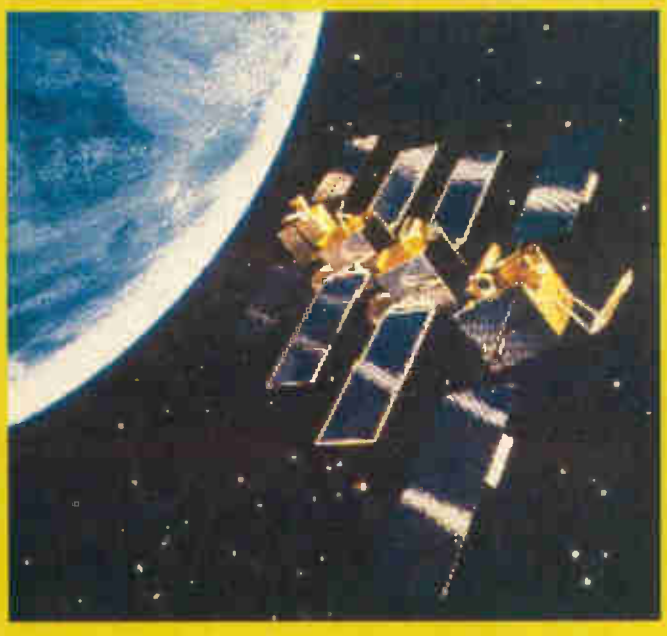
"Then Dick Turpin looked us all over" Ribby continued "and said 'Right! I'm going to rob all the ladies and pester all the men!' At that a fat lady next to me started to laugh. 'No, no' she said, 'you mean rob all the men and pester all the ladies!'"

"At this a thin little chap in the corner jumped up, folded his arms and stamped his foot. 'Mr Turpin knows what he means' he said."

I looked at Ribby, who was laughing to himself. "Enough, Ribby, I think – Steven seems to have finished the job with your set."

There had been dry-joints at regulators IC951 and IC952, a not uncommon condition in this chassis. Once they had been attended to remote-control operation was restored and there were no further problems.

We managed to get rid of Ribby pretty promptly after that!



DX and Satellite Reception

Terrestrial DX and satellite TV reception reports. Broadcast and satellite TV news. The Dale Parabolic aerial. Regional reflections. Roger Bunney reports

A CBS test card seen via Eutelsat W2 (16°E) prior to a news feed.

April was another very quiet time for terrestrial DX-TV reception, a pattern that has continued over the past few months. At the time of writing there has been no evidence of a mid-April Sporadic E opening, an event that often indicates a good SpE season ahead.

Cyril Willis (King's Lynn) reports reception on the 23rd, 27th and 28th however. On the 23rd he received MTV (Hungary) ch. R1 plus unidentified signals. The 27th was productive, with SF-1 (Switzerland) ch. E2, Tele-A (Italy) ch. E2–, RAI (Italy) chs. IA and IB and SVT-1 (Sweden) ch. E2. The 28th produced Tele-A ch. E2– again.

Peter Schubert (Rainham) received a single unidentified ch. E3 signal on the 24th then, on the evening of the 27th, he found that long-duration, low-level ch. E2 video was present from the south, mostly at scanner level though lifting at times to provide very weak pictures. This was mostly likely to have been Madrid ch. E2.

I hope to experience a final season of TVE (Spain) ch. E2 before the Madrid transmitter closes down at the end of June, see later. Madrid ch. E2 was my first SpE DX reception way back in 1963. An email from Hugh Cocks (Algarve) summarising the TVE VHF closure timetable mentions that the Spanish tend to favour established channels, E39, E42 and E45 being particularly popular, despite the possibility of co-channel interference. UHF is generally "very cluttered" he comments. DTT from Spain is received in the Algarve when tropospheric conditions allow, though Spanish digital pay-TV seems to have folded at the same time as ONdigital in the UK! Only the national TV channels are available via DTT, with Madrid local news – this is rather belated in comparison with analogue off-air news.

Satellite sightings

Last month I mentioned Eutelsat 2F3 at 21·5°E and the variable reception because of its severely inclined orbit. Reception is restricted to mid-late afternoon and twelve hours later, during the early morning period. When I checked the slot at 1445 hours on April 25 I found good signals, which suggests that 2F3 appears above threshold from about 1430 onwards. For a Sunday, the satellite was busy. There were several horse-race meetings, including Sligo and Brighton, greyhound racing and a violent protest meeting in Manchester. A far-right French politician who supports BNP views was on a visit to the UK, and an anti-BNP group was holding a vocal protest outside the hall involved. GlobeCast UKI was linking live pictures via 2F3 in 16:9 format for BBC News Manchester. This was at 12·526GHz H (SR 4,226, FEC 7/8). Another UK company carried similar material, as Service 1, at 11·696GHz H (5,632, 3/4).

Politics continues to bubble in Cyprus, in particular between the Turkish and Greek communities over the partition of the island. Ant 1 Cyprus carried live reports into the evening of the 24th via Eutelsat W2 (16°E) at 12·540GHz H (5,632, 3/4).

Edmund Spicer (W. Sussex) found Atlantic Bird 3 (5°W) downlinking horse racing from Dubai: bookies and Arab gentlemen were milling around, and Dubai was captioned on several advertising hoardings. The transmission was at 12·543GHz H (27,500, 3/4) with the identification GCPE1. TV Sport Romania was seen carrying UK-sourced sport via the same satellite, at 12·696GHz V (14,685, 3/4). But check the PIDs carefully: they are V 1907, A 1911 and PRC 8190 (as detailed on the SatCoDX site) and may need to be inserted manually to achieve picture lock – otherwise the screen may remain blank.

April 17th was a bad day. During the evening Eutelsat W1 (10°E) carried live pictures of rioting in the Gaza strip: an Israeli gunship had destroyed the Hamas leader's car with two missiles. APTN Jerusalem was feeding, via Satlink Israel, raw (unedited) footage of the car and the occupants' remains. This was at the usual 10·971GHz H (4,167, 5/6). A few hours earlier Telecom 2D (8°W) was providing live reports for BBC News from a building site at Malmesbury, Wilts, where the body of a missing Swindon girl had been buried. There was further drama when it

was revealed that a suspect in the case had just been found dead. GlobeCast NE was uplinking from the building site as BBC News Malmesbury, at 12·513GHz H (4,226, 7/8). Sky News was also on site with its 'Breaking news' feed, but I was unable to find the signal. In recent weeks Sky News has been using MPEG 4:2:2 for its feeds, including those from one of its favoured satellites, Eutelsat W2 at 16°E. A PC + Skystar board is needed to resolve pictures with MPEG 4:2:2 – or a specialised receiver that costs typically £2,000+.

Exciting news from Roy Carmen (Dorking), who has just found his first 'registered' feed via Intelsat 706 (53°W). It's New Data, at 12·682GHz V (5,632, 3/4) with the service ident LAX Enc 8. Content was an NTSC test card that ran for over two hours. Roy mentions that the CNN Newsource feeder via NSS 7 (21·5°W) underwent "changes" on or about April 14. While still downlinking at 11·565GHz H (6,109, 3/4), the PIDs are now V 124. A 100, PCR 124 and TXT 0. The name now reads INS-Europe (International Newsource) and the 'secret' service ident appears as AOR 2 (Atlantic Ocean Region 2) on the RSD information menu. CNN had indicated that the news feeder would be encrypted during April, based on a Scientific Atlanta standard, but to date it's still in the clear.

Iraq is rarely out of the news of course. US broadcaster ABC News NY routinely carries NTSC feeds back to NY via Intelsat 707 (1°W) at 11·675GHz V (5,632, 3/4) as Scopus Service 1. During downtime a locked-off shot of the view from the ABC Baghdad office balcony is left 'up'. ABC also uses Eutelsat W2 (16°E) at 12·563GHz H (5,632, 3/4) when feeding its London office, but still as NTSC.

When your dish can access the inclined-orbit Eutelsat 2F3 (21·5°E), check at 12·538GHz H (4,226, 7/8) for Baghdad 216. This is the BBC Baghdad output – occasionally 12·532GHz is used. BBC Madrid used 2F3 at 12·538GHz for pictures from Spain when the security forces there found the rail bombers' flat.

Alan Richards, now up in the Lincolnshire Wolds, reports mediocre reception (signal strength 30 per cent) from the new Amos 2 satellite at 4°W. The first signals seen, at 10·726GHz H (2,894, 3/4), carried programming and news from KRT (Ukraine). The news included extensive unedited footage from Iraq showing the Fallujah atrocities.

On April 3/4 Eutelsat W2 provided exciting pictures from the new race track in Bahrain: the Grand Prix was a great success, and the track is likely to host many high-profile meetings in the future. The 3rd was a practice day, with cars and drivers feeling out the course, the big day being the 4th. A scan revealed the downlink at 12·552GHz H (11,265, 3/4) in a two-channel multiplex, Slot 2 RTL Bahrain and Slot 1 RTL. The former transmitted interviews and reports for the German RTL and NTV networks, the latter being used exclusively for RTL content.

Terracom SWE 3 appeared via Telecom 2D (8°W) on several occasions in the early evening during early/mid April with Swedish winter sports, skiing etc. at or near 12·557GHz H (6,109, 3/4). It's a very active satellite at this time, with the GranadaMedia satellite trucks on air and various regional French TV feeds. During weekend afternoons there are many sports feeds from West/Central Europe.

Broadcast news

Spain: Hugh Cocks reports that all remaining Band I and III TV transmitters are now scheduled to close, moving to UHF. I will list only the Band I transmitters as these are the most relevant for the coming SpE season.

Madrid Navacerrada ch. E2 to close on June 30, moving to ch. E26.

Alicanti Aitana ch. E3 to close on October 31, moving to ch. E63.

A Coruna Santiago ch. E4 to close on June 30, moving to ch. E53.

Vizcaya Sollube-Baracaldo ch. E4 to close on June 30, moving to ch. E26.

The NASA air-speed record flight: a live picture from NASA TV via NSS 7 (22°W).

Curiously the broadcasters intend to use many of the same UHF channels, leading to the possibility of co-channel interference – chs. E39, E42 and E45 are particularly prone to co-channel problems. This does appear to be the final close down, so make use of TVE during the few remaining months.

Central Europe: The Benelux DX club has provided a list of Central European DAB transmitters that are now in operation.

Access road to the current Belmont transmitter mast. Note the ice in winter warning.

Interesting that there are several 'out-of-band' transmitters. These are Sachsen-Oost Kanal 05C (178·35MHz); Saarland Kanal 08B (197·64MHz); and Berlin Kanal 08C (199·36MHz). Then the channels run from 11B to 12D as follows: 11B 218·64MHz; 11C 220·35MHz; 11D 222·06MHz; 12A 223·936MHz; 12B 225·648MHz; 12C 227·36MHz; 12D 229·072MHz. There are transmitters in Germany, the Netherlands, Austria, Belgium, Switzerland, Denmark, Luxembourg and Norway.

Tests are currently being held in Band L (1·5GHz) in France and the Netherlands.

The Netherlands: The DVB-T transmitter count is on the increase. A long list is available of 13 main sites, the 'preferred' channel group being E21, E23, E34, E57 and E64. Exceptions are Alphen aan den Rijn chs. E21, E34, E52, E57 and E64 (10kW ERP) and RTV Utrecht ch. 9 that's transmitted via Lopik ch. E33. Transmitter ERPs vary from 1kW up to 10kW.
Luxembourg: Sad that the RTL Dudelange ch. E7 transmitter has closed, moving to ch. E27H at 1,000kW ERP. RTL Club is transmitted as DVB-T in ch. E41H at 2·5kW ERP.
Finland: Eleven main transmitters now use DVB-T, each one carrying three multiplexes. Multiplex A has YLE-1, YLE-2, TV Finland, YLE44 and Teema; multiplex B MTV3, Sub-TV and Sports Channel; multiplex C Channel 4, SF and Nelonen. Tampere for example has multiplex A on ch. E34, multiplex B on ch. E23 and multiplex C on ch. E58.
US: The FCC has announced that a plan to close down analogue TV in 2009 is being discussed. The broadcasters will 'return' the vacated analogue bandwidth. Switch-off will be subject to at least 85 per cent of the public having access to digital transmissions. The NAB has questioned the 85 per cent calculation and is not happy with the proposals.
Yemen: TV and radio expansion is anticipated, with moves to start private broadcasting. Commercial groups are anxious to exploit an increase in TV stations. The Democracy Channel has been mentioned as ready to start once the government has given approval to an opening up of the airwaves.

Satellite news

With improvements in compression and software techniques the use of satellite phones to transmit immediate TV pictures back to the main networks from a war zone or breaking news site is likely to increase. In its NAB review issue (8 April 2004) *Broadcast* magazine mentioned that BBC News is now using the Nokia 3650 camera-phone to send video clips running up to 15 minutes in length via the GPRS/2.5G system. It's likely that this and similar camera packages will become standard issue for reporters – and even perhaps for Jo Public to dial live breaking-news exclusives to Sky News etc. Fit an external microphone input to the camera unit and there will be live interviews on tap!

In its April issue (pages 6-12) the New Zealand trade magazine *SatFACTS* reports on a new receiver, called Blackbird, that requires no external CAM, no card and has onboard software which, once downloaded with a code-key routine from the net, provides instant display of encrypted programming. I quote from Bob Cooper's article: "Blackbird is a legal free-to-air receiver that opens up all dish network channels. It appears that many recent Chinese-sourced FTA receivers have onboard chips that can run in the public code-key mode. Finally, a complete solution that works without an access card." It can run Viaccess, Seca, Irdeto and Nagravision. There's a website with more information on Blackbird and public code keys at

http://www.godss.com

The EBU has signed up frequency space aboard Atlantic Bird 3, Eutelsat W3A and E-Bird to enhance Olympic Games coverage for broadcasters across Europe. The new 306MHz of bandwidth (four wideband transponders) will be used by a teleport the EBU is to build in Athens, running 36 full-time programme feeds. Tests start on August 2, football coverage starts on the 11/12th and the opening ceremony will be broadcast on the 13th. The Paralympic Games, again in Athens, from September 17-28, will also benefit from high-level EBU uplinking capacity.

FSTV (Frontage Satellite Television), a Nigerian company that commenced operations on April 1, downloads up to thirty satellite TV channels from the World's main broadcasters and is initially transmitting them in the Lagos region, offering anything from African religion to MTV, soaps, politics and chat shows. GlobeCast is now transmitting the 2M Maroc Moroccan TV channel across Africa from NSS 7. It's uplinked from Casablanca via Telecom D to the Serte, Paris HQ, then up once more to NSS 7. Elsewhere in Africa RTI (Radio Television Ivoriane) is now being transmitted across the continent as Channel One TV.

Twelve companies have been authorised by the Pakistan Media Regulatory Authority to operate TV channels for programme transmission across the country. The same Authority has issued licences for many FR band radio stations and cable operations. BTV (Bangladash TV) is to open a satellite channel to transmit its national terrestrial service and repeats when the terrestrial channel is off-air. The Arab States Broadcasting Union hopes to launch a ten Arabic TV channel package shortly, via Telecom/GlobeCast capacity, for worldwide transmission. A new studio for the service is being built by Abu Dhabi TV.

The Dale Parabolic aerial

In the early Sixties the Dale Parabolic Band III aerial, see Figure 1, was helpful in hilly and well-screened areas where signal scattering was a problem. The eight-reflector screen plus dipole design proved so successful that a Mk 2 version was introduced. This had a V-reflector screen with three elements on each arm and a three-element Yagi array with the dipole mounted at the focal point. The aerials were widely used at Ventnor, Isle of Wight, because of the screening caused by St Boniface Down. A remaining example of the Dale Parabolic was still in situ at Corfe Castle village, Dorset up to two years ago. Corfe and Ventnor both took ch. 11 signals from Chillerton Down.

Regional reflections

Alan Richards (Horncastle, Lincolnshire) recently sent me a copy of the Nostalgia and Local Heritage column in his local paper. It related to the original Belmont transmitter mast, which rose to some 1,263ft and was built in late 1965. In March 1969 large quantities of ice formed on the guys and the lattice mast itself, threatening to bring the mast down. It was leaning at 5° out of vertical but survived, unlike its twin at Emley Moor which col-

lapsed and removed TV programming in the Yorkshire region for some days before a temporary mast was erected. The present concrete mast was built many months later.

Alan decided to visit the Belmont site and found, by the gate to the access road, a large sign warning about falling ice in winter. There was also a planning application for further aerials to be mounted on the mast. Several large satellite dishes take the incoming programme feeds for Channel 5 and the DTT services. DTT arrives via satellite, while transmitters still receive their analogue feeds via terrestrial links – check the DTT delay!

A couple of publications are rarely seen nowadays: grab a copy if you find one at a jumble or ham radio sale. *The Authority's Stations*, dated 1962, is a wonderful description of the spread of the ITA network across the UK, transmitter by transmitter, with an account of why each mast is where it is and field strength maps. The Channel Islands transmitter at Fremont Point, Jersey in particular posed serious problems. The mainland feed was from Stockland Hill to Alderney, a distance of eighty miles, then via a microwave link that used a complex aerial diversity system – SABRE was eventually installed. To minimise interference to the incoming signal from Stockland Hill, transmissions from Fremont Point were not available in Alderney. Residents on the island had to erect large aerials to receive Stockland Hill, or Chillerton Down, directly. Picture quality ranged from good to appalling, depending on tropospheric conditions. After some years a terrestrial microwave circuit delivered quality signals via the French mainland. Interesting that for a time Channel TV transmitted a late local news service in French for those on the mainland. The other, perhaps rarer, publication to look out for is the *IBA Technical Review No. 4 – Television Transmitting Stations*, dated September 1974. This contains much detail on the design and construction of the 405/625-line transmitter network.

In the ITA days the relays were unmanned but the main TV transmitters generally had a crew of three-four technical staff per shift, plus perhaps a GPO lines man, a site cleaner and a kitchen staff of one-two. Facilities were available for snowed-up conditions when the access road was blocked. Not to Grand Hotel standards, judging by an overnight sleep-in at Chillerton Down on one occasion!

The present HTV region was originally operated by two companies, Television Wales and West and Wales (West and North) Television, that eventually merged. There has traditionally been conflict over ITV fringe areas, with the output from St Hilary for example extending well into Stockland Hill's primary coverage area in North Devon and Somerset. Coverage means people, and the more you can claim the more you can charge for the commercials! So at Southern Television an outpost office was established at Dorchester, while Westward maintained an office down the road at Weymouth! Southern even transmitted a weekly Dorset Diary item in the evening Day by Day programme.

Far to the east Southern had a nominal fringe audience at Southend-on-Sea, from its Dover transmitter. The occasional Southend local news item was included in Day by Day, with perhaps an annual OB from the local football club, to ensure that the people of Southend and its environs could be included in Southern's viewer figures! For many years the Dover studio produced only a 30-minute (Friday) programme per week. These days Southend is well covered from Bluebell Hill.

The early days of ITV were unique, with each company having its own identification slide, logo and even music at the beginning and end of each day's transmissions. Today regional ITV is bland and lacks character – there's not even a test card. Several internet sites feature regional ITV as it was, and are packed with information and personal notes from those who worked there. Even the closedown sequences of both Southern and TVS are featured, which I found moving having worked for both.

At many transmitters the ITA would hold a summer "open day" to enable the public to view the facilities. Southern took the initiative in erecting a marquee and providing tea and cakes – also a camera (see yourself on the telly). A few TV personalities would be present to sign autographs. All next to the towering 750ft mast at Chillerton Down, Isle of Wight. ■

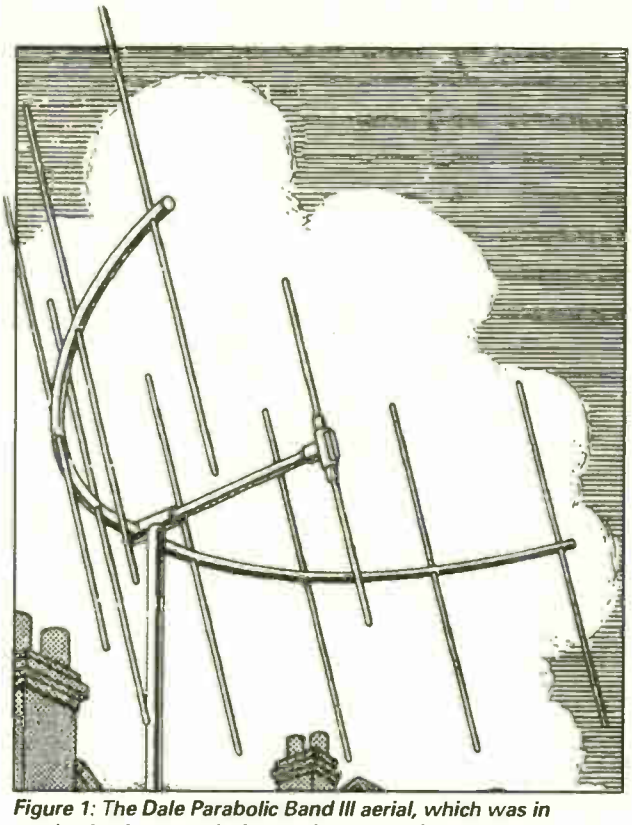


Figure 1: The Dale Parabolic Band III aerial, which was in production in the early Sixties. It was helpful where signal scattering was a problem.

AUDIO FAULTS

Reports from
Geoff Darby
M.J. Abbott
Philip Rosbottom
and
Chris Bowers

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

Reports can be sent by post to:

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

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

Marantz 75CR2020/2A

I had no service manual for this flat-format tuner/amplifier/CD unit. It looked as if it could be based on a Philips chassis, as Marantz equipment often is, but it was not one that I recognised. It certainly used a Philips CD deck however, and this is where the problems lay. Although the tray would open and close, the laser unit stubbornly refused to home. There was no lens movement even when the sled had been homed manually. All hope of it doing anything ended each time with the message "Disc Err" in the display.

Once I had the deck out to examine the PCB mounted beneath it I was able to check the supply voltages – they are conveniently silk-screened by the side of the connector that brings them in. All were present and correct. I then turned my attention to the other wiring loom, which leaves the board. Checks on the two pins marked SCL and SDA were inconclusive but felt wrong.

I followed the cable to a sub PCB that's mounted between the output hybrid chip's heatsink and the front panel PCB. There's a largish surface-mounted IC, which I took to be some kind of microcontroller, on this board. By the side of it there was one of those large-value green memory back-up capacitors. More by instinct than anything else, I switched off and discharged this capacitor with a screwdriver blade. When I repowered the unit, the reset forced by this action cleared out the processor and everything then worked normally.

This wasn't quite the end of the story however. The unit was left unpowered on the soak-test bench overnight. When power was applied the following morning the fault was back. A new back-up capacitor, followed by several days of re-testing after overnight power removal, proved that the capacitor had been the cause of the problem. **G.D.**

Crown CDTV99

This all-in-one radio/CD/TV combi unit was dead. When it had been dismantled, which turned out to be surprisingly easy, I discovered that the DC fuse on the main PCB had failed. It had not blown violently, but had significantly melted. As there were no obvious shorts present I replaced the fuse and switched on. Everything appeared to work until I came to turn the unit off with the front-panel on/off switch. The unit stubbornly remained on.

Suspecting a short-circuit power-switching transistor somewhere, I slid the board right out to see if I could follow the print round to a likely candidate. What I found was that two tracks of fine print that went to the switch were totally vaporised. I thought this was going to be the end of a practicable repair, fearing that something very nasty must have occurred to burn out the tracks, which were controlling some sort of remote switching element somewhere on the board. The fact that the unit did basically work however persuaded me to carry on, at least as far as bridging the misssing tracks. Remarkably, once this had been done the operation of the switch was restored and a detailed check on all functions proved that the unit was now fully operational. **G.D.**

Sony HCD-XB6

This hi-fi unit came to me from another dealer, with most of the case screws missing. He, in turn, had taken it from his friend John, who "deals a bit . . ." The basic problem was no audio with any functions. The output protection relay closed correctly however, and a wet-finger test produced a healthy hum from both channels. In addition the hum level was correctly controlled by the volume encoder.

The next step was checks at the MC14052 input-select chip IC102. With a CD playing, scope checks showed that there was a good level of audio at input pins 5 and 14 but nothing at output pins 3 and 13. Further checks showed that the inhibit pin 6 was high instead of low. This pin is connected to pin 30, "port C", of the volume control and equaliser chip IC201. When I unsoldered pin 6 of IC102 the voltage at pin 30 of IC201 dropped to zero but pin 6 of IC102 remained high. This suggested that there was an internal problem with IC102.

When a new MC14052 multiplexer chip had been fitted the voltage at pin 6 was at the correct level and normal audio was present with all functions. **G.D.**

Sony and Samsung speakers

I've recently had two speakers with a similar type of failure that I have never before seen during many long years in this trade. The first was from a Samsung home cinema sub bin. It buzzed on each hefty bass note. Once the unit had been dismantled to the point where I could see the speaker, I found that the cone had become completely and cleanly unglued from the polystyrene surround.

The second unit was a Sony hi-fi speaker that made a similar buzz on bass notes. This time the cause was the flat, concertina piece behind the cone: it serves to keep the voice coil central in the magnet gap and prevent ingress of dust etc. into the gap. I found that it had become unglued from the speaker cone virtually the whole way round.

In both cases application of EvoStick impact adhesive reunited the detached items and provided a complete cure. **G.D.**

Aiwa ADF660 and ADF770

These twin-capstan three-head decks are of excellent quality and are well worth repair. Spares are in short supply however. There are two drive belts, the main one that measures 79·578mm diameter, 250mm circumference and 4·4mm width and the flywheel-to-flywheel belt that measures 73·21mm diameter, 230mm circumference and 3·8mm width. The flywheel-to-flywheel belt, the reel idler and the right-hand pinch roller are at present available from CPC. The left-hand pinch roller is a special order item. **M.J.A.**

NAD 3130

The output was distorted, as though the output stage had expired. But the cause turned out to be the smoothing capacitor in the negative supply to the dual IC used in the tone/filter circuit. It was shorting. There are several of these low-quality capacitors around the PCB. Any of them could give trouble! **P.R.**

Pioneer CT-F2121

This cassette deck, dating from 1974, would stop after five seconds. I found that the encapsulated auto-stop switch didn't operate when there was tape movement. Tapping its case a few times cleared the fault. It's on top of the mechanism, behind the cassette housing, and I suspect that there's a reed switch with a rotating magnet inside. **P.R.**

Nakamichi 700 Tri Tracer

This unit wouldn't record one channel. Inside there's a statement about the quality and the superior engineering. But you can never allow for bad connectors after 25 years or so. The plug-in daughter board on the main PCB had bad connections. In addition the tape monitor switch worked intermittently. Switch cleaner cured that. **P.R.**

Sony TC-TX333

This tape deck's buttons seemed to operate the wrong function. The cause of the trouble was traced to the system control processor IC04 on the main board. A replacement, part no. 8-759-497-87, restored normal operation of this single-tape deck. **C.B.**

Sony STR-DB830

There was no tuner reception with this unit. Voltage checks on the main board soon revealed that the 15V regulator IC401 and the 12V regulator IC399 were faulty. Replacements restored the tuner reception. **C.B.**

Sony STR-KSL5

This unit powered up then went into the protection mode. The cause of the trouble was found on the amp board, where jumper wire JW802 had poor soldered connections. Resoldering this item restored normal power up. **C.B.**

Sony HCD-H117

The problem with this unit was intermittent FM reception. The cause was traced to a short-circuit in the ceramic filters CF301 and CF303 (part no. 1-577-070-8). Replacements restored normal FM operation. **C.B.**

Test Case 499

TV rental has declined in recent years, but there is still some life in it – at least in this neck of the woods. White goods and slot meters are nowadays part of the rental scenario as far as the Test Case crew are concerned, and Cathode Ray has become adept at replacing pumps, programmers and motor-brushes alongside his TV and video activities and satellite-dish work: versatility indeed!

This doesn't mean that Ray can turn any repair round instantly and, as so often, it's the intermittent faults that are the most difficult ones to solve. A recent case of 'bench-dwell' involved a widescreen Hitachi TV set, Model C28W430N, which is fitted with the A7 chassis. Its problem was "spasmodic nuffingness", to quote Ray's picturesque description: it would sometimes fail to come on when asked, and would sometimes shut down all by itself. Ray welcomed it to his bench, anticipating an easy repair. A couple of other sets fitted with this chassis had passed through the workshop recently. Their similar problems had been solved by resoldering the three-legged components on the main heatsink – IC951, IC602 and Q601. The bad joints here were dealt with by using copper braid to remove the original solder then fluxing, tinning and resoldering. It's a good thing that rental TV sets are set to run on test while awaiting transportation, because it soon became clear that, after similar treatment, this set had not been cured: it still suffered from spasmodic nuffingness.

It was taken back to the workbench and subjected to a good go with the handle of a screwdriver. This revealed something all right: a big blue flash and a bang as some long, untrimmed component leadout wires on the print side of the PCB shorted together. But the fault was still present when this had been attended to. A more civil attempt to find bad joints was then undertaken, involving a bright light, a magnifying glass and a 'soft' mechanical probe. This revealed little black, ragged rings at a few other joints on the board. Each was big-pen marked as it was found. They were then all dealt with together: stripped, fluxed, tinned and soldered. Surely this must have cleared the fault, Ray thought, as he and Todd staggered back to the soak-test bench with the monster.

It hadn't! Television Ted, who was pottering around in his garden while on holiday, was called to a telephone conference. He did not, of course, have any details of the set in question right there with him. But, prompted by Ray's description of the chassis and of the "b****y great heatsink all down it wiv the dry-joints", he remembered the type of set and how he had been dogged by one that had had a similar problem. On that occasion he had received some good advice from a technical consultant at Hitachi. The advice had been to fit an earthing spring between the line output transformer's ferrite-frame clamp and the line output transistor's earthed heatsink.

Well, it might have worked for Ted but it didn't for Ray, on this occasion anyway. The problem was resolved only when Ted returned to the workshop. That was too late, unfortunately, to avoid the rental contract being terminated by the customer. This sort of thing has happened a lot recently. So what was the root cause of this horror-story? It was nothing very big, at least in the physical sense. For the details, turn to page 571.

DVD

Fault reports from
Geoff Darby
Chris Bowers
Andrew Duggan
and
Martyn S. Davis

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

Reports can be sent by post to:

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Pioneer CLD-D515 LaserDisc player

Karaoke George has been bringing his kit to me for years. It's usually pretty battered around the edges, because of the hard life it leads out on the road, travelling from pub to pub. But he started out with good-quality equipment all those years ago and, apart from its cosmetic appearance, it has stood up to its daily bashing pretty well.

This player arrived on Friday morning and was needed on Sunday night. The complaint was that it played the first half minute of any track then skipped back to the start. It sounded as if there was some kind of problem with the free movement of the optical pickup. Considerately, George brought a disc along with the player. They are monster things, of 12in. diameter, that look like a silver LP. There are recordings on both sides, and a wonderful mechanical arrangement in the machine enables both sides to be read without having to turn the disc over.

Basically a sort of 'railway track' runs from below the turntable in the centre of the deck towards the back. Here, the track curves up and over in a U shape, on its side, after which it returns to the centre of the machine across the top surface of the disc. There's a rack gear along one edge of the track. The sled motor is mounted on the optical block and, via a worm and two other gears, one of which meshes with the rack, drives the block, either at high speed for disc access or at low speed for tracking – in much the same way as with a CD deck. Once the end of the lower side of the disc is reached however, or side B is requested by use of the front-panel controls, the optical block runs off past the edge of the disc, climbs the vertical section of the track, turning upside down in the process, then carries on to track across the upper side of the disc.

To see what was going on I loaded the disc (Sing the Hits Made Popular by Neil Diamond, Vol. 1!) then requested side B. The optical block steamed along its track under the disc, came up at the back, and found its way to the end of the upper track at the centre of the disc. The machine then proceeded to play, albeit in black and white as it was an NTSC disc . . . As reported, after about thirty seconds there was much servo grunting and screeching and the play point jumped back. By watching closely I could see that the optical block didn't move on. So, when the lens had been deflected as far as possible by the tracking motor, the servo just 'lost it' and the lens relaxed back to its zero deflection point about 30 seconds back.

Once the disc had been ejected and the optical block had returned to its rest place on the lower track, taking out five screws enabled the top section of the track to be removed. I was then able to wind the worm gear manually until the laser had moved along far enough to come off the end of the lower track. When the flexiprint had been unplugged the laser could be removed completely to examine its mechanics.

It was immediately apparent that one of the drive gears was not parallel with the other one. The 'open-frame' gearbox is secured to the optical block by two screws, and the motor to the gearbox by two more. Once these had been removed, the motor could be dropped away and the gearbox lifted off. The cause of the problem was then clear. The two gears sit on pins that are moulded to the side of the gearbox. One of them had sheared off. The pins are supported at the far end by being located in a slot that's machined into the side of the laser, so the sheared off one had remained basically in place but had allowed the gear to twist out of alignment. When the motor was being driven hard for disc access, it was able to turn the gear train without problem. But when it was being driven at only very low power, for optical block tracking, it all just locked up.

I quickly discovered that the gear concerned fitted very nicely on some 2mm diameter enamelled copper wire that I had to hand. I was able to drill out the side of the plastic gearbox at the shear site and insert a new pin, made from a suitable length of copper wire. I secured it initially with Superglue, then reinforced the short stub left poking through the wall with a small amount of Araldite. When it had set solidly, I refitted the

gears and motor to the gearbox, then the gearbox back to the optical block. The flexiprint was reconnected, the optical block was wound back on to the lower track, and the upper track was refitted.

The original exercise of loading the disc and requesting side B was then repeated. This time the disc played on beyond the thirty seconds point. Careful observation of the optical block showed that it now moved on, by a minuscule amount, every few seconds. A long soak test proved that the player was now fit for another stint on the road.

Finally a quick phone call brought a delighted George trotting around to the workshop, wallet ready in his hand, and opened, as he approached the door ... **G.D.**

Dansai DVD1010

The designer of this budget machine must have been new to the idea of reliability. The power supply is mounted upside down over the MPEG board, which has chips that generate lots of heat on it. In addition there are numerous electrolytic capacitors in the power supply, most of which are mounted close to hot-running diodes and heatsinks. This cocktail for potential disaster is rounded off by having only a few ventilation slots at either side of the cabinet.

I found that the following electrolytics in this player were either bulging, open-circuit or had a very high ESR reading: C14 (1,000µF, 16V); C16, C17 and C18 (all 1,000µF, 10V); and C10 which was 47µF, 16V though marked on the board as 10µF, 16V. Once these capacitors had been replaced the power supply came back to life and the machine produced good results. **G.D.**

Sony DVP-NS305

The unit produced no display and the disc spun at a high speed. The cause of the trouble was traced to a dry-joint at Q404 on side B of board IF89. Once this transistor had been resoldered there was a normal display and discs rotated at the correct speed. **C.B.**

Sony SLV-D950GI

This DVD player/VCR wouldn't eject DVDs. A look inside revealed the cause: rectangular belt H105 (part no. 3-078-583-01) had come off the loading mechanism pulley. A replacement belt restored normal DVD-eject operation. **C.B.**

Sony HCD-S550

There was no CD playback though DVD and SACD discs played back normally. The cause of the fault was traced to a ceramic chip capacitor on the DVD board, C428 (3,300pF, 16V). A replacement restored CD playback. **C.B.**

Apex DVD1100WB

This DVD player seemed to be stuck in standby. Some quick checks in the power supply led me to C20 (470µF, 25V, 105°C) which, when removed, seemed to be slightly swollen. A replacement brought the unit back to life. **A.D.**

Sanyo HVDX1E

This new DVD/VCR combi unit was dead. In the absence of a service manual I decided to carry out a quick 'bleep' test around the power supply with my meter. It didn't take long to discover that D111 (1N5822) was short-circuit. The part no. is LG0DR158220AA.

We've had a similar problem with some **Philips** DVD players, so maybe this will become a stock fault. **M.S.D.**

VCR CLINIC

Reports from
Dave Gough
Andrew T. Duggan
Gary Laidler
J.S. Ogilvie
A. Haq
and
Roger Burchett

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

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

Matsui VC9601N

The customer said that the tape would load then the machine would shut down. A visual check showed that the brake band had snapped. I suspected that this was not all that was wrong and, when I removed the deck, I found that the left supply reel had fallen apart. Once it had been reassembled and the machine had been put back together it produced a fine picture.

I've had this fault with numerous Matsui VCRs. **D.G.**

Daewoo V50

This machine was dead with no display. I removed the power supply can and checked the ESR of the electrolytic capacitors. C53, C63, C65 and C66 all produced high readings. Once replacements had been fitted and some resoldering had been carried out in the power supply the VCR sprang to life and worked well. **D.G.**

JVC HR-DVS1EK

This expensive-looking VCR also has a mini DV deck. Fortunately the problem was with the VCR deck. It was half way through the loading cycle and, when the machine was powered, all that happened was that a clicking noise came from the gearing. I fitted a new mode switch (it lives under the main cam) then carried out a check on all the gears. Realignment is straightforward, as the gears are aligned with holes in the main deck. A soak test confirmed that all was then OK. **A.T.D.**

Sanyo VHR190E

If the complaint is no eject, remove the top cover then the front fascia. Before you replace the eject switch, check for poor joints at the middle connector. **A.T.D.**

LG BC999NI

I tuned in this six-head Nicam VCR a year ago. The customer complained that it subsequently started to go dead intermittently and was now totally dead. He gave me the machine for spares, and I tuned in his new £50 supermarket cheapie. Back in the workshop, cold checks showed that D106 (1N5822) was leaky. A replacement cured the fault, and the results were excellent.

So all that was required was a 20p diode. I'm worried about the future of the TV/video trade, but am never going to be short of decent machines if people keep throwing them away! **G.L.**

Aiwa HV-FX7500

The fault card said "ejects tapes". When I opened the machine up and removed the deck I found that the centre gear assembly was in bits. This VCR uses a Toshiba deck, as in the **Toshiba Model V709B**. A replacement gear assembly and clutch assembly cured the fault. They are both available from SEME, under part nos. VDC7718 and VDC7720. **J.S.O.**

LG BC989NI

This was a straightforward job: the VCR was dead after a power cut. The cause turned out to be C116 (1,000μF). **J.S.O.**

Panasonic NVF70

This VCR had no RF output but was fine with an AV scart output. I found that IC1 (LA7051) in the RF converter was faulty. **J.S.O.**

Mitsubishi HS841V

It's common to find that the front loading arm unit is broken in these machines. It's available from SEME under part no. VDC7847. **J.S.O.**

Panasonic NVFJ610 and NVSJ410

These machines came in shortly after each other, both with the same fault. The problem was no remote-control operation, though the machines worked correctly when their on-board controls were used. In both cases I found that, after removing the PCB from the cases, the IR sensor IC3 was dry-jointed. Resoldering cured the fault. **J.S.O.**

Philips 14PV203/07

The fault report that came with this TV/VCR combi unit said "no eject". When I checked I found that the mechanism at the side of the cassette housing was dodgy. A replacement restored normal operation. It's called the rack assembly, the part no. being 9965 000 12234, and is available from SEME. **J.S.O.**

Toshiba V705B

This VCR seemed to be dead. But I found that there were fluctuating voltages on the secondary side of the chopper transformer. The cause of the problem was C007 and C008, which were both low in value. **A.H.**

Hitachi VT430

This oldish machine was in surprisingly good condition, but had developed an annoying fault: when any function was selected it would occasionally go into rewind instead of the function selected. The condition was now permanent.

"End sensors" I hear you say. Well, nearly, though I admit that I replaced the supply-side end sensor as a first check before getting out the scope. I then found that the buffer chip IC903, between the end sensors and the microcontroller chip IC901, was faulty. Pin 1 should go low when the supply side end sensor has no light falling on it, but instead was 'floating' at about 1·5V.

IC903 is a BA6993 dual op-amp chip, and had to be obtained from Charles Hyde as a special order. **R.B**

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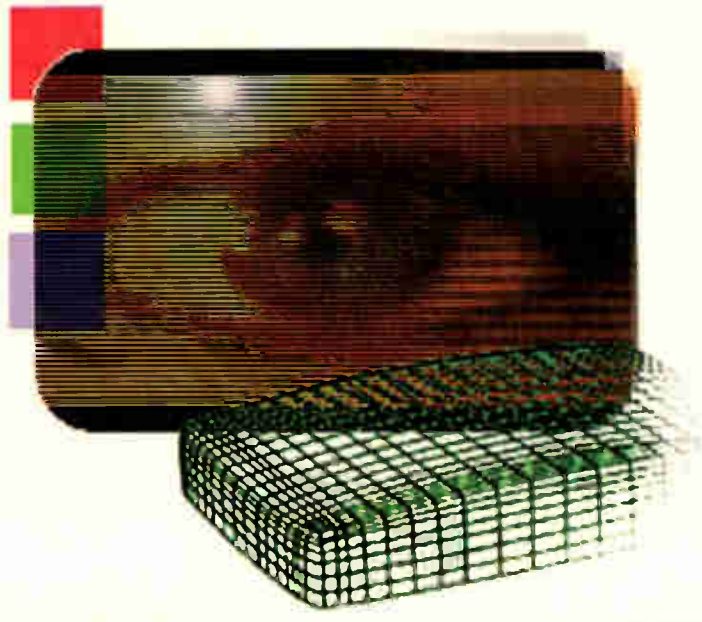

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Sony KVB2912U (AE2 chassis)

There was an intermittent fault with this set. After about half an hour the picture would blank out, but the on-screen display and the sound would remain. I looked at the set on and off for five weeks, checking, changing and scoping, so I will cut the story short. I eventually decided that it might be a good idea to put the set in the teletext mix mode and see what happened when the picture went off. Bingo! When the picture went off, so did the red in the teletext display.

This took me to the red output pin 13 of the SDA5248 teletext chip IC101: the red output disappeared when the picture blanked out. The chip is available from SEME but is expensive at about £30. It cured the fault however, and I was glad to see the back of this 29in. monster. **M.D.**

Bush DVD142TV (11AK46 chassis)

This TV-DVD combi unit produced sound but no picture in both the TV and DVD modes. What I didn't expect to find was dry-jointed connections to the line output transformer, as the set was just out of guarantee. The result was no voltage at the collector of the line output transistor. I look forward to seeing more of these sets! **M.D.**

Alba CTV4808 (11AK19 chassis)

A fault I've had on many occasions with this set is an audible tripping noise from the chopper transformer. The cause is always that the HT reservoir capacitor C829 (47μF, 160V) is open-circuit. Strangely, the fault seems to affect only 20in. sets. **M.D.**

Sharp 56FW-53H (DA100 chassis)

This set had an intermittent picture/colour fault. While I had it on test the picture blanked out altogether, which made for easier fault finding. I checked around the TEA5101A RGB output chip IC1801 on the CRT base panel and found that the voltage at pin 2 was low at only 4V instead of 11·5V. This supply comes via transistor Q912, which seems to form some sort of switch-on delay, being biased on by the CRT heater supply. Anyway, a check on Q912 (2SC2412) showed that it was leaky. A replacement restored the supply and cured the intermittent grey-scale drift. **M.D.**

Samsung TVP5050

This TV-VCR combi unit was dead with no output from the power supply. The dealer it came from had already replaced the STRS6707 chopper chip to no avail. After start up the supply at pin 9 of this IC comes from the chopper transformer, via a simple series-pass regulator based on Q802 (TIP102). This is where the trouble lay. Q802 was short-circuit collector-to-base, and its base-bias zener diode DZ802 (7·5V) was also short-circuit. Replacing these two items restored the set to life. **M.D.**

Bush WS7674 (PT92 chassis)

This just out of guarantee set was dead with the red LED on. When it was brought out of standby the LED went to green, then off and finally back to red. Most faults have been in the power supply, but the HT output was correct at 145V. I checked all the obvious components in the line output stage, but everything seemed to be OK. I then decided to remove the line output transformer. Once this had been done the green light stayed on. A replacement was ordered from CHS, using the number on the small label on its side – 1362.5006D. To my relief the new transformer restored normal operation. **P.S.**

Samsung WS32M64V (KS3A chassis)

This set had been repaired by another dealer. When we became involved the customer told us that following the repair the set's brightness varied and the colour went purple. I put the set on test and sure enough the brightness varied and the grey-scale was going crazy. The problem was where to start. I decided to phone Samsung technical and, after describing the fault, I was asked whether anyone had adjusted the screen (A1) control. If so, there's a set-

ting-up procedure. This is as follows:
(1) Feed a blank picture signal to the aerial socket (from a pattern generator or old video set to AV).
(2) Access the factory mode (standby, display, menu, mute, standby).
(3) Select G2 adjust.
(4) Turn the screen VR until the red text at the top of the picture turns green. If you continue to turn the VR the text will go red again. Set for the middle of the green section.
(5) Press the menu button.
(6) Select video adjust 1.
(7) Choose any item, e.g. select 'red cut-off'.
(8) Change the value of the selected adjustment by 1, then return to the original value. For example if the red cutoff value is 127, change it to 128 then return it to 127.
(9) Press the menu button to return to the main service menu.

Both problems were cured once this had been done. Screen/A1 adjustments are starting to become critical. **P.S.**

Beko 16328NX

The symptom looked like field distortion. There were black horizontal strips across the screen: they travelled well down the screen though not to the bottom. But freezing and heat application made no difference. I then noticed, across the scan coils, a 220Ω, 1W resistor that was in distress. A check showed that it was open-circuit. Once a replacement had been fitted the set was ready for return to the customer. **P.S.**

Toshiba 28N23B (11AK37 chassis)

No sound problems can lead you up the garden path. You will have to contact Toshiba technical, which can provide service menu information to reprogram the EPROM. The purpose of this note is to stop you tackling the problem with your signal tracer, because there simply is no sound. Happy days! **P.S.**

LG RI32CZ10RX (14.2 chassis)

The customer complained about a loud whistle from the back, intermittent of course. The cause was eventually traced to the EW loading coil L501, part no. 051707. **U.H.**

NEI 1551TX

The set was dead. In this event check for 12V at pin 9 of the chopper control chip IC800. If the supply is missing, replace thermistor TH901. A resistance check with a good thermistor should produce a reading of 6·8kΩ when cold. Note that this thermistor can also be the cause of intermittent power supply problems. **U.H.**

Toshiba 50WH18B

This projection set was slow to come out of standby. In addition the remote-control operations were erratic. The cause was eventually traced to IC QT07 on the text PCB. A solder reflow of this IC cured the faults. **U.H.**

Thomson Tekno 2 Combo

I hate repairing combi units. This one was dead. Checks on the primary side of the power supply revealed that one of the start-up resistors, RP05 (120kΩ), was open-circuit. A replacement restored normal operation. **U.H.**

Grundig ST55-725 (CUC7350 chassis)

The job card said dead set. Expecting the usual power supply rebuild, I ordered the parts that would have been required. But it turned out to be a strange fault. I was surprised to find that the mains fuse was intact. There was no supply at pin 7 of the chopper control IC however. When a replacement IC was fitted the power supply started tripping, with drive present at pin 6 of the IC.

Checks on the secondary side of the power supply showed that D61001 was short-circuit, but a replacement failed to cure the fault. Much time was then spent checking the secondary side and the output stages. As everything seemed to be OK I returned to the primary side of the power supply, where the BYT54M diodes D60029 and D60030 proved to be short-circuit. Replacements brought the set to life with line collapse. The cause of this was the line output transformer, part no. GR29221 031 63A. In all it turned out to be an expensive repair. **U.H.**

Wharfedale 550

This set was tripping. The first thing I noticed was that the line scan coil plug on the main board was very discoloured. I hard-wired it and, amazingly, found that the line output transistor had survived – usually it doesn't. The set still tripped however. I then spotted a disc capacitor, C599 (2·2nF, 2kV), with a black dot on it. It's right by the line output transformer, and read leaky. A replacement restored normal operation. **G.L.**

Naiko N2866

This is a budget supermarket 28in. set with a built-in DVD player. The customer said that it had been intermittently dead and was now totally dead. To get the main board out isn't fun – you have to disconnect lots of wires. Once it was out the cause of the trouble was clear. The legs of the BYW76 diode DP14 were slightly wider than the PCB holes and, during assembly, it hadn't gone home fully. The solder must have just been making contact. All was OK once it had been resoldered.

Now that's a one-off I thought, but a week later I had another set with the same fault. **G.L.**

Matsui 28N03

This set was dead. Initial checks on the primary side of the power supply failed to reveal any shorts, so I moved to the secondary side where I found that DP12 (BYV28-600) was short-circuit. I fitted a replacement and, flushed with success, switched the set on. It produced a bright screen with flyback lines, because there was no HT supply to the RGB output stages. Checks around the line output transformer revealed that RL18 (33Ω) was open-circuit. A replacement restored normal operation, and a long soak test proved that all was well. **G.L.**

Sony KVM2131U (BE1 chassis)

No sound with an occasional crackling noise was cured by replacing D202 (1SS133). This type of diode is used throughout the chassis, and is not too reliable. So you can suspect it if there is one in the area giving you trouble. **B.F.**

Goodmans 255NS (Daewoo CP775 chassis)

The sound was OK but the screen was blacked out. I found that all the voltages derived from the line output transformer were low, including the tube heater voltage. The unlikely cause was a poor connection at the plug/socket on the small scan-coil PCB. Usually this results in failure of the line output transistor. **B.F.**

Thomson 14MS15UT (TX807 chassis)

The field linearity was poor and the picture was shifted to the left. The cause was a corrupted EEPROM (ST24W04), which SEME can supply under order code M22W04. After fitting a replacement you will probably have to adjust the height. To enter the service mode turn the set off to standby, switch it off at the power switch, and switch on again while holding down the magenta key on the remote-control unit. Hold this key until the picture appears and then the adjustment data. Again using the magenta key, select the geometry menu. Adjust VA50 and store with the OK button. Press exit to leave the service mode. **B.F.**

Philips 25PT532B (GR2.4 chassis)

Once it had warmed up this set would usually go off with a flashing red power LED. It would have to cool down before you could turn it on again. The cause was

eventually traced to poor connections at the scan-coil socket PCB, not the usual ones that cause failure of the line output transistor but the two at the other end. **B.F.**

Philips 22CE2567 (2A chassis)

For about the first half an hour the picture would continually flick from on- to off-tune every second or so. The cure was to replace the three electrolytics in the IF module. **B.F.**

Toshiba 3327DB (C2D chassis)

This monster's field scanning was cramped at the bottom and stretched at the top. Field problems are usually caused by C317 and C322, with possible electrolyte leakage that needs to be cleaned or damages IC302. On this occasion however the fault was cured by replacing C305 (1μF, 50V). **B.F.**

LG KE14P2PX

This combi unit was dead. The 4A input fuse was blown, and there was a low resistance reading across a section of the bridge rectifier. The degaussing posistor, type 14MQ, needed replacement. After that the resistance reading was about 350Ω. **B.F.**

Hitachi C2874TN

A common fault with this complex set is failure of the LA7838 field output IC, which often becomes intermittent. Replacement of the IC and its decoupling capacitor cures the fault. To do this, I suggest cutting the plastic frame to gain access to the pins. Although this may seem a bit drastic, removing the chassis frame now that these sets are a few years old disturbs the ribbon cable that links the two PCBs. As a result the cable can fracture, leading to lots of intermittent faults, with extremely awkward replacement being the only cure. **G.D.**

Crown CTF28NT

This set was tripping. I found that the line output transistor was short-circuit. D402 (BY228) had evidently been overheating and was also short-circuit. Once these two items had been replaced there was a picture, but it was narrow with no EW correction. Fortunately the cause was not too far away – R427 (10Ω, 1W fusible) was open-circuit. **G.D.**

Tatung B series chassis

There was no sound. Audio arrived at the output chip IC601, but nothing came out despite the 14V supply being present at pin 2. But a new IC made no difference. Much time was wasted until I realised that the IC is type TDA7056. I had fitted one with the suffix A, which has a volume and muting circuit at pin 5. There was lots of sound once the correct device had been fitted! **G.D.**

Akura AP2821S

Ooh look, a new silver Akura! Inside there's a piece of Turkish delight. This set was dead because RP05 (1MΩ) was open-circuit. And, of course, the line output transformer was arcing. **G.D.**

Ferguson B59F (ICC7 chassis)

"Came in at the sides then went dead" the customer reported. Not surprisingly, the line output transistor was short-circuit. When this and the usual tuning capacitor had been replaced there was a picture but, after a few seconds, the new transistor started to overheat and the width came in at the sides, with some foldover. Clearly something was wrong with the line drive, the culprit being CP59 (3,300μF, 35V). I've noticed that this capacitor seems to be in a poor state in most of these sets, so replacement is advisable as a matter of course. It's the reservoir capacitor for the 24V supply. **G.D.**

Panasonic TX36PB50

This set had been out for only a short while before it was part-exchanged for something bigger! When we checked it over in the workshop it appeared to have no sound, though the previous owner had not mentioned this. It seems to be a common fault however, and my thanks go to the Panasonic technical website that pointed me in the right direction. Basically, you have to remove the sound board, which is known as the DP PCB, and reflow the solder around the various ICs. The most likely causes of the symptom are IC2510, IC2501 and IC2504. Make sure that you resolder all these surface-mounted ICs and all the plated-through electrolytics carefully. Resolder the capacitors on both sides of the PCB. Have a general look around for other poor soldered joints, and deal with them as necessary. **M.L.**

Hitachi C2566TN

This set was suffering from all the known Hitachi problems. It would shut off seconds after switching on, or sometimes work for a while before shutting down. All seemed to be well after a good solder up around the regulators and a new 68kΩ resistor in the power supply. Until, that is, I tried to turn up the volume and change channels with the front controls. There was no sound at all, and the channel up and down buttons had no effect. I knew about this one from a time back – the EEPROM (IC002) was faulty. We keep them in stock, and a replacement cleared the problems. **M.L.**

Panasonic TX14GV1

This TV/VCR combi unit came to the workshop from the showroom. The sales staff said it didn't start up. But it worked all right for us. So back off, tap around, back on, soak test – no start up! In fact the unit would take a tape in but wouldn't eject it, and on the TV side it didn't produce a picture. The timer light was flashing orange, while the power light was green in standby with no illumination at power up. To cut a long story short, the 5V supply to the SDA5457 micro I701 was intermittent because of dry-joints at L702 and D705. These components are on the bottom board. **M.L.**

Naiko N2850W

There were slight brightness and contrast variations for the first ten minutes, after which the picture would flash for a while then disappear, leaving a just-visible green raster and sometimes flyback lines. The sound and remote-control operation were both OK. The first anode supply was varying slightly, but a new line output transformer failed to cure the problem. Nor did replacing the TDA6107Q RGB output chip on the CRT base. Further checks failed to reveal anything amiss, leaving the tube as the main suspect.

In the end another set with the same Philips A66ECK001X13 CRT came in for repair, so I carried out a 'back-to-back' test, linking all the connections from the suspect CRT to the other set. This confirmed that the CRT was the cause of the trouble. **A.D.**

Goodmans 285NS (Daewoo CP775 chassis)

When one of these sets comes in dead and tripping, the line output transformer T402 usually has a shorted primary winding or has been arcing and has killed the 2SD1880 line output transistor Q401. One set came in with both of these items faulty, and in addition the TDA8351 field output chip I301 had a hole in its front. D408 (BYV95C) looked scorched, while C413 (22μF, 160V) was swollen. These two components provide the 46V supply for I301.

Once these items had been replaced there was sound but no picture, just a bright white shadow a third of the way up the screen. A replacement TDA8375A jungle chip (I501) restored the picture. It lives under the screening can.

We've also had the BYW95C boost diode D406 fail as a result of a defective LOPT. **A.D.**

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Extended Fault Reports

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

Reports from
Charles Ritchie
M. Richardson
Martyn S. Davis
David I. Scott and
Arthur Jackson

Panasonic TX25MD1 (Euro-2L chassis)

The fault symptoms with this set were field cramping and RGB lines across the picture. Replacing D456 (MA2160B) in the field flyback boost circuit and resoldering the joints around the TDA8175 field output chip IC451 usually cures the fault, but not this time. The TDA8175 IC also had to be replaced, but the device is now obsolete. Fortunately Panasonic supplies a kit, part no. TZS9EK026-1, that contains a TDA8177 IC, a small PCB, a few resistors and fitting instructions. Once I had fitted the kit, gone into the service mode and adjusted VAMP, VSYM, VLIN, VDC and VPOS the set worked well.

When you fit the kit for the first time it seems to be a daunting task. Fortunately it gets easier with practice. There are a few omissions however. Resistors R455 and R457 are surface-mounted components. R455 must be removed and a wire link fitted on PCB E (the main board) before PCB D (the new PCB) is fitted. There is no information on how to get into the service mode, and it would be nice to have before and after modification diagrams of the field output stage.

To get into the service mode with this chassis, set the bass to maximum and the treble to minimum. Then press the F button followed by the volume-down button on the TV set, while pressing the reveal button on the remote-control unit. Use the red/green buttons to select a function, and the yellow/blue buttons to alter values. Press the store button on the TV set to retain the new values, and the N button on the remote-control unit to exit the service mode. **C.R.**

Philips 32PW9723/05 (MD2.25 chassis)

This 32in. widescreen set was completely dead. I removed the back and checked the components in the power supply. The STW9NA60 chopper transistor Tr7541 was short-circuit, also the 1N5062 mains bridge rectifier diodes D6510-3. As a precaution, I also replaced the MC44604P chopper chip IC7520 and the surrounding capacitors.

Thank goodness for the variac! I slowly turned up its output, and the set produced a good picture with sound. Everything seemed to be fine. When the output from the variac was increased further however there was a loud bang from the power supply and the set died again.

It was now obvious that the blue disc capacitor C2540 (22nF, 2kV) was the cause of the problem, and was without doubt responsible for the failure of the other components that had been replaced. A hole was discovered at the bottom of the capacitor. Fortunately the new chopper transistor was fine: I suspect that without the use of the variac I would have had to replace all the other parts again. **M.R.**

Thomson 28WF45EG (ICC20 chassis)

This newish set came in dead with the front LED flashing error code 25, which indicates that the switched 5V supply is missing. It was the first time I had worked on the chassis, so I spent a fair amount of time getting to know it and seeking a possible cause of the fault. Eventually it all boiled down to the line output transformer. This comes as a kit, part no. 35699030, that curiously doesn't include the output transistor, part no. 10461310.

Once I had replaced these items there was sound but no picture, because diodes DL302 and DL303 had gone short-circuit.

How did I get to the line output transformer? Because Thomson's helpful technical department suggested that I try it. I find it amazing and, in a strange way, reassuring that after all these years Thomson still hasn't worked out how to design reliable line output transformers. There's hope for the service trade yet! **M.S.D.**

GEC C2100

When I was asked if I would look at this supposedly well cared for set my first thought was that its owners had got the model number wrong. When it arrived I was astonished to find that it was indeed a thirty-year old single-standard hybrid set with a wood-veneer cabinet, and that it did seem to be in spotless condition. Apparently it had been regularly used as the main set over the years, with only a minimal number of repairs (supported by bills), and had been relegated to another room only when Channel 5 started up – the C2100 has only four channel push-buttons of course.

Infrequent use had continued until a few weeks previously, when there was sound but no picture for a few minutes after which the set had gone completely dead. It didn't take long to find that the rear-mounted HT cut-out had operated because of an overload, the cause being failure of the 0·47µF boost reservoir capacitor – it had gone short-circuit. I was

fearful that the PY500A boost diode might have suffered as well. But no, once the capacitor had been replaced (yes, I did have one to hand!) the picture came up with the correct width and no ballooning as the brightness was increased.

I couldn't help noticing that the picture was very washed out and dim, and fortunately knew the cause of this as well, a low-emission PL802 luminance output valve. A replacement valve (also to hand!) followed by adjustment of the many convergence controls rewarded me with an amazingly good picture given the age of the set and the technology it used, and also the fact that it still had its original Mullard red-labelled Colourscreen tube. The owners were extremely pleased, but I had to warn them that, despite its excellent condition both inside and out, it was living on borrowed time. They were nevertheless reluctant to let it go, and I have no doubt that I shall see it again. **D.I.S.**

Thomson 32WF25U (ICC17 chassis)

When this large, flatscreen set was switched on a red LED illuminated as usual. It quickly changed to amber, and EHT was heard. Normally the amber goes green and, after about another four-five seconds, a picture appears. But in this case the amber remained for fifteen seconds and no picture appeared. After the fifteen seconds the LED flashed green and amber alternately, then flashed two pulses followed by a delay then another six pulses. This means error code 26, which occurs when the tube takes a long time to warm up.

The cause of the problem was the tube's A1/G2 supply. As no shorts could be found, I disconnected the A1 lead from the tube base and checked the voltage. A supply of only 4V was available from the LOPT. A replacement transformer – the part no. for this model is 10680470 – cured the fault.

The error code is worth noting, as other components could produce the same symptoms. **A.J.**

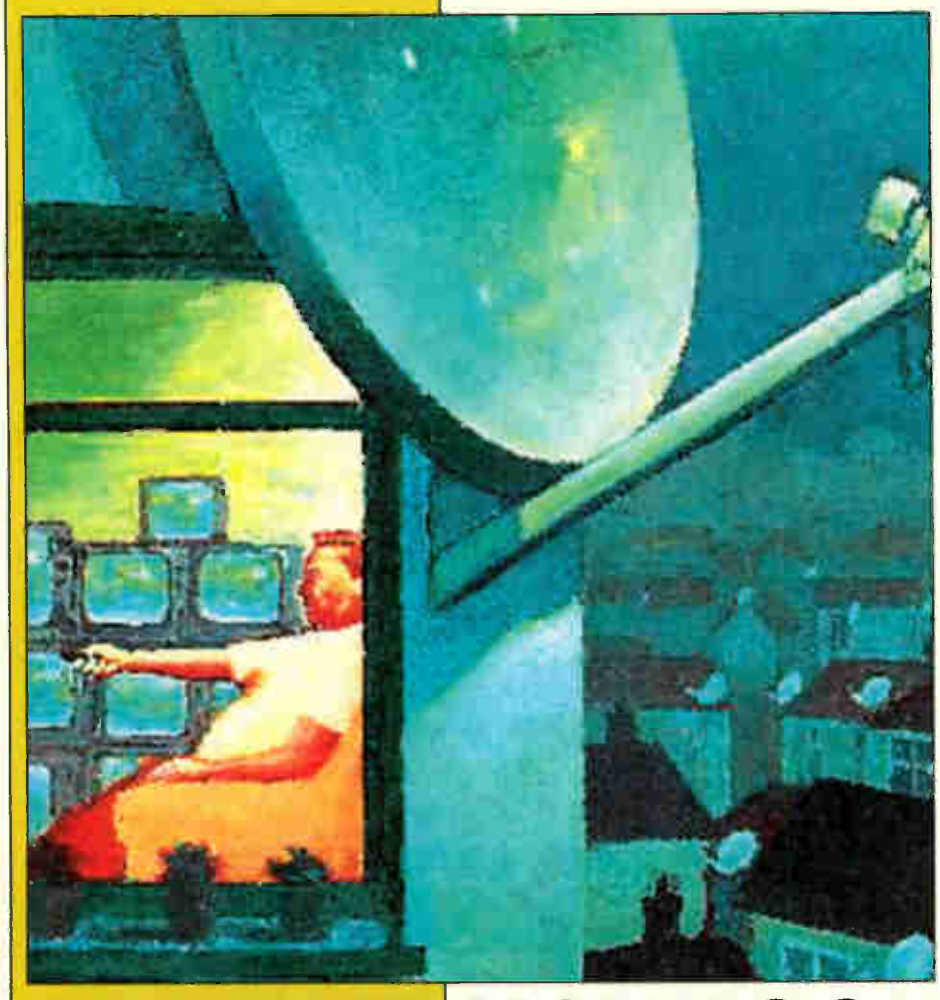
Sanyo C28DN1 (EB4-A28 chassis)

This set produced a bright standby light, but when channel-up was pressed the LED went dull then started to flash. Voltage checks revealed that the primary side of the power supply was very dead, as the surge-limiter resistor R602 (3·9Ω, 7W) was open-circuit. The LED and the microcontroller chip are powered via a separate mains transformer.

Further checks showed that the chopper transistor Q613 and the line output transistor Q432 were short-circuit. I replaced R602 and Q613, checked other relevant components on the primary side of the power supply, then removed the line output transistor and connected a dummy load across the HT line. When the set was powered via a variac, I discovered that the HT rose to over 200V at 60 per cent mains input.

The cause of the trouble was R641 (68kΩ), which was open-circuit. It's part of a potential divider across the 150V HT rail, its lower end feeding a voltage to the optocoupler D615.

Once R641 and Q432 had been replaced there was normal HT. But the LA7833 field output chip IC501 had also been damaged. Replacing this item completed the repair. **A.J.**



SATELLITE NOTEBOOK

Reports from
Christopher Holland
Hugh Cocks
George Cooper
and
Michael Dranfield

Trouble with German channels

Herr Schmidt has a large holiday villa here. He also has six Technisat digital FTA receivers that are fed from a single dish via a multiswitch arrangement. The receivers and the associated TV sets are in various different rooms – there are two 42in. plasma sets, three LCD sets and a widescreen CRT set. Unfortunately Herr Schmidt's handyman had been let loose trying to install the satellite gear, which had been shipped to Portugal from Germany. In the end, he had admitted defeat.

There was reception in three rooms, though some channels were missing. The more distant rooms didn't get a hint of a signal. When I checked the dish I found that it was more or less correctly aligned with the Astra 1 satellites at 19·2°E, which is where the German digital channels come from, but some adjustment was required to obtain maximum output. The cause of the distribution problem was soon evident: terrestrial TV output points had been fitted instead of the correct diplexed ones with both a terrestrial coax and a satellite F socket. None of the TV sets were connected to the terrestrial sockets, as there was no terrestrial TV input to the multiswitch.

While the terrestrial TV sockets passed DC from the satellite receivers back to the multiswitch, as with a satellite socket, they weren't too hot at passing the satellite IF band. In fact they introduced quite a loss, and their response was uneven. Photo 1 shows a typical view of the Astra 1 spectrum without the offending socket, while Photo 2 shows the spectrum with one of these sockets inserted in the feed. Interestingly, the loss is a bit lower at the HF end of the band! Once we had fitted the correct type of socket each receiver was presented with a good IF signal that was flat across the band.

The Technisat multiswitch consists of two four-way units. The master four-way

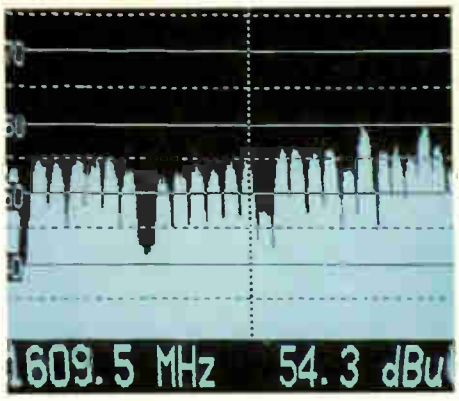


Photo 1. Typical view of the Astra 1 IF spectrum.

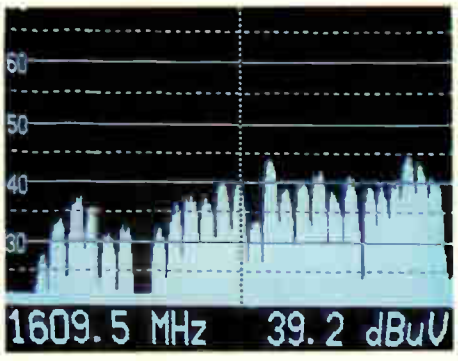


Photo 2: Astra 1 IF spectrum attenuated by inclusion of a terrestrial TV socket in the feed.

Photo 3: Typical test pattern transmitted via Astra 2A transponder 14.

Photo 4: Kingston Inmedia feed via Eurobird transponder C1.

Photo 5: Get Lucky test via Eurobird transponder C1.

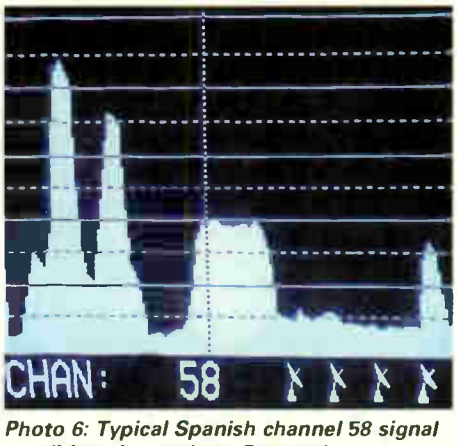


Photo 6: Typical Spanish channel 58 signal conditions in southern Portugal.

Photo 7: Typical reception of TVE1.

Photo 8: The receiver's programme 'Channel Manager'.

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

Channel and EPG no.	*Sat*	*TP*	*Frequency/pol*
Escape (693)	EB	C1	11·223GHz/H
Get Lucky (235). See Photo 5	EB	C1	11·223GHz/H
Horror Channel (330)	EB	C1	11·223GHz/H
Kingston Inmedia feeds	EB	C1	11·223GHz/H

TP = transponder. EB = Eurobird.

unit has four inputs from the LNB, as usual, four outputs to receivers and a mains supply. In addition there are four LNB outputs that feed the second four-way switch. This doesn't require any mains power – possibly a DC supply is fed from the master switch via the interconnecting coaxial leads. In this installation the two switches were housed in the same box, but the slave switch can be located a considerable distance from the master one if required. This could be useful in some situations. **C.H.**

Digital channel update

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

BBC Parliament has left transponder 22 (12·129GHz V) and moved to Astra 2D transponder 50 (10·847GHz V). The contents of transponder 33 (12·344GHz H), including a number of commercial radio stations and TV shopping channels, have been moved to transponder 36 (12·402GHz V) – at the time of writing transponder 33 has been switched off.

Astra 2A transponder 14 (11·973GHz V) is transmitting occasional feeds when not on the BT Tower caption shown last month. Photo 3 shows a typical test pattern transmitted after a feed from the Formula 1 Spanish Grand Prix in early May. The recently activated Eurobird transponder C1 (11·223GHz H) has occasional feeds from Kingston Inmedia, see Photo 4. **C.H.**

New version of DVD-lab

In the May column (see page 436) I mentioned DVD-lab, which is a very useful piece of software for compiling DVDs to be used with DVD players. A new version, called DVD-lab PRO, is to be released shortly. There are several major additions. First, up to eight multiple audio tracks can now be recorded on a disc – previously only a main audio track could be included alongside the video track.

Secondly, both 16:9 widescreen and conventional 4:3 aspect ratio recordings can be included on the same DVD. This is useful when a number of off-air recordings are to be put on the same disc – until now the aspect ratio was locked to the first recording on the disc. It's done by recording the different aspect-ratio programmes as separate video transport streams (VTSs). When compiling menus, a 'bridge' is used to link the different items together. However I've found that some DVD players can't find the second VTS on the disc, though other players work all right. I've also tried a well-known DVD copying program called DVD Shrink, which is available free from www.dvdshrink.org. Again the second video stream couldn't be located. But to be fair so far I've tried only DVD-R discs: DVD+R discs might be better in this respect.

Another helpful addition is the option to compress a video stream in the compilation quickly by any desired percentage, in order to fit all the recordings on to a 4·7Gbyte disc. I've used this facility to reduce the size of a file by about 80 per cent, with little noticeable loss of picture quality. The operation is surprisingly quick. The original file is kept at the same location as the new reduced one, so a comparison of their quality can be carried out.

At present DVD-lab PRO is available only as a time-limited (30 days) beta test download from the website at www.dvdlb.net. The full version is due to be released in May or June. It's going to be priced at a hefty $199 however. But according to the website comparable authoring programs that offer these additional facilities cost considerably more than this. The previous DVD-lab 1.4 will continue to be available at $99. It's more than adequate for most DVD writing applications. **H.C.**

Spanish DTT

Not surprisingly, DTT reception has not previously been mentioned in this column! But most UK readers who are involved with satellite TV reception of one form or another are also probably involved with terrestrial digital TV reception, and may be interested to hear about my experiments here in Portugal. While DTT is now commonplace in the UK, there are no local transmissions in this part of the world. They are expected within the next year or so, but the Portuguese authorities are not exactly rushing into things. Fortunately some DTT signals can be picked up from across the boarder in Southern Spain. In the warmer weather they vary considerably in strength on a daily or even hourly basis.

Spain had a go with a pay DTT service

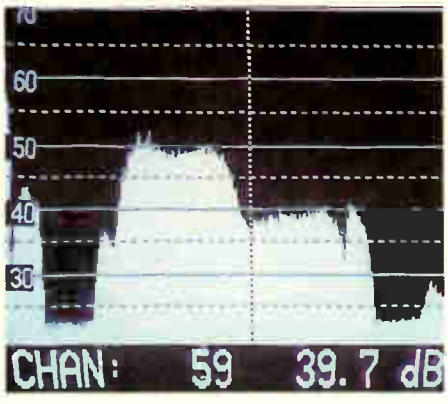


Photo 9: DTT transmissions are present on chs. 58 and 59 during intense lift periods.

Photo 10: Start of a channel search on ch. 59.

called Quiero TV, which folded at the same time as ONdigital in the UK though it had started about a year later. The reason why it didn't last long was mainly considerable competition from two rival satellite TV services, which have since merged. At the moment the only DTT transmissions that can be picked up are the Spanish national services TVE1, TVE2, Antena 3, Tele 5 and the pay-TV service Canal Plus. Except for Canal Plus these are all FTA channels – Canal Plus has some hours of free viewing during the day, when a picture can be received, but when it switches to the scambled mode the screen goes to black. I'm not sure whether subscribers can view Canal Plus yet with a DTT receiver that has a smart card in place. On the other channels the local Spanish news is from the Madrid area, not from the southern Andalucian region as with analogue off-air terrestrial signals. There is also a considerable time delay between the DTT and analogue signals, suggesting that satellite distribution to the terrestrial transmitters is probably used. In all likelihood the transmissions are still in an experimental phase.

For my tests I used a Freeview-type box called Digital 1500, which is intended for the German market. Naturally enough it's made in the Far East. I had tried last month with an old ONdigital box, but this refused to acknowledge even the presence of any signals, though they were clearly visible when the spectrum analyser was used!

The main receivable signal, which carries the national channels, is on channel 58. Photo 6 shows typical signal levels during very slight 'lift' conditions, when they are up a few dB from poor-weather conditions. The analogue Antena 3 signal on ch. 56 can be seen just below it. If conditions are poor the signal is present and usable but can slowly fade up and down, particularly around sunset, making the picture disappear for short periods. Photos 7 and 8 show typical reception of TVE1 and the receiver's programme 'Channel Manager' respectively. Once lift conditions become more intense ch. 58 is joined by an identical multiplex on ch. 59 (see Photo 9) and, at times, a Moroccan analogue signal appears in ch. 58, wiping out any hope of DTT reception.

Photo 10 shows the start of a channel search on ch. 59, or 77800kHz as the receiver likes to call it. The transmission type is shown as being 64QAM. Interestingly, the tuner goes down to Band I. I've never heard of Band I DTT transmissions, though it would be an interesting DX possibility! The receiver's UHF modulator provides software-selectable W. European 5·5MHz, UK 6MHz or E. European 6·5MHz intercarrier sound, something I doubt whether you would find with a current Freeview box!

At times two other services can be received, in ch. 66: Net TV, which consists of pop music videos, and Veo which is a financial channel. These are often likely to appear at sunset, for only a short period, when ch. 58 is subject to fading. Once lift conditions are predominant the ch. 66 pictures go, being swamped by a very strong digital carrier. The receiver has good lock, but no channels can be found. Identical signals are then present on chs. 67-69. Possibly this is a relic of the old pay-TV DTT broadcaster and someone somewhere forgot to turn a transmitter off! Until a few days ago ch. 48 had a digital carrier present, very similar in level to ch. 58, so presumably from the same site. A series of Juegos (games) were listed in the EPG, nothing else. Possibly this was also something to do with the old pay-TV service and someone had finally remembered to switch it off.

For reception I use a flat-panel type aerial connected to a low-gain, low-noise Labgear preamplifier, mounted up a mast at about 13-14m with a good view towards Spain. A more directional aerial system with a rotator would no doubt help. I lose reception for a brief period when the signal is very marginal and a motorcycle without interference suppression goes along a nearby road. This doesn't happen with cars and motorcycles that have properly-suppressed engines.

Spain has a large number local UHF analogue TV stations. To an outsider the situation would appear to be rather chaotic, both with respect to programme content, some of which wouldn't be allowed as FTA in the UK, and the frequency allocations, which seem to be arranged to optimise co-channel interference possibilities. In fact some local stations have offset themselves by up to about half a channel, probably in an attempt to minimise co-channel problems. Each region is due to have full national and regional TV multiplexes soon, together with a single local-TV one. Local stations that are not awarded a slot within the multiplex will then have to abandon their analogue transmissions.

Apparently for the time being virtually all digital transmissions will be in the ch. 48-69 range. Once the analogue transmitters close spectrum space will be freed, though at present the Band I/III transmitters are all moving to UHF, making the channel-congestion problem worse. **H.C.**

Manhattan DSR2500

This digital and analogue satellite receiver was stuck in standby. The power supply is to the left of the motherboard, and a visual check showed that one capacitor, C109 (100µF, 16V), was in very poor condition. A replacement got the receiver going again but, for added reliability, I replaced all the electrolytics in the power supply. **G.C.**

Panasonic TU-DSB31

There's a built-in software problem with this model: the flash memory chips cannot complete a large operating software jump in one go. Because of this, if you have any old unsold stock more than about a year old the box, when you come to update its software, will go through the download routine but will not rewrite any software. Unless you have 3.0 or above software, there will be problems with reading the card.

The easiest way to cure the fault is to replace the flash memory chips IC357 and IC359 and make sure that the box is updated every time Sky sends out a new version of the software. This is of course done automatically when the box is in regular use. **M.D.**

Grundig GDS2000

This digibox worked all right but an audible noise came from the chopper transformer. The cause was found to be C1 (220µF, 400V), the mains bridge rectifier's reservoir capacitor. It was virtually open-circuit. **M.D.**

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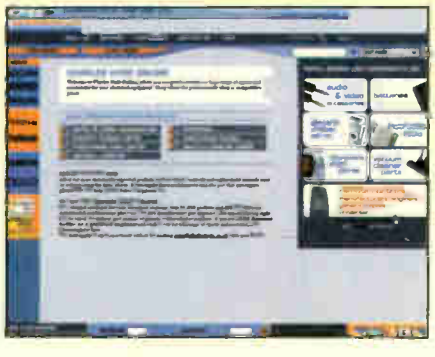

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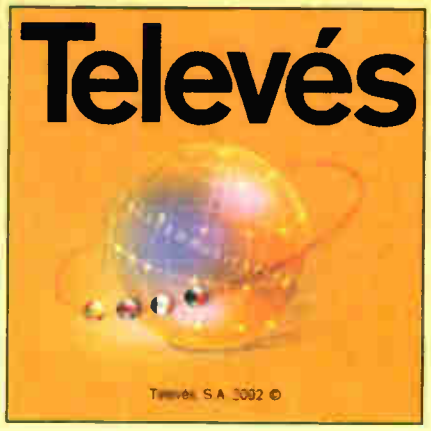

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Viglen ENVY15P (MC1528LE)

The LED came on but there was no activity in the line output stage. This monitor is an updated version of the AST LR14, with push-button front controls and most of the internal presets replaced by an 'electronic-screwdriver' microcontroller board. The first thing I noticed was that there was something clonking about inside. This turned out to be a large self-tapping screw like the two that fix the chassis tray to the front assembly. After a search to try to find where it might have come from I came to the conclusion that it was a 'spare' that had fallen in during manufacture.

The cause of the failure was easy to spot from the print side. Unfortunately it was impossible to read the component reference number, as the PCB was well and truly charred. The victim was a MOSFET that hid between a bobbin-type inductor and a vertical subpanel, about half way between the chopper transformer and the rear of the main PCB. It's almost overshadowed by the overhead-mounted energy-saving PCB. When I unsoldered the MOSFET's leads from what was left of the copper pads and attempted to remove the device the copper tab came out, leaving the plastic part stuck to the adjacent vertical subpanel. Miraculously, the plastic part didn't disintegrate completely, so it was possible to see most of the type number – IRF?30. The ? could have been 5, 6 or 8, so I had to do some detective work.

The bobbin inductor is directly connected to this MOSFET, which switches the supply to it. The other end of the inductor is connected to a 2SK1701 on a heatsink: this is the PWM switcher. A 220μF, 100V electrolytic capacitor is connected to the drain of the damaged MOSFET, while a 47μF, 100V electrolytic is connected to its source. The possibilities for the MOSFET were an IRF530 which is rated at 14A/100V, an IRF630 which is rated at 9A/200V, or an IRF830 which is rated at 4·5A/500V. The IRF630 seemed the most likely, though it could have been an IRF530. So I decided on a device that gave the best of these possibilities: the 2SK1350 is rated at 15A/200V, the same voltage as the IRF630 and an even better current rating than the IRF530. It has the additional advantage of being an insulated TO220 type – useful as the insulating material that originally prevented the device shorting to the adjacent subpanel had been destroyed by the burn up. The dissipation rating of the 2SK1350 is only 45W however, considerably less than the device it was to replace. But this shouldn't have been a problem, as the device is operated as a saturated switch. In addition, by the time I had removed the carbonised PCB material there was quite a large hole, which would provide ventilation!

In view of the severity of the burn-up I was surprised to find no other damage during cold checks before reassembling the monitor – and even more surprised to find that it now worked! After giving it a bench test for a couple of hours I pulled out the power lead and eased a finger into the chassis to feel the 2SK1350's temperature. It was warm enough to prove that it had been conducting in the mode used. But warm was all, not hot. My guess would be that the correct type is the IRF630 which, if the insulation barrier protecting the vertical subpanel hasn't been damaged, would out perform the insulated 2SK1350 and is easier to obtain. **I.F.**

Taxan 7D16 (Model EV735TCO99)

This 17in. monitor was totally dead. A quick visual inspection revealed a large burnt area at the primary side of the power supply, which had blown up. Fortunately there was no board damage, and another of these monitors could be used to determine the values of several resistors that had been burnt beyond recognition. The following damaged items were replaced: IC601 (UC3842); Q601 (2SK2545); ZD601 (20V, 500mW); D614 (1N4148); R610 (0·33Ω, 2W); R608 (1kΩ, 0·5W); R615 (39Ω, 0·5W); and R626 (18Ω, 0·5W). In addition R603 and R604 (both 150kΩ, 1W) and R627 and R639 (both 560kΩ, 0·5W) were replaced because they had become smoke damaged by neighbouring burnt components, and C610 (100μF, 35V) was replaced because its ESR had risen – it was probably the cause of all the destruction. **G.M.**

Sony CPD1730

The customer complained of all sorts of problems with this ageing 17in. monitor. Reading between the lines, I felt that there was probably an intermittent field output fault that produced different symptoms at different times. I decided to give the unit a soak test before dismantling it: once it had warmed up, I figured, I might be able to see the symptoms the customer had been on about. Sure enough after a couple of hours or so the height started to stretch, then there was poor field linearity, and finally the field scanning collapsed to a single white horizontal line across the screen.

Examination of the board revealed dry-joints around the pins of the field output IC. I reworked them and gave the monitor a long soak test, which proved that the monitor was now OK. **B.B.**

Solution to Test Case 499

– see page 551 –

These intermittent faults are so frustrating! Even so, Ray had brought some of his troubles upon himself. As an authorised Hitachi service centre, the workshop has access to the manufacturer's dealer website. That's where Ray should have gone, right at the start, to check whether this problem had been encountered and solved before. It's a fool who doesn't stand on the shoulders of giants when invited to do so!

The points that Ray had attended to were all listed in the site's techinfo/tipdata pages, along with a few more by way of dry-joints etc. Amongst the suggestions there was mention that tripout can be caused by operation of the over-voltage protection circuit. The HT voltage, nominally 152V for this large widescreen model, is quite critical. Ray found that it was on the high side. Following the advice on his PC screen, Ray replaced R950 in the voltage-sensing network, squirt-cleaned the HT preset potentiometer VR950, and adjusted it for 152V. This was followed by a visit to the set-up menu to trim the geometry and other picture settings.

The set was again left to run on the soak-test bench. At long last it behaved itself, running all day every day. It's unfortunate that the set finally came to rest in a row of sets marked 'terminated rental'. But that's life in the year 2004 . . .

NEXT MONTH IN TELEVISION

Servicing in the field

There are two schools of thought on how to run a repair service: take every product back to the workshop, or try to carry out as many repairs as possible on site. Michael Maurice finds the latter approach best suited to his one-man business with its large suburban customer base. Next month he describes the advantages of field servicing and how he manages to complete about 90 per cent of repairs in customers' homes.

A laptop video out problem

One of Ray Porter's customers bought a laptop PC with a 15in. screen because it could be used with photo CDs and DVDs and had a video output. There were problems with commissioning the 'TV out' feature however.

Converting a SSM to a spectrum analyser

A spectrum analyser is almost essential when there are signal problems – lack of, interference, etc. Chris Jones describes a minimal-cost modification to a widely used signal-strength meter so that it acts as an effective spectrum analyser.

Vintage car radios

Early car radios used valves of course, so a means of generating an HT supply from the car battery was required. This was done by using a vibrator unit with a step-up transformer. J. LeJeune describes how it worked.

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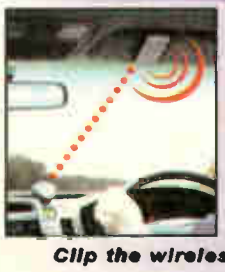

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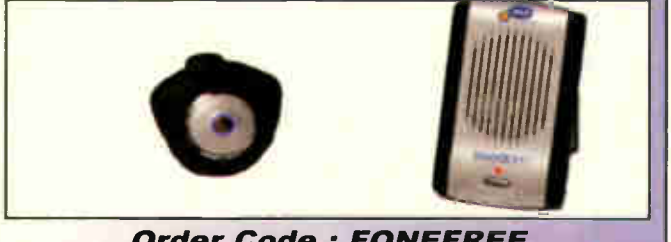

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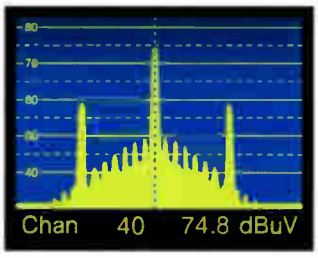

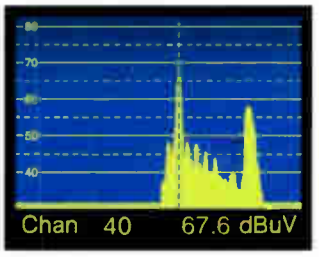

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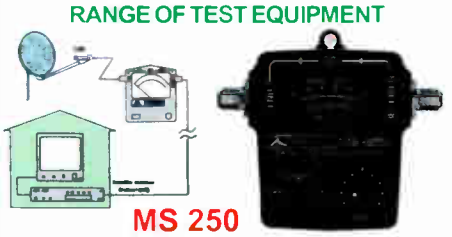

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