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Ferguson	FDT500	IRC83077
Goodmans	GDB1	IRC83079
Goodmans	GDB2	IRC83079
Goodmans	GDB3	IRC83079
Goodmans	GDB4	IRC83079
Grundig	GDT1000	IRC83081
Grundig	GDT1500	IRC83081
Grundig	GDT2000	IRC83077
Hitachi	HDB60	IRC83079
Matsui	DTR1	IRC83079
Nokia	121T	IRC83078
Nokia	221T	IRC83078
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Thomson	DTI1000	IRC83080
Thomson	DTI550	IRC83080
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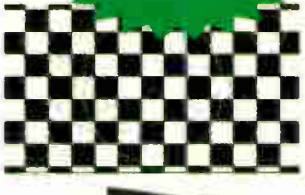

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HIGHBURY BUSINESS

The Hayes story

The death of Sir Godfrey Hounsfield on 12 August draws attention once again to the extraordinary achievements of those who worked at the EMI Central Research Laboratories, Hayes, Middlesex. Sir Godrey's contributions relate to computers and CT scanning for medical diagnosis. We'll come back to that, but first a note on the work at Hayes from the early Thirties – as readers doubtlessly know, that's where the first practical all-electronic TV system was developed, the famed 405-line system that was brought into use for broadcasting by the BBC in 1936.

EMI was formed in 1931 as a result of the merger of the Gramophone Company (HMV) and the Columbia Gramophone Company, both of which had been extending their activities into the radio field. It was a difficult time economically, at the height of the great depression. The significant thing was that the merger brought Isaac Shoenberg to the new company as Head of Research, also Alan Blumlein who had been working with him at Columbia. Blumlein's initial job had been to develop a new electronic recording system, in order to circumvent US patents. The result was the moving-coil microphone, the moving-coil pickup and new amplifiers. Once at Hayes, Blumlein went on to develop the first practical stereo sound recording system, in 1933. During the same year there was a further bit of patent circumvention at Hayes. This time the problem had been Philips' patent on the pentode valve. Apparently within two days of being given the task C.S. Bull and S. Rodder came up with the idea of the beam tetrode!

As early as 1929 HMV had become interested in TV, and a research programme was begun in 1930 when a TV laboratory was set up. Its initial work was on standards and the development of practical CRTs for TV receivers – this led to the Emiscope. But probably the most significant advance in the TV field was the development of the first practical electronic camera tube, the Emitron. J.D. McGee and W.F. Tedham made the first experimental Emitron tube in the autumn of 1932.

Work on TV was a major aspect of research at Hayes throughout the Thirties, with Blumlein in particular taking out numerous patents. One was for the tuned line output stage that developed the EHT required for the CRT. As with his stereo sound system, it was some years before it came into use.

The next big step was radar, which had first been proposed by Sir Robert Watson-Watt in 1935 – as a ground-based way of detecting enemy planes. It is not easy to determine what role EMI played in the early development of radar, because for obvious reasons such work was carried out in great secrecy. Apparently the first airborne radar receiver was produced by EMI, based on one of its TV receivers, but EMI did not know exactly what the receiver was being used for! It was not until late 1939 that EMI was given a government contract to work on radar. Blumlein was certainly involved in this work, though he came to be based at the Telecommunications Research Establishment, Malvern (despite still being on the EMI payroll). EMI was subsequently involved in the development of several radar systems, including the first PPI (Plan Position Indicator) radar that provided aircrew with an image of the ground below. In fact it was during a test of this radar equipment, also known as H2S, that Blumlein and others died in a tragic aircrash in 1942.

Sir Godfrey Hounsfield joined EMI at Hayes in 1951 to work on radar and guided weapons. He became interested in computers and, in 1958, led the team that developed the first all-transistor computer in the UK, the Emideck 1100. EMI was unable to make a success of its computers however, and the computer division was sold off in 1962. This seems to have been the start of the decline of EMI, which was sold to the Thorn Group in 1979. Not before considerable other achievements however.

Audio tapes and equipment were launched in the mid-Fifties. A technical achievement but again a marketing failure. The other major achievement started off in 1967, when EMI was flush with funds following the success of the Beatles, who recorded for the company. Sir Godfrey Hounsfield was given a free hand to pursue product research, and decided to develop the CT scanner. The basic idea was to link a computer to an X-ray machine and take a number of low-power cross-sectional scans to build up an image. This was much more sensitive than previous X-ray equipment, and became a major diagnostic tool.

EMI sold some 700 scanners between 1972 and 1977. They had gone through considerable development, but further heavy investment was required. At this point US competitors entered the field with more advanced and cheaper scanners. A financially weakened EMI had to withdraw from the medical equipment field, and was taken over by Thorn.

It's not, unfortunately, a story with a happy ending. But what achievements while it lasted. Stereo sound, TV, radar, computers and CT scanners. Just about every major form of electronic equipment. And what an extraordinary cast of researchers.

CRTs make comeback

A set fitted with the LG.Philips 32in. WSRF SuperSlim tube.

LG.Philips Displays is preparing to start mass production of what are claimed to be the world's slimmest TV cathode-ray tubes. The 32in. WSRF (WideScreen Real Flat) SuperSlim tubes will enable CRT TV sets to be almost as slim as plasma and LCD ones. Mass production is scheduled to start at the company's plant at Gumi, Korea during the first quarter of 2005. The tubes are currently being produced at the company's Durham factory, and production at the Nanjing plant in China is due to start shortly. The SuperSlim tube measures just 35cm from front to back, an up to thirty per cent reduction compared to current 32in. widescreen CRTs. An article on the technology involved appeared in our January 2004 issue.

A 32in. widescreen set fitted with the SuperSlim CRT would have a depth of about 38cm, compared with typically 54cm when a current type of tube is used. LG.Philips says that this will give CRT TV sets a flat, stylish design comparable with plasma and LCD models. There will be considerable savings for manufacturers by reducing glass and weight, the packaging materials required and transport costs.

Some setmakers are already producing models fitted with the LG.Philips 21in. RF (Real Flat) SuperSlim tube, and the company plans to expand the SuperSlim range to include 29in. RF and 28in. WSRF tubes. CRTs continue to provide superior displays in comparison with plasma and LCD ones at considerably less cost to the consumer. Various problems continue to bug flat-panel displays. A video delay compared to the sound is experienced with some plasma sets. Research continues to ascertain the cause and possible solutions. A problem you can get with LCD panels is permanently bright pixels. The specification allows for this, but that's no consolation for those who are bothered by the phenomenon.

Samsung has also developed a new slimline CRT, with a 38cm depth in the 32in. size, and plans to start mass production next year. It intends to use the tube in all its larger-screen CRT sets by the end of 2005.

TV developments

Sony has launched a significant range of new TV sets in Japan. It incorporates three new Sony technologies. Triluminos is claimed to be the first LCD system that uses LEDs to provide the backlight. Wega Engine HD is an integrated digital high-definition system for the Japanese HDTV service: it includes the DRC-MFv2 controller chip, which provides a 1,920 x 1,080 pixel display and reduces noise and signal imperfections. Finally the S-Master sound engine is claimed to be the world's first 100W output full digital amplifier. The XMB interface system enables users to select programmes and inputs from various AV sources.

Interesting that to display TV pictures with its Vaio PCs Sony developed a graphics chip called Motion Reality. The PCs use separate chips to handle PC and TV displays.

Sharp has developed a new video interface IC for use with small-to-medium format TFT LCDs, enabling them to sense and switch automatically between NTSC and PAL signals. The RB5P0090M video interface IC converts NTSC and PAL signals to RGB form to drive an LCD, and reduces the number of peripheral components by about 20 per cent in comparison with previous manually-switched chips.

Thomson has launched a Freeview STB, Model DTI2300, with Top Up TV technology built in (Top Up TV is the new digital terrestrial subscription service that offers ten extra channels for £7.99 a month). It has a slot for a Top Up TV viewing card, an electronic programme guide with channel preview, and an RF and two scart sockets. Price is about £80.

DVD+R/RW update

Philips and HP have announced that their Video Content Protection System (VCPS) has been approved by the US FCC and will now be available to manufacturers via a licensing program. VCPS is designed for use with DVD+R, DVD+RW and DVD+R DL discs. Philips and HP say that it can be easily integrated in PCs, DVD recorders and players and discs, adding that use of the technology does not increase the cost manufacturing the discs. VCPS-enabled products will be able to record video from digital TV broadcasts under the FCC's Broadcast Flag regulation system.

Broadcast Flag is a digital code that can be embedded in a digital broadcast stream. It prevents indiscriminate redistribution of digital broadcast content over the internet. From July 2005 FCC regulations will require recorders to incorporate FCC-approved protection technology to be able to record broadcasts that are marked with the Broadcast Flag. VCPS is a simple system for consumers – there is no change in how viewers see and record TV programmes.

Philips is to expand production of DVD+R DL (Double Layer) discs, which almost double the storage capacity of the system: up to 8·5GB of data can be stored on DL discs, equivalent to about four hours of standard DVD quality video or 16 hours of standard VHS quality video. According to Philips the new DVD+R DL discs are compatible with almost all DVD video players and DVD-ROM drives.

DVD recorder update

A number of companies, including Philips, have recently launched combined DVD/hard disk recorders. The Philips Models DVDR725H and HDRW720 have 160GB and 80GB hard-disk drives respectively, being able to store up to 250 or 130 hours of video material. Programmes being viewed are automatically stored on the adjustable six-hour hard-disk drive buffer and can be retrieved, watched again, transferred to the hard drive or recorded on a DVD+R/RW disc. When recording on to the hard drive, a Flex Time system enables the user to time-shift and watch the programme from an earlier point while the recording continues without interruption. It is also possible to watch a programme stored on the hard drive while another one is being recorded. The instant replay feature gives immediate repeat TV at the press of a button. An autorecording feature automatically starts recording even when the TV set is switched off. High-speed archiving transfers recordings on to discs at up to twenty times the original recording time at the press of a single button. Both models include the GUIDE Plus+ interactive programme guide – this service enables recordings to be programmed on-screen up to seven days in advance. Model DVDR520H has an 80GB hard drive with fewer features. Prices of these machines range from £280 to £550.

Panasonic has launched a combined DVD-RAM/-R/hard disk recorder, Model DMR-E95H, that can store up to 284 hours of video in the EP mode or up to 36 hours in the XP mode. It includes memory-card slots for SD and PC cards. Recordings can be copied from the hard drive to a DVD-RAM disc at x12 speed or to a DVD–R disc at x24 speed.

Bush has released a combined VCR and DVD recorder, Model DVRHS01, that can record from VCR to DVD or DVD to video and is compatible with DVD-R/RW/video and CD discs. It has one-touch record, SP/LP recording, on-screen programming, Nicam, front AV inputs, and handles Dolby Digital and DTS. Price is about £300.

DVD copying software banned

The Motion Picture Association of America (MPAA) has announced the successful resolution of litigation, which began over two years ago, between its members and 321 Studios. In a private settlement with the motion picture companies, 321 Studios and its founders have agreed to cease selling DVD copying software (such as DVD Copy-X) on a worldwide basis.

321 Studios claimed that its software was designed for making back-up copies of legally purchased DVDs, but the courts disagreed. 321 Studios has closed down its operations and its founders will be making a substantial payment to the motion picture studios.

The litigation started in April 2002, when 321 Studios sued several MPAA member companies in a California Federal Court. A counter-suit followed and, in the ensuing years, several other studios started cases against 321 Studios. In the US earlier this year two Federal courts ordered 321 to cease selling software that circumvented DVD copyright protection. The case in the UK had not yet come before a judge. The settlement closes all three cases however, in California, New York and the UK.

Philips' keyring camcorder

Philips has launched a keyring 'camcorder', Model Key019, that can store up to 25 minutes of MPEG-4 video in its 128MB internal memory. It can also be used as an MP3 player, and is small enough to be worn around the neck. A 2 Megapixel image sensor is used. The Microdisplay viewfinder enables users to frame, capture and play back footage. Output is to a PC's USB port, which provides simple and easy data transfer and also charges the Key019's battery. Easy-to-use software for downloading video, pictures and music is supplied with the unit.

NVCF date

The twelfth National Vintage Communications Fair will be held on Sunday 10 October at Hall 11, the National Exhibition Centre, Birmingham from 10.30 a.m. to 4 p.m. Admission costs £5 (under 14s free). Vintage products of all sorts will be available from over 300 stallholders.
For further information email info@nvcf.org.uk or consult the website at www.nvcf.org.uk

Teletext Games

The Digital Interactive Television Group (DITG), an independent UK interactive TV group, has entered into a partnership with Teletext. Under the agreement DITG's gaming division runs Teletext Games, a new service that has been launched with Teletext on 4. Sky viewers can access the service via the teletext button when watching Channel 4. The Teletext Games service offers viewers multi-screen, video-based and console-style games, including fruit-machine type games and virtual horseracing.

Subscription overtakes ads

According to a report from Ofcom, the regulator for media and communications, income from subscriptions to UK pay-TV services has for the first time exceeded that from the sale of advertising. The same report reveals that income from the use of mobile phones now exceeds that from residential fixed-line telephones.

Correction

Our apologies to Colin McCormick, who wrote and illustrated the Beta format feature in our last issue, for omitting his name from the article. This was due to an editorial slip in preparing the article for publication.

The Proview BM568 LCD monitor

This LCD monitor is very popular amongst serious computer users because of its excellent performance. J. Quentin Bullock describes its operation and some faults he had to deal with when he bought one second-hand

This monitor, which was first released in 2001, has proved to be very popular amongst serious computer users. Its sharp detail, good contrast, attractive design and reliability make it a desirable, high-quality addition to a computer system.

The dark-screen symptom

I purchased a two-year old one cheaply as the owner said it was faulty. The symptom was described as being a dark screen with an image that was barely visible when inspected closely. I found that this was so. To prove that the monitor was actually producing a display, I shone a torch on the front of the screen at an angle, so that I got some reflection through the LCD: this confirmed that there was an image.

The symptom is typical of failure of the backlight, as a result of which there's no light through the TFT (Thin Film Transistor) LCD (Liquid Crystal Display) panel. The backlight is usually provided by one or more very thin cold-cathode fluorescent tubes, which are mounted behind the LCD panel itself to provide the white light needed to produce an image on the screen. This light passes through the LCD section of the display and the colour filters, creating a full-colour display. In this case there are two of these fluorescent tubes.

LCD technology

TFT LCD panels create TV and computer displays with bright, sharp images, crisp text and none of the flicker you get with a CRT because of its field scanning. The fluorescent tube(s) behind the screen provide bright, white light. In front of them there's a polarising filter that allows light in one plane only through. This is followed, see Fig. 1, by a layer of glass with the matrix of thin-film transistors, for light control, on it. The manufacturing process consists of depositing layers of metal and silicon on the glass and doping and etching the layers, using a technology called photolithography, to form the matrix of wires, transistors and insulators.

In front of this glass panel there's a liquid crystal layer which is divided into individual cells, each cell representing a screen pixel. Each cell is controlled by one of the transistors on the TFT matrix layer. The voltage across a cell controls the alignment of the liquid-crystal molecules, which in turn controls the passage of polarised light through the cell – from no light to maximum light output. The action of the transistor varies the light transmission and hence the contrast level. There's a common electrode layer on top of the LCD layer.

Next we come to a glass layer on which a colour filter is printed. It consists of red, green and blue dots with black between them to increase the contrast. Each liquid-crystal cell is behind one of these dots. When a cell is activated, polarised white light passes through the liquid crystal then a filter dot to produce a red, green or blue pixel, of variable intensity, on the screen. The final layer of the screen is another polarising filter. This helps to eliminate glare and increases the sharpness of the displayed images.

The key to the optical action is light polarisation. Ordinary light has random polarisation and cannot be controlled by a liquid-crystal filter. The light has to be polarised in one plane only for control to be possible.

Backlight supply

As most of these monitors work with a 12V DC supply, a 'back-light-inverter' circuit is included. It converts 12V DC to a high-voltage AC supply for the fluorescent tubes. In this monitor the inverter PCB is approximately 1 x 6in., and each side is a mirror image of the other as it feeds two tubes. Along with many surface-mounted devices and a few ICs, there are two small transformers, one at each end of the board, to provide the high-voltage output for the fluorescent tubes. The circuit design switches the tubes on and off rapidly, to provide dimming control. The technique is known as pulse-width modulation: by increasing the on part of the duty cycle, the screen's brightness is increased.

Comparison of the tiny inverter-PCB fuse with the tip of a ball-point pen.

The fluorescent tubes

The fluorescent tubes are fragile and very narrow (about a quarter the size of a pencil). They should be handled with great care, especially when trying to remove the connectors at the ends. The tubes are filled with a low-pressure inert gas and mercury vapour, and there's a relatively large iron cylinder electrode at each end.

When the high starting voltage is applied to the tube the gas inside becomes ionised, enabling current to flow through the tube. This current excites the mercury atoms, which release photons of ultra-violet light. These UV photons in turn excite the phosphor coating inside the tube, so that it fluoresces, the result being bright white light.

The electrodes slowly wear away in a process known as sputtering, caused by continuous positive-ion bombardment of the cathode. But other causes of failure will usually have occurred long before wear of the large electrodes becomes a problem.

An inverter problem

With this monitor the tubes are built into the screen unit and are thus not readily available for visual inspection. It seems however that the backlight-inverter PCB is far more likely to be faulty than the tubes. In this case there was not even an apparent flicker from the backlight, as one might expect from a failing tube when a high starting current is present. So I inspected the PCB for any obvious problems, then checked some of the components.

At this point I noticed the marking F1 on the board, beneath a tiny, transparent yellow surface-mounted device: it was the smallest fuse I had ever seen. When the fuse was checked it read open-circuit. As I could find no cause for its demise I fitted a replacement, though this had to be a temporary 20mm glass type. The SMD fuse had 'F N' printed on its casing, which appears to mean fast-acting for F and 2A for N. A list of letter codes and their current/voltage ratings is shown in Table 1.

A terrible display

Having replaced the fuse I connected the monitor to its 12V DC adapter and a PC. The screen's backlight now worked perfectly, and I waited patiently while the operating system loaded. But the screen image looked terrible when the boot-up had been completed. I loaded a photo-editing program on the PC, so that I could view a photograph to see what it looked like. Thanks to the colour chart in the software, I immediately saw what the trouble was: there was no red at all on the screen, though bringing up the on-screen menu produced a blue menu box with a bright red header.

Part of the backlight inverter panel that produces the AC supply for the flourescent tubes.

Cable trouble

Another problem was that instead of coming on as soon as a signal was sent to it the monitor didn't come out of standby until the PC had almost finished booting up its operating system. So I couldn't view the BIOS (Basic Input/Output System) system-checks screen and the early part of the boot-up process.

I eventually found the cause of the colour problem when moving the VGA (Video Graphics Display) cable that runs from the back of the monitor's base to the graphics card in the PC, as the blue immediately disappeared from the screen to leave a green display. Purposeful bending of the cable brought back the blue, and more forceful bending restored the red, producing a sharp, full-colour display.

As I didn't have a replacement cable I connected a meter, set to audible continuity, to the pins of the 15-pin socket that connects the cable to the graphics card in the PC and the respective PCB connector plug wires at the other end, then started to flex the cable. This narrowed the position of the break to within an inch of the 15-pin socket. I took the socket apart and noted which wires go to which pins, cut off two inches of the cable where the break was located, resoldered the wires to their respective pins, and finally pushed the whole assembly back into the socket's blue covering. Having done this, I would highly recommend being more patient and ordering a new cable!

After completing the repair I reconnected the screen to the PC.

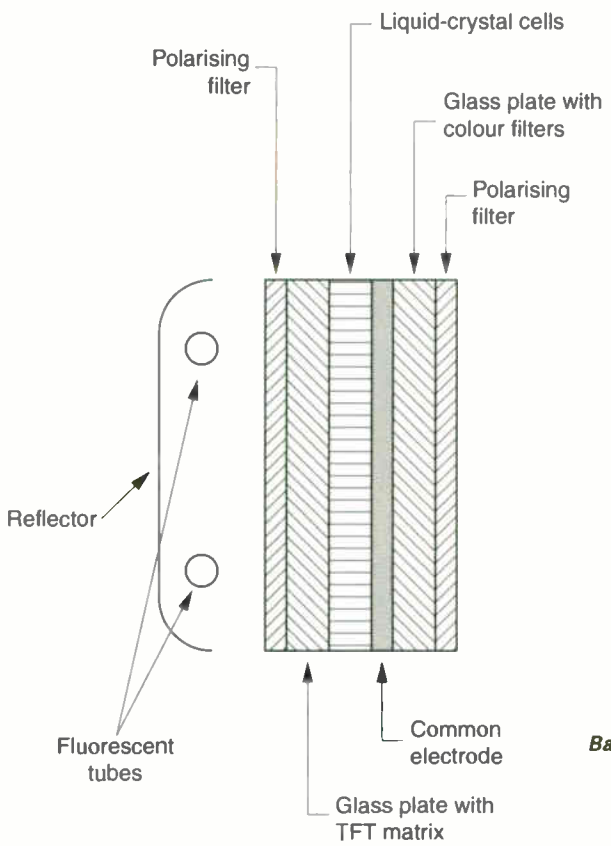
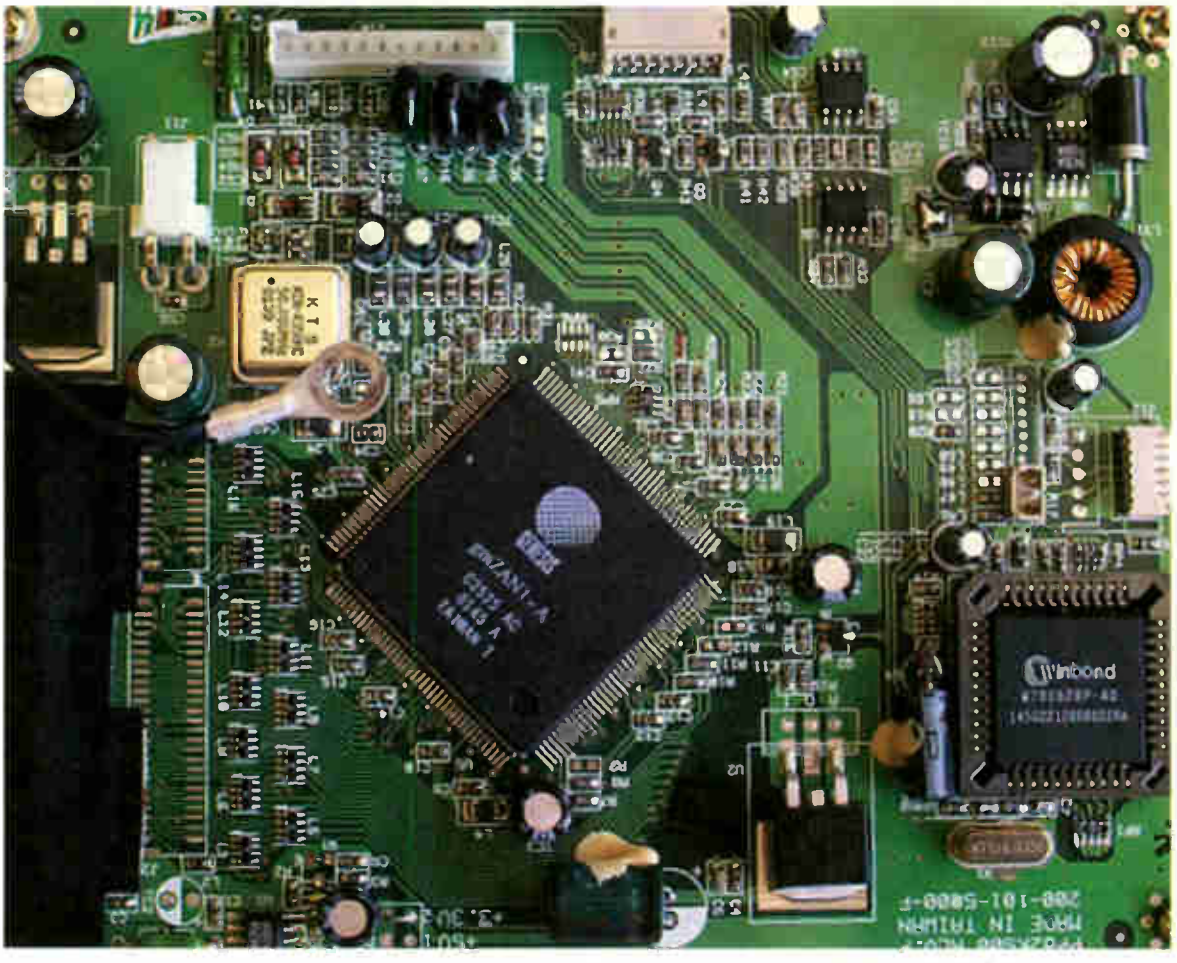


Figure 1: Basic construction of a TFT liquid-crystal display.



The main PCB in the Proview BM568 LCD monitor.

The monitor came out of standby as soon as I turned the PC on, enabling me to view the entire boot-up process, and now produced a full-colour display. In retrospect, I think there could be two possible explanations for the failure of the monitor to come out of standby as soon as the PC was turned on: either there was another break, affecting a different conductor, or the missing red had made the monitor behave as if no signal was present.

In conclusion

The monitor continues to work happily many weeks later, producing clean, crisp images, and the complete absence of headaches and eye fatigue are a welcome relief after long-term endurance of CRT monitors.

Spares

It's worth mention that a number of spares for this monitor, including the VGA cable, can be bought from the Proview website at http://www.proview.net

Considering the strain that the VGA cable experiences,internal breaks are to be expected after a time.

Compatible inverter boards are available from various suppliers, though not from the manufacturer. Instead of attempting a repair, many engineers replace the inverter board when it's the cause of backlight problems. Often the fault is simply that the fuse has gone open-circuit for no apparent reason. In my view these boards should be repaired whenever ossible, saving £70 plus.

It's quite rare for the fluorescent tubes to need replacement. They are designed to last a long time, and breakage seems to be the more common way for them to die – especially if the screen is dropped. ■

Table 1: Letter codes and current/voltage ratings for Littelfuse surface-mounted fuses

Code	*A*	*V*	*Code*	*A*	*V*
B, FB	0·125	125	L, FL	1·75	63
C, FC	0·2	125	N, FN, TN	2	63
D, FD	0·25	125	O, FO	2·5	32
E, FE	0·375	125	P, FP, TP	3	32
F, FF, TF	0·5	63	S, FS	4	24
G, FG	0·75	63	T, FT	5	24
H, FH, TH	1	63	U, FU	7	24
J, FJ	1·25	63	.6	0·6	63
K, FK, TK	1·5	63	.8	0·8	63

The above applies with 429, 430, 433 and 466 series fuses.

434 and 467 series fuses use the same letter codes for the current rating but all have a voltage rating of 32V. There are two additional letters with the 434 series, X 0·68A and R 3·5A.

429, 433, 434, 466 and 467 series fuses are very fast acting. The 430 series has a slow-blow characteristic.

For further information check the Littelfuse website at http://www.littelfuse.com/data/Product_Catalogs/Chapter10SurfaceMounFuses.pdf

Vintage radio repairs

Yura/Microsonic keyring radios

These little Soviet radios were imported in large quantities during the late Fifties. They use six germanium transistors and provide MW reception only. Pete Roberts describes the sorts of faults you can expect to find and ways of dealing with them

Above – Photo 1: External view of a Yuri-badged keyring radio dating from the late Fifties.

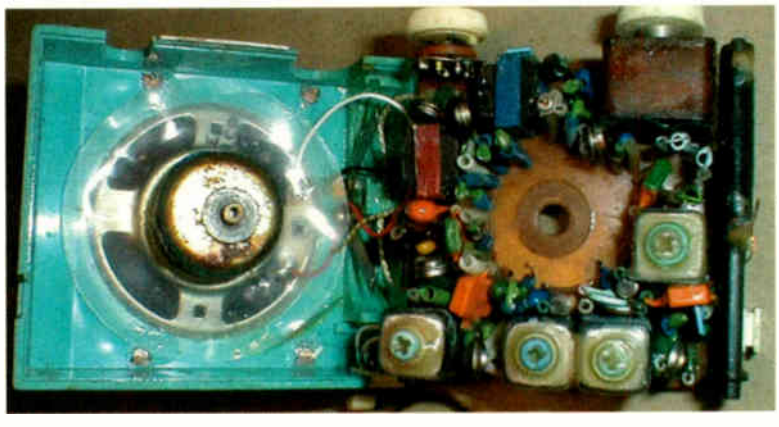
Right – Photo 2: Internal view, showing the PCB and cabinet speaker.

Many of these small Soviet-made keyring radios were imported under the Yura brand by Technical and Optical Equipment of London during the late 1950s. T&OE was at the time the sole importer of Soviet radio and camera equipment. It was also reputed to be the KGB's UK headquarters: whether that's just an urban myth I don't know! The radios were also imported via Hong Kong, badged "Microsonic – Made in Hong Kong", despite being of obviously Soviet manufacture. This might have had something to do with Cold War politics, but was more likely to be a dodge to avoid import duties, from which Crown Colony products were exempt.

Basic details

Photo 1 shows an external view of a Yura-badged version, Photo 2 the PCB and cabinet speaker, and Photo 3 the front of the case, with speaker and battery terminals. Despite their small size, these sets were not toys. They used six germanium transistors in a medium-wave only (550-1,640kHz) superhet circuit, the line-up consisting of a self-oscillating mixer, two IF stages, a germanium-diode detector, an audio amplifier/driver and a transformer-driven balanced push-pull output stage. Some versions even have negative feedback! Two different IFs appear to have been used, 455 or 470kHz.

Power, at 2·4V, is provided by two series-connected 125mAh NiCad button cells. These give about six hours' use per charge,



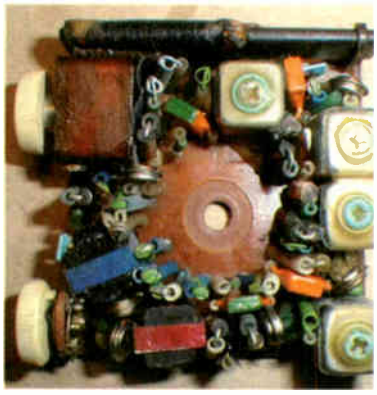
depending on volume. Each radio came with four cells and a charger, the idea being to have two cells on charge while the other pair was in use. The chargers don't use a mains transformer. Instead, a 'lossless' dropper capacitor fed the rectifier. Unfortunately these units have a tendency to explode while in use!

Repairs

I've had a few of these radios to fix. The usual cause of a dead set is the electrolytics. These are tiny axial capacitors with a voltage rating of 3V or 6V. You will find them all very leaky or even short-circuit. Values vary, the most common being 3μF, 5μF and 0·5μF. In view of the low voltage rating, I use match-head sized tantalum-bead replacements, fitting the closest E12 value (3·3μF, 4·7μF and 0·47μF). It seems to be difficult to obtain miniature aluminium electrolytics with these values and a working voltage rating of less than 40V, and running such capacitors at a volt or so can result in loss of polarisation. Solid tantalum capacitors aren't affected adversely by being used at very low DC voltages.

With a recent set, see Photos 4 and 5, replacement of the electrolytics failed to restore normal operation and a quick check around the circuit revealed that the various voltages were much as they should be. After checking the various wire links at the rear of the PCB for continuity and dry-joints, I decided to use 'heuristic signal injection': I touched the collector and base connections of each transistor in turn with a metal screwdriver blade in contact with a finger, working back towards the mixer. Using this technique in an IF stage you should hear fluorescent tube buzz, static or even strong local station breakthrough.

Although its DC voltages appeared to be correct, the first IF transistor wasn't amplifying. As I had a donor chassis, I was able to



Far left – Photo 3: Front of the case, showing the peaker and battery terminals.

Centre – Photo 4: Front of the PCB before repair.

Left – Photo 5: Rear of the PCB with wire links.

fit the correct replacement. This restored normal operation. If original transistors aren't to hand, an OC44M can be used in the mixer stage, the OC45M is suitable as an IF amplifier, and all AF devices can be replaced with an AC128, an AC125 or an AC153. This applies with most of the germanium transistors used in Russian receivers, the exception being SW and FM models. These require the higher-frequency AF125 or AF127 in the RF and IF stages.

Should you come across one of these sets that has been stored with the batteries in place, the contact springs will have become corroded. These are glued into the case. If a good wire-brushing doesn't do the trick, the PCB, speaker and metal trim will have to be stripped out. The springs can then be given an overnight soak in spirit (clear) vinegar, followed by a good wash with warm, soapy water. Don't put the used vinegar on your chips!

Performance

These sets are capable of really good performance, being superior to contemporary Far Eastern pocket receivers. They are very sensitive, selective and have effective AGC. The only real niggle is the tiny tuning knob, which is mounted directly on the shaft of the tuning capacitor. It makes finding closely-spaced stations difficult.

Batteries

The original batteries are no longer available, and there is no modern equivalent. But similarly-sized NiCad or NiMH replacements will fit, held in place with a bit of packing if necessary. Alternatively a couple of non-rechargeable button cells could be used, or two AA cells in an external holder can be connected to the set using a pair of crocodile clips. I've found however that some sets are prone to instability when run at 3V. ■

Satellite TV distribution systems

New TV distribution systems nowadays almost always include satellite reception. Bill Wright provides a detailed, practical guide to this type of installation work, starting with small systems. Subsequent articles will deal with the medium-sized installations typically found in apartment buildings

This series is intended as a beginner's guide for those who are reasonably familiar with domestic Sky systems and would like to go a stage further, to system installations. We'll go over most of the basics however to ensure that everything you need to know is covered. The articles are based on practical experience, gained from my own business. Let's start with the test equipment you will need.

Test equipment

You can't install a terrestrial and satellite distribution system without decent test gear. Analogue-only equipment is almost useless: it's essential that you can measure signal strength, BER (Bit Error Ratio) and, ideally, carrier-to-noise ratio.

While a modern spectrum analyser is not absolutely essential, it does make the job a lot easier. But an analyser intended for analogue-only use will not help much. The band of 'noise' that represents a digital multiplex will not indicate the true signal level, because the measurement bandwidth is incorrect. This and the lack of BER measurement is the reason why there are so many very nice but rather middle-aged analysers available at the moment for peanuts. Those of our brethren in the trade who are, shall we say, not exactly at the cutting edge are finally realising that they will have to shell out some serious money on a test gear upgrade.

If you are new to this sort of work and don't own a suitable meter or analyser, it's well worth hiring the latter. This will give you the opportunity to try out a particular model before you take the plunge and buy your own. In this article I'll assume that you have access to reasonable test equipment.

The measurement unit normally used for RF distribution systems is dBmV (dB relative to 1mV), so that's what I will be using here. Those accustomed to the 'small-signal unit', dBμV, need to add 60 to all my numbers, since 60dBμV = 0dBmV. The use of dBmV makes the mental arithmetic for calculating signal levels along a system easier, because the numbers are much smaller.

Incidentally I've confined the scope of this article to reception of Sky digital (and other services from the same group of satellites). Systems can however be designed for the distribution of signals from pretty well any combination of satellites.

The workshop

There's more to this job than site work. Head-ends and repeaters are best built and tested in the comfort and calm of the workshop. If you don't have a workshop, you could manage with a small bench in the corner of the garage. Whatever your workshop facilities, don't attempt to build a large head-end on site unless you want to drive yourself barmy.

In addition to the obvious hand tools, mains isolation equipment and so forth, a well-equipped head-end builder's workshop will have:

- A simple multimeter.
- A good up-to-date spectrum analyser. All the screenshots in this article were taken with a Promax Prolink 4.
- A good modern TV set.
- A DTT receiver.
- A Sky digital receiver. There's no need for a card.
- A bench power supply unit. This need be only a little 3A one.

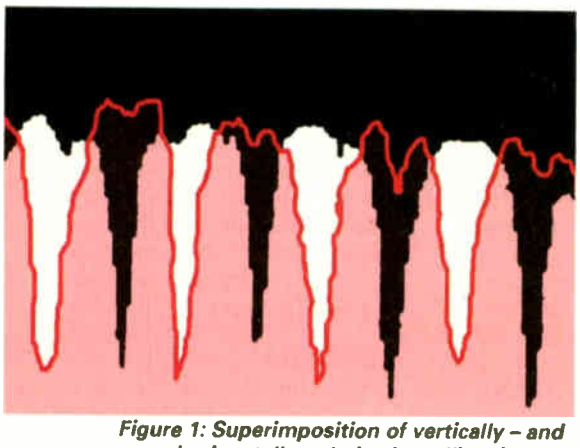


Figure 1: Superimposition of vertically – and horizontally-polarised satellite signals.

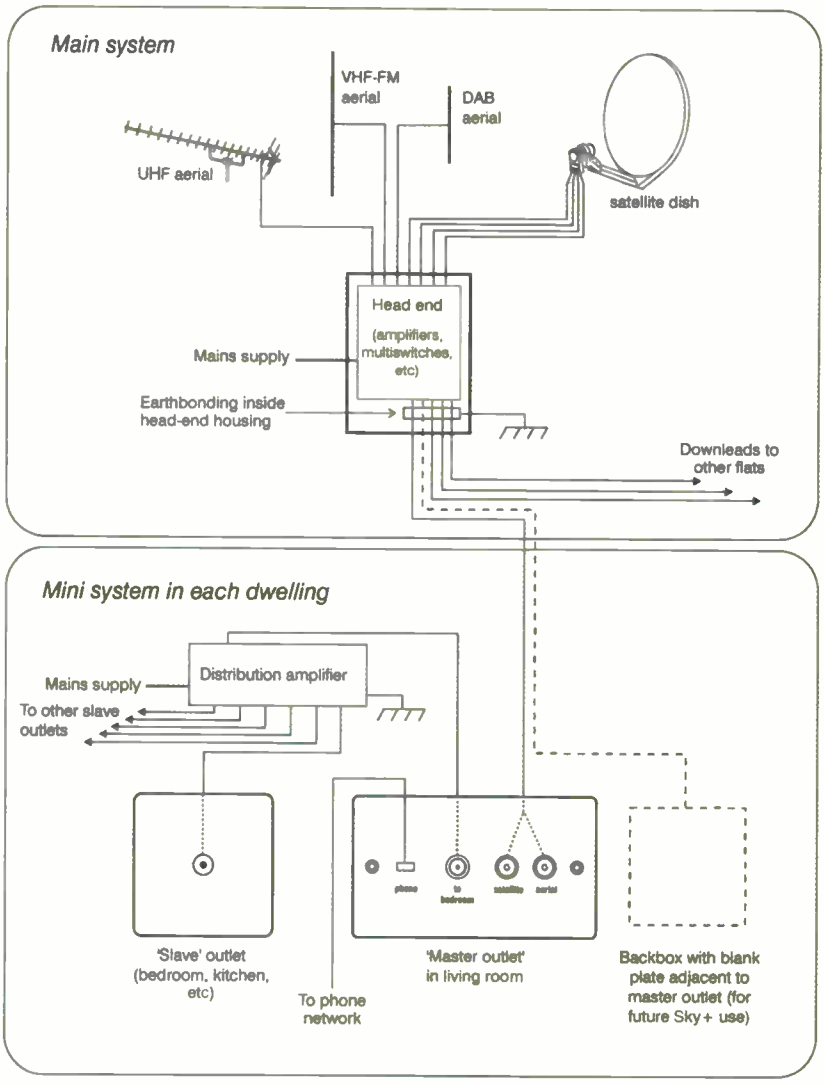


Figure 2: A schematic for a typical small distribution system, including the 'mini' system for one flat.

- A range of coaxial patch cords with quick-fit F connectors.
- A frequency-agile VSB UHF modulator. Use this to test channel filters when there is no locally-available signal.
- A noise generator. This helps with the aligning and retuning of UHF channel filters and with the diagnosis of frequency-response errors.

A good range of signals should be available in the workshop, including:

- The four fixed polarisations/bands from 28·2°E. A 70 or 80cm dish with an LNB of known performance should be used.
- The output from a Sky minidish.
- A clean feed from a UHF aerial, with all the local analogue and DTT signals at good strength and good carrier-to-noise ratio. In some areas it's worth having wideband aerials of both polarisations on a rotator.
- Feeds from a DAB aerial and a VHF-FM aerial.

My own workshop has a few extra items that I consider essential. These include an intercom to the kitchen (any chance of a cuppa dear?) and an easy chair. This is the 'thinking chair', which has solved many a knotty problem. I also have a decent hi-fi, justified because music seems to stop me pulling my hair out.

The basics

I hope that experienced dish installers will bear with me while I cover the basics of Sky digital reception.

The microwave signals received by the dish cannot be handled by ordinary coaxial cable. So they are downconverted at the dish to a more convenient band of frequencies. The LNB (Low Noise Block downconverter) receives the incoming signals via a feedhorn, downconverts them and, since they are very weak, amplifies them by about 50dB. The output from the LNB occupies a band of frequencies just above the UHF TV band. These downconverted signals are known as the satellite IF.

If that was all there was to it, satellite signal distribution would be as straightforward as ordinary UHF TV distribution. But there's a complication: in fact there are several.

Polarisation

The first complication is that broadcasting satellites transmit signals with two polarisations, horizontal and vertical. The channel centres with one polarisation are half way between those of the other polarisation. The two sets of signals can't be mixed, because they overlap. Figure 1 was obtained by superimposing the spectrum-analyser displays of horizontally- and vertically-polarised channels in the same frequency spectrum. I coloured the channels of one polarisation a pretty pink (I really had fun!). As you can appreciate, it would be impossible to send both sets of channels down one cable: the result would be garbage, the channels being mixed up.

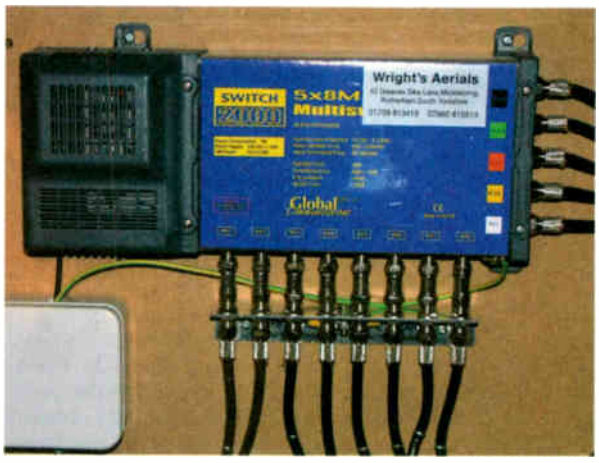


Figure 3: A Global 5X8M mains-powered multiswitch in place. The one terrestrial and four satellite inputs are on the right, with the outputs along the bottom. This photograph was taken before the installation was earth bonded.

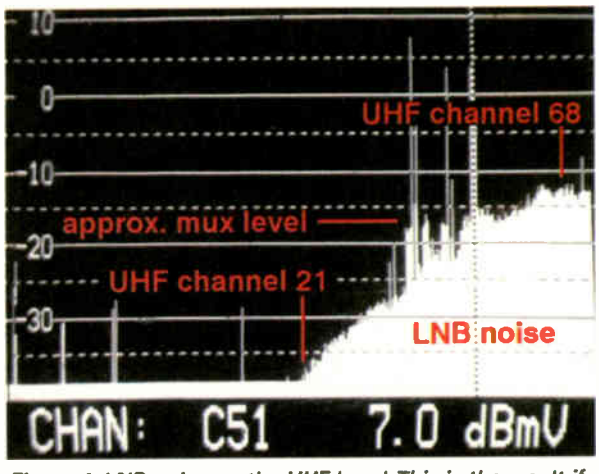


Figure 4: LNB noise on the UHF band. This is the result if the multiswitch doesn't filter out LNB noise from the UHF band. The amount of UHF noise varies greatly between LNBs. In this example the LNB was the standard one supplied with a minidish.

It would be unwieldy to have to use two separate cables from the LNB to the receiver. So the receiver must tell the LNB which set of signals (horizontal or vertical) it wants. This is done quite simply, by switching the LNB supply between 13V (vertical) and 18V (horizontal). So when the supply is 13V the LNB sends the vertically-polarised signals to the receiver, and when the supply is 18V it sends the horizontally-polarised signals to the receiver.

Band switching

The second major complication is that the range of frequencies transmitted by the satellites is far greater than the input bandwidth of a domestic satellite receiver. The solution to this one is for the LNB to downconvert by two different factors. Thus we get what are loosely called 'high-band' and 'low-band' signals. The high-band signals are down-converted using a 10·600MHz local oscillator, while the low-band signals are down-converted using a 9·750MHz local oscillator. So the receiver has to tell the LNB which local oscillator to use it order to get the signals it wants. To obtain the high-band signals the receiver adds a 22kHz tone to the LNB supply. When this tone is missing, the LNB defaults to providing the low-band signals.

So there are four sets of channels available to the receiver, selected by a combination of the supply voltage and tone/no tone sent to the LNB, as shown in Table 1. A Sky+ receiver requires two such dish feeds, which must be independently switchable, so that both of its tuners have access to all the channels.

Multi-output switchable LNBs

If the number of receivers in use is small, and they are not too far from the dish, it's feasible for each receiver to have its own cable from the LNB. A special LNB with four independent outputs is required. Any LNB output fed with the appropriate voltage and tone/no tone will supply the appropriate group of channels to the receiver.

These are called 'quad' LNBs, but I always ask for "an LNB with four universal outputs, please" to avoid confusion with 'quattro' LNBs, about which more – much more – later. A quad LNB is always used for Sky+ installations, even if the other two outputs aren't needed. In a one-dwelling installation, that's all there is to it.

LNBs are now available with eight independent outputs, though I can't quite bring myself to ask for an "octuplet"! These provide a simple way of supplying one Sky+ facility to each of four flats for example, although there are a couple of problems. First, the terrestrial signals have to be combined with the satellite ones, unless separate cables and outlets are to be installed. Secondly, this would be classed as a communal TV system and would therefore have to be earth-bonded, even though it would not need separate mains supplies. More about earth bonding later.

Although it's feasible to use quad and 'octuplet' LNBs for very small multi-dwelling systems, I am inclined not to do so, preferring the conventional methods always used for larger systems.

Small multi-dwelling systems

I'm going to take you through the installation of a straightforward twelve-outlet system, from the dish to the outlet plates. Later we'll consider in more detail each component, then we'll look at larger systems.

Let's take as our example a block of twelve flats. It's 'new build', so we can install the cables at an early stage. The block is nice and compact, with three floors each with four small flats. There's a central stairway with an adjacent riser, and it's decided that the head-end will be installed in the cleaners' store under the stairs on the middle floor.

Each flat is to have a living-room TV outlet that provides satellite and terrestrial reception (the 'master' outlet), and 'slave' outlets that enable the living-room satellite receiver output to be viewed in the bedrooms. Figure 2 shows a schematic of the main system for the whole building and the 'mini' system for each flat. The down-leads from the head-end will run above the ceilings, in the small void below the structural concrete. This means that they will take fairly direct routes.

Dish size

With a small system the only active satellite IF item between the LNB and the outlet sockets is the polarisation switch. A small system like this doesn't need any further satellite IF amplification. Although the switch amplifies the signals a little, to compensate for internal splitter losses, it adds very little noise. So the carrier-to-noise ratio is only slightly worsened (there will be more about c/n ratios later).

This means that we can use a dish and LNB combination that provides a relatively modest carrier-to-noise improvement compared to a standard Sky minidish. A good-quality 65cm dish is perfectly adequate for a small distribution system in areas where Sky recommends the smaller minidish (roughly south of a line from Liverpool to Newcastle). Farther north a 75 or 85cm dish should be used.

Fixed output LNBs

Take another look at Figure 2. There are four cables from the LNB to the head-end, with each carrying one fixed set of channels – VL, HL, VH or HH. The LNB is not a quad. It's a quattro, which means that its four outputs are fixed and it doesn't respond to 13/18V and 0/22kHz switching. I always ask for "a four fixed-outputs LNB" to avoid confusion with the quad type.

So we have four sets of satellite IF signals available at the head-end. Each of the twelve outlets must have access at all times to any of the four sets of satellite signals, plus the terrestrial ones. So there clearly has to be some switching at the head-end.

The magic switch

Figure 3 shows a polarisation and band switcher with five inputs and eight outputs. This is a multiswitch, known colloquially as a 'magic switch', the heart of any satellite distribution system. Four of the inputs are for the satellite IF signals, the fifth being for terrestrial signals. Each of the eight outputs

provides satellite IF and terrestrial signals. Each output responds to 13/18V and 0/22kHz switching. Thus as far as the Sky box is concerned there is a normal dish at the other end of the cable with all signals available. Switches are available with four to sixteen outputs.

This is a standalone multiswitch. It needs a mains supply because it takes virtually no power from the receivers. It's an 'active terrestrial' switch, which means that it amplifies the terrestrial signals to compensate (approximately) for internal splitter losses. Thus when planning a large system the switch has to be considered as part of the terrestrial amplification. Its maximum terrestrial input and output signal levels and its noise contribution must be taken into account. The gain or loss with the satellite IF signals will also vary with the make and type of switch. It is vital to consider the specification of the switch when a system is being designed.

Terrestrial performance of the multiswitch

Only one cable connects the head-end to each 'master' output, so the switch has to combine the terrestrial signals with the satellite IF signals. Irrespective of the 13/18V and 0/22kHz switching, or even if no satellite receiver is in use, the terrestrial signals will be available at each output.

Because the satellite IF signals share a downlead with the UHF ones, an important function of the switch is to filter out LNB noise from the UHF band. The LNB noise on the UHF band has to be reduced by a minimum of 50dB. To test the performance of the switch in this respect, attenuate the UHF aerial signals temporarily until the level of the analogue channels at the switch output is 0dBmV. This should produce a noise-free picture – just. Connection and disconnection of the LNB feeds should have very little effect on the picture. The same test can be carried out for terrestrial digital interference, by observing any change in the BER.

Figs. 4 to 8 show the disastrous effects on UHF reception of unbridled LNB noise.

Downlead routes

You will have appreciated by now that, because of the need for polarisation and band switching, the optimum layout is for each downlead to go all the way from the outlet to the head-end, as shown in Figure 2. Tap-off lines are not cost-effective for a small system. Our block of

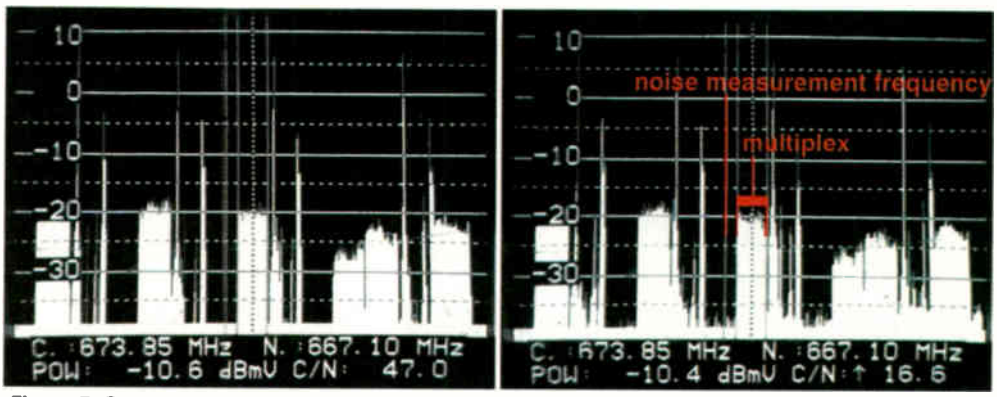


Figure 5: Spectrum-analyser displays of the Emley Moor channels. The multiswitch's filtering of the UHF noise from the LNB was seriously deficient. On the left the LNB is disconnected. On the right it's connected, and the noise is just visible at the bottom of the display. Note the carrier-to-noise ratios indicated.

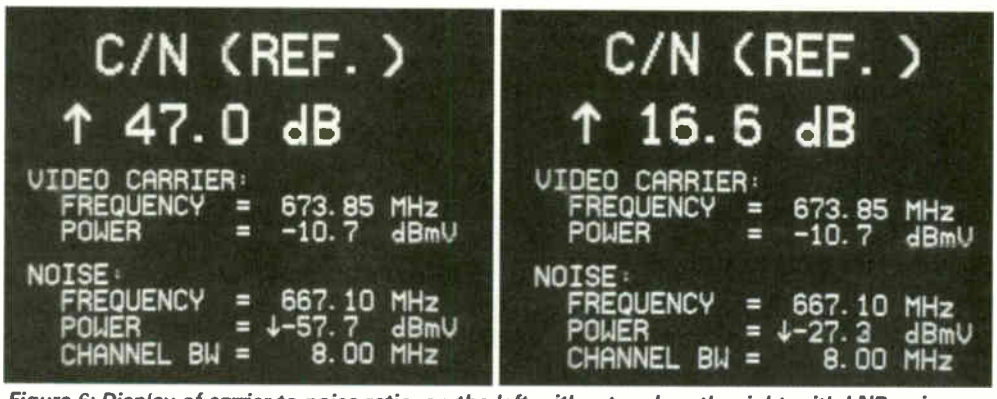


Figure 6: Display of carrier-to-noise ratio, on the left without and on the right with LNB noise. The spectrum-analyser tuning and signal source are the same as in Fig. 5.

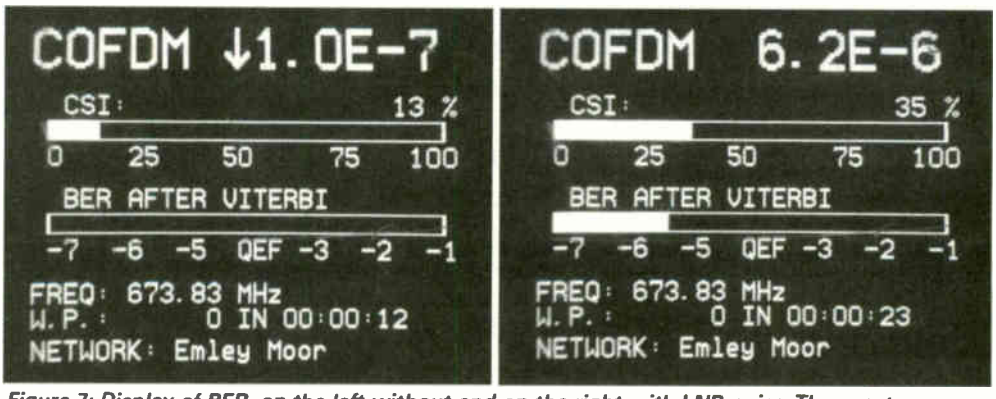


Figure 7: Display of BER, on the left without and on the right with LNB noise. The spectrum-analyser tuning and signal source are the same as in Fig. 5. If the BER after Viterbi processing drops below the QEF (Quasi Error Free) level, there will be no picture. A reading like this indicates very unreliable reception.

Figure 8: The effect of LNB noise on UHF analogue reception. These shots are from the same installation as the spectrum-analyser displays in Fig. 5. Note that although the signal level remains about the same the picture on the right (with the LNB connected to the multiswitch) is very snowy.

Figure 9: The Labgear PSW242T, which is typical of the various makes of 'master' wallplate, includes a triplexed satellite/UHF/VHF outlet, a socket for the main return feed to other rooms and a phone socket.

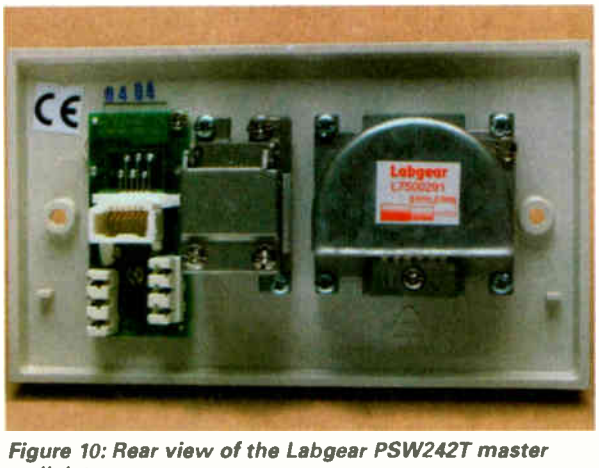


Figure 10: Rear view of the Labgear PSW242T master wallplate.

flats is not a large building, so none of the twelve downleads is excessively long.

Signal loss via the cable is a big factor in system design, but with a small system like this it is not an overriding concern, since the downleads will not exceed 25 metres. The head-end is on the middle floor near the centre of the building: this minimises variations in downlead length.

Outlet plates

One downlead links each living-room outlet (the master output) to the head-end. The type of outlet plate commonly used in the living room (see Figs. 9 and 10) has three sections, the connection to the distribution system, the connection to feed the bedrooms(s), and the phone socket.

Because the downlead carries satellite IF, UHF TV and, probably, VHF radio, the outlet includes a diplexer or triplexer to separate the signals. The satellite IF port must carry DC and 22kHz so that the receiver can control the multiswitch. The UHF and VHF ports might or might not include full high-voltage safety isolation, but in any case the inner conductors will be isolated so that the satellite DC and 22kHz tone don't appear at the UHF and VHF ports.

The satellite IF to UHF diplexing cannot prevent LNB noise on the UHF band affecting terrestrial reception. The multiswitch must filter out this noise.

To allow for FM and DAB, the VHF port should have a passband extending from 87MHz to 250MHz.

Additional outlets

Most homes have more than one TV set, so a good distribution system will include outlets in the bedrooms and probably in other rooms as well. The client will specify the number and locations of the outlets.

So that residents can view satellite TV from their living-room receiver in every room, it has become common to install 'mini distribution systems' in each dwelling, as shown in Figure 2. The feed from the head-end to the living-room outlet is the only connection between a dwelling and the main distribution system. The living-room outlet is thus known as the 'master' outlet. The 'return' or 'uplink' port in the master outlet takes the RF output from the satellite receiver, together with all the terrestrial signals, to the other rooms. The outlets in the bedrooms etc. are called 'slaves'.

If there is only one slave, all that's needed is a cable from the master return port to the slave. If there is more than one slave, a distribution amplifier is needed. This is usually fitted near the electricity consumer unit. The amplifier should be compatible with the Sky remote-eye system so that the satellite receiver can be controlled from any room. To compensate for the extra cable and outlet losses, the amplifier should provide about 6dB gain to each output. Don't use types with 12dB or more gain, because you have provided good signal levels at the master outlet and the output from a Sky box is quite high. Excessive gain is unnecessary and could be detrimental. The slave outlets must be non-isolating types because of the 9V supply to the Sky remote eyes.

Suitable distribution amplifiers are available from many different manufacturers. My experience has been that budget DIY products are not good enough for commercial installations. The 6MHz signal that carries the remote-control commands from the Sky eye back to the receiver is not strong enough to stand a great deal of attenuation. Some amplifiers weaken the return signals considerably. I have found these to be unreliable, especially where cable runs are long. In addition there is usually no easy way to earth the DIY products.

After some experimentation we have standardised on the Labgear MSR range. These are twice the price of a typical DIY amplifier, and in my opinion worth every penny. The data sheet for this product can be found at http://www.labger.co.uk/pdf/7.pdf

Signal measurements

So that's our little block of flats all set up for good TV reception. We will now turn to the specifics of digital satellite TV signals, starting with basic measurements.

Carrier-to-noise ratio

This is pretty much the same thing as the more familiar analogue signal-to-noise ratio. In an analogue system a worsening of the signal-to-noise ratio will of course result in an increasingly snowy picture. But when the transmission is digital the transition from perfect reception to no reception is much more abrupt. This is the well-known 'digital cliff', and we must be very sure that our distribution system won't tumble over it. The way to do this is to keep the carrier-to-noise ratio as high as possible at every point in the system.

Every active device along the distribution chain adds a little random RF noise. Thus with a large system that includes amplifiers and repeaters the carrier-to-noise ratio will gradually worsen along the signal path. This is inevitable, but we must minimise the degradation as much as we can, in order to provide every receiver with the cleanest possible signal. The first thing to do is to make sure that the carrier-to-noise ratio at the LNB is good and healthy. We will return to this next month.

Measuring the carrier-to-noise ratio

The measurement of carrier-to-noise ratio is not straightforward. The theory is that you find the ratio between the level of the carrier and the level of the noise that occupies the same bandwidth. How can the noise level be measured in the presence of the carrier, I hear you ask? It can't of course and, even if you have a very persuasive telephone manner, it's unlikely that Astra will

Table 1: The four sets of satellite signals an LNB can send to the receiver

Channels required by receiver	*LNB supply from receiver*	*Maximum range received*	*Actual range received (approx.)*	*Local oscillator frequency*
VL (Vertical low band)	13V/0kHz	10·7-11·9GHz	10·72-11·7GHz	9·75GHz
HL (Horizontal low band)	18V/0kHz	10·7-11·9GHz	10·72-11·7GHz	9·75GHz
VH (Vertical high band)	13V/22kHz	11·55-12·75GHz	11·7-12·48GHz	10·6GHz
HH (Horizontal high band)	18V/22kHz	11·55-12·75GHz	11·7-12·48GHz	10·6GHz

The satellite IF input to the receiver is approximately 950-2,150MHz.

switch off the multiplex for a few minutes while you make your measurement. So there has to be a fudge of some kind.

The usual approach is to measure the noise level at the closest unoccupied frequency. Alternatively, point the dish at a quiet part of the sky. Neither of these methods is foolproof however. The minimum carrier-to-noise ratio for satellite TV with its QPSK modulation is about 12dB but, in practice, a system should deliver a significantly better figure at each outlet. Incidentally with most analysers the measurement bandwidth can be adjusted.

Measuring the bit-error ratio

It's not usually necessary to measure the carrier-to-noise ratio directly: measurement of the bit-error ratio (BER) provides a valid indication of the practical effects of the carrier-to-noise ratio, and is foolproof and almost always unambiguous. Two error-correction methods are applied after QPSK demodulating, Viterbi and Reed-Solomon. Most test equipment indicates the post-Viterbi error rate and the Reed-Solomon error rate (wrong data packets), but what we're interested in is the raw BER, i.e. at the output from the QPSK demodulator before error correction. The BER after Viterbi processing gives a nice, comforting indication that the picture will be fine, but is of little real value. Your analyser or meter will probably also provide a 'wrong packets' reading. This is cumulative, so it will let you know if an intermittent fault occurs while your back is turned.

BER is given in scientific notation. For example 2 E–3 means that two out of every thousand bits are incorrect, while 3 E–5 means that three out of every 100,000 bits are incorrect.

If you connect your analyser or meter to a good working Sky minidish you will be surprised at the low (poor) pre-correction BER: 7·0 E–3 is typical. Domestic Sky reception relies heavily on error correction. The weaker multiplexes will be not very far above threshold. By 'threshold' I mean the point where the error correction begins to break down and the picture starts to freeze. Very roughly, n E–2 will result in uncorrectable errors and stop-start pictures, n E–3 covers the range between 'very dubious' and 'acceptable', and n E–4 means rock solid.

The general standard of a commercial installation should be very much higher than that of a domestic Sky system, and BER is an important aspect of this. The BER values appropriate for distribution systems are therefore higher than those for domestic Sky installations. In particular the LNB's output must have a high BER to allow for the noise added by amplifiers and switches. At the outlets, aim for pre-correction BER values of no lower than 1·0 E–3. Ideally, all multiplexes should be at n E–4 or better. These values are for an overcast or rainy day.

Next month

Next month we'll start by considering the vital business of the carrier-to-noise ratio at the LNB. This is at the heart of satellite IF signal distribution.

HELP WANTED

Wanted: Line output transformer, type FCC 2215BE, for the 22in. Murphy/Fidelity Model MS22501 (ZX4200 chassis). Phone Cedric Crook on 0127 587 9620 (Clevedon, Somerset).

Wanted: CRT type A80EFF002X11 for the Toshiba Model 3357DB, or a good working set. Also circuit diagrams for the Audiolab 8000P and 8000C preamplifier and power amplifier. Phone Darryl Mather on 0161 494 5528.

For disposal: I have for disposal a large quantity of TV sets and VCRs for spares or repair. Phone Brian Pinches on 0174 387 3511 (Shrewsbury, Shropshire).

Wanted: Information on how to align internally DBX150X noise-reduction units or a service manual. I have a circuit diagram and operator's manual. Phone Colin on 0191 587 0502, fax 0191 586 1991 or email somelltd@hotmail.com

Wanted: Quad 34 or 44 preamplifiers and 405 power amplifiers for spares, also boards and modules for these, in any condition. Contact Mike on 0175 861 3790.

Wanted: Circuit diagram for the Bush Model BTV140T, photocopy OK, or the power supply circuit for this model. F. Nedza, 40 Brynhyfryd, Glynneath, SA11 5BA.

Wanted: Remote-control unit and user manual for the Jerrold Model 550 cable receiver, made by General Instruments. All expenses paid. Darren Egerton, 40 Longfield Crescent, Littlemoor Estate, Oldham, Lancs, OL4 2SB.

For disposal: Philips N1500, N1700 and 2020 VCRs, all with tapes, also a Philips V2000 repair manual. For further details phone L.R. Cooke on 0120 700 441

Wanted: Module no. MTSH 7BD23A (E5710C) for the Thorn VCR Model VR414VA or a mains unit for a Thorn VCR Model VR172L(M) 504 609B. Donald Bills, 46 Blewitt Street, Pensnett, Brieley Hill, Dudley.

Wanted: Old half-inch diameter ferrite rods. Must be six inches or more long. Will pay very good money. Peter Tankard, 16A Birkendale Road, Sheffield, S6 3NL. Phone 0114 231 6321 between 9 a.m. and 10.30 p.m.

For disposal: Six TDA2170 ICs that may be of use to someone. Email Simon Page on simonjulianpage@hotmail.com

Wanted: Pin connection details for transistor types H331, C331 and C118, which appear to be standard-cased bipolar devices, and information on suitable substitutes. F.C. Bailey, Virolles, 24700 Montpon-Menesterol, France. Phone 00 33 553 826 267 or email fbailey@ctacom.fr

Servicing JVC HRJ200 series VCRs

John Coombes provides a detailed fault-finding guide for these popular VCRs

These VCRs were released in about 1994. The range includes Models HRJ200, HRJ205 and HRJ400. They are good-quality machines, capable of excellent performance, and are worth repair if in reasonable condition.

Power supply faults

Fig. 1 shows the chopper power circuit used in these VCRs, and Fig. 2 the regulator and power-switching circuits on board 03.

If the machine is dead with the 1·25A mains fuse F1 open-circuit, check for shorts in the mains bridge rectifier circuit. The diodes are D1-4 (4 x 10E6-F2) and the reservoir capacitor C10 (68μF, 400V). Alternatively the 2SC4517A chopper transistor Q1 could be short-circuit. When Q1 fails R8 (0·39Ω, 1W) usually goes open-circuit. Q1, R8 and the optocoupler PC1 (PS2561L-1WL) should all be replaced in the event of failure of Q1. On rare occasions the cause of F1 going open-circuit is shorted turns in the chopper transformer T1.

If the power supply doesn't work and F1 is OK, check C12 (2·2μF, 50V). It may give a high-ESR or low-capacitance reading.

If the symptom is no results with circuit protector CP1 (ICP-N20) in the 6V supply blown for no apparent reason, an earth bracket (part no. 46086) and screw (SDST2604ZY) should be fitted to prevent a static charge build up. It has to be fitted to the front loading mechanism, at the top right, to earth the mechanism to the outer case. If the earth bracket modification has already been fitted, check that the modification in the servo chip (IC401) circuit has been carried out. This is as follows. R401 (originally 1·2kΩ) is replaced with a 560Ω resistor, part no. QRSA08J-561YN. An extra resistor, R440 (560Ω, part QRD162J-561), is added in series with pin 29 of IC401. Cut the print near pin 29 of IC401 and use the legs of the resistor to connect pin 29 to the junction of C401 and pin 2 of CN401. A spacer (part no. PU59915-105) was supplied to prevent the added resistor (R440) shorting to the PCB. Fig. 3 shows the modification.

If the display is dim or not alight, check C34 (22μF, 50V) which goes low in value and the condition of R32 (47Ω).

Mechanical faults

One of the most common problems is a faulty mode switch (S3). Symptoms can include random rewind failure, with tape looping on eject, or intermittent no play, fast forward and/or rewind. The tape may simply be ejected from the cassette housing. In many cases the switch can be removed, cleaned and refitted – ensure that the timing is set up correctly.

If the tape is chewed when play is selected, check that the take-up and supply reel disc assemblies run freely. If the reel discs are jerky or stop completely, the holes may be packed with grease or the spindles may be dry with little lubrication. Alternatively the capstan motor may not be operating correctly.

If there is jerky movement or noise comes from the capstan motor, remove and dismantle it, clean the spindle shaft, relubricate at the ends and refit. If there is no noise, the capstan motor is working normally. If noise is still present, check the capstan motor (part no. PU61285) by replacement. If the capstan motor squeals or makes a groaning noise in operation, the cause could be poor lubrication of the capstan motor bearings.

The sound can slur because the capstan slows down. The capstan motor may be faulty or the cause could simply be a stretched capstan belt.

If the tape is chewed when ejected and the idler unit remains between the two tables, replace the capstan belt, the loading belt and the plate assembly (item 145 in the exploded view in the manual). In extreme cases the plate assembly may be cracked.

If the cassette is ejected after insertion, start sensor S1 may be faulty. Remove and add sensor PS3, part no. PU60629.

Tape damage after rewinding is caused by spillage from the take-up spool. This usually means that the brake assembly is faulty. If the main brake (part no. PQ46308A-2) and sub-brake (part no. PQ46309A-4) are not too badly warn cleaning the brake pads may cure the fault, otherwise the brakes will have to be replaced.

If the VCR won't play a tape, check the operation of the reel drive. The clutch can drop out of position because the circlip has come off. A replacement circlip will restore normal operation.

A crack in the capstan gear will result in failure of a tape to play, tape ejection or making a ticking noise. There's a replacement gear kit.

If the tape is jammed in the machine, check the loading arms. The lug on an arm can break, releasing the spring with the result that the arms jam. Alternatively the gears on the cassette housing may be damaged. These are not available as spare parts: the cassette housing (part no. PUS29672A) has to be replaced.

Erratic faults can be caused by oxidised glue on the PCB. Examples are the power LED not

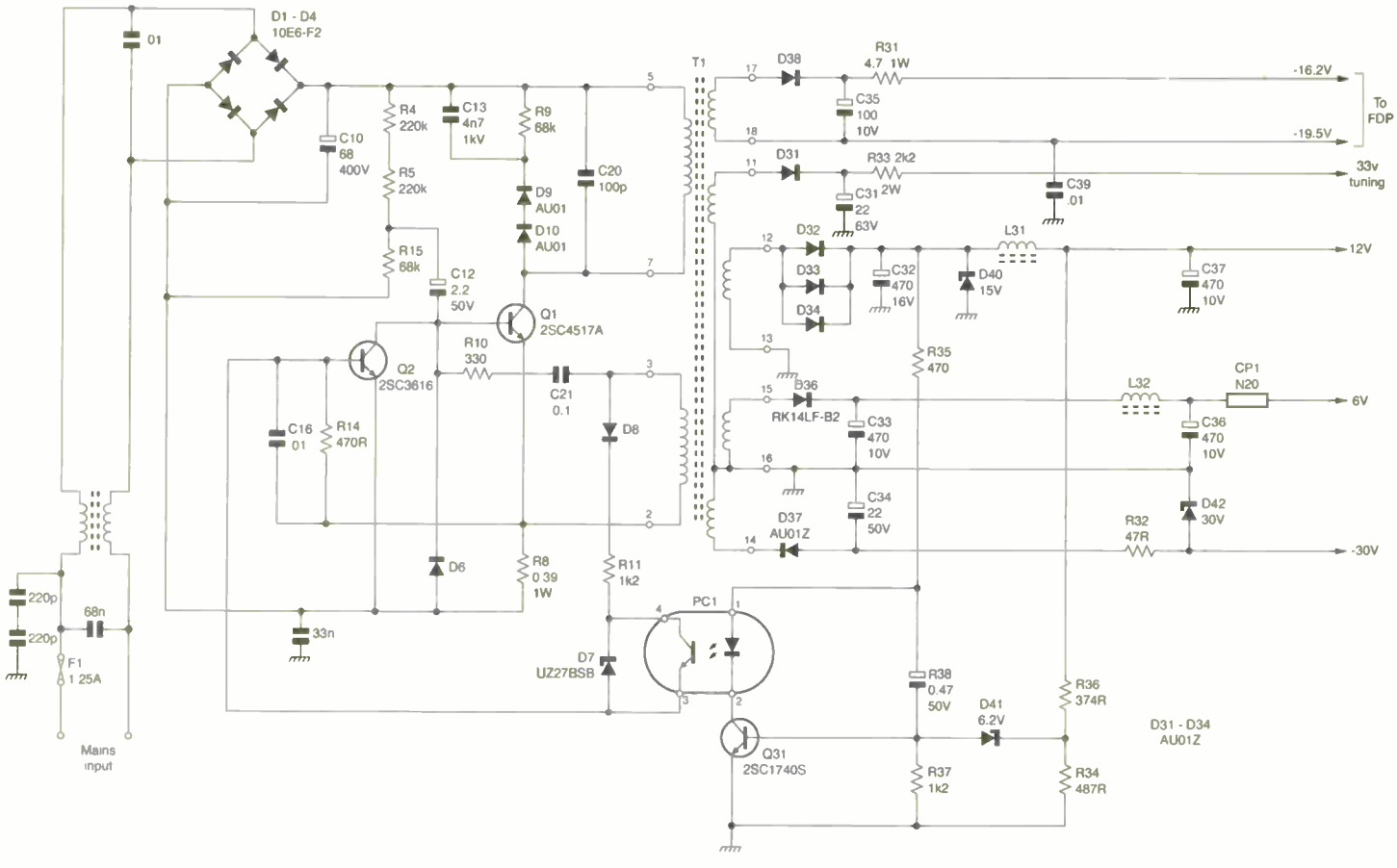


Figure 1: Circuit diagram of the chopper power supply in JVC HRJ200 series VCRs (board 01).

lit, the VCR going to standby and not accepting a tape, or the capstan motor going into the rewind mode of its own accord.

For noisy rewind/fast forward, check the capstan-motor bearings for wear or, more often, lack of lubrication. Also, to ensure that the capstan motor runs freely, clean the capstan flywheel's spindle.

Video problems

The most common fault is white dots on the picture (static noise). The cure is to replace the brush assembly (part no. PDM4343A) and cap (part no. PDM4328-2) in the drum assembly. If the static noise is very bad, the symptom can look like a faulty upper drum. When replacing the brush assembly, make sure that the spindle is clean and free of grease. If the picture is still very poor after replacing the brush assembly, ensure that the head switching is set up correctly.

If there is incorrect record/playback in the LP mode but SP is OK, check whether the rotary transformer coils on the drum motor are damaged.

Check for dirty video heads if there is sound but poor playback. If the picture is still snowy after cleaning the heads, check the FM envelope at TP506 on pre/rec board 43. If the output from both or maybe just one head is low the upper drum may be in need of replacement. First however check that the guide poles are set correctly, also the head switching. Check that there is a 5V supply at pin 12 of the BA7182S preamplifier chip IC501. If there is no output at pin 18 of IC501, the IC is probably faulty. If the output is present here but not at TP506, check the emitter-follower transistor Q504 (2SA1740S) by replacement.

An occasional complaint is double images, particularly noticeable when there are vertical lines in the picture. The fault can be very intermittent. The cause is a faulty connection at the earth pin of the delay line.

A very intermittent fault we have had is loss of EE/rec video and sound, which may be accompanied by a very coarse whistle on sound and patterning on the vision, playback being OK. The cause has been a faulty IF module (TNR2). It becomes unstable, the only cure being replacement.

Snowy pictures and noisy sound can be caused by a low-gain tuner (TNR1) or broken aerial sockets at the RF converter/switch. Make sure that the earthing is not dry-jointed and that the centre pins are correctly soldered.

If the picture drifts off tune, check the 33V zener diode D1 (MTZ33CT-77) which could be leaky. If a replacement fails to cure the problem, replace the tuner unit.

Sound faults

A faulty audio/control head can be the cause of no or low sound. Make sure that the head is clean before condemning it, as a badly contaminated head will provide poor performance. If the head is OK, check the DC conditions at the pins of the BA7790LS audio chip IC301. If any voltages are incorrect, check back to source or check IC301 by replacement. There should be a 10·3V supply at pin 7: this is derived from the switched 12V supply via R353 (220Ω), with C347 (10μF, 16V) for smoothing.

If a scart lead is in use, ensure that it is pushed into the VCR's

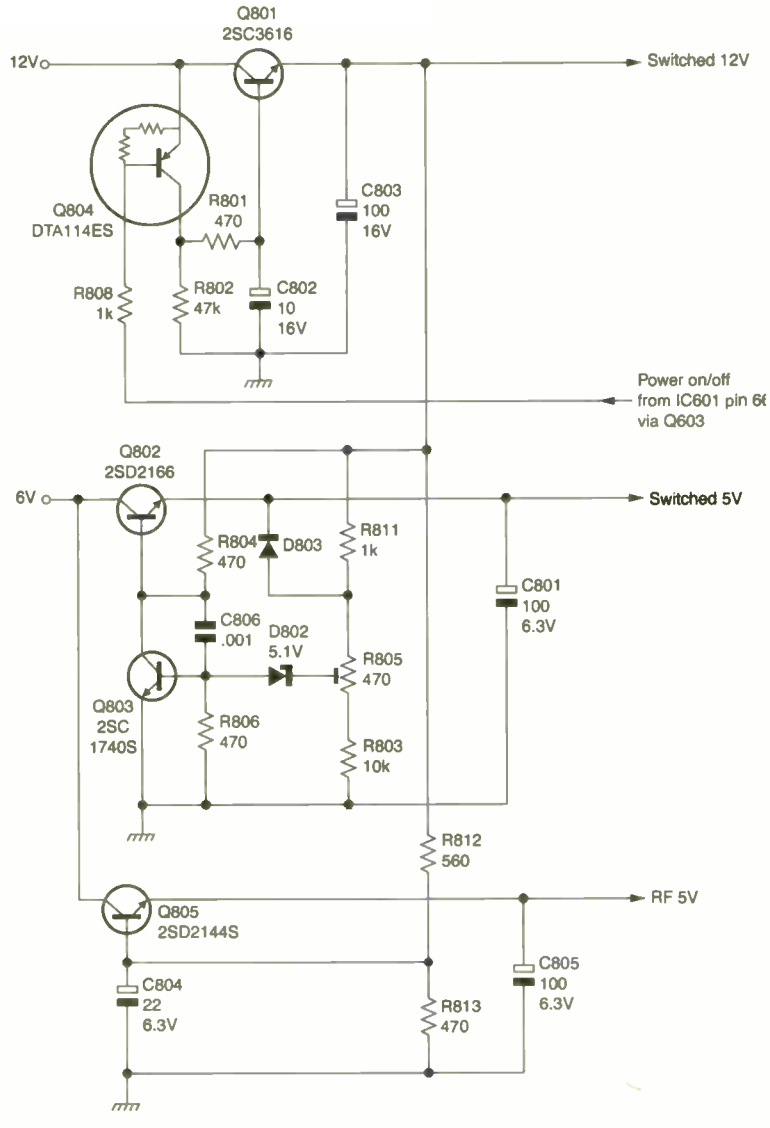


Figure 2: The regulator and power-switching circuits on board 03.

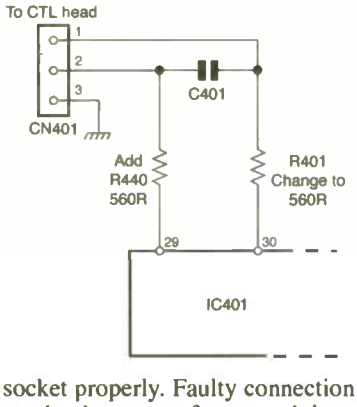


Figure 3: Modification to the control head circuit to prevent intermittent failure of CP1.

socket properly. Faulty connection can be the cause of no sound, loss of picture or sometimes both.

If these points are in order, check that there is an audio output at pin 7 of the IF unit TNR2. If not, check for dry-joints then check the IF unit by replacement.

Syscon and servo faults

If the machine doesn't accept tapes, check the loading motor. Replace if faulty. If the loading motor is OK, check that there is 12V at pin 6 of the loading-motor drive chip IC1 (BA6418N). If this supply is missing, check back to source via the deck terminal board etc. If the supply is present, check IC1 by replacement. The fault could be caused by the syscon chip IC601 (type HD6433926A13F). Check the DC conditions here and if necessary the IC by replacement.

The capstan motor (part no. PU61285) can be the cause of syscon/servo problems. It can be responsible for intermittent operation with shut down half way through a mode change. If the motor is OK, check the DC conditions around the syscon chip IC601 and the servo chip IC401 (JCP0039). There should be a 5V supply at pin 39 of IC401. If this is missing, check back to source: if it is low, suspect IC401. If the DC conditions at the two ICs are correct, check the relevant IC by replacement. Mode switch S3 can be the cause of incorrect operation. It can sometimes be dismantled, cleaned and relubricated. Then reassemble and soak test.

Start switch S1 on the cassette housing can cause problems. Check that it is producing a start pulse at pin 39 of IC601. If not, check it by replacement.

If the machine plays up on rewind or fast forward, or cuts out after a short operation, check the take-up reel sensor PS1 and/or the end sensor Q3 by replacement

Display faults

If the display unit FDP1 produces odd effects, for example loss of a segment, a dim display or the display keeps varying, carry out checks around the display-driver chip IC1 (type UPD16311GCK) before condemning FDP1. There should be a 5·2V supply at pins 33 and 45 of IC1, and a –28·5V supply at pin 34. If the 5·2V supply is missing or low, check back to source. If the –28·5V is incorrect, check the condition of R32 (47Ω) in the chopper power supply and C34 (22μF, 50V) for high ESR. A high ESR reading usually means that C34 is low in value.

If the supplies to IC1 are correct, check for dry-joints at FDP1 and IC1. If everything is in order in this respect, check FDP1 by replacement.

Remote-control faults

If there is no remote-control operation, the first step is to establish whether the handset or the infra-red receiver is faulty. A remote-control unit tester will check whether the handset is producing an output, but not whether the output is correct to change channels, volume etc. If there's intermittent operation or only some channels work, the cause could be poor batteries or bad battery contacts.

If the handset appears to be working, check for dry-joints at all three connections to the infra-red receiver IC2 (type GP1U581X). There should be a 5·2V supply at pin 2 of IC2. If this voltage is missing, check for dry-joints at plug/socket CN1. If the voltage is OK, use an oscilloscope to check that IC2 is producing a pulse output at pin 1, and that this is reaching pin 50 of the syscon chip IC601 (type HD6433926A13F). If pulses are present here, replace IC601. ■

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STV2102B	£5.00
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STV2112B	£8.50
STV2116A	£7.50

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distributor of electronic components

Part No.	Price
STV2118B	£7 00
STV2145	£3 00
STV2151A	£10 00
STV2155	£12 00
STV2160	£6 00
STV2246	£7 00
STV2246C	£7 00
STV2248	£7 00
STV5109	£4 50
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STV5180D	£3 25
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STV6400	£4 50
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STV8223B	£2 75
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STV9422P	£6 50
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TEA1064A	£1 30
TEA1067	£1 50
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1456T	PSU	ONWAKIT
1458T	PSU	ONWAKIT
1459T	PSU	ONWAKIT
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14SLTX	STANDBY	MODKIT37
1799Y	STANDBY	MODKIT37
2002	PSU	ONWAKIT
2009B	PSU	ONWAKIT
2052T	PSU	ONWAKIT
2152T	PSU	ONWAKIT
2099TX	STANDBY	MODKIT37
BTV17	STANDBY	MODKIT37
CTV501	PSU	ONWAKIT
CTV701	PSU	ONWAKIT
CTV840	PSU	ONWAKIT
CTV841	PSU	ONWAKIT
CTV485	PSU	ONWAKIT
AKAI		
CT1417	PSU	ONWAKIT
CT2159U	PSU	ONWAKIT
CT2162UNT	PSU	ONWAKIT
CT2863UNT	PSU	ONWAKIT
DECCA/TATUNG		
F SERIES	PSU	MODKIT30
TVC563	STANDBY	MODKIT37
GOLDSTAR		
CF25A50F	FRAME	MODKIT36
CF25C22C	FRAME	MODKIT35
CF28A50F	FRAME	MODKIT36
CF28C22F	FRAME	MODKIT35
CF28C28F	FRAME	MODKIT36
CF29C42F	FRAME	MODKIT35
GOODMANS		
147TT	PSU	ONWAKIT
149T	PSU	ONWAKIT
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1430RW	PSU	ONWAKIT
1450T	PSU	ONWAKIT
1455TS	PSU	ONWAKIT
2019R	PSU	ONWAKIT
2029T	PSU	ONWAKIT
2029TA	PSU	ONWAKIT
COMPACT 11	PSU	MODKIT47
F16 CHASSIS	FRAME	GOODKIT1
F16 CHASSIS	LINE	GOODKIT1
F16	PSU	GOODKIT1
F16	VIDEO	GOODKIT1
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CUC 2058	PSU	MODKIT48

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HINARI		
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AV29SX1PF	FIELD O/P	JVCKIT1
AV29TSIE1	FIELD O/P	JVCKIT1
C14E1EK	PSU	ONWAKIT
C14T1EK	PSU	ONWAKIT
C21ET1EK	PSU	ONWAKIT
CS21M3EK	PSU	ONWAKIT
MATSUI		
1455	PSU	ONWAKIT
1496R/T (H3N90)	PSU	MODKIT43
1496R/T (BUZ90)	PSU	MODKIT44
1498	PSU	ONWAKIT
2086	PSU	ONWAKIT
2096R/T (H3N90)	PSU	MODKIT43
2096R/T (BUZ90)	PSU	MODKIT44
2098	PSU	ONWAKIT
21V1N (BUZ90)	PSU	GRUNDIGKIT2
21V1T(MJF18004)	PSU	GRUNDIGKIT3
TVR180R/208	STANDBY	MODKIT37
TVR185T	STANDBY	MODKIT39
MITSUBISHI		
AV1 SERIES	PSU	MITSKIT3
CT1M5B	PSU	MITSKIT3
CT21M5BT	PSU	MITSKIT3
CT25M5BT	PSU	MITSKIT3
CT21A2STX	TDA 8178S	MITSKIT1
CT21AX1B	PSU	MITSKIT3
CT21A3STX	TDA 8178S	MITSKIT1
CT21AV1BS	PSU	MITSKIT3
CT25A2STX	TDA 8178S	MITSKIT1
CT25A3STX	TDA 8178S	MITSKIT1
CT25A4STX	TDA 8178S	MITSKIT1
CT25A6STX	TDA 8178S	MITSKIT1
CT25AV1B	PSU	MITSKIT3
CT25AV1BS	PSU	MITSKIT3
CT25AV1BD	PSU	MITSKIT3
CT25AV1BDS	PSU	MITSKIT3
CT28AV1B	PSU	MITSKIT3
CT28AX1BD	PSU	MITSKIT3
CT28AV1BDS	PSU	MITSKIT3
CT29AS1	TDA 8178S	MITSKIT2
CT29A4	TDA 8178S	MITSKIT2
CT29A6	TDA 8178S	MITSKIT2
CT29B2	TDA 8178S	MITSKIT2
CT29B3	TDA 8178S	MITSKIT2

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C289FTXN	PSU	NIKKAIKIT1
C28F41FXN	PSU	NIKKAIKIT1
PANASONIC		
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TX25XD60	VERT OUTPUT	PANKIT2
TC28XD60	VERT OUTPUT	PANKIT2
TX28XD70	VERT OUTPUT	PANKIT2
TX29XD70	VERT OUTPUT	PANKIT2
TX-W26D3	VERT OUTPUT	PANKIT2
PHILIPS		
28PT4457/05	PSU	MODKIT50
28PW5407/05	PSU	MODKIT50
28PW6006/05	PSU	MODKIT50
310.10708		PHILKIT3
310.20491		PHILKIT2
310.20496		PHILKIT10
310.31994		PHILKIT6
310.32252		PHILKIT5
310.32253		PHILKIT4
310.32254		PHILKIT9
310.32255		PHILKIT7
310.32262		PHILKIT8
310.62264		PHILKIT1
ANUBIS A	SOPS	PHILKIT2
CP110 CHASSIS	SOPS	PHILKIT8
G90A CHASSIS	SOPS	PHILKIT10
G90B CHASSIS	SOPS	PHILKIT10
G110 CHASSIS	SOPS	PHILKIT3
GR2.1 CHASSIS	SOPS	PHILKIT1
GR2.2 CHASSIS	SOPS	PHILKIT1
D-16 CHASSIS	SOPS	PHILKIT6
HSM VIDEO	SOPS	PHILKIT5
JSM VIDEO	SOPS	PHILKIT4
KSM VIDEO	SOPS	PHILKIT9
LSM VIDEO	SOPS	PHILKIT7
L01 1E CHASSIS	PSU	MODKIT50
SAMSUNG		
CI5944	FRAME	SAMKIT2
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VIK310	PSU	SAMSUNGKIT
VIK320	PSU	SAMSUNGKIT
VIK350	PSU	SAMSUNGKIT
VI375	PSU	SAMSUNGKIT
VI395	PSU	SAMSUNGKIT
WINNER 1	PSU	SAMSUNGKIT
SHARP		
51CS03H	PSU	SHARPKIT1
51CS05H	PSU	SHARPKIT1
56FW53H	PSU & DOLBY	MODKIT45
59CS03H	PSU	SHARPKIT2
59CS05H	PSU	SHARPKIT2
59CSD8H	PSU	SHARPKIT2
59DS03H	PSU	SHARPKIT3
59FW53H	PSU & EW	MODKIT49

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SHARP..continued		
66CS03H	PSU	SHARPKIT2
66CS05H	PSU	SHARPKIT2
66CSD8H	PSU	SHARPKIT2
66FW53H	PSU & DOLBY	MODKIT45
66FW53H	PSU & EW	MODKIT49
66FW54H	PSU & DOLBY	MODKIT45
66FW54H	PSU & EW	MODKIT49
76FW53H	PSU & DOLBY	MODKIT45
76FW53H	PSU & EW	MODKIT49
76FW54H	PSU & DOLBY	MODKIT45
76FW54H	PSU & EW	MODKIT49
DA-100 CHASSIS	PSU & EW	MODKIT49
SONY		
SLV715HB	VCR - PSU	MODKIT40
SLV777UB	VCR - PSU	MODKIT40
THOMSON		
35029400		THOMKIT2
35065920		THORNKIT1
FV70	PSU	THORNKIT1
ICC7 CHASSIS	TDA 8178FS	THOMKIT1
ICC7 CHASSIS	FRAME	THOMKIT3
ICC8 CHASSIS	TDA 8178FS	THOMKIT1
ICC8 CHASSIS	FRAME	THOMKIT3
ICC9 CHASSIS	EAST/WEST	THOMKIT4
ICC17 CHASSIS	PSU	MODKIT41
ISS20 (TV-DVD)	PSU	MODKIT46
R3000	PSU	THOMKIT2
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22H3	IR9594
2415	IR9584
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2445	IR9584
2452	IR9584
2453	IR9584
2463	IR9584
2475	IR9584
26H3	IR9594
29132	IR9584
36K2	IR9594
41H3	IR9594
4231	IR9584
4414	IR9584
4415	IR9584
4423	IR9584
4433	IR9584
51A0	IR9584
51A2	IR9584
51A3	IR9584
51A4	IR9584
51A5	IR9584
51G2	IR9584
51G3	IR9584
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
68LS2	IR9639
A10R	IR9259
A14R	IR9259
A36R	IR9259
B51F	IR9639
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B59NX	IR9639
B68F	IR9639
B68NX	IR9639

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D68N	IR9639
D78N	IR9639
E51N	IR9639
E59R8	IR9639
RCU1734	IR9584
RCU1742	IR9584
RCU1785	IR9594
RCU1789	IR9594
RH880	IR9584
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
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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
TP621	IR9299
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
A51B780	IR9142
C1405	IR9476
C1414	IR9476
C2057H	IR9142
C2067	IR9142
C2067H	IR9142
C2114	IR9476
C2146TN	IR9677
C2147TN	IR9677
C2156TN	IR9984
C2166TN	IR9677
C2170TN	IR9983
C2186TN	IR9983
C2257H	IR9142
C2259H	IR9142
C2261	IR9142
C2267H	IR9142
C2268H	IR9142
C2273	IR9142
C2273H	IR9142
C24W1TN	IR9983
C24W511TN	IR9983
C24WS511T	IR9983
C2514	IR9476
C2546	IR9677
C2546TN	IR9677
C2547TN	IR9677
C2556TN	IR9983
C2566TN	IR9677
C2567TN	IR9983
C2567TN2	IR9983
C2568TN	IR9983
C2659H	IR9142
C2660	IR9142
C2661	IR9142
C2846TN	IR9677
C2847TN	IR9677
C2856TN	IR9983
C2886TN	IR9677
C28[illegible]TN	IR9983
C28W410TN	IR9983
C28W510TN	IR9983
CBP1476R	IR9142
CBP1646R	IR9142
CBP2067	IR9142
CBP2216	IR9142
CBP222	IR9142
CBP226	IR9142
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CL2156TAN	IR9983
CL24W1TAN	IR9983
CL2556TAN	IR9983
CL2586TAN	IR9983
CL2856TAN	IR9983
CL2886TAN	IR9983
CL28W1TAN	IR9983
CL28WD2TAN	IR9983
CL32WD2TAN	IR9983
CLE871A	IR9602
CLE871B	IR9602
CLE874A	IR9602
CLE874B	IR9602
CLE876	IR9476
CLE876C	IR9477
CLE876D	IR9477
CLE876G	IR9477
CLE902A	IR9677
CLE902B	IR9677
CLE903A	IR9677
CLE921A	IR9983
CLE921B	IR9983
CLE922A	IR9982
CLE922B	IR9982
CLR876E	IR9477
CP2146TA	IR9677
CP2546	IR9677
CP2546TA	IR9677
CP2556TAN	IR9983
CP2841TA	IR9677
CP2856TA	IR9983
CP2856TAN	IR9983
CP2886TAN	IR9983
CP2WD2TAN	IR9983
CP3WD2TAN	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
AV26VM1EN	IR9698
AV29SX1EN	IR9698
AV29TS1EN	IR9698
AV32WZ2EN	IR9698
RC8072	IR9698
RC8074	IR9698
RMC530	IR9698
RMC582	IR9698
RMC761	IR9698
RMC7611E	IR9698
RMC770	IR9698
RMC771	IR9698
RMC7711E	IR9698
RMC793	IR9698
RMC7931E	IR9698
MATSUI	
076G047240	IR9490
076L067240	IR9490
2076R	IR9490
2092T	IR9490
NOKIA	
3126	IR9157
3126F	IR9157
C1	IR9161
C2	IR9161
C3	IR9161
C4	IR9161
CM 1	IR9569
D1	IR9161
D2	IR9161
E1	IR9161
E2	IR9161
EM2	IR9700
ES5	IR9701
FS10	IR9573
FS11	IR9506
FS4/1	IR9573
FS4/2	IR9573
FS5	IR9506
FS5/1	IR9573
FS8	IR9506
FS9	IR9573
IRC1	IR9157
IRC2	IR9157
IRM1	IR9535
IRS1	IR9535
IRS2	IR9535
IRS3	IR9535
RCN610	IR9752
RCN620	IR9751
RCN624	IR9757
SM1	IR9491
SM2	IR9491
PANASONIC	
02280227	IR9835
91005926	IR9835
EUR50100	IR9826
EUR51920	IR9835
EUR51921	IR9835
IR3592	IR9826
TC1485DR	IR9826
TC14S1R	IR9834
TC150E	IR9562
TC1658PFR	IR9826
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PANASONIC ..continued	
TC1785UR	IR9826
TC2185DRS	IR9826
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TC21R1C	IR9826
TC21R1U	IR9826
TC21S1R	IR9834
TCC23PFR	IR9826
TNQ1410	IR9826
TNQ8E0421	IR9826
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TNQ8E0428	IR9826
TNQ8E0430	IR9826
TNQ8E0432	IR9826
TNQ8E0435	IR9836
TNQ8E0436	IR9836
TNQ8E0441	IR9826
TNQ8E0461	IR9834
TX14S1T	IR9834
TX21S1RC	IR9834
TX21S1T	IR9834
TX21S1TC	IR9834
TX21T1C	IR9826
TX25A2C	IR9836
TX25A2CI	IR9836
TX25W2	IR9836
TX25W2C	IR9836
TX25W2CI	IR9836
TX28A1D	IR9826
TX28A2C	IR9836
TX28A2CI	IR9836
TX28W2	IR9836
TX28W2C	IR9836
TX28XDP1C	IR9835
TX29AD1D	IR9835
TX29W2CI	IR9836
TX33A2C	IR9836
TX33A2CI	IR9836
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RC5002	IR9510
RC5140	IR9510
RC5154	IR9510
RC5240	IR9510
RC5250	IR9510
RC5260	IR9510
RC5300	IR9510
RC5350	IR9510
RC5410	IR9553
RC5420	IR9553
RC5540	IR9510
RC5701	IR9434
RC5801	IR9553
RC5801	IR9556
RC5901	IR9556
RC5903	IR9555
RC6008	IR9434
RC6404	IR9465
RC6416	IR9465
RC6512	IR9464
RC6804	IR9434
RC7118	IR9464
RC7141	IR9465
RC7500	IR9464
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RC7512	IR9864
RC7535	IR9864
RC8201	IR9434
RC8205	IR9710
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RC9020	IR9434
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RC9050	IR9556
RC9057	IR9710
RC9060	IR9556
RC9070	IR9434
RC9133	IR9710
SANYO	
4AA4U1TO092	IR9459
JXBA	IR9457
JXCL	IR9530
JXCR	IR9530
JXFF	IR9457
JXGA	IR9139
JXGE	IR9139
JXGT	IR9460
JXGW	IR9460
JXGY	IR9460
JXLB	IR9460
JXLG	IR9460
RC238	IR9974
RC254	IR9974
RC258	IR9530
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RC307	IR9457
RC308	IR9457
RC317	IR9457
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RC321	IR9457
RC612	IR9457
RC625	IR9457
RC628	IR9457
RC642	IR9530
RC645	IR9974
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RC702	IR9139
RC710	IR9139
RC711	IR9460
RC801	IR9139
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51AM12S	IR9788
51AT15S	IR9788
54AM12S	IR9788
54AT15S	IR9788
54CS05SN	IR9711
70CS03S	IR9711
72CS03S	IR9711
72CS05SN	IR9711
DV21081S	IR9711
DV2130EX	IR9487
DV25071S	IR9711

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DV25083S	IR9711
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DV28081S	IR9711
DV28083S	IR9711
DV3750S	IR9788
DV3760S	IR9788
DV5160S	IR9788
DV5403S	IR9711
DV5432S	IR9711
DV5465S	IR9711
DV5470S	IR9711
DV5935H	IR9711
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DV6303S	IR9711
DV6311S	IR9711
DV6313S	IR9711
DV6332S	IR9711
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DV7002S	IR9711
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DV7011S	IR9711
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DV7032S	IR9711
DV7036S	IR9711
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RRMCG0739BM5A	IR9711
RRMCG1014BM5A	IR9711
RRMCG1023BM5A	IR9711
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RRMCG1036BM5A	IR9711
RRMCG1046BM5A	IR9788
RRMCG1048BM5A	IR9788
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RM630	IR9511
RM631	IR9511
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RM633	IR9511
RM634	IR9511
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RM641	IR9321
RM641A	IR9321
RM650	IR9336
RM651	IR9336
RM652	IR9336
RM654	IR9336
RM656	IR9448
RM657	IR9336
RM658	IR9321
RM661A	IR9321
RM670	IR9123
RM671	IR9123
RM672	IR9123
RM673	IR9123
RM677	IR9448
RM681	IR9442
RM682	IR9442
RM683	IR9442
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RM687B	IR9448
RM687C	IR9448
RM689	IR9441
RM694	IR9452
RM698	IR9442
RM717	IR9441
RM719	IR9448
RM816	IR9441
RM817	IR9441
RM820	IR9452
RM826	IR9441
RM828	IR9452
RM830	IR9443
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RM832	IR9443
RM833	IR9451
RM834	IR9452
RM836	IR9871
RM837	IR9451
RM839	IR9871
RM841	IR9452
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1400RBW	IR9962
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1440RBT	IR9962

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1440TBT	IR9852
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1450RD	IR9852
1480RB	IR9953
1480RBT	IR9953
1480RBW	IR9953
1480TB	IR9953
1480TBT	IR9953
1480TBW	IR9953
1480TBY	IR9953
1480TBZ	IR9953
1510RBT	IR9962
1510RDT	IR9962
1510RT	IR9962
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155R9BZ	IR9962
156R9	IR9962
156R9B	IR9962
156R9BG	IR9962
156R9BW	IR9962
1720RB	IR9962
1722TB	IR9852
1732TD	IR9852
2100RB	IR9962
2100RBG	IR9962
2100RBT	IR9962
2101RBZ	IR9962
2102RBZ	IR9962
2121RD	IR9962
2132DB	IR9852
2140RB	IR9852
2140TB	IR9852
2141TB	IR9852
2145DB	IR9852
2145DD	IR9852
2150TD	IR9953
2152DB	IR9953
2152DD	IR9953
2155DB	IR9953
2163DB	IR9953
2163DB	IR9953
216R9B	IR9962
216R9B2	IR9962
2173DB	IR9953
2180TD	IR9953
2181TB	IR9852
2181TB	IR9953
219R	IR9962
219R9B	IR9962
219R9B2	IR9962
2522DB	IR9953
2522DD	IR9953
2527DB	IR9953
2535DB	IR9852
2535DD	IR9852
2537DD	IR9852
2545DB	IR9852
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2550TB	IR9953
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2636B	IR9953
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2837DD	IR9852
2852DB	IR9953
2853DD	IR9953
2855DD	IR9953
2857DB	IR9953
2857DD	IR9953
2863DD	IR9953
2866DD	IR9953
2873DB	IR9953
2877DB	IR9953
2879DB	IR9953
3327DB	IR9953
3339DB	IR9953
3357DB	IR9953
3377DB	IR9953
3387DB	IR9953
3787DB	IR9953
40PW8DB	IR9953
48J6DB	IR9953
48PJ6DG	IR9953
55PJ6DB	IR9953
56PW8DB	IR9953
7037DD	IR9852
7053DD	IR9953
CT6869	IR9953
CT9369	IR9962
CT9383	IR9962
CT9387	IR9962
CT9396	IR9962
CT9399	IR9962
CT9414	IR9962
CT9432	IR9962
CT9455	IR9962
CT9475	IR9962
CT9476	IR9962
CT9480	IR9962
CT9552	IR9962
CT9626	IR9953
CT9784	IR9953
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CT9867	IR9962
CT9868	IR9953
CT9900	IR9953
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1000uF	CAP119	£1.50 10
2200uF	CAP120	£2.10 10
3300uF	CAP167	£1.60 5
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22uF	CAP121	£0.35 10
33uF	CAP122	£0.35 10
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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
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22uF	CAP38	£0.45 10
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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
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68uF	CAP142	£0.90 10

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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
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DVD

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Technics SL-HDV600

This unit is part of a four-piece system. The complaint was that its surround, centre and subwoofer outputs were missing. This sort of problem is often caused by incorrect user settings. As I didn't have the user manual for the system I went into the menus blindly, hoping that experience would soon lead me to a wrong setting. But I wasn't able to find anything that immediately looked suspicious, or indeed even relevant. Just in case, I carried out a system-initialise operation – 'stop' on the front panel and '>10' on the remote-control unit. I reasoned that if the problem was a software one this would at least restore some basic surround sound. But there was still none. Time to set about fault finding.

The AV decoder chip is a 204-pin beast. It provides three data streams that are fed to the six-channel DA converter chip IC4211. 'DIN2' at IC4211 was missing, and I was also able to confirm that it didn't emerge at pin 93, 'ADOUT1', of the decoder IC. I was loathe to believe that either of these ICs was faulty so, unable to find any relevant information at the Panasonic website, I put in a call to the very competent and helpful Panasonic Technical Support team. I wasn't disappointed. The chap I spoke to knew exactly what the cause of the problem was, and soon put me straight. But it's a rather complicated operation.

You first need to go to 'setup'. This is done by pressing the handset's 'shift' and 'display' buttons simultaneously. Next, use the remote right-arrow button to navigate along to the third tab. The top item in this menu is 'speaker setting'. When you press the handset's 'enter' button you will get a picture of an armchair. L, C and R speakers should be shown to the front, an SW one to the right, and LS and RS ones to the rear. Six small windows should be scattered amongst these icons, variously labelled 'dB' and 'mS'. To the left of the chair there are 'exit' and 'test' button icons. At the lower left there's a representation of the left/right/up/down and 'return' handset buttons. 'Active' ones are highlighted in yellow.

In this case the only speakers that showed were the front ones. This is where it gets complicated. There is no indication as to how you should turn on the missing ones. I stumbled on the procedure accidentally, by using the arrow buttons that were highlighted as being currently active. The result was a yellow box that suddenly appeared in front of the armchair. By next hitting the 'enter' button that was still, curiously, symbolised in white I was able to use the up and down arrow buttons to find three centre-speaker settings – 'none', 'small' and 'large'. Having discovered this trick, I was able to navigate to other locations around the chair and find the remaining speakers that were missing (subwoofer and rear surrounds).

There is one final stumbling block, which the man at Panasonic warned me about. To save the new settings, you must depart from the page only by using the 'exit' icon: if you use the 'return' one, everything will go back as it was. Only you wouldn't know this . . .

Once I had managed to get all the speakers showing on the screen I was able to use the on-screen 'test' icon, which starts a rotating white-noise output from each speaker in turn. This proved that all the audio outputs were now present. After exiting (correctly!), I tried a disc again. This time there was full surround-sound playback. **G.D.**

Sony DVP-S9

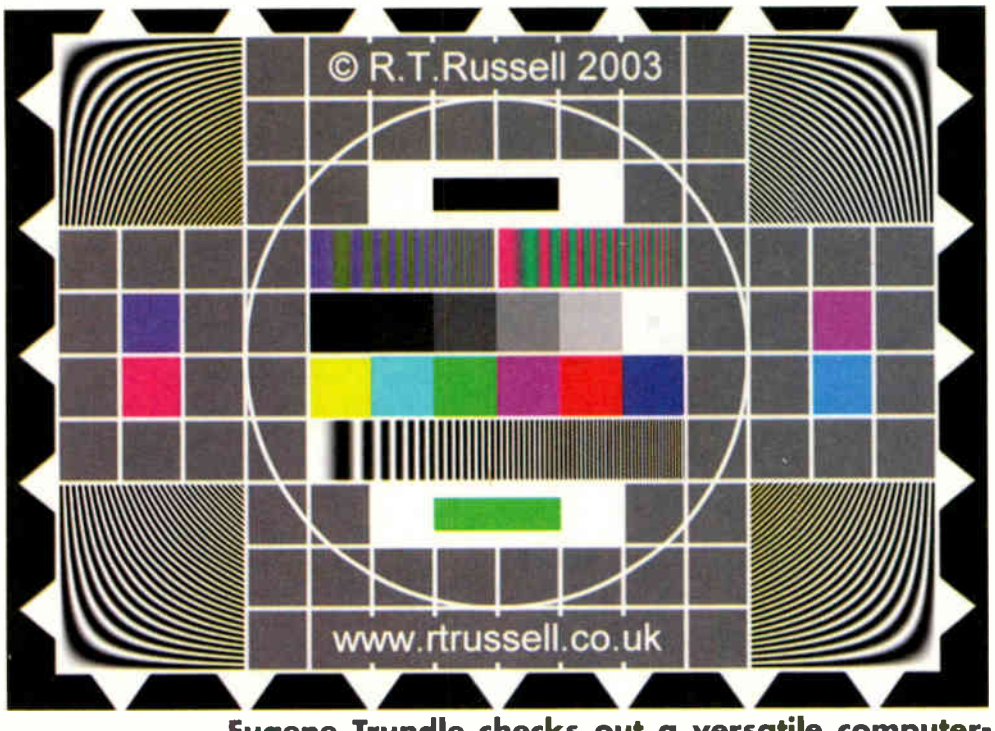
This unit wouldn't play DVDs: all other functions were OK. The cause of the trouble was the microprocessor chip IC302 on board MB. A replacement, part no. 8-759-828-01, restored normal operation. Use the improved version, which can be identified by having three white dots on the top. **C.B.**

JVC DR-MV1

This combi unit's DVD tray would get stuck on the front-panel flap when loading a disc. Inspection of the loading tray revealed that the front-panel flap, which moves up and down and slides along the disc tray bottom, was getting caught up on the silver trim at the end of the tray. The solution was to put three self-adhesive strips on the front panel runs, enabling the silver trim on the tray to clear the closing flap. This restored normal disc loading and closing. **C.B.**

TEST REPORT:

Russell pattern generator



Eugene Trundle checks out a versatile computer-programmable test-card generator

Photo 1: The default composite test cord.

TV test patterns have become easier to generate over the years. They are nowadays available on DVD and videotape, from bench-based and pocket-sized generators, from PCs and, the subject of this test report, in pocket-sized PC-programmable form. As relevant ICs become cheaper and more sophisticated, the cost of the hardware comes down: increasingly, test patterns and cards are software-based.

Description

The Russell generator, shown in Photo 2, is a hand-held device that fits easily into the pocket and runs from an external 9V DC supply. A mains power unit is supplied with it as standard, not as an option. It provides a single composite test card which may be the default one, see Photo 1, or others that can be downloaded – or indeed your own image from within a PC. There are no user controls, not even an on-off switch, and the output is available in composite video form at a BNC socket. The following are incorporated: four teletext pages with Fastext links; an integral vertical-interval test signal (VITS) of the pulse and bar type; and a programmable WSS (Wide Screen Switching) signal on TV line 23. As far as I know these features are not available in any other low-cost generator. But the truly unique feature of this design is its ability to produce patterns or pictures in several line standards (405, 441, 525, 625 and 819) and in monochrome or NTSC or PAL colour. For more details see Table 1.

Programming

Many users will be content to use the generator as it comes, with its very comprehensive composite test pattern. With the software supplied, a 9-pin serial port extension cable and a PC that runs Windows 95 or later, it's possible to delete the default image; reprogram the generator with any BMP, GIF, JPEG or YUV image; compose, load, save and edit the four teletext pages, and program the Fastext coloured keys; select the required line/field scanning standard and colour-encoding system; and enable or disable WSS, VTS, text and Fastext.

The software includes some interesting sample images, amongst which there are the classic test cards C, D and F, along with a selection of others, one a widescreen type. There is also a range of useful waveforms and test images: colour bars; frequency sweep; sawtooth; full-screen pulse and bar; etc. Some of these are not actually included with the software but can be downloaded automatically when required from specialist internet sites. I found that the software is intuitive and very easy to use.

The RTR card

The first thing I noticed with the default test-card pattern on display was the quality of the image, given the constraints of composite-video (CVBS) coupling. This quality is guaranteed by the use of 12MHz image sampling, which gives for example a very smooth circle and well-defined picture features, and 8-bit linear coding. In fact the signal is a 'textbook' one, with mathematical PAL coding and an eight-field PAL sequence. These latter points deserve a little more explanation.

The relationship between the colour subcarrier frequency and the line-scan frequency in the PAL specification is such that they are locked together with a quarter-line offset between them. This minimises the visibility of dot patterns in coloured areas of the picture. The quarter-line offset involves a sequence of four pictures/eight fields to complete a whole cycle, thus achieving a broadcast-standard waveform.

The card is distinguished by the curved lines at each corner – 'zebra's bums' as they were christened the day the device arrived here. In fact they are 'zone plates', consisting of luminance-only content in the form of hyperbolic gratings that correspond to 0-30MHz in the horizontal plane with equivalent spacings vertically. Zone plates have long been used to check frequency-dependent processing systems, showing beat patterns, aliasing, etc. Cross-colour should not be present in these zones, because they don't contain the chroma sub-

Table 1: Russell pattern generator specification

TV standards:	405, 441, 525, 625, 819 lines, monochrome, NTSC, PAL.
Pattern:	Composite test card pre-programmed; others available, or user's own image.
Teletext:	Four lines programmable, linked to TV Fastext keys.
Video output:	1V at 75Ω. Via BNC socket.
Power source:	External, 9-12V DC at 150mA.
Storage format:	12MHz sampling, 8-bit linear coding.
Storage capacity:	One still frame (8-field PAL sequence).
Programming connector:	9-way female D-type socket.
Dimensions:	130 x 65 x 25mm
Weight:	150g.
Accessories supplied:	Mains power unit; BNC-phono adaptor; Windows programming software.

carrier frequency, though it will show on part of the luminance frequency-grating below the colour blocks in the centre circle. The severity and visibility of cross-colour patterning depends on the quality of the TV set or monitor, and in particular whether it's fitted with a comb filter.

Most of the rest of the test pattern is conventional, with features that will be familiar to most readers of this magazine. Inside the centre circle, one third of the way down, there are sinusoidal U and V frequency sweeps from 0-3MHz, while the luminance grating, again in sinewave form, runs from 0-6MHz. Above that the colour bars, in this case squares, provide the standard YCGMRB sequence at 100 per cent amplitude. The four squares outside the circle provide U and V signals to test PAL decoders: they should be free from Venetian-blind and crosstalk effects.

The tips of the arrowheads at the picture edges correspond to the extreme edges of the picture area and provide a check on scan amplitudes and centring. The test card is not as good as some for setting 'static convergence', i.e. colour registration at screen centre. With the picture height reduced (or without, if there's a field timebase flyback problem!) the teletext and VITS lines are visible. The features and checks provided by the card are set out and explained in a coloured chart that's supplied with the generator.

Teletext facility

As with the main image, the four text pages incorporated can be customised. Again the default program sufficed for me and my checks and I found there pages 100-400, Fastext-linked and showing respectively a teletext index, a product description, program details for BBC BASIC, and a full engineering test page including a clock-cracker. As previously mentioned, the contents of these pages can be programmed by the user as required.

Inside

Photo 3 shows an internal view of the instrument. There's a good-quality glassfibre PCB on which seven assorted ICs and a three-legged voltage regulator are mounted. The total component count is 43 plus the hardware. The assembly looks robust and set to last for many years, especially as there are no aluminium electrolytic capacitors or hot-running components.

Uses

This generator is not intended for the same market as the types of general-purpose, battery-powered, multi-pattern, scart-socketed and audio-oscillating test-card generators that have been reviewed in *Television* previously. The virtues of this one are its versatility in pre-programming; its close approach to broadcast standards in terms of encoding and image quality; and its teletext, WSS and VITS features. It will find a market amongst professional users who require a caption, test card or picture for use in CCTV continuity or setting up applications; for factory, production and educational facilities where a 'textbook' video signal is needed; for amateur TV stations or repeaters where a continuous caption, e.g. a call sign, is required; for TV dealers who may want to program in-house advertisements, special-offer captions etc.; in repair workshops to provide a distributed-in-house, general-purpose high-quality test card; for broadcasters in need of a permanent, captioned picture as a 'holding' signal for a landline, microwave or satellite circuit; for those who use pulse-and-bar (VITS) signals to check the integrity of transmission paths; and no doubt many others.

Photo 2: The Russell pattern generator, external view.

It's a unique instrument indeed, which can for example be programmed to pipe Test Card D into a vintage black-and-white set or to provide a near broadcast-standard widescreen colour image for testing big new plasma screens – and auto-switch its scanning standard into the bargain!

Availability

The test-card generator is available from R.T. Russell, 19 Welling Road, Orsett, Essex, RM16 3DF. Its price at the time of writing is £123-37, which includes post and packing and VAT. For further details there's a website at www.rtrussell.co.uk

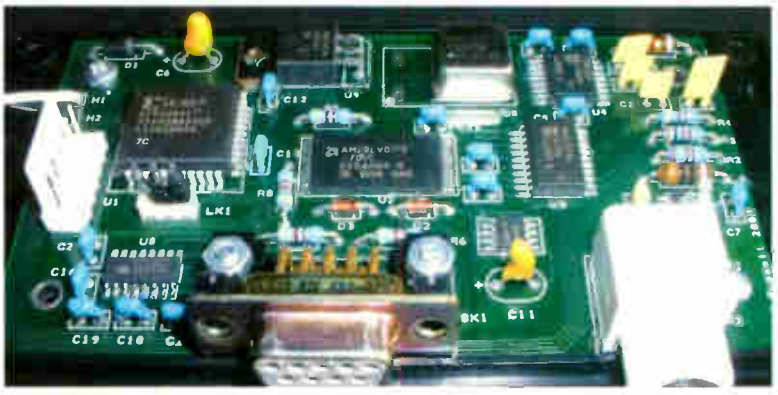


Photo 3: Internal view of the Russell pattern generator.

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.

Scams and the phone nuisance

Those of you starting a new business in the UK may be unaware of a number of scams that will rob you of your hard-earned profits if you are taken in.

The first is the Data Protection Registration racket. A company contacts you and offers to register you for £95 or more. If you keep personal data on customers you do indeed have to register with the Data Protection Registrar at Wilmslow (phone 01625 545 745). It costs £35 a year. Don't give money to anyone else: deal direct with the Wilmslow office. If anyone else contacts you about this, put the phone down or tear up the letter or fax.

The second is the 'advertise in our calendar/diary for charity' scam. You will be phoned and asked if you would like to advertise. The bad ones will phone and tell you that you (or your wife) have already agreed to advertise. It's best to put the phone down without speaking. You may be threatened with court action and all sorts of things and think "did I?" or "did she?" Don't agree to advertise in anything of this sort. It may well be worthwhile advertising in legitimate publications such as the Yellow Pages, a Thomson Directory or your local papers, but be wary of anyone else. Never commit yourself to anything by phone, and always keep a written record.

When I started my business in 1995 it didn't take me long to realise that I would have to minimise the number of phone calls – I was running an internet business, so it was ridiculous to spend hours on phone-call questions that could be answered in seconds by email. In addition I prefer to have everything in writing, so that there's no question about what I said or wrote. I signed up for TPS (Telephone Preference Service) and FPS (Fax Preference Service), and got BT to admit that there is such a thing as ACR (Anonymous Call Rejection). The first two are free: ACR costs £9.99 a quarter and is worth every penny. I now receive no 'withheld' calls at all – they can't get through. A few people get round this by dialling from abroad, but I'm well practised at slamming the phone down without saying a word. I know the voices of the few friends who phone me from outside the UK. If it's not one of them, I hang up. If anyone gets through with any sort of offer I don't want I get their details, fill out a TPS form and post it. They don't phone again: a £5.000 fine is a good wake-up call for anyone!

Those who can't get through by phone are welcome to send me a letter or email me. I don't divulge my email addresses – I provide an email form that hides them. If you want to do this yourself (recommended) it's free but you need a server that supports PHP. You will find information here: www.satcure.net/getscript2.htm

I discarded my fax machine. I now use that line for my ADSL and my wife uses it for personal calls. I haven't missed the fax machine: it was a great gobbler of expensive thermal paper that went brown before I got round to reading the messages. If I want to send or receive a fax, I use the computer.

I also have a clever little device that's connected between the computer and my phone line. The computer logs all calling numbers, lets me put names against them (so next time they phone the computer announces the name) and records audio messages while I'm out. It has a little on-screen 'button' that I can click if I want the computer to record an ongoing call. The quality is superb.

I'm under a lot less stress now that I receive so few calls and most times the caller's name is announced.

I recommend these measures to anyone who thinks that their business depends on the telephone. It probably doesn't.

Martin Pickering,
Sandbach, Cheshire.

Fake semiconductor devices

While repairing a Phonic 740 mixer/amplifier I came across an apparently widespread problem – fake semiconductor devices. The output stages in this model use a complementary pair of Toshiba 2SA1943/2SC5200 output transistors. In one channel both of them had blown, along with various other driver and bias transistors and resistors.

After obtaining all the parts required, which was no easy task, I fitted them then applied power – via a series light bulb, just in case. All appeared to be well, so a full-mains test was carried out. This also appeared to be OK – until the power output was tested. This amplifier is rated at about 200W per channel. At about the 20W mark it went pop! The 2SA1943 had gone short-circuit, along with a couple of other components. I decided to crack open

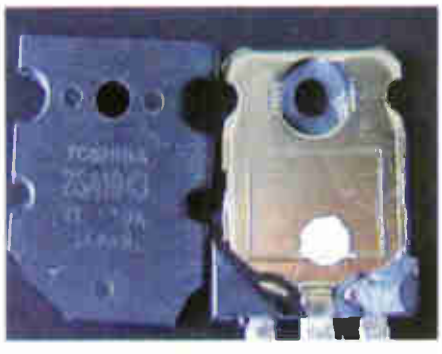


Photo 1:Internal view of the fake Toshiba 2SA1943 transistor.

the case and noticed that the die size was tiny in comparison with that in one of the removed faulty devices. The good devices are also extremely difficult to get apart.

I took a photo of the offending replacement transistor (see Photo 1) and sent it to Toshiba for verification. I also sent a copy to the supplier, a well-known distributor. Toshiba said it would deal only with the distributor, who sent me two new devices, this time made by Fairchild.

I subsequently surfed the web and came across a good website that goes into detail about fake semiconductor devices: www. sound.westhost.com/counterfeit.htm

I have also come across articles, at diyaudio.com, which describe how to carry out some basic tests to make sure that devices are genuine.

I still have doubts about the Fairchild devices I received. Their Hfe seems remarkably high at 130. Good devices are more in the region of 60. The fake device I have is about 160.

Have other readers had this problem?

Bob Fisk, Thames Ditton, Surrey.
bob@bfisk.demon.co.uk

A videotape problem

I've recently encountered a problem with the TV range of TDK videotapes. Three VCRs have come in for repair, each with this type of videocassette jammed or stuck in the mechanism. The problem is that the identification label is stuck to the underside of the cassette. If it was on top, the problem would not occur.

Fortunately there was no major damage to the three VCRs. Have other engineers had this problem?

I found the article on Betamax machines (September) excellent. For many years I repaired Betamax equipment, and I've collected a number of items from this era. It's nice to know that they are still worth something. To this day I continue to use a Betamax camcorder which, in the right conditions, produces excellent pictures.

Steve Roberts,
Mallaig, Inverness-shire.

Editorial note: Our apologies to Colin McCormick, author of the Betamax article, for leaving his name off. This was due to an editing slip.

Vintage car radios

I would like to comment on J. LeJeune's article on vintage car radios in the August issue. I first worked on car radio receivers in 1948, when many that came in for repair dated from pre-war days. During the heyday of valve car radios five, six or more valves was the norm. It was not until the dual AF triode/output pentode came along that the number of valves was reduced to three or four.

Generally speaking battery consumption was about 2-3·5A with a 12V system, double that with 6V. Unless your car battery was in a pretty poor state, you would have had to have sat listening at the roadside for a good few hours before it drained so much that the starting handle would be needed! In those days, and for a long time after, the law required side and tail lights to be shown on parked vehicles during lighting-up hours. Thus car batteries were designed to cope with lengthy current drains, as so-called 'leisure batteries' are today.

On the question of valve heater voltages, 6·3V and 12·6V were regarded as average for nominal 6V and 12V batteries at half charge. Just before WW2 some US valve manufacturers introduced loctal-based types with nominal heater ratings of 7V and 14V to suit 6V and 12V batteries on charge but, after a few years, these valves were de-rated to the standard 6·3V and 12·6V.

Philco sets epitomised early car radios. They consisted of a main receiver and a small control head that were connected by Bowden cables. The main unit was normally mounted on the transmission 'hump' below the car's parcel shelf, not under the bonnet, with the control head placed conveniently for the driver's hand. Buzz from the vibrator was not intrusive when the car was in motion. Philco favoured the synchronous (self-rectifying) type of vibrator. When a valve rectifier was used it was normally a full-wave type such as the 6X5GT. The OZ4 cold-cathode rectifier was never widely used, possibly because it tended to generate interference. I can't remember ever seeing a conventional selenium rectifier but, towards the end of the valve era, some radio manufacturers used contact-cooled types.

The only popular car radios I recall that had the main unit under the bonnet, linked by Bowden cables to controls on the dashboard, were the switched-tuning types made by Ekco from about 1948. This firm also supplied sets for fitting directly behind the dashboard, depending on the make of car. It produced some very sophisticated car radio receivers in the late Forties and early Fifties, some with excellent bandspread short-wave coverage and instantly adjustable preset tuning. Permeability tuning was much used: far from being cumbersome, it was extremely neat and took up little space.

After early flirtation with Mullard loctal valves Ekco adopted this firm's B8A range. Despite the availability of valves with 12·6V heaters, most British car radios made at the time used 6·3V heater valves for either 6V or 12V operation: in the latter mode the valves were wired in series-parallel across the supply. An example was another well-known car radio of the late Forties, the Smiths Radiomobile/HMV Model 100, which was specified by some leading car manufacturers for their most expensive models. Its construction, with separate main receiver and power supply units, made a number of different mounting arrangements possible. A push-pull output stage housed in an identical case to the power supply was available if a really large sound output was required. When this was used the existing output valve was employed as a driver stage. The 100 featured a tuned RF amplifier and push-buttons for tuning, wave-change and tone control. It could be used with either positive- or negative-earth systems without adjustment, reversible electrolytic condensers being used in the battery input filter network.

One of the smallest car radios of the early post-war period was made by Pye, in two versions for 6V and 12V operation, the consumption being 5·5A and 2·6A respectively. It was one of the few that employed an OZ4 rectifier. Unusually, 12·6V valves were used in parallel in the 12V version. Permeability tuning was used. Pye produced some much better car radios in the mid Fifties, including Models TCR13 (6V, 3·7A) and RCR14 (12V, 1·8A). They had an RF amplifier stage and were again permeability tuned.

Photo 2: Our thanks to Roger Goodman who provided this picture of a car radio vibrator unit.

Smiths Radiomobile came back strongly with the 200 series, which used six or eight valves depending on the type of output stage. Permeability tuning was employed. With 6V operation the consumption was 7·6A or 7·9A, by far the highest I have encountered with British car radios. These sets were also sold as the Motorola 600 and 800 series. Not to be outdone, Philco introduced six- and eight-valve sets that were virtual clones of the Radiomobile ones.

The Ekco CR227 with push-pull output stage provided a far greater power output than its rivals. It again used a combination of manual and preset permeability tuning, and had a comparatively modest consumption of 5A at 12V. Another set that ought not to be forgotten is the Philips X61V, which used seven valves and provided VHF/FM reception in addition to LW and MW. It even had a socket into which a Philishave could be plugged! Manual or push-button permeability tuning was used.

Many fine car radios of the Forties and Fifties could be mentioned, but the foregoing summary shows that multi-valve sets were in the majority compared with those that used four or fewer valves. At the other extreme the Defiant CR100 had just three valves (ECH81, EBF89 and ECL83) with a contact-cooled rectifier and permeability tuning. It was cheap if not very cheerful. You get what you pay for.

Oh yes, and there was at least one TRF car radio, the curious Kresta. This consisted of two units, one of which was in the form of a flattened tube that contained the two RF amplifiers, the detector and AF amplifier, with once again permeability tuning. It was fitted above the car's windscreen. The output stage and power supply were in the second unit, which was fitted under the dashboard.

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Is there life after TV repair?

If you find that TV repair work is drying up, there are plenty of other things you can do in addition or as an alternative to maintain your income. Martin Pickering, B.Eng. makes some suggestions

My own TV repair career was fairly short. It started and ended when I was fifteen years old, but made me some useful weekend pocket money. I was about to take a degree course at Liverpool University, after which I worked for GEC Telecommunications for thirteen years. During this time I repaired CB radios as another 'pocket-money hobby', and published a newsletter for other repairers.

That ended when I moved to Siemens Ltd. in Congleton, where I worked for three years before taking up a post as quality-control manager at Brother Industries near Wrexham. Two years later I was made redundant, and spent seven happy months spending my redundancy money and getting to know my children. When the money ran out I went to work in a satellite TV warehouse, and quickly learnt how to sell and how to repair the equipment. Three years later I was made redundant yet again. I moved into my garage, where I started my own satellite-receiver repair business.

There is work available fitting devices to caravans and motor homes, for example this rear-view camera mounted towards the top centre at the rear of a motor home.

Inset: the monitor in use as a rear-view mirror.

Business experience

This built up until, after just six months, I was making more than enough money to pay the mortgage and food bills. I saw the writing on the wall when, in 1998, BSkyB announced that it would start a digital service and supply free receivers to subscribers. It was clear that, even if the digital receivers were unreliable, there would be no repair market during the first year of warranty. So I had to think of something else to do.

In 1995 I had set up an internet web site that provided free information and offered repair kits and spare parts for sale. By 1998 it was not making anything more than the traditional pocket money, but I thought I may be able to expand it to make enough to live on.

Through my trade contacts I was able to buy accessories such as remote-control units very cheaply, selling them via my website at a reasonable profit. At that time I couldn't accept payment by credit card, and the Merchant Services were quoting me ridiculous rates to do so. Consequently I worked mostly on an honour basis, where I would send out the goods and the customer would send me a cheque by return. Most customers were wholly trustworthy, so my annual losses from bad debts amounted to only 0·18 per cent, which was a lot less than the credit-card companies wanted!

When analogue satellite receiver repairs died in 2000 I anticipated a huge dip in turnover, and appealed against my tax assessment so that the payment would be more realistic. But my turnover actually rose. So not only did I have to register for VAT, I also had to pay a penalty for unpaid tax. The internet mail-order business was actually going rather well.

By 2001 I was making quite a lot of money from mail-order. I had also begun to repair digital satellite receivers, but my success rate was poor. In addition my eyesight was deteriorating with age. So I handed over my repair business to Michael Dranfield, who is young enough to be able to read those tiny component markings!

By 2002 I was becoming too successful for my own health. I was working from 8 a.m. until midnight seven days a week, ordering stock and sending out packages. Fortunately I found a company that was prepared to share the burden. This company now handles the ordering, payments and despatch, while I look after the websites, the technical enquiries and new product development. There still aren't enough hours in the day, but at least I don't have to stuff padded bags!

So that's a brief description of what I now do instead of carrying out repairs. What can you do if the repair business no longer brings in enough to feed yourself and your family? Here are some suggestions.

Outgoings

Start by looking at your essential outgoings – the ones you cannot ignore, such as the mortgage, insurance, food, clothing and the expenditure required to keep things going. From that you can work out a bare minimum monthly figure. Add 30 per cent to cover tax and National Insurance contributions. A lot of people don't like to do this, because it frightens them and they'd rather not know. But I urge you to calculate this total sum, then divide it by thirty to get an approximate daily earnings requirement. The daily figure doesn't look too bad, although you will probably wonder how you will manage it. I know I did!

Now double that daily figure and call it your average daily earnings 'target'. That's what you need to

earn each day to live comfortably, take holidays and save a little. In my case it came to something like £100 a day, which works out at selling ten items and making a profit of £10 on each, or twenty items at a profit of £5 on each. That's actually not too difficult to achieve.

If you can no longer make a living from repairs, as you have been doing in the past, there are a number of possible choices.

Diversifying

You might be able to diversify and repair other equipment. In an industrial area all sorts of diverse repairs will be needed to factory equipment, such as public-address systems, high-power lighting, security cameras and video recording systems, charger units for fork-lift trucks, chart recorders, various types of control equipment; also to office equipment including printers, monitors and photocopiers. There's a market for computer repairs, but it's rather competitive – you might make more money by learning how to sort out computer network problems.

In a rural area there is less likely to be a demand for repair work of this type, but you would be surprised at how many farmers have electric fence units stashed away awaiting repair! There are also various control units that are used in milking sheds, and recent legislation means that a lot of vehicles now have to be fitted with rear-view cameras. Telephone extensions, loud outdoor bells and armoured cable are frequently needed on farms. Even CB radio has its place.

In many areas there is good work to be obtained by fitting various devices to caravans and motor homes (see previous articles by Tom Baker). And don't forget the general-purpose equipment used by dentists and doctors, including amalgam grinders, ultraviolet light units, intercoms and visual announcement displays, telephone and computer systems. Don't be afraid to have a look. I've made good money by installing and repairing intercoms and the like.

Restaurants have equipment such as extractor fans, coffee machines, heaters, deep fat fryers and various other items that are not very complex to repair or replace. Don't shy away from replacement. These businesses are usually desperate to get the equipment working, and a replacement is usually the quickest and cheapest solution. The old equipment could be taken away for repair at your leisure.

A change

The repair business can be very stressful, and you might feel that age is against you. Or perhaps you simply want a change? In this case you may be able to turn a hobby into a business, as my brother did. He quit his job of eighteen years and set up a small workshop to make fancy walking sticks. In addition he sells the bare wood and accessories to other stick makers via his website: www.uksticks.com.

He now makes a very good living, and enjoys every minute, making sticks and giving weekend lessons to others. What do you enjoy doing that could make you money?

Using the internet

Here's a very easy way to generate a small but continual income from the internet. I make about £200 a month in this way. Simply set up a website and fill every page with interesting information. Sign up with Google.com and put its special advertisement code on every web page. Whenever someone clicks on an advert for something that interests them, Google adds a few cents to your account. Yes, it takes time to create enough pages to make a significant income. But work on it, a page a day, and you'll soon get it done. You can see how I did mine at www.netcentral.co.uk/satcure/faqlist.htm

If you have no internet connection, it's time to take the plunge. You can buy and sell via the internet and get all sorts of useful information, at very little cost. If you have a 56k modem you can connect, without signing any contract, and all it costs you is the price of a local-rate call. I don't want to put the number I use here, because it may change, but look at this web page (go to your library if you can't access it in any other way): it has the latest information www.satcure.com/television/
If you intend to run a business on the internet you will need a broadband connection (if available in your area). You can check availability by area at www.internet-central.net/broadband

The advantage of broadband is that your telephone works simultaneously on the same line: it's like having a separate line for internet use.

You can pay £30 a month or more for a business broadband connection, though you might get away with a 'home user' account if your usage is light. That would cost between £15-£25 a month. This might seem a lot, but it's less than £1 a day – a heck of a lot less than shop overheads!

The internet provides all sorts of opportunities. Here is one of Martin Pickering's web pages.

And do you really need a shop? If you are running a small mail-order business you can probably work from home. If you get someone else to handle the orders (as I did) you can definitely work from home.

A popular way to work on the internet is as an 'affiliate'. This simply means that you pass customers to a website that sells particular items and, if that customer buys something, you get a percentage of the profit.

Another way is to 'drop ship'. You keep no stock at all: when a customer orders some goods, you take the payment and pass the order to a shipping company that arranges delivery and invoices you at the trade price at the end of the month.

Another popular way is to sell items via an auction site such as 'ebay'.

You can get more information, help and advice on this sort of thing by joining (free) one or more discussion forums such as www.betterwebspace.com

For just £22 a year this company offers you your own website name (e.g. www.mybiz.com) and space on a server to upload your files, as well as unlimited email addresses and a user-friendly 'control panel' that makes everything really easy to do. There are plenty of other similar offers, but I can recommend this one for reliability and ease of use (I get no commission, I'm just a satisfied customer!). ■

Bench Notes

Adrian Gardiner describes an epic battle with a Sony hi-fi system that had multiple faults, in particular with the MiniDisc section. There's a moral to the tale!

A compact, 'flat-profile' Sony hi-fi system, Model HCD-MJ1, arrived on my bench a few weeks back. It's a complete system, comprising a dual-band tuner, a CD player and a MiniDisc recorder. Having battled with one of them in the past, I really didn't want the job – especially as the customer listed multiple faults. So, without even looking at it, I had given a high estimate. As tends to happen in such a situation, the customer then gave the go-ahead! So, after putting it off for a week, I settled down one Tuesday afternoon to what was the start of an in-depth relationship with the unit.

Multiple faults

The fault list was as follows: (1) random behaviour; (2) sometimes no operation at all; (3) loses stations; (4) MiniDisc section dead; (5) CD section faulty.

To dismantle the unit is no mean feat. Start by removing the back panel, then remove seven screws from underneath the unit and lift off the top. Be careful when doing this, as the switch panels are screwed to the top and are attached to the main board by a ribbon cable. Inside, the unit consists of multiple boards that are interconnected by ribbon cables. To operate the unit when it has been dismantled calls for a lot of care with the various boards. It can however be operated without the tuner, CD or MiniDisc section connected.

Having dismantled the unit I gave the main control/power supply panel, which is mounted on top of the amplifier board, a good visual inspection. This revealed a likely cause of the first three faults: the 1F back-up capacitor C852 was leaking electrolyte. A replacement was ordered from Sony, part no. 1-110-489-11, and was subsequently fitted. This restored normal functions and storage of preset radio stations.

But operational tests confirmed that the CD and MiniDisc sections were still faulty. The CD deck refused to read any discs I inserted, and the entire system crashed when MiniDisc was selected, resulting in a blank display.

The CD deck

The CD deck is straightforward, being based on a standard KSS213 laser. Getting at it is another matter however! The display board has to be removed first, along with the main control board. Several metal plates then have to be removed. The CD mechanism can then be unscrewed and removed, complete with the CD board.

I had assumed that the optical pickup would be the culprit but, on removing the mechanism, dry-joints were clearly visible on the underside of the CD board. These were attended to, and the soldering of the RF amplifier/servo control IC was reflowed. This all proved to be worthwhile, as the CD section now worked. Unfortunately the MiniDisc section wasn't going to be as straightforward.

The MiniDisc deck

I have never liked MiniDisc units, and they've never liked me! The unit in the MJ1 consists of three main parts: the mechanism, the control board and the 'digital' board, which handles all the signal processing. As mentioned above, when the MiniDisc section of the hi-fi system was selected the whole lot appeared to crash, with no further operation.

A common cause of this with Sony units is a defective optical block. You can test by disconnecting the block from the control board. Before you do this be sure to bridge out the laser diodes, as they are extremely sensitive to static. You don't want to risk damaging the block if it is not faulty!

Unfortunately carrying out this test with the MJ1 means a complete strip down. As I pulled the unit to bits I noticed that it had been 'got at'. Two ultra-flexible ribbon cables connect the control board to the digital board, a 30-way and an 18-way one. The larger one was torn! In addition, the overwrite head was badly mangled. Why do customers do this?!

A new 30-way cable, part no. 1-769-118-11, was obviously required before I could continue. When it arrived I was hopeful that it would restore MiniDisc operation. It didn't: the unit remained dead. So I disconnected the optical block and applied power. Success: the MiniDisc section now responded, proving that the block was faulty. Another order went off to Sony, for a replacement block, part no. 8-583-009-11, and a new overwrite head, part no. 1-500-304-21.

Care is required when fitting these parts. The mechanism separates into two halves when its four corner screws are undone. When reassembling it, ensure that the optical block is at the rest position, nearest the spindle motor, otherwise you may end up with another mangled overwrite head.

Once I had reassembled the mechanism I switched on and at least it was alive. But this was not the end of the tale! A horrible noise came from the deck, and the optical pickup moved smartly to the outer edge of its travel and attempted to continue moving. The life of the new overwrite head looked very precarious. I quickly reached for the mains plug.

I checked my work carefully, but failed to find anything amiss. So, after returning the block to its correct position, I reapplied power. This time there didn't seem to be a problem. Confused as to what could have happened, I inserted a disc. The unit took it in happily, then promptly went into its self-destruct mode again!

On further investigation I became suspicious of the other ultra-flexible cable that links the control and digital boards. When I flexed this 18-way ribbon cable I was able to instigate the damaging behaviour.

Still faulty

On Tuesday afternoon, week three, I again sat down to repair the Sony HCD-MJ1. A shiny box had arrived from Sony, and I was confident that it

would solve all my problems. Inside it there was an 18-way ribbon cable, part no. 1-769-119-11. I fitted it with great care, then applied power. The unit sprang to life. I selected MiniDisc at the front control panel, which was balanced somewhat precariously as the unit had not been reassembled. When a disc was inserted, the unit responded: it sat there 'chattering' away, trying to read the disc's table of contents. And there it continued to sit, trying to read the TOC.

How can one unit have so many faults? This question went through my mind repeatedly. In addition to failure to read the TOC, the unit refused to eject the disc: it seemed to crash the microcontroller chip when eject was selected.

Normally when you replace the optical block in a Sony MiniDisc unit you will get away with just installing it. But Sony suggests a fairly lengthy set-up procedure that involves adjusting the laser power, traverse, focus bias and an error-rate check. I concluded that my present problems were caused by the need to set up these various parameters. The exact procedure is too long to describe here, and the service manual is required. You start by selecting the service mode however: press the bass/treble, clock and MD buttons simultaneously.

When I put this unit into the service mode there was more strange behaviour. Every time I tried to select the various settings the unit just froze, and the only way to reset it was to remove the power. I clearly had another major problem.

When I keyed the model into Sony's assist program a technical bulletin that suggested the cause came up. The main suspect was the primary digital signal decoder chip IC121. This is a 100-pin flatpack device that lives on the control panel. A modified version is now supplied, type CXD2535BR, part no. 8-752-375-36. The EEPROM should also be replaced. Several settings in the EEPROM are then altered to new values. So another order went off to Sony and, to remain consistent, I awaited the following Tuesday to fit it!

Nearly there!

The MJ1 had been such a trial that I was no longer confident of success after fitting the replacement digital signal decoder chip and EEPROM. I applied power, entered the service mode and initiated the EEPROM settings in order to enter the modified values. After that the unit no longer crashed, and appeared to update OK. So I took the bull by the horns and prepared to perform the full optical block set-up. This time there was success and, after about twenty minutes of careful effort, I was more than happy with the results.

I inserted my original disc. The unit attempted a TOC read and successfully displayed the results. It also played correctly, and seemed to record all right. Eject was then selected, which is where it went horribly wrong. The unit had failed to write a TOC and promptly crashed again. The way to reset it this time was to disconnect the power and remove the disc manually. The whole procedure could then be repeated.

Tests on the MD micro IC201 showed that the appropriate output pin went low when eject was selected. When I checked at the BA6287F motor-drive chip IC431 I found that the signal reached it. But the IC appeared to ignore the request, so it had to go!

A replacement, part no. 8-759-040-83, was ordered and duly arrived. After fitting it the unit at very long last worked as it should do. TOC writing now took place correctly, and the disc was ejected on request. All that was now left to do was to reverse the dismantling procedure and return the unit to its very patient owner.

Moral

So, did I learn anything from this experience? Yes! Never again try to avoid a repair by quoting high!

Test Case 502

In addition to selling and renting equipment, the Test Case shop is responsible for a dwindling number of maintenance-contract TV sets. Some of them are incredibly old, but while the punters pay the annual fee and the workshop technicians can mend them, everybody's happy. One of these ancient sets, noted down in our records just as "JVC TV", was the subject of a phoned request for help the other day. When Todd arrived he found a set the like of which he'd not come across before, a 26in. JVC Model 7933TS. The complaint was no picture, though the sound was there in full measure and the tube's heaters were alight.

He decided to take it back to the workshop, where we found that it was fitted with no less than the Ferguson TX10 chassis (the later 1560/61 series version, which is relevant to some component reference numbers here). It's of similar age to Todd himself in fact, both dating from the early 1980s! On to Cathode Ray's bench it went. Then, armed with the service manual and all its clip-in supplements, Ray started on a hunt in what, to him, was unknown territory. He soon found that the EHT voltage and scanning currents were present, also a correct focus potential. But there was virtually no voltage at the tube's first anodes, pins 5, 7 and 11. Hence the missing picture. No problem here thought Ray, as he followed the link between these pins and the slider of the set-A1 potentiometer RV831 on the main PCB. He found about 70V, perhaps ten per cent of what should be present, at the supply end of RV831. So his next step was to check the BY584 flyback-rectifier diode D744, which is fed from the scan coils. The forward-voltage reading he obtained when he checked this diode was strange, suggesting that it might be faulty. There were no BY584s in the stores, so Ray took the suspect one to TV Ted who, after a checking it with his component tester, pronounced it OK – even though its forward voltage drop was about 1·8V.

The diode was refitted, then the values of the resistors in this part of the circuit were checked: R821 (150kΩ) in the feed to the control, the 2MΩ control itself, and R824 (1·8MΩ) which is in series to chassis. All were within a few per cent of their correct values. The VDR chain Z831-3 that's connected to the junction of RV831 and R821 was disconnected as a test, but this action had no effect on the low A1 voltage. Maybe there was something wrong with the 10nF reservoir capacitor C816, which is returned to the HT supply? A substitute again made no difference. By this stage veteran technicians Sage and Ted were taking a decided interest, both eager to have a crack at repairing the familiar old set.

Television Ted seized the initiative and hooked an oscilloscope to the cathode of D744, where he found a sawtooth waveform of many hundred volts peak amplitude. At the other end of R821 however there was the low potential of about 70V. What could account for this big drop across R821? Once again it was checked, this time by substitution, and proved to be OK. The resistances of RV831 and R824 were checked again and found to be correct. The VDRs remained disconnected, and the new reservoir capacitor (C816) was in place. Disconnection of RV831's slider didn't help. So exactly what was going on here? Old hands may well know the answer without referring to page 763.

DX and Satellite Reception

Terrestrial DX and satellite TV reception reports. Broadcast and satellite TV news. An LNB oddity. The Channel Is ITV link. Roger Bunney reports

Caption received via the ABC Scopus feed from Intelsat 10-02 (1°W).

Here's some exciting news! A check at the US website www.dxfm.com towards the end of July reveals, on the DXing DTV page, details of some digital DX-TV reception via Sporadic E propagation. At the end of May 2004 Matthew C. Settel of Bellevue, New England received KVBC-TV, Las Vegas, Nevada via SpE at a world record distance of 1,088 miles. The previous record, and first ever recorded SpE DTV-DX reception, occurred on 30 May 2003 when another US TVDXer received KOTA-TV, Rapid City, South Dakota ch. A2 at a distance of 1,062 miles. US DXers are also enjoying tropospheric DTV-DX at distances of many hundreds of miles. For details and pictures of US DX-TV successes, both analogue and digital, refer to the above website – where you can even view ch. A2 live.

Back to European analogue DX reception however. Conditions were excellent at times during July, though there were lulls that lasted for several days. There is also news of transatlantic DX. Here's a collated summary of identified SpE reception during the month.

1/7/04	TVE (Spain) chs. E2-4; RAI (Italy) chs. IA, B; TVA (Italy) ch. IA; Tele-A (Italy) ch. E2–; IRIB (Iran) ch. E2; JTV (Jordan) ch. E3; C+ (Canal Plus, France) ch. L2; STV (Syria) ch. E2. Several unidentified Arabic channels were received.
4/7/04	TVE E2; RAI IA.
5/7/04	TVE E2, 3; RAI IA; Italian private station at E2– (47·72MHz).
6/7/04	TVE E2, 3; RAI IA, B; Tele A ch. E2–; RTP (Portugal) E3; MTV (Hungary) R1; HRT (Croatia) E4; YLE (Finland) E3; Puerto Rica A2-5, see later.
8/7/04	ETV (Estonia) R2.
9/7/04	HRT E4; SLO (Slovenia) E3; MTV R1; RAI IA, B; C+ L2; YT (Ukraine) R2; BTV (Belarus) R1; LTV (Lithuania) R2.
10/7/04	RAI IA, B; HRT E4; Italian private station E2– (47·72MHz); PTP (Russia) R2.
11/7/04	HRT E4; SLO E3; RAI IA, B; Tele-A E2; TVE E2, 3.
14/7/04	RAI IA, B; Tele-A E2–; TVR-2 (Rumania) R2.
15/7/04	TVE E2, 3; RTP E3, 4; RAI IA, B; Tele-A E2–; ARD (Germany) E2; C+ L3.
16/7/04	HRT E4; RAI IA.
18/7/04	RAI IA.
19/7/04	RTP E3.
20/7/04	TVE E2.
21/7/04	RAI IA, B; RTP E3; C+ L2; MTV R1.
22/7/04	RAI IA; YT R2; LRT (Latvia) R2.
24/7/04	RAI IA, B; C+ L2.
25/7/04	RVE E2; RAI IA, B; C+ L2. Also auroral activity at up to ch. R3.
26/7/04	TVE E2, 3; NRK (Norway) E2, 3.
27/7/04	RTP E3. Enhanced tropospheric conditions in Eastern UK.

On July 23/24 a very large sunspot group across the Sun's centre produced geomagnetic storm (auroral) activity. Scanner monitoring of Band I on the 25th produced neither RF noises nor visual displays here in Romsey. But at King's Lynn Cyril Willis received auroral signal activity at up to ch. R3.

During an evening SpE opening on the 7th Cyril received weak ch. A2 video and Spanish audio from Puerto Rica. A check on exact offsets with his PCR100 computer program confirmed the presence of signals from WKAQ (Telemondo, San Juan) ch.A2; WPAM-TV (Mayaguez) ch. A3; WAPA-TV (San Juan) ch. A4; and WORA-TV (Mayaguez) ch. A5. Chs. A3, 4

and 5 were measured as signal-trace markings on the PCR100 board.

On July 5 at 1600 hours Hugh Cocks in the Algarve received WBCD News 2 (Charlestown, South Carolina) ch. A2 with a news programme. In addition a 'video soap' was present in ch. A3. Reception lasted for about an hour.

On June 26 Paul Logan (N. Ireland) again received US Band II FM radio. The stations were WHCF (Bangor, Maine) at 88·5MHz and WFRY 'Froggy FM' (Watertown, New York state) at 97·5MHz, the latter a world FM reception distance record.

Congratulations to Paul, Cyril and Hugh, and our US DX friends on their DTV-DX. Overall an excellent month.

Satellite sightings

A nautical theme was present during the evening of July 26 via the shiny new Intelsat 10-02 (1°W). It carried, at 11·589GHz H (SR 5,632, FEC 3/4), a UK regional TV item, probably BBC, from Sunderland, where an aircraft carrier's crew had apparently been given the freedom of the city. An interviewer was asking the usual "how do you feel?" type questions. The service identification was 'international' however, though uplinking was being carried out by the SoloSat facility. Meanwhile, at 11·494GHz H (6,109, 3/4), a Norwegian dockside event featured VTR inserts from a small motorboat that cruised between old three-masted sailing ships. Earlier, on July 16, there was another waterside event from Scandinavia via the same satellite, this time at 11·129GHz H (6,109, 3/4). I mention it not because of the content but for the camera rehearsal shots, which showed a rather odd production crew – they were all wearing striped nightshirts!

Eutelsat 2F3 at 21·5°E is in a heavily inclined orbit, over 3·5°, so the optimum time for reception with a non-tracking dish varies over the months. In recent months it has been missing during the afternoon and early evening – the best times for horse racing and regional inserts. Reception is possible later in the evening, and the time is likely to move back to the early evening and then the afternoon. Most activity at present, in the late evening, is Irish and UK greyhound race meetings. Best spots to check are between 11·600-11·690GHz H, with SISLink in operation at typically SR 5,632 and FEC 3/4. On July 24 for example SIS trucks 03, 17, 20, 27 and 28 were active with horse racing at Lingfield, Wexford and Leopardstown and greyhound racing at Sittingbourne, Kent. During a check at 2020 on July 26 most feeds were unidentified, apart from dogs from Nottingham. The horse-racing channel At the Races was seen at 11·688GHz H (5,632, 3/4, SIS 20) but then changed frequency to 12·519GHz H (4,226, 7/8, UKI 888 P1) – odd that.

The Tellytrack downlink via Europe*Star-1 (45°E) at 11·495GHz V (3,253, 7/8) is one source of international horse racing, including UK afternoon/evening meetings. Tellytrack is undergoing an identity change to Tellytrack International – a check on the 'hidden identification' that RSD receivers can display in their menus revealed 'MCCNETWORK'.

During the late evening of the 23rd there were dramatic pictures of the opening of the rebuilt river bridge at Mostar, Bosnia. The historic bridge had been destroyed during the warring in the area in the Nineties. Masses of people attended, some jumping from the bridge with flares. There was a large choir, also bands and coloured floodlighting. APTN's UP4 lease via Eutelsat W1 (10°E) carried the pictures at 10·972GHz V (4,167, 7/8). Sky News took the pictures, with a four-second delay between the UP4 feed and the Sky downlink at 28·2°E. On the previous evening curious things happened to the UP4 path. During Security Council reporting from Washington there were abrupt signal-level variations from 30 to two per cent down, settling at about 40 per cent (the normal level with my 1·2m dish), but the signal fluctuations then returned, rising to over 50 per cent. There was no heavy rain fade at the time.

As noted in the news section below, there are changes to ITV regional hook-ups. On July 12 Anglia was seen using a non-BT sat truck. A signal was present at the usual BT TES-42 slot (12·538GHz V, 5,632, 3/4) via Telecom 2D (8°W), but no pictures appeared. A scan across the slot revealed that another facility company, SNG Broadcast London, was providing the link. The usual BT PIDs are audio 1 0256, audio 2 0257 video 0308, PCR 8190 and txt 0000. SNG Broadcast was using 4195, 4197, 4194, 4194 and 0000 respectively.

Prize-giving ceremony at the Canadian Molson Indy 2000, Toronto. Received via Atlantic Bird 1 (12·5°W).

Adrian Howman (Fakenham) says in an email that he has checked on Alan Richard's suspicion that there's a second signal hidden under TVSA via PAS 3R/6 (43°W) at 12·613GHz V. He has found that this is Televisa Frad, which has an SR of 1,560 (FEC not reported). It's a very critical signal to locate. Adrian uses a Coship 3188C blind-search receiver, a 1·2m prime-focus dish and a C120 LNB (0·6dB noise figure) fitted with scalar rings.

At about 61-63°W, beyond my horizon of visibility, Adrian is receiving a high-level noise signal (visible on his analogue receiver). It's likely to be digital data. Can anyone throw any light on this?

Alan Richards (Skegness) reports further signal sightings at 43°W: the Mexican channels XEW2 and XTV4. The signals, at 12·609GHz V with the low SR of 1,562 and FEC 7/8, are strong but can be 'touchy' with his Humax receiver. In early July Alan received a couple of interesting signals via Hispasat at 30°W. Spain is sensitive about Gibraltar, especially so when a UK nuclear submarine was about to dock on July 9. An RTVE report from the Spanish side of the border was received at 12·625GHz H (4,500, 3/4). On the 15th he received Marbella Tenis (their spelling!) with the Nations Senior Cup, played at over 25°C. This was a few miles down the road from Gibraltar. The signal was at 12·640GHz V (6,750, 3/4).

Atlantic Bird 1 (12·5°W) carries occasional traffic other than the GlobeCast multiplex at 11·016GHz H (20,145, 3/4). On July 11 there was the Molson Indy 2000, 2004 racing from Toronto, Canada at 12·657GHz H (13,328, 7/8), with the prize podium flanked by real Mounties (the RCMP). Service ident Sure Connect was flanked by the 'hidden' ident DCI.

Broadcast news

Denmark: It's uncertain whether any DTT transmitters are on air yet but various channels have been allocated, as follows: Jyderup ch. E65H; Koebenhaven Vest ch. E51H; Vordingborg ch. E66H; Nakskov ch. E66H; Roe ch. E59H; Svendborg ch. E25H; Tommerup ch. E25H; Abevira ch. E37H; Varde ch. E54H; Videbaek ch. E46H; Fledensted ch. E54H; Aarhus ch. E44H; Flolstebro ch. E44H; Viborg ch. E47H; Thisted ch.

Test pattern received via PAS 3R/6 (43°W).

E31V; Nibe ch. E29H; and Tolne ch. E29V.

There has been DAB expansion, with a national network that uses channel 12C (227·36MHz). DR services include DR Klassik, Plus, Nyheda, Boogie Skum, Yase, Rock, Soft and DR Denmark. Commercial broadcasting is to use channel 11C (220·352MHz) in the east and channel 13B (232·496MHz) in the west.

Germany: During good tropospheric conditions a BDXC TVDXer recently received 525-line UHF signals from the AFN (American Forces Network) Shape transmitter at Geilenunchen (ch. E28V, 400W). At present there are about 25 system M AFN transmitters in operation. Most are low powered. The highest powered are in the AFN Atlantique network: Wiesbaden ch. E22H (2kW ERP); Kaiserslautern ch. E30H (3kW); Wursburg ch. E47V (500W); and Bitburg ch. E51V (5kW). AFN Shape has been received in the UK in past years.

RSL-TV: The Southampton and Portsmouth services have been taken over by the Oxford Channel. A new identification appears at the top right-hand corner. Locally we have a large SIX and, underneath Southampton. Both stations use channel E29H.

Satellite news

In the past the ITV network has used several uplink providers for national and regional hook-ups, including SISLink, BT, Links 'r Us and SNG Broadcast. ITV has now negotiated a single-source contract with SISLink which will, for the next five years, be providing ITV's news, sports and regional uplinks.

SISLink has for many years provided satellite uplinking and related services in the UK and Europe, and has in recent times covered conflict areas such as Iraq. SISLink trucks commonly use a vehicle-mounted dish, though trailer dishes have occasionally been used. In this new era however SISLink trucks are likely to consist of a single driver/operator car or Range Rover type vehicle, certainly for simpler operations such as regional magazine items, breaking news, etc., though trucks are still used at larger venues such as major sporting events – SISLink currently has over forty uplink trucks.

SISLink has developed uPOD, a small package that the publicity sheet describes as being "a self-contained, automated uplink". It bolts on the vehicle roof, can access inclined or stationary satellites, can handle digital and analogue (PAL/NTSC) signals, and can be PC or remote-controlled. The dish is sectionalised and can provide single or dual uplinks. It's certainly the cheapest solution.

ITV is to use uPOD, which is likely to replace the BT TES trucks soon for regional action. It may therefore change from Telecom 2D (8°W) to another satellite such as Intelsat 801 (31·5°W) and use different PIDs, frequencies and polarisations – it may even encrypt!

Current BT trucks apparently downlink to BT's London Teleport. Regional satellite inserts are then microwave linked terrestrially to the relevant studio. I guess that SISLink will downlink directly to a large Ku-band dish at the relevant studio centre, thus saving BT line charges etc. The Meridian Southampton studio for example has a 1·8m Channel Master dish available. This will presumably be installed at the merged operation at Whitely near Fareham when the Southampton studio, former home of Southern Television and TVS, is vacated on December 31. It's to be demolished, with the site used for housing.

An LNB oddity

Very recently I 'received' programme material via Europe*Star 1 (45°E) at 12·365GHz, an unusual frequency. This occurred during a wideband scan when I had, inadvertently, set the receiver to scan 10·950-12·750GHz. I would normally set a low Ku-band scan to cover 10·950-11·750GHz. The scan ran off however and up popped a signal clearly at 12·365GHz. In discussion with Roy Carmen, he reported the same signal at 11·515GHz. He also provided the explanation.

With a Universal LNB the local oscillator runs at 9,750MHz for low-Ku band and 10·600MHz for high-Ku band. Now for the mathematics: 10,600 – 9,750 = 850MHz, and 12,365 – 850 = 11,515MHz (11·515GHz). As Roy comments, "one of the hazards of having manual LNB band switching", which I have!

The Channel Is ITV link

Expansion of regional services in the early days of ITV was dramatic and rapid, spreading to the Borders and North East Scotland by late 1961. One of the most difficult areas for ITV network programming to reach was the Channel Islands. Jersey being on the other side of the English Channel over a hundred miles to the south of the UK. The ITA, forerunner of the IBA, was faced with severe difficulties in providing adequate-quality rebroadcast signals on the Islands. There were no satellites then, and a microwave link from the UK, along the French coast then to the Islands via the Cherbourg Peninsula was not feasible.

The alternative was to receive off-air signals from the nearest UK transmitters that had adequate power, namely Chillerton Down ch. 11 (Southern Television) or Stockland Hill ch. 9 (Westward TV). These signals would be fed to the St. Helier, Jersey studios of Channel Television, the franchise holder for the Islands, for insertion of its own commercials and regional programmes, then rebroadcast from Fremont Point on the north coast of the island.

The island that's nearest to the mainland is Alderney, some 40 miles from Jersey, so a receiving station for cross-Channel ITV was established there. Fremont Point was to use ch. 9 with horizontal polarisation, the only one available for the Channel Islands service. It would minimise mutual interference with the RTF transmitters at Bourges (ch. F9) and Rouen (ch. F10). The Fremont Point transmitter was to operate at an ERP of 10kW.

The Stockland Hill (ch. 9 vertical) signal was more consistent than that from Chillerton Down and was therefore used as the main signal source. It would then be transmitted to Jersey via a micorwave link. Transmissions from Fremont Point towards Alderney had to be very low to minimise interference to both Stockland Hill and the Alderney receiving station. So those living on Alderney had to continue using high-gain aerials to receive ITV signals directly from Chillerton Down or Stockland Hill.

Use of stacked Yagi aerials at the Alderney receiving station proved to be problematical. A means of achieving higher gain with less interference pickup was therefore sought. Eventually

a large parabolic reflector dish was built on the descending slopes leading down to Braye Bay, pointing NW to Stockland Hill across the sea. Being on the slope provided additional screening from French TV signals and those from Fremont Point. But a cross-sea path can produce considerable variation in signal level, with severe fading – the latter particularly at sunset on hot, dry days. A further problem was that during enhanced tropospheric conditions there could be interference from the ch. 9 Winter Hill transmitter (Granada). The signals from the big dish were fed to a nearby tower which provided the microwave link to Jersey. Channel Televison opened on September 1 1962.

ITV colour arrived in 1969 and rapidly spread throughout the network, including Channel TV. The new service operated at UHF, and again the Stockland Hill transmitter was to be used as the source of signals in the Channel Islands. The ITA had by now become the IBA, and its research section looked into the problem of reception at UHF, taking into account interference of various types. This led to the invention of Sabre, an adaptive, active aerial that consisted of planar etched dipoles in long rectangular troughs that contained electronics. The latter optimised pickup in the forward direction, and signals that appeared off-beam by just a few degrees were automatically nulled out over a period of seconds. How this was achieved is roughly as follows. The output from each dipole was fed to a network for adjustment of amplitude and phase. The signals were then combined, the process maximising the wanted signal and cancelling out unwanted ones. There were sixteen dipoles in the linear array.

Colour transmissions from Fremont Point started in July 1976, using the earlier technology. The IBA ferried its newly-designed Sabre aerial system to Alderney in March 1977 and installed it on the mast there, just below a 20-aerial stack of conventional UHF arrays. Sabre lived up to expectations, and provided improved signal reception from Stockland Hill for the next quarter of a century or so.

The 30ft parabolic dish, now disused, that was originally installed at Braye Bay, Alderney for reception from Stockland Hill.

Situation today

During a recent visit to Alderney I found the 30ft parabolic dish for the Stockland Hill link high on the slopes overlooking Braye Bay. The dish now has a horizontal UHF dipole plus small mesh reflector mounted at the focal point but is out of use. A nearby ruggedised double-six FM array is aimed at the north west, taking the Band II output from North Hessary Tor on Dartmoor. The dish is in good condition, though at least two large bird's nests have been added. It's easy to stroll under and around the dish, and well worth the climb up from the beach.

The nearby lattice mast is impressive. It's the Alderney group C/D transmitter site. There are several receiving aerials on the mast, directed at the UK, including a large dual-bay Sabre system and two microwave dishes. Now of course a 60cm satellite dish standing on the ground provides constant high-quality network TV from the UK.

During a period of heavy TV interference the BBC fed Fremont Point and its relays across the Islands from Sky digiboxes (for BBC-1 and –2): I recall BBC Radio Jersey broadcasting a warning to terrestrial viewers to ignore the top corner red button on the satellite-derived signals. The BBC now supplies network output via satellite. Exiles in the UK can receive BBC-1 Channel Islands TV news directly via Sky.

The Alderney TV relay transmitter and mast. Sabre is the large boxed panel near the top of the lattice structure. The local group C/D transmission aerial is the thin vertical element atop the mast.

References

The Authority's Stations, a slim book published by the IBA in December 1992.

A description of the Sabre system can be found on the internet at www.tx.mb21.co.uk/features/sabre/sabre-twoth.asp

Also check for pre-1985 information on regional ITV at www.pembers.freeservice.co.uk/405 lines/

Both sites are highly recommended.

AUDIO FAULTS

Reports from
Martin McCluskey
Geoff Darby
Steve Roberts
Chris Bowers
Martin J. Abbott
and
Philip Rosbottom

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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Highbury Business,
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Bush MN35RM

The owner of this smart-looking blue and silver midi system said it had "gone off" after he had extended the speaker leads! Realising that this wouldn't be covered by the guarantee, he had then tried to dismantle the unit and, in the process, had pulled out the CD drawer too far. When I checked inside I found that fuses F601 and F602 (1·6A) had blown while the AN7164 audio output chip had a hole in the side of it. Sound was restored once these items had been replaced and the speaker leads had been attended to, but that left the problem of the CD drawer.

As I didn't have a service manual I had to reset the gears by trial and error, which is not as simple as it sounds. With the CD tray removed, turn the mechanism to the point where the tray would be fully out. Unclip the small blue cog from the baseplate, and line up its arrow with the dot on the large blue cog. Then turn the small cog one tooth anti-clockwise before clipping it back into place. Refit the CD drawer and all should be OK. **M.McC.**

JVC CA-MXG9BK

The complaint with this four-piece system was "CD fault". The first thing I noticed however was that none of the VFDs on any of the units worked. Suspecting a problem with the negative VFD supply, I went straight to the RX-MXG9 tuner/amplifier unit. A quick check at the heater pins of the VFD in this unit showed that the supply was indeed missing. This is always an easy place to check, with any manufacturer's equipment, as the AC heater voltage is 'floated' on the main negative DC VFD supply.

A look at the circuit diagram showed that the negative voltage is produced by a voltage-doubler arrangement, with C816 (220μF, 16V) the first capacitor in the circuit. It's a widely-used method of generating the supply, and it is very common for this capacitor to go open-circuit. So it proved to be here, a replacement restoring all the displays. The silk-screening on the underside of the PCB showed the polarity of the capacitor reversed compared with the upper-side marking, which agreed with the circuit diagram. I fitted the replacement to agree with the circuit diagram, i.e. the correct way round!

With basic system operation now in order, I turned to the XL-MXG9 CD unit. On test playability was found to be poor. The laser unit is an Optima 150S, which is generally very reliable. Its performance is readily compromised however when dust is present. It's not dust on the lens that causes most trouble, but dust that gathers on the critical-angle mirror inside the optical block. It is easy to clean.

First, manoeuvre the laser to a position that provides ready access. Carefully unclip the black plastic cover around the lens. Once this has been removed you can, if you shine a strong light into the top, see the mirror – with its dust – a few millimetres below the lens. Take a small-ended cotton bud and tease the end out to a point. Next use a small scalpel tip or something similar to move the lens, gently, as far to one side as it will go, being careful not to damage or distort the delicate suspension wires. Then, using it dry, carefully feed the cotton bud down into the gap created until you reach the mirror. Small movements will remove the dust and polish the mirror. Remove the cotton bud, again being careful not to damage the lens mount. Then proceed with a normal lens clean, using your favourite alcohol or whatever.

Refit the cover and finish the deck service by relubricating the slides, motor bearings etc. In at least nine cases out of ten you will find that the original performance of the laser has been restored, and that the repair will be long-lasting.

As a final measure the electrical set-ups should be checked, in particular the E-F balance, as the sensitivity of the pickup diodes can alter over the lifetime of the laser. When this happens the correct balance point shifts. **G.D.**

Panasonic SA-XR10

The job ticket that came with this rather elegant slimline AV amplifier/tuner said "crackles with the volume control after thirty plus minutes". I found this description odd because, as six audio channels have to be controlled at once, the unit employs a rotary encoder rather than a conventional potentiometer for volume adjustment. I left it to run on its internal tuner, set to a local station, and put it at the back of the bench. After about an hour I rotated the volume control up and down. There was indeed a loud burst of 'crackle' from the speakers, but this was actually a brief burst of full volume. If you rotated the control very carefully you could get this burst to remain on, but this wasn't going to do my test speakers a lot of good!

During the brief periods when I allowed the full volume to occur I noticed that the dB reading in the display didn't alter. I also found that the point at which the burst occurred during the encoder's rotation wasn't consistent. All this suggested a fault with the electronic volume control system, or the data fed to it by the system microcontroller. The former seemed more likely,

as the display remained correct.

There followed a few frustrating minutes while I tried to get the unit apart. It looks as if the top cover will slide off once the screws have been removed, but in fact the sides have to be removed by undoing the screws at the back of them, then sliding them backwards and upwards. By this time the system had cooled down and was operating correctly again so, with the top cover loosely in place, I left it to warm up while I studied the block diagram.

As the amplifier is almost entirely digital, this didn't help much. After the input selector chip IC801 all the analogue signals go to the AD converter chip IC101. At this point I decided that there was nothing to be gained by continuing with 'proper' fault-finding, and that it was time to resort to a can of freezer and a soldering-iron tip.

First stop was the digital signal-processor chip IC1014, to which the volume-control encoder is directly connected. It didn't produce any reaction. Next, mainly because it is easy to get at, being on top of a sub-PCB at the front left, I tackled the AC3/DTS/AAC decoder chip IC1002. A few drops of freezer on this IC immediately put a stop to the problem, and it was ten minutes before the fault returned – if the chip was left alone. Freezer again cured the problem, and I was then able to instigate it by applying the tip of my soldering iron to the top of the IC for five seconds. So a replacement was ordered and fitted. This provided a complete cure. **G.D.**

Hughes and Kettner WARP7

I have had the following fault on a couple of occasions now with this German-made 'combo' head guitar amplifier: the primary winding of the mains transformer goes open-circuit. It's a simple repair, but spares for this amplifier are no longer available in the UK as there is no appointed agent. A suitable replacement transformer can be obtained from CPC however, order code no. TF00648. Earlier this year the cost was £21.

Most amplifiers manufactured by Hughes and Kettner are worth repairing, but bear in mind that replacement parts/components will have to be obtained from various suppliers. **S.R.**

Aiwa ADF660

The tape speed was being reduced because of excessive tension on the supply side. The symptom had become progressively worse, until the point was reached where the last ten minutes of a C90 cassette were unplayable. There were several causes.

I had to remove the supply reel shaft from its socket and lubricate the socket with RS contact treatment oil (494-720). The shaft can be pulled from its socket without need for excessive force.

The guide on the left-hand pinch roller was causing excessive tape friction. Cleaning the guide with BIB anti-static cleaning fluid cured this fault. If the pinch roller is not misshapen, cleaning it will suffice.

To change the reel-idler assembly you have to remove the flywheels. The idler supplied wouldn't work in the play mode because the shaft protruded from its top side. The simplest solution is to change the tyre over to the old unit.

When the flywheels have been dismantled it's a good idea to clean the drive surfaces with isopropyl alcohol. Also retension the solenoid return spring.

After reassembling the unit, check the tape path with a known good test tape. I've found that a test recording on metal tape with 5kHz at +2dB on the right-hand channel is useful.

Recording drop-out and channel balance should also be checked. Inject 4kHz, 8kHz and 13kHz tones equally into the right- and left-hand channels from a good-quality chrome tape. The playback result can be monitored on the bar-graph VU meter display. Twitter on the display indicates drop-outs. If this is excessive from one channel, adjust the head-height nut. This is a micro-fine adjustment. It takes some patience to get optimum results. **M.J.A.**

Sony HCD-SD1

The sound would cut out after three or four minutes. The cause of the problem was on the connector PCB, where the connections to the audio output relay RY501 were poor. A quick resolder restored the sound. **C.B.**

Sony HCD-D117

The problem with this unit was intermittent FM reception. The cause was in the IF amplifier section, where there was a short-circuit in ceramic filter CF301. A replacement filter restored normal reception. Ceramic filter CF303 could cause the same fault. **C.B.**

Sony HCD-CP100

After twenty minutes the LCD section would show only one fully-lit, seven-segment section. Checks inside the unit with a voltmeter, a heat gun and a can of freezer proved that the cause of the fault was the main processor chip IC802. A replacement IC restored the display. The chip is glued as well as being soldered. **C.B.**

Sony HCD-ED1

This unit wouldn't read discs. A close inspection of the optical pickup and the spindle motor was carried out. The cause of the trouble turned out to be the spindle motor, M101, part no. X-4950-343-1. There was a hairline crack on the black plastic disc plate. As a result it was being pushed down too far on the motor's shaft and the laser was unable to focus. Replacement of the spindle motor base outsert restored normal CD playback. **C.B.**

Sony CFD-121

The CD door wouldn't close when the open-close switch was pressed. The cause was simply that the push-switch, part no. 169296011, was defective. A replacement restored normal open/close operation. **C.B.**

Sony HCD-SD1

When this unit was turned on a popping sound came from the speakers. The cause of the problem was on the amplifier PCB, where there were dry-joints at the two power amplifier chips IC801 and IC851. Resoldering them cured the fault. **C.B.**

Nikko STA301

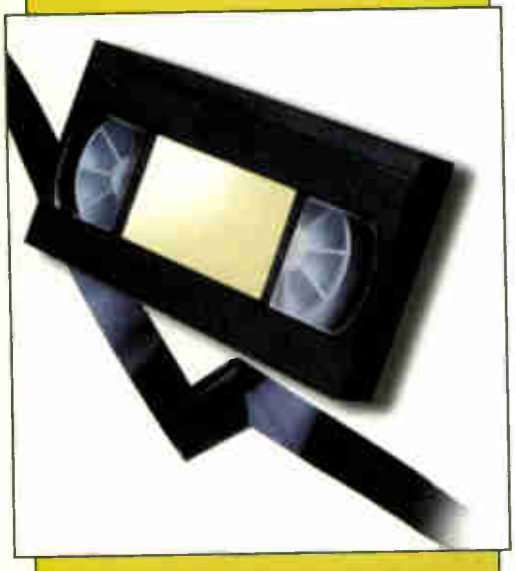
The ICs that Nikko had designed for the preamplifier in this tuner-amplifier, which dates from 1972, had expired. They can be replaced with two 5534s on small Vero boards as plug-ins. **P.R.**

Sony DTC1000ES

This large DAT recorder, which dates from 1987 and was the first model made, would work only after it had been switched on for at least ten minutes. In addition to hundreds of dry-joints, the 10μF, 16V electrolytics on the drum PCB, under the drum assembly, needed replacement. There are four of them (silver, surface-mounted). They were leaking and almost open-circuit. **P.R.**

Pioneer CT676

This cassette deck dates from 1991. The drawer had come off its locating slot and was loose, and the motor ran at full speed. An exact replacement motor can be obtained from CPC. It's easy to change: three screws hold the plate, which can be removed without further dismantling. **P.R.**



VCR CLINIC

Reports from
Eugene Trundle
Bob Flynn
Martin McCluskey
J.S. Ogilvie
and
John Coombes

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Panasonic NV-FJ620

Playback was erratic because readout of the control-track pulses was being upset by crinkling along the lower edge of the tape. The cause was a faulty pinch roller. We often get the problem with the deck used in this and contemporary Panasonic VHS VCRs, and now keep the part in stock. **E.T.**

Hitachi VTFX940E (later Philips Turbo deck)

Cassettes were ejected with a small loop of tape hanging out. The brakes were OK, and wind and rewind were faultless. The only clues were a jerky tape movement at the start of rewind, before it went to high speed, and a faltering take-up spool movement in play. The cure was to replace the clutch (item 115). **B.F.**

Sony SLV-SE20UX (S mechanism)

This machine would either refuse to accept a cassette or, when asked to eject it, would do so and then take it back in again. When a cassette was in the VCR, all the other functions seemed to be OK. The cure was to replace the centre LED for the two end-sensors. **B.F.**

Philips 14PV170 (Turbo deck)

Although the power LED went to green, this TV/VCR combi unit would not power up except for the loading motor trying to eject a non-existent cassette – even though the mechanics were in a fully-ejected state. Various things were tried with no result. In desperation I replaced the complete mechanism, but the situation remained the same.

With only the main board under the deck to check, I carried out a visual inspection and found some corrosion under C2802, which is an 0·22μF memory back-up capacitor. The two tracks that run between its legs were then found to be open-circuit. Repairing them cured the problem. **B.F.**

Sanyo VHRH900

This expensive (by today's standards) upmarket VCR, with picture-in-picture, came in dead. There were no functions and no clock display. Checks showed that the power supply was running, but the +5V output was very low. The cure was to replace the relevant reservoir capacitor, C5101 (1,000μF, 16). **M.McC.**

Samsung TI205C-DF

A problem you can get with these TV/VCR combi units is interference dashes on the playback picture. The cause is poor connection between a metal earthing 'spring' and the VCR deck plate. The best solution is to bypass this arrangement by soldering one end of a piece of wire to the 'spring' and securing the other end to the deck with a screw. Some Samsung VCRs suffer from the same problem.

Be careful, when working on the combi units, not to plug the pink and blue cables into the wrong positions on the TV PCB. **M.McC.**

JVC HRD455EK

This elderly machine was in showroom condition, but the playback picture consisted of distorted video with poor sync. In addition there was a hum bar on EE pictures. I removed the sub-panel with the mains transformer and DC regulator and used a digital meter set to AC voltage to check the various smoothing capacitors. There was over 3V of ripple across C23. Replacement of this 2,200μF, 16V electrolytic capacitor cured the problems. **M.McC.**

Toshiba V856B

There was very bad interference on the playback picture. It wasn't so bad when I took the top cover off, so I checked all the earthing on the deck. This was OK. The cause of the trouble eventually turned out to be CP051 (1μF, 50V) in the power supply – a replacement cleared the interference. **J.S.O.**

JVC HRS7000EK

This machine was dead following a power cut. So the obvious thing to check was the capacitors in the power supply. I found that C2 (2·2μF, 50V) was open-circuit. C59 and C60 were also open-circuit. The machine came to life once three new capacitors had been fitted. **J.S.O.**

Panasonic NVSD200

If the mechanism ticks when in the playback mode, replace the capstan flywheel (part no. VXP1519) and check and regrease the capstan motor. If this doesn't clear the problem, check the tension roller unit (part no. VXA4799) for wear. **J.C.**

Philips VR765

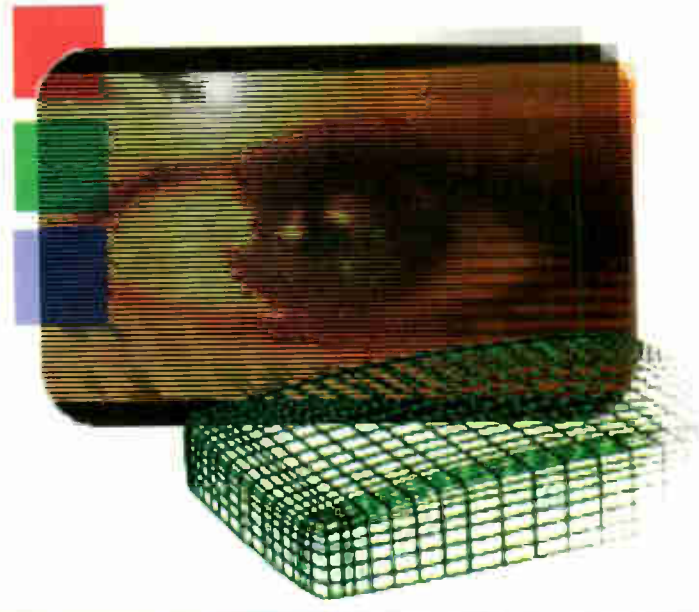
This VCR was dead. All the obvious things, like fuses and capacitors, were checked without any faults being found. The cause of the trouble turned out to be diode D6156 (type BYW98-200) which was short-circuit. **J.C.**

Panasonic NVSD200

There was low audio in the EE mode. The cause can be difficult to trace but is usually in the vision IF unit. Check for dry-joints at capacitor CO729. **J.C.**

Panasonic NVSD220

There was a warble on the audio. The cure was to replace C1, C2, C23 (all 22μF), C6 (47μF) and C22 (220μF). **J.C.**



TV FAULT FINDING

Reports from
Michael Dranfield
Philip Salkeld
Charles Ritchie
Eugene Trundle
Uel Harte
Bob Longhurst and
Mike Leach

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Sharp 51DT-25H

This set was stuck in standby. While I was carrying out some checks it came on and worked fine, so I resoldered some suspect joints and replaced the back. With the set now reassembled I tried it again and found that it was once more stuck in standby. Further checks showed that there was only 1·9V at the EEPROM's supply pin while the HT was low at 39V. So the cause of the problem was in the power supply.

The 560kΩ start-up resistors R704 and R705 had both risen in value to over 1MΩ. I replaced them with 0·75W, 350V metal-film resistors from Farnell. This cured the fault. I would have expected the power supply to produce no outputs at all with these resistors faulty. **M.D.**

Daewoo WP895

This set was tripping, the cause being a leaky BY228 diode (D403) in the EW modulator circuit. Simple faults always seem to turn into bigger ones however! Once a replacement had been fitted the set came on all right and everything seemed to be OK until teletext was selected. It then became apparent that the width was excessive with EW distortion. The cause was a shorted EW output FET within the TDA8358J field output chip (output at pin 8). A replacement IC was obtained and fitted, but now the width was insufficient. Scope checks at pins 5 (parabola) and 8 confirmed that the new chip and the EW modulator were working, so it seemed that the geometry just needed to be set up to cater for component tolerances. So another £20 odd was spent on a service manual with the setting-up adjustments.

To enter the service mode select program number 91, adjust the sharpness to minimum, exit all menus then quickly press red, green, menu in that sequence. Use the remote-control unit's programme up/down buttons to navigate through the adjustments, and volume up/down to change the values. Be warned however: the adjustments take place very slowly, and it's easy to conclude that changing the value has had no effect. For example the value for width default is given as –1100, and the value for vertical centring default is given as +3939. So, depending on how corrupt the EEPROM has become, you could be sat there for ages. Anyway, setting up the EW adjustments finally cured the problem. **M.D.**

Matsui 1436

The line hold was off frequency with this set. I adjusted it and resoldered a few dry-joints but a week later the set was back with the same fault. This time I replaced the line hold prreset VR481 and tested the set for a couple of days. It worked fine, but bounced again a week later with the same fault.

Now the line frequency is set by the components that are connected to pin 34 of the TA7698AP luminance/chrominance processor/timebase generator IC. So my plan was to replace any components connected to this pin. When I traced back from the pin however I found that R490 (15kΩ) was covered in hard, brown conductive glue. I scraped the glue off, but the resistor underneath didn't look too good. I removed it and found that its value had increased to 18·5kΩ. The glue attack was obviously increasing its value slowly. A replacement resistor was fitted and the set hasn't been seen since. **M.D.**

Ferguson ICC17 chassis

This set's power supply had blown up, with the BU2525AX chopper transistor dead short. I replaced quite a few components, but the power supply went bang again at switch on. The cause was eventually traced to slight leakage in TP42 (BC857B). I have decide in future with these sets to replace all four surface-mounted transistors in the power supply, TP42, TP57, TP58 and TP59. They are so cheap and easy to replace compared with the time taken to remove, test and replace. **M.D.**

Philips 32PW6006/05 (L01.1E chassis)

We've had a number of these sets in because they were dead. You usually find

the mains fuse black and the side blown off the chopper transistor. A power-supply repair kit is available from Philips, part no. 3122 785 90600. To avoid a call-back it's important to replace all the parts supplied. I've fitted a few recently and it has been good to see a Philips power kit going in with success first time. **P.S.**

JVC AV28GT1SJF (11AK45 chassis)

This set was dead with the chopper transistor Q102 short-circuit and the 0·22Ω, 0·5W fusible resistor R152 burnt out. Further checks in the power supply failed to reveal any other faults, so I ordered Q102, part no. VE-30001386, R152, part no. VE-30001224 and, for good measure, IC106, part no. VE-30011968. When the parts arrived I fitted them and switched on nervously, hoping for the best. The set started up perfectly. **P.S.**

Beko NR30128T

You don't get many field collapse faults with this chassis. As I didn't have the circuit diagram I decided to check the voltages around the TDA3654 field output chip. There were no voltages at any of the pins. Resistor checks were next carried out, and I found that R126 (5·6Ω) was faulty. A replacement rated at 1W restored the field scanning. In general these are excellent and fairly reliable sets. **P.S.**

Samsung WS28M64N

There was a strange fault with this set. The picture was fine, but with teletext there was a vertical judder. A phone call to Samsung produced the answer. Go into the service menu (standby, display, menu, mute, standby), select the video adjustment 2 menu, locate VSU and reduce it by three digits. In this case the VSU was at 110: reducing it to 108 brought the teletext back to normal. Nice to get help! **P.S.**

Philips 21PV688/05

This combi set was dead. I noticed that when it was switched on the line timebase started up then the set reverted to standby. Further investigation brought me to R3514 (1Ω, 0·5W) which was burnt out. I traced the connections to this resistor and came to the TDA8365 field output chip IC7510, where pins 5, 6 and 7 were short-circuit. All that was required to restore normal operation was replacement of these two components. **P.S.**

Samsung CZ21A083N (KS1A chassis)

The problem with this in-warranty set was line shift displacement. When I carried out a visual check I noticed two components that looked the worse for wear. With no circuit diagram available, I decided to trace their connections. This brought me to the line output transformer, so it seemed that they were associated with the line feedback pulses used for synchronisation. The two components were CR405S (4·7nF), part no. 2305-000382, and R414 (15kΩ), part no. 2001-001078. Once replacements had been fitted the set was back in correct working order. **P.S.**

Samsung WS28W6NS (KS3A chassis)

A problem I've had a few times with these sets is an intermittent loud crack with picture disturbance. The cure is to redress the degaussing coils away from the EHT cap. **C.R.**

Black Diamond BD29S (11AK19PRO chassis)

This set was stuck in standby. I zoomed in on the line output transistor Q605 and found that there was a short-circuit reading between its collector and emitter. Isolating pin 3 (HT) of the line output transformer proved that the short wasn't in the line output stage. Then, moving over to the power supply, I found that the HT rectifier D816 (UF5407) was short-circuit. All was well once a replacement had been fitted. **C.R.**

Sharp DV5131H (S3B chassis)

The fault with this set was intermittent field collapse. I've had it before with this chassis. During manufacture, C731 (0·1μF) and R507 (1Ω, 0·5W) are mounted on the print side of the PCB and are supported by glue. This glue tends to corrode the pins of the TDA8170 field output chip IC501. The fault can usually be cured by removing C731 and R507, cleaning off all the glue, resoldering IC501 then refitting C731 and R507 in their correct locations on the component side of the PCB. I don't understand why Sharp mounted these components in this way, but I suppose I shouldn't complain – it brings in extra work!

If you get field cramping with this chassis, check C712 (100μF, 35V) in the power supply. **C.R.**

Ferguson A14R (TX80 chassis)

I've had two of these sets in recently. The first one was dead with TP10 (S2000A3) in the combined switch-mode/line output (Wessel) stage short-circuit. No reason for its failure could be found, so I fitted a replacement and switched on. A whiff of smoke came from the scan coils. I switched the set off quickly and, fortunately, the new transistor had survived. I was able to salvage scan coils from a scrap tube. When they were fitted, the set worked perfectly.

The complaint with the second set was intermittent operation. This was cured by resoldering RP39 (6·8kΩ, 9W) in the standby supply. **C.R.**

Sony KP41DS1

The complaint with this rear-projection set was that the screen came up bright green then the set shut itself down. Checks showed that there was zero voltage at the cathode of the green tube because L731 in the 200V feed on its base panel was open-circuit. We replaced C735 and C737 as well, just in case they had been responsible. **E.T.**

Philips 20PV164/05

This 20in. TV/VCR combi unit was dead with its 4A mains fuse blown. As there was no measurable electrical fault we replaced the fuse and switched on. A puff of smoke from degaussing posistor 3310 showed that it was the cause of the trouble. **E.T.**

Toshiba 2500TB

These are old but good sets. This one's picture fault was reminiscent of those we got years ago with valve TV sets: lack of height, squashed at the bottom and stretched at the top. Very often C317 is the cause, but on this occasion another 2·2μF capacitor, C303, was responsible. It's in the feedback circuit. **E.T.**

Sony KV25K5U (FE1 chassis)

When this set was switched on all it did was to flash its standby light in sequences of two. This indicates that the set is in the protection mode, and we found that the 2SD2539 line output transistor Q533 was short-circuit between all three legs. Its demise had probably been caused by the hairline cracks around the pins of the driver transformer T531. **E.T.**

Tatung TUS9744C

This is an ancient set, but the owner wanted it to be repaired! The fault symptoms were no sound or picture, though the channel indicator lit up to show that there was some life present. Checks showed that the 18V supply was missing at the line driver and other stages. In this stereo/Nicam model it loops through the AV interface board, the one that caries the scart socket. This is where the cause of the trouble lay: there were cracked soldered connections to many of its plug/socket links with the motherboard. **E.T.**

Daewoo DVT2082

There was complete lack of sound from this TV/VCR combi unit, though the pic-

ture was present and all other functions worked correctly. We found that the TDA7056 audio output chip I601 was very warm to touch. A replacement restored the sound. **E.T.**

Black Diamond BD21T (11AK19B chassis)

The customer said that this set had been slow to come on and was now dead. Some quick checks revealed that the HT supply was at 87V instead of 115V. After disconnecting the feed to the line output stage the HT was still only 87V. The cause of the trouble was the HT reservoir capacitor C829 (47µF, 160V) which was open-circuit. **U.H.**

Grundig MW82-502IRDT (CUC2058 chassis)

If you find that one of these sets has a habit of blowing any of the three RGB amplifier ICs at switch on from cold, replace the CRT socket rather than condemning the CRT. **U.H.**

Samsung WI28W6VN

This one caught me out. The fault symptom was no picture. When I checked the A1 voltage I found that it was very low at only 78V, and that adjustment of the control made no difference. So I fitted a new line output transformer, which made no difference. Closer investigation revealed a 10nF, 3kV decoupling capacitor, C530, which was leaky. The part no. is 2201-000969. **U.H.**

Philips 21PV688/05

This unit was dead. The cause was quickly traced to the primary side of the power supply, where D6336 and the blue disc capacitor C2328 were both found to be short-circuit. The part nos. are 4822 130 31878 and 4822 122 50116 respectively. Replacements restored normal operation. **U.H.**

Toshiba 2181TB (C80 chassis)

This set was dead. The mains fuse was intact but the surge-limiter resistor R872 was open-circuit. There were no apparent shorts, so I accused the STR58041 chopper chip of being leaky. While removing it I noticed, by chance, a small blue disc capacitor, C812 (470pF, 2kV), with a burn mark. It's partly hidden by the heatsink. A new capacitor and resistor restored normal operation. **U.H.**

Sony KVM2151U (BE2A chassis)

The picture intermittently came in from the sides, with bowing etc. It was easy to clear or bring on the fault: just tap or flex the PCB. Simple I thought, just a matter of resoldering. Many obvious and suspect joints were attended to, but the fault persisted. The 'quick, profitable' job was becoming a nightmare. I can only say that eventually, after using magnifying goggles etc., I came across R807 (6·8kΩ) which was dry-jointed at one end. This little surface-mounted resistor is in series with the base of the EW driver transistor Q803. Job done once it had been resoldered. **B.L.**

Sony KV36FS70 (AE5A chassis)

This set would shut down intermittently for no apparent reason, sometimes after five minutes and sometimes after a couple of hours. It's a real monster, so we wanted it out of the way quickly! When it went off the standby light would flash five times. This indicates that there is a problem with the tube's cathode current (or AKB as the service manual puts it). A glance at the CRT base panel revealed two high-value resistors, R5387 and R5386, which are in the A1/G2 circuit. They should both be 820kΩ. When measured one was 962kΩ and the other 13MΩ! Only the two resistors were needed to fix this one. **M.L.**

Philips 21PV918/07

This TV/VCR combi unit was stuck in standby. I don't like these things, so I phoned Philips service which had the answer – in broken English. Replace transistors Tr7543 (BC847B) and Tr7547 (BC857B) in the protection circuit and be sure to clean off all the original glue beneath these surface-mounted components. I did this and had little confidence that it would work, but it did! It's obviously a common problem, but only if you know it! **M.L.**

Hitachi C2125S

This Vestel-based Hitachi set was said to be stuck in standby. When powered via the on/off switch these sets always go into standby. You can then turn them on with either the channel up/down on the local keypad or use the remote-control unit. In this case the local keypad wouldn't turn the set on, the remote-control unit would. When the set did come on none of the local controls had any effect. The cause of the trouble turned out to be the EEPROM, IC502. A replacement restored the local functions and all was well. **M.L.**

Sony KV21FV1U (BC5 chassis)

Sound was normal but there was no sign of any display unless the A1 voltage was slightly increased. This revealed a blank raster. So I obtained a circuit diagram and set about tracing the video signal path. As I had already confirmed that the outputs from the scart socket were correct, I checked the video input at pin 43 of IC301 (CXA2139S). This was correct. Further checks at the supply and the clock and data pins of this IC failed to reveal anything amiss, so I decided to order a replacement. When this arrived I fitted it. I always hate that first switch on, after spending some £30 on a calculated guess! I needn't have worried. A perfect picture appeared. **B.L.**

Matsui 32WN03SIL

This set was stuck in standby. It didn't take me long to discover that the line output transistor was short-circuit. Further checks drew a blank, so a new S2000AFI transistor was fitted. At switch on the line output transformer erupted, destroying the new transistor. By quoting the transformer's type number I was able to obtain an HR replacement, type HR8624. I had also noticed a rather sad-looking electrolytic capacitor in the power supply, CP14 (2·2µF, 400V), which proved to be open-circuit. Once these three components had been replaced the set was OK. **B.L.**

Sanyo CE14MT4B

The customer said "there was a pretty pink screen with perfect sound". On test this proved to be correct. The menu captions and teletext were a sort of washed-out whitish colour. I checked the CRT drive voltages and found that they were all slightly different. When I checked back to the RGB outputs from the TB1254AN jungle chip, at pins 20, 21 and 22, I found that there were three different voltages here as well. I desoldered these three pins, then touched each one to its respective solder pad. The green drive was the only one that produced a picture, the red and blue pins producing a bright, blank raster. A replacement IC restored the picture. **B.L.**

Bush 28ZKFWST66 (PAL1 chassis)

This set was totally dead with the 2·5A internal mains fuse blown and the chopper FET short-circuit. Being aware of other Bush blow-ups, I decided to obtain a manual. I then checked various possibilities, to no avail. So I decided to replace the STP4NA60FI chopper FET TP2 and the TEA2262 chip ICP1. After fitting a new fuse I switched on and waited for the bang. There was no bang, and when the set was brought out of standby it worked perfectly. Phew! **B.L.**

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J Edwards

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Fault

Reoc TT7 (Beko 14.1 chassis)

This brand name is used by the Safeway supermarket group. The problem with the set was no audio, just a quiet hiss. There was sound when a signal was fed to the scart socket, so I concentrated on the Micronas MSP3410P Nicam procesor chip IC301. I fitted a replacement and also changed the associated 18MHz crystal, but this made no difference. A glance at the circuit diagram showed that there are virtually no peripheral components associated with the Nicam section of the chip. There are a couple of 10nF decoupling capacitors, C236/7, which I replaced. But there was still no sound.

Then it occurred to me that the sound system could be incorrectly set in the menu. Using the service handset, I went to the system menu and found that it was correctly set to PAL I. But the sound menu showed that the receiver was set for BG, and this couldn't be changed.

Normal sound was restored by replacing the EEPROM chip IC402. Why it wouldn't allow me to select PAL I in the sound set-up I don't know. But beware of this possibility. **A.D.**

Bush WS6677 (11AK19 chassis)

The set would come out of standby but wouldn't produce a raster. Normally it's a bread-and-butter fault, but this time it was a bit different. The line drive is produced by the TDA8843 jungle chip IC401, at pin 40. There was no line drive here, and no oscillation at pin 35, which is connected to crystal X401. I replaced the crystal, then the associated capacitor and resistor, and after that the chip itself, all to no avail.

Then I remembered a similar problem with another chassis that uses this Philips IC. Pin 9 of the chip is used to decouple an internal reference voltage. The reading here should be 6·75V DC, but was only 4·5V. In this set there's a 22nF, ceramic disc decoupling capacitor here (C406). A replacement cured the fault.

The internal reference voltage controls most functions to some extent. Different voltages, depending on the capacitor leakage, cause different symptoms. A check on this voltage at an early stage could avoid a lot of headscratching. **A.D.**

Bush 1435 (11AK36 chassis)

This set wouldn't come out of standby – the red LED remained on. Another engineer had had trouble with it, and eventually it came to me. The microcontroller chip had been replaced, so this wasn't to blame. Incidentally the PCB has 56 holes for the chip, but some sets are fitted with a 42-pin device. The smaller IC is a non-text chip.

Microcontroller chip reset is at pin 2. There should be a change from 0V to 5V just after the chip's supply pin 1 goes high. In this case the voltage at pin 2 remained low, leaving the chip in the reset mode.

The reset pulse delay is controlled by a transistor, a zener diode, three resistors and an electrolytic capacitor. None of them was responsible for the trouble. The cause was the fact that the 5V supply was low at 4V, which is insufficient for the zener diode to conduct and turn the transistor on. The 5V supply comes from Q805, which is shown as a transistor in the circuit diagram but is in fact a 3-pin 78L05 regulator. A replacement restored normal operation.

There are at least four versions of the circuit diagram for the 11AK36 chassis, and none are up-to-date. Most Vestel circuit diagrams are available at the company's website, but you require a password and an account number. **A.D.**

Thomson 28WF201G (type 446X, ICC17GB chassis)

This Polish-made widescreen set would produce only a flashing LED at the front. It wouldn't start up when the remote-control key was pressed. The flashing code from the LED was two flashes then seven, which means that the set is in the protection mode. The customer said that he had seen dramatic variations in picture size before the set went off.

It has been mentioned in these pages before that RP63 (432kΩ) in the chopper power supply can give trouble. It's in the HT sensing circuit for regulation via the optocoupler. So I took this tiny resistor out and checked it. The reading was about 2kΩ high. I thought it best to fit a replacement, but didn't have this unusual value in stock. So I made up a temporary network of four resistors in series (330kΩ + 100kΩ + 1kΩ + 1kΩ) and soldered it in. This at least proved that the cause of the fault didn't lie here!

I then noticed that CL25 (1μF, 25V) in

the line scan circuit was venting its top. There's a good circuit of this area on page 602 of the August 2002 issue of *Television*. I also noticed that the red-bodied scan-correction capacitor CL24 (360nF) was swollen. Indeed CL24 had a molten impression on it of the metal tab of the adjacent thyristor (TL51). When checked CL24 proved to be open-circuit.

The set ran normally once these two capacitors had been replaced. But I was dismayed to notice that with captions and teletext the verticals were bent inwards. This was because the EW output transistor TL41 (BD241C) was short-circuit collector-to-emitter. It's mounted on the rear metalwork. A new transistor completed the repair – a TIP31C seems to be suitable here. **G.H.**

Mitsubishi CT25B2 (Euro 11 chassis)

The line output transistor Q522 (2SD1878) was short-circuit because the HT was too high. As usual, replacing C905 (470μF, 35V), C906 (47μF, 50V), C909 (2·2μF, 50V) and C920 (100μF, 25V) in the power supply put that right, so a new line output transistor was fitted. At switch on it all looked as if it was going to work, but nothing appeared. Z551 (SOC2000) was open-circuit because the EW chip IC551 (TEA2031A) was short-circuit. When these items had been replaced there was a raster that was stretched in the top half and cramped in the bottom half, also no teletext.

Suspecting a corrupted EEPROM, I replaced C958 (1,000μF, 16V) which can cause this then switched on to check the EEPROM settings. I found that teletext had returned, but the field scanning was still distorted. As the EEPROM settings were normal attention was turned to the field circuit, where C454 (4·7μF, 50V) was found to be the cause. **B.F.**

Philips 25ST1750 (GR2.2 chassis)

The complaint was "dead set", but the power supply was tripping. Cold checks showed that the line output transistor Tr7545 was short-circuit. There were also poor joints in the line driver and output stages. These were attended to, then the HT was checked with a dummy load fitted and found to be correct. So a new BU508AF line output transistor was fitted. When the set was switched on a violent flashover shot from the line output transformer, instantly blowing the new transistor.

An estimate was provided and accepted but, when the new transformer and transistor were fitted, there was no sync and no sound because the TDA2579B timebase generator chip IC7470 had been damaged. There was an excellent picture, and sound, when a replacement had been fitted. But when teletext was requested only a blank screen with random characters appeared.

The text PCB in this model is pluggable, and fortunately I had one from a scrap set to complete the repair. It was a sharp reminder of the dangers of estimates. **A.J.**

Thomson 72MK89DU (ICC11 chassis)

As these sets age, a couple of unusual fault symptoms are showing up. One is intermittent sound, another is intermittent or no remote-control operation, sometimes with the letter P in red present at the bottom left of the picture.

The cause is the EEPROM chip IR003. But reinstallation and setting up are required. If the faults are intermittent it's worth entering the service mode and noting the contents of the original device. This can save a lot of setting up time. IR003 is available from Thomson spares, the part no. being 10097100. **A.J.**

Sharp 76FW54H (DA100 chassis)

The complaints with this 32in. widescreen set were slow to come on and picture small. On test the set appeared to start normally. EHT rustle was heard, but the green LED then went out again as the set reverted to standby. This cycle occurred a few times, then the picture appeared briefly – only on the right half of the screen however, the left half being blank. But a full-width teletext option could be displayed.

When we switched the set off and attempted to start it again in the service mode it wouldn't come out of standby. The cause of the problem was a corrupted EEPROM chip, IC1003 (part no. RH-IX1603BMZZ). Once a replacement had been fitted the faults had all gone and only retuning was required. **A.J.**

Thomson 52RW87E (ICC21 chassis)

The complaint with this huge and very inaccessible 52in. rear-projection TV set was no sound or picture with the red LED flashing. When I tested the set it made three attempts to start. During these delayed attempts EHT was heard then the set went into the protection mode and displayed error code 33.

Cold checks in the power and deflection circuits were fruitless, so a service manual was ordered. The error code information in the manual describes code 33 as "deflection safety circuit has detected a problem". The HT supply was correct but, as the set went into the protection mode so quickly, other voltage checks were initially of little help – until I finally started to make sense of the operation of the protection system, following paths over several pages in the manual.

To cut a long story short, I traced a number of deflection protect lines to pin 5 of IV200 on the SSB. This pin is called "flash" and, amongst other components, the cathodes of three diodes (DV520/521/523) are connected to it. The anodes of these diodes are connected via ICs IV520/521 to sampling points in the deflection stages. Thomson technical had never had any problems of this nature but eventually came back with the information I requested, the threshold voltage at IV200's flash input pin. This is 2V: anything above 2V removes the line drive and initiates protection.

During the set's brief on time the voltage at pin 5 of IV200 rose to 4·5V. This potential was arriving via DV521. Cold checks on all the components associated with this protect input line (called H.DEFL PROT) revealed no problems so, rightly or wrongly, I decided to lift one end of DV521 temporarily then switch on briefly and carefully watch for clues.

The cause of the problem was immediately obvious, as a large arc shot from the line output transformer because of insulation breakdown. A replacement transformer (part no. 10737140) was obtained and fitted, and DV521 was reconnected. When the set was switched on again it produced an excellent picture.

I learnt a lot working through this fault, and my service manual has many notes for next time. **A.J.**

JVC AV28GT1SJF (11AK45B4 chassis)

This widescreen set was still under warranty. It had failed with the symptoms no sound or picture, a high-pitched noise and a pulsing red LED. Checks showed that the line output transistor Q602 was short-circuit. Further checks revealed that the HT voltage was correct, and no problems were evident in the flyback tuning and scan coupling circuitry. I fitted a replacement line output transistor and tried again. There was a high-pitched noise, the transistor got very warm and, while scope checks were being carried out, quickly failed.

I suspected heavy loading, and blamed the line output transformer. This was not the cause of the problem of course! I then did what I should have done earlier, fitted a dummy load instead of the line output transistor and checked the frequency of the line drive. It varied between 3-4kHz at source, pin 50 of IC200. The cause of the problem was a faulty crystal, X201, which is connected between pins 51 and 52 of IC200. Its part no. is VE-30008778. **A.J.**

WHAT a LIFE!

The ever-changing world of radio. Reader feedback and some reminiscences. A printer headache. Donald Bullock's monthly commentary

It seems, according to the papers, that the days of our old faithful the transistor radio are numbered. Switch-off time could be approaching for the UK's analogue radio transmitters. The newer generation is receiving its programmes digitally, via their mobile phones. And, as everyone knows, only the young folk count these days. Funny, but those of my generation didn't get an innings at all: when I was young you didn't count until you reached twenty one, and even then you continued to be corrected and soberly advised by older folk.

A new generation of digital receivers is apparently about to hit us. They'll incorporate something called The Bug, a gadget designed by Wayne Hemingway. It manages to rewind programmes, so that those who switch on after the programme has started can wind it back to the beginning. All this and more says Chris Kimber, head of a BBC department called Radio Interactive. "Only ten years ago" chortles Chris, "radio was a one-way experience. But digital technology has now given it ears that provide programme makers with instant feedback. No need to wait for old-fashioned letters. There'll be chat rooms, message boards, text messaging and email. Our programmes will really connect with people, in a way that only ten years ago was impossible. And it's happening in Britain faster than anywhere else!"

Later this year, we are told, suitable radios will be available in supermarkets for £50. Not from across your counters, dear dealers. But why stop at fifty pounds? Why not five? Or five pence? And guaranteed for ever? Just give them time.

There's more breathtaking news. These wizard new wireless sets, er radios, will enable any tardy fellow to listen to programmes that went out a week earlier. Even now, seven million people a month use this facility, mainly to listen to *The Archers*. It's all too magical for me. I'm so excited I could eat three steaks washed down with four glasses of Joshua Juice.

The fives ages

As part of an inquest on radio as we knew it, social historians are drawing up the Five Ages of Radio. These are as follows.

First the spark. Guglielmo Marconi invented his spark transmitter and the first aerial ever in December 1894, in Italy. He patented it is Britain on 2 June 1896. In 1897, when he was 23, he formed The Wireless Telegraph and Signal Company.

Secondly AM broadcasting. Reginald Fessenden discovered amplitude modulation and, in 1906, became the first person to broadcast words and music, using a special HF alternator to generate an 80kHz carrier. Ships' operators were amazed to hear him over their headphones, playing his violin and reading from the Bible.

Thirdly the short waves. Frank Conrad, an amateur radio enthusiast with the call-sign 8XK, invented short-wave wireless and made the first commercial broadcast from his garage in Pittsburgh, Pennsylvania in 1920. He called his programmes 'Air Concerts'. The transmitter he built for Westinghouse later that year was given the call-sign KDKA. It commenced broadcasting on 2 November 1920, giving the results of the presidential election, and is claimed to have been the world's first non-experimental broadcasting station. It ran for fifty years.

Fourthly FM. Frequency-modulation was invented by Edwin Armstrong in 1933. It requires a wider bandwidth, but can carry stereo and has much clearer, static-free sound.

Finally digital radio, which was developed by a consortium of engineers in Germany in the early 1980s. Digital radio was officially adopted in 1994. It provides room for expansion through more efficient use of the crowded FM spectrum, with interference-free, crystal-clear listening.

So there you have it. The five ages. As my decent old science master Mr Forsey would say, "now write that down". What he'd say about the dawning radio fiasco in this country however I can't imagine.

Prices

Alan Boyle, an old friend of this column, tells me that his local Kwik-Save branch is now selling brown goods, including an Alba CD-tape-radio at £14.99 with a twelve-month money-back guarantee. In comparison Greeneyes must have been done the other day when she called into our local Lidl store in Spain and paid 17 euros for a personal voice memo recorder. It's of German manufacture, is solidly built and performs well.

Incidentally how many of you have noticed that some of the more expensive, better-quality power tools can now be bought at a fraction of the price under alternative brand names? For anyone who is not too conversant with the originals, the returns address on the guarantee form helps with identification.

Worldwide fame

Television certainly gets about. I receive letters from all over the world, in particular from Australia and New Zealand, many from dealers or repairmen who swear that the oddballs amongst our customers regularly call on them too! A few readers in Spain have sought me out, and the other day I had a delightful and amusing letter from Diana Harthan who lives, with her TV engineer husband, in Portugal. She tells me she's his Greeneyes!

"My technical knowledge is so

small that it would fit into a thimble and still leave plenty of room" she commented, before telling me about their oddball experiences. That thimble remark reminded me of a very formidable lady I knew years ago. She ran the lithographic department of a well-known book publisher. Some of the men she had to deal with seemed to think that, because she was a woman, her abilities were doubtful. She had a shock comment for such occasions. "You can talk to me in as much detail as you like, young man" she would say, "what I don't know about lithographic printing can be written on the side of a blackcurrant." That put them in their place.

Wally

I was also reminded about Wally, who worked for me half a lifetime ago. He was one of the most capable men I ever knew, a learned man with a fearful intelligence: an excellent TV engineer and a superb general handyman.

Because he was very thin his clothes hung on him, giving an odd impression. But he was healthy, and tended to move around a lot as he spoke. One day he was called down to the shop to see a complaining oaf of a customer (no, they're not always right!). As he was patiently explaining the situation, the oaf threw back his head and called him a fool.

"Oh, I know that" said Wally, without the slightest pause, "a complete fool in fact. How could I fail to know it? After all, people like you have been telling me I'm a fool for years!"

That poleaxed the customer. Wally thanked him for his diagnosis and graciously took his leave.

Later I went to sympathise with him. "We all suffer the same" I said, "all my friends agree that I'm a good TV engineer and a good writer."

"Really?" Wally replied.

"Yes" I continued, "but my writer friends say I'm a good TV engineer while my engineer friends say I'm a good writer!"

Wally's wife's birthday was about to come up at the time. It was typical of Wally that instead of buying her a present off the shelf he decided to make her an oak, quilt-lined needlework cabinet. It was in the early days of small, private DIY shops. I was about to pay an outside call and would be passing a good one, so Wally asked me to pop in and buy him a small sheet of wood.

"The proprietor is helpful but quaint" Wally said, "he sells oak and elm in small sheets. Just ask him for a sheet of elm."

"OK" I said as I walked towards the van. Then I stopped and turned round. "Elm?" I questioned, "I thought you said you wanted oak!"

"I do" said Wally, "but if you go in and ask for oak he'll say 'why not have a piece of elm instead?' So ask him for a piece of elm and, when he suggests oak instead, say 'what a good idea'. He'll feel good that you took his advice, you'll get what you went in for, and it will all be fine."

I did, and it happened just as he said!

Another headache

My Epsom Color 680 printer has been driving me mad. It seems to have brain trouble. Before I settle down to write an article I like to run through my emails and print those I want to refer to. But when I try, the printer won't play ball. Sometimes it does nothing but blink at me. Sometimes it jumps into life and zips and zaps endlessly with no results. On other occasions it prints me yards of budget airline tickets for flights that left years ago.

Son John had an identical printer. The other day he threw it out and bought one of another make. Steven also had one. He put up with it for a week or two then dumped his one. They've proved to be a headache for all of us. At one time it was worse, when we had no choice but to buy their own ink cartridges at unbelievable prices.

So, Epsom, if you want to stay in business try making a simpler printer that isn't a smart-alec spoilt brat. One that ordinary people can work easily. One that doesn't endlessly gobble up ludicrously tiny thimbles of ink. One whose mechanism doesn't keep zipping and zapping about but instantly prints what the user wants printed. And make it sensibly box-shaped. You'll make a fortune!

Remote control

Doug Carson has written again, this time about a TV service call he had from an 82-year old chap who lives at a remote farm in the Coniston area. His caller explained that he had suffered a slight stroke and could no longer operate the remote control he had been using to switch the set on and off and change channels.

"When I got there" says Doug, "I found that the 'remote control' was in fact an eight-foot long bamboo cane that he used to press the on-off and programme-selection buttons on his ancient Decca set – one fitted with the hybrid 80 chassis. The set still produced excellent pictures however."

"I sold him a nice reconditioned Mitsubishi set with a more conventional remote-control system" Doug concludes.

A phone call

The phone rang while I was reading Doug's letter in the workshop. The caller sounded out of breath, but I felt I somehow recognised the voice.

"I got telly trouble, Mr Bullock" he rasped.

"Good!" I said, in my happiest and most assured voice. "What's it up to?"

"Well, when we watches ITV we gets BBC sound, and the other way round. And the picture keeps rolling slowly from the top left-hand corner to the bottom right-hand corner."

"Anything else?" I asked.

"Yes, the picture's sorta diamond-shaped, and everything moves backwards, like a film going the wrong way. By the way, do you do long-distance calls?"

"Where are you?" I asked

"213 Montana Road."

"Where's that?" I enquired.

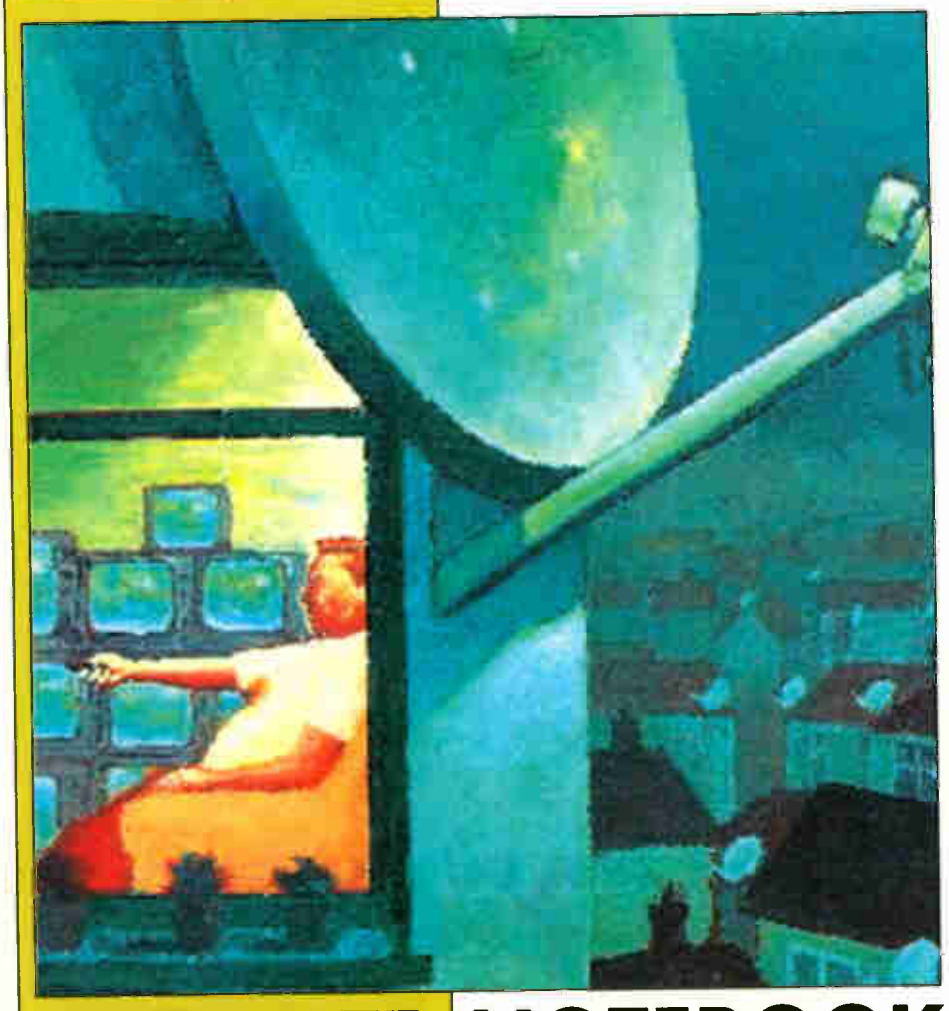
"Mexico" he replied, and burst into laughter.

"I see" I said, "and I daresay the name's Ellis. Ribby Ellis the practical joker."

"Dead right!" he guffawed. "Har har har cyuk cyuk . . ."

Keep it up!

Finally, as mentioned on previous occasions, I welcome your comments – particularly by email. You can reach me at donald@wheatleypress.com ■



SATELLITE NOTEBOOK

Reports from
Christopher Holland
Pete Haylor
and
Michael Dranfield

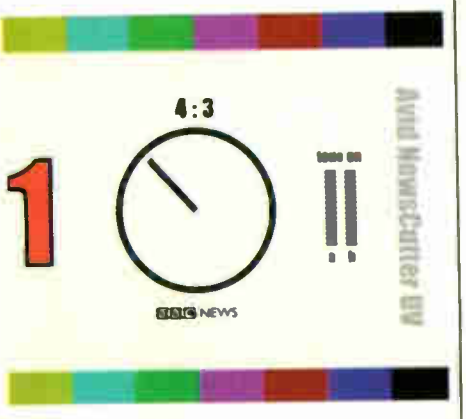


Photo 1: A caption used by the BBC during the Olympics.

Photo 2: A caption used by the BBC during the Olympics.

Photo 3: A caption used by the BBC during the Olympics.

Photo 4: A caption used by the BBC during the Olympics.

The Olympics

Hellas Sat 2 at 39°E was very busy with BBC links during the Olympics. The BBC News feeds were at 10·983GHz V, with an unusual symbol rate, 5,590, and 7/8 forward error correction. A number of cards and captions were used, see Photos 1-4. There were remote commentary links at 11·162, 11·170 and 11·180GHz V, all with a symbol rate of 6,140 and FEC 7/8, sometimes preceded by colour bars as in Photo 5. The colour bars in this photo include a 'tick-tock' moving logo (top left) to indicate a live digital transmission – I've noticed this before with BBC links.

There was a constant BBC Olympic feed at 11·187GHz V, with the narrow symbol rate of 2.730 and FEC 7/8. I don't think this was the main link to London: it appeared to be a feed to remote locations, so that commentators there could see some of the events.

BBC News 24 was sometimes shown prior to the Olympic Grandstand titles caption, see Photo 6, before going live.

EBU transmissions from Athens via Eutelsat W3 at 7°E were many and varied. Several variations of the EBU colour bars were used: Photo 7 shows a good example. **C.H.**

Satellite radio sound levels

Satellite radio stations continue to broadcast with varying audio levels. The BBC stations go out at similar levels. Using the Cooledit computer audio program mentioned before in these pages, I recently measured a 3dB difference between BBC Radio 2 on ch. 852 and Arrow Rock on ch. 911.

Photo 8 shows the result for Arrow Rock, indicating a relative level of –4·7dB, while Photo 9 shows the level for BBC Radio 2, with a relative level of –1·7dB. The transition step between the two can be clearly seen. I wonder why the

Photo 5: BBC colour bars used during the Olympics.

Photo 6: The BBC Olympic Grandstand titles caption.

Photo 7: An EBU colour-bar caption used during the Olympics.

stations don't have a standard audio level, as with MW and FM transmissions? **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. **C.H.**

Historic satellite transmissions

BBC4 TV recently broadcast, as part of its look at Sixties TV, a fascinating programme about TV sports coverage. It included some captions I've never seen before. The programme will no doubt be repeated in the not too distant future: it's well worth watching.

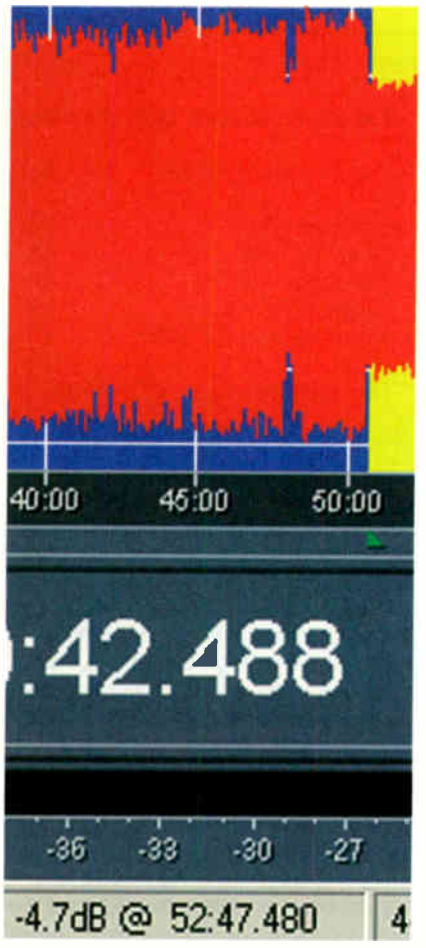


Photo 8: Arrow Rock Radio audio level, checked with a computer audio program.

Photo 10 shows the NBC caption transmitted via the non-geostationary satellite Telstar 2 prior to the Cassius Clay vs. Sonny Liston boxing match in New York in 1964. The match was shown on BBC TV and was the first ever to be transmitted via satellite. No doubt the reason for the second part being in French was for the earth station at Brittany. This was used to receive and transmit via Telstar, along with Goonhilly in Cornwall and the US station at Andover, Maine.

Photo 11 shows the NHK, Tokyo caption used for the EBU satellite feed during the 1964 Olympics. The satellite was an experimental US one called Syncom. It was the first geosynchronous satellite, i.e. it provided uninterrupted transmissions. In comparison the earlier Telstar satellites, which were in low Earth orbit, required several ground stations to track them because of constant movement relative to Earth – the signal was lost when a Telstar satellite moved below the receiving station's horizon. Geosynchronous satellites still required some ground-station tracking: they were not absolutely still, as geostationary ones are, but nevertheless Syncom was a major advance in satellite technology. The first true geostationary satellite, Early Bird, was a year or so away. It was also known as Intelsat 1, and was located above the Atlantic Ocean.

Photo 9: BBC Radio 2 audio level, checked with a computer audio program.

According to the programme the Syncom feed was received in Germany and passed to the UK via the then terrestrial Eurovision network. The German ARD/NDR EBU caption transmitted prior to link up with the satellite is shown in Photo 12. There was no sound with the vision signal, presumably because of the number of language feeds required by EBU broadcasters and the limited bandwidth provided by Syncom. Digital transmission would have solved that problem, but was several decades in the future! The audio feed to the BBC came via a new undersea cable, which unfortunately failed during the games. As a result the studio commentary in London relied on SW radio links to Japan. How things have changed in forty years!

Moving on to 1966 Photo 13, though not actually via satellite, shows the combined BBC and ITV caption used that year prior to the World Cup coverage from England to the Eurovision network. The World Cup was seen around the world however, so no doubt it was transmitted via Early Bird or elsewhere. **C.H.**

Faulty motor

A loyal customer phoned up. "The motorised you fitted has stopped working" he said.

Photo 10: NBC caption transmitted via Telstar 2 prior to the Cassius Clay vs. Sonny Liston boxing match in New York in 1964.

Photo 11: The NHK, Tokyo caption used for the EBU satellite feed during the 1964 Olympics.

Photo 12: ARD/NDR EBU caption transmitted prior to link up with the Early Bird satellite.

Photo 13: The combined BBC and ITV caption used in 1966 prior to World Cup coverage, from England to the Eurovision network.

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

Channel and EPG no.	*Sat*	*TP*	*Frequency/pol*
Bonanza (238)	EB	C5	11·391GHz/H
Celtic TV (430)	EB	C1	11·223GHz/H
Raaj Radio (891)	EB	D7S	11·585GHz/H
Rangers TV (431)	EB	C1	11·223GHz/H
South African TV (837)	2B	36	12·402GHz/V

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

The system consists of a Strong 4355 with a Moteck DiSEqC motor, a 1m dish and an 0·6dB LNB. The motor was stuck at the extreme west position. Use of the control buttons on the motor had no effect, neither did use of an external DiSEqC controller. I have to say that removing a motor that's mounted above the roof with a 1m dish on it is not my favourite trick!

Having got the motor back to the workshop I dismantled it. First suspicions related to the electronics, so I sent an email to Moteck for advice. The information supplied was comprehensive and the tests suggested soon cleared the PCB and the limit switches. Suspicion then fell on the motor and gearbox. These were separated and tested and the gearbox proved to be OK. When testing the motor with a variable power supply I found that at between 5-15V the motor ran for a short time then the current went from 60mA to the maximum the power supply would give before shutting down.

Other tests were made after further contact with Moteck, and it was agreed that the motor was faulty. A new one was dispatched from the factory and arrived within four days – not bad from Taiwan. It was fitted to the gearbox and tested. As the unit appeared to be OK I returned to the customer and refitted it. Thankfully it worked with the increased load – weight of the dish etc.

My thanks to Moteck for their interest in customer service (a rare thing today) with a product that was out of guarantee, and the help provided by the technical department – I was even sent pictures of the areas to test. It's nice to find a manufacturer that cares, even though the name is not well known over here. **P.H.**

Panasonic TU-DSB30

If the unit is stuck in standby, check near the flash memory for a component that's designated R494. It appears to be some sort of surface-mounted fuse, and is not fitted in later production units. If present, remove it. This may well cure the fault.

My guess is that the component was something to do with the factory programming of the flash chips, and should be blown open when this has been completed. If it's not fully open-circuit, the digibox can stick in standby.

It would be nice to be able to obtain service manuals for Panasonic digiboxes, especially as Panasonic has now ceased to produce Sky digiboxes. **M.D.**

Sony VTXS760

This digibox would intermittently return to standby. When it was powered up again I saw that it had rebooted, as it came back on with the Sky home page ch. 998. I next found that if the LNB was disconnected the box would stay on. Checks then showed that the LNB voltage fell when the LNB feed was plugged in. In fact all the voltages on the secondary side of the power supply fell, by as much as ten per cent, as soon as the LNB was connected. The 12V output measured 11·89V and fell to 10·99V under load.

Cold checks failed to reveal any problem, but I noticed that the box stayed on longer with the lid off. By now it was clear that the fault was a thermal one, and use of freezer soon revealed the cause. A quick puff on the St VIPER50 chopper chip IC800 restored all the voltages to their correct levels. A new IC cured the fault. **M.D.**

Amstrad DRX100

This digibox had what looked like a straightforward fault, 'no satellite signal'. The tuner was not the cause however, neither did a new QPSK chip cure the fault. The circuitry around the channel decoder chip U100 is very simple, but extensive checks on the peripheral components failed to reveal the cause of the problem.

Eventually, after much time had been spent on it, the cause of the fault was found to be on the power-supply PCB. The 8V supply was about 0·5V low, but contained no HF ripple. I decided to replace the three 330μF, 25V electrolytic capacitors on the power-supply PCB, and this cured the fault. 470μF replacements were used as the original capacitors still read 280μF at 1kHz and their ESR was below 1Ω. **M.D.** ■

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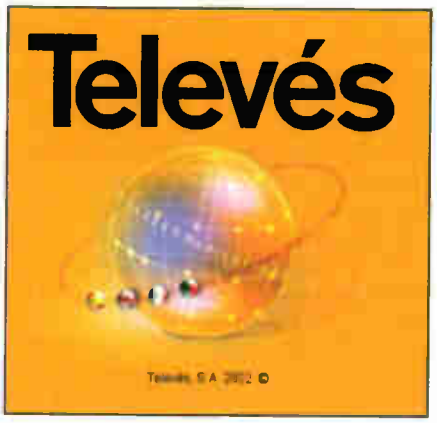

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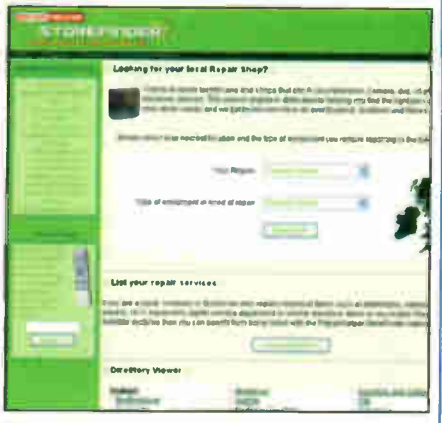

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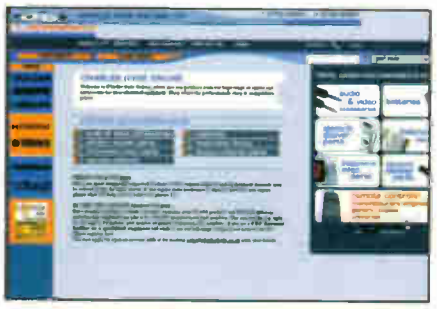

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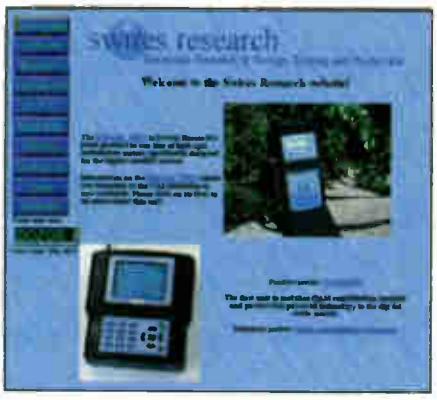

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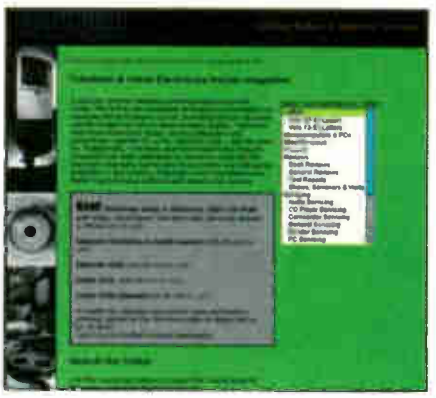

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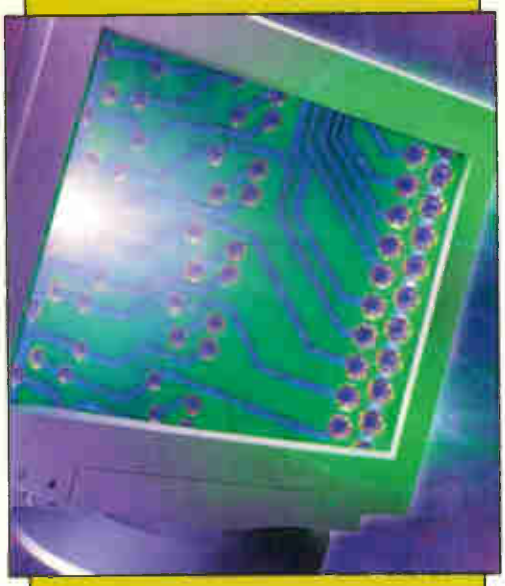

MONITORS

Fault reports from
Ian Field
Gerry Mumford
and
Alun Rawson-Williams

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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Highbury Business,
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Azalea Drive, Swanley,
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or e-mailed to:
t.winford@highburybiz.com

Elonex AS-4G

The complaint with this monitor was no focus adjustment. Out of interest, it's almost identical to the MN039P. Some of the component reference numbers differ, along with small details on the screen-print legend – but the FCC ID is the same (11BT2)!

On test I found that there was very little difference to the focusing, which was pretty bad, when either the G2/A1 or the focus control on the line output transformer was adjusted. The CRT was of Chunghwa manufacture. The fault is quite common with this make of CRT, though only slightly more so than with other 'big-brand' names, the most striking difference being that this make of CRT can be 'flashed', and that most of the CRTs so treated 'come clean' and stay that way.

The adaptor that I use for the purpose consists of a scrap CRT receptacle with all three cathode pins connected to an earth strap and a flylead from the focus cavity. This flylead can be eased under the anode cap. The CRT receptacle's pins have to be heavily insulated to encourage the flashover to jump between the CRT's internal electrodes. The safest thing to do with the earth strap is to solder it directly to the CRT's Aquadag earthing braid. Even then the transients can damage some types of monitor.

I left the monitor cracking away while I carried out some chores. When I reassembled the unit I found that the focusing could be adjusted to about as good as you can expect with this quality of monitor. The soldering was, as usual, very bad and required attention.

I've found that some repairers tamper mischievously with the coupling coils in the line output stage. The shift coupling inductor L401 is type 321200 001006 ML9526, the EW coupling coil L403 is type 321200 000406 ML9501 while the fixed linearity coil L402 is type 321000 000606 ML9448. L402 is biased by a fixed magnet, and has a white line on the sleeving to indicate its correct orientation – the alignment mark on the PCB is a small punched hole with no solder pad. On at least one occasion I've found that L402 has been replaced with a non-polarised type.

When I finish casing up I tidy the signal lead by winding it around the swivel base – which in this instance promptly fell apart! There's no pivot screw: the two parts are held together by a collet that clips on to four latching prongs which are arranged in a circle. The clip isn't very strong, and pulls off easily. A spare electrolytic capacitor of the correct diameter to push in the round hole between the four prongs to stop them springing inwards and releasing the collet can usually be found. If not, a slightly undersized one with a few turns of PVC tape wound round it does just as well. **I.F.**

ADI/Viglen CM700

This 17in. monitor was badged Viglen, but the sticker on the back revealed its true ADI identity. These monitors also come badged Compaq. This one was dead, and some voltage checks in the power supply revealed that it was tripping. Cold checks showed a virtual short across the B+ feed to the line output stage. I then discovered that the B+ regulator FET Q664 (IRF630) was very leaky, probably because reservoir capacitor C854 (100μF, 250V) was open-circuit. Replacement of these two components cleared the fault. **G.M.**

Taxan Ergovision EV977TCO99 (Model F996PYW)

This monitor powered up with the green LED lit but there was no display. The EHT was missing, and a quick visual inspection revealed bad dry-joints at the FET, Q0406 (2SK2843), that supplies the line output transformer. The FET was also short-circuit, and as a result the fusible feed resistor R409 (0·1Ω, 0·5W) was open-circuit. The monitor worked perfectly once these two items had been replaced. **G.M.**

Acer 77E (Model 7377XE)

This 17in. monitor was manufactured in June 2003. When it was switched on from cold the front LED lit and the degaussing action could be heard, but there was no raster. Checks showed that there was no voltage at the line output transformer or the collector of the BU2520DX line output transistor, which was short-circuit all round. When I traced back to the source of the supply I came across what I at first thought was a quick-blow safety resistor. It was open-circuit and turned out to be a 2AT axial-wired Wickman fuse.

Try as I might, I couldn't find a cause of the breakdown – dry-joints, an open-circuit tuning capacitor, leaky or short-circuit tuning capacitors, excessive HT, a line drive problem, etc. I removed the line output transformer for testing, and inspected it thoroughly for any signs of arcing. As it seemed to be OK, I cleaned it and resoldered it into circuit. The fuse and transistor were then replaced, after which I connected the monitor to the mains supply via a variac. The voltage was wound up very gingerly and, at slightly over 260V, the monitor worked well enough. It continued to do so for the next two days, with the voltage now at 240V. I returned it to the customer and have heard no more for several months. **A.R-W.**

Solution to Test Case 502

– see page 739 –

In days of old when men were bold they designed and produced the TX10 chassis. And, nearly a quarter of a century later, they defeated our Cathode Ray with it. Ted may well have encountered this fault before, and probably diagnosed its cause. But he failed to recall any details after all those years. Going at it again now, he reasoned that either the supply's source impedance was too high (unlikely, straight through D744 from the working scan circuit), or something was pulling down the voltage at the reservoir capacitor C816.

By way of experiment, Ted removed the A1 control potentiometer RV831 from the PCB, whereupon the voltage at C816 shot up – and stayed up when a 2MΩ skeleton potentiometer was fitted as a substitute. The picture appeared, and the new potentiometer enabled its brightness to be controlled. Plainly RV831 was responsible for the problem, despite the fact that the resistance of its track measured correctly. In fact this component has a grounded metal case and, when a high voltage was applied, there was internal leakage between the track and the case. Wow!

No further details of the repair will be divulged to our rubbernecking readers, on the basis that we might incriminate ourselves – or at least Television Ted. Certainly our customer was very pleased to see the set working and back at home, declaring that it would "see me out"!

It's worth mention as relevant to no picture faults with the TX10 chassis that the EHT and focus potentials are derived from the chopper transformer while the first anode supply is derived from the line output stage.

NEXT MONTH IN TELEVISION

Test report: the DigiFusion FVRT100 DVR

The FVRT100 is a hard-disk recorder for use with DTT reception. Roger Thomas bought one to replace his elderly VCR and gives it a thorough check out.

Project: an electronic stethoscope

This simple but efficient design uses an electret microphone for sound pickup, a TL431 adjustable regulator (comparator) for amplification and a MOSFET as the output stage. There are all sorts of uses for stethoscopes. In particular they can be helpful for activity detection when fault-finding.

The Luneberg lens aerial

J. LeJeune describes an unusual aerial for satellite signal reception.

Vintage repairs: the Collaro Conquest autochanger

Michael Maurice describes the operation of this record changer, which dates from the Fifties/Sixties, and what's involved when repair is necessary.

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Image Size	6.00mm(H) x 4.96mm(V)
Video Output	1.0Vp-p NTSC Comp / 1.0Vp-p PAL Comp
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Sync. System	INT Only
Resolution	More than 380 TV Lines
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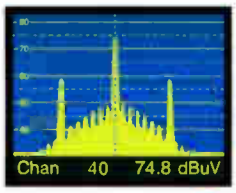
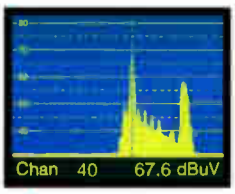
PROMAX





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