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CONTENTS

November 2001 Vol. 52, No. 1

3 Comment
BBC in the digital age.

4 Teletopics
ITV prepares for satellite transmission. Sony's new camcorder format. LG Philips Displays introduces Cyberline CRTs. DVD recorders launched in the UK.

10 What a life
Some TV and VCR faults, a moan about the state of TV programs and presentation, and a spoilt radio-cassette recorder design. Donald Bullock’s servicing commentary.

12 Where's mobile TV going?
Douglas Clarkson outlines progress on the emerging European standard for mobile television.

16 The Internationale Funkausstellung 2001
The IFA, held biennially in Berlin, is the world's largest consumer electronics exhibition, where many new developments are given their first public showing. This year’s big themes included the Multimedia Home Platform, plasma displays, DVD recorders and hard-disk video systems. George Cole reports.

21 Servicing the NEI CE25/CE28 series chassis
Alan Dent continues his fault-finding series on these chassis, this time dealing with the tuner, the signal processing sections and the audio circuitry.

23 Help wanted

24 Simple Ni-Cad pulse charger
Ian Field presents a simple Ni-Cad battery pulse-charger circuit based on the use of a conventional iron-cored mains transformer. A commercial unit could easily be modified for pulse-charging by adding this circuit.

26 DVD player servicing
In this third part of his current series K.F. Ibrahim describes the system control, A/V decoder, audio processing and user interface sections of a DVD player.

30 Work on motor homes
Motor homes offer many opportunities for installation work. Tom Baker describes step replacement with a motorised version.

32 Letters

34 DX and satellite reception

38 TV fault finding

42 Monitors
Guidance on repairing computer and other monitors.

44 VCR Clinic

46 Jack's workshop

47 Test case 467

48 Satellite notebook
Some digibox repairs. Digital TV channel update. Obtaining Euronews in different languages.

50 Web service
Useful web sites for TV professionals, technicians and enthusiasts.

53 Audio faults
Hints and tips on repairing professional and consumer equipment.

54 Next month in Television

Picture courtesy Ford Motor Company

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BBC in the digital age

From its start the BBC has been a broadcaster in the fullest sense of the term: it devised transmission and reception equipment, built up one of the first transmitting networks in the world, and provided programming to feed the transmitters and make it worthwhile to construct (in the very early days) or buy reception equipment. Throughout its long and illustrious history, starting as the British Broadcasting Company in 1922 (with a staff of four!), becoming a public corporation in 1927, and up to the present time it has been at the forefront of broadcasting technology. When the idea of digitising signals first came to be considered, the BBC was at work investigating the possibilities. There were two achievements in particular prior to the age of digital signal transmission.

By 1969 the BBC had devised and brought into operation for networking throughout the UK a sound-in-sync system (compress the sound, digitise it and insert the result in the line sync pulse period). This reduced the number of transmission lines required (many rented from the GPO, as it then was) and, at the same time, improved the sound quality (the bandwidth was increased from 10kHz to 14kHz). It involved practical implementation of the processes of signal sampling, digitalisation and pulse code modulation - with the added advantage of noise reduction. Not long after that BBC engineers went on to develop Ceefax. ITA engineers were working along the same lines and came up with a similar idea, Oracle. Two such technologies would obviously make life unnecessarily difficult for the setmakers and everyone else, so work on a common standard was initiated. Agreement was reached in January 1974: teletext, as we now know it, came into full-scale operation in the autumn of 1976.

Subsequently BBC engineers came up with the Nicam digital sound transmission system. Digital signal and transmission technology is not new to the BBC, which in fact helped to create it. It was probably more important in the early days of broadcasting to integrate technological research, transmission capability and programme making. In more recent times there has been a belief, in all industries, that different activities are best run by separate companies/organisations, and this is the way things have tended to go. The results have not been all that encouraging. Take the railways for example. To separate the running of trains from the provision of tracks and signalling looks like a recipe for disaster. Enough said. Industrial and service companies have long been urged to rid themselves of property ownership and have largely done so. This helps the property companies of course, but I'd say that it was worse for a retail company, for example, to own its shops if it can afford to do so. Several companies have come unstuck when they have sold off the freeholds and subsequently found that, when trading conditions became difficult, they couldn't pay the rent.

Companies have also been urged to outsource all sorts of other activities, with varying consequences. Such ideas tend to go in cycles. No doubt the latest generation of business consultants are urging their clients to take on the ownership of premises and so on. In the broadcasting field the ITC followed the trend by divesting itself of its engineering and transmission side to NTL. Now that NTL is in difficulties, the aerials and transmission business has been put up for sale. The US investment bank Goldman Sachs has been appointed to seek a trade buyer. No one knows who will end up owning the ITV transmitters. This couldn't, surely, be the outcome that was envisaged?

The BBC at any rate remains a largely integrated organisation, though management fads have created more than enough problems for the Corporation in recent years. It is at present developing digital services and, some time back, presented proposals for new channels to the Department of Culture, Media and Sport. For four digital TV and five digital radio channels to be precise. The government has now responded. Three of the TV channels (two children's channels and one, BBC4, devoted mainly to the arts, science and current affairs, a replacement for BBC Knowledge) have been given the OK, as have the five digital radio channels. But the proposed BBC3, an entertainment channel aimed at those aged 16-34, as a replacement for BBC Choice, has not been approved. The BBC was told that it has not made a good enough case. It has however been given the opportunity to put forward new proposals. According to Culture Secretary Tessa Jowell, the BBC's proposals for BBC3 "were not truly distinctive in an already overcrowded market".

There has of course been a lot of pressure from the commercial channel operators to limit the BBC's efforts to make itself a major force in digital broadcasting. This seems to be the main reason for the failure to give BBC3 the go ahead. The commercial broadcasters are certainly going through a very difficult period, and there are probably enough general entertainment channels. But the BBC wants to be able to appeal to audiences across the board, as it has in the past. If it fails to gain a significant audience in this important sector, one knows all too well what the argument will be next time round: public service broadcasting doesn't appeal to the majority of viewers and should be sold off.

It's a great pity that we have to put up with all this horse trading in the broadcasting field. In the interests of diversity I suppose we have to live with it, but let's hope that the present and future governments will continue to appreciate the importance of public service broadcasting, which the BBC is now giving a digital dimension.

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ITV via satellite

ITV has been making preparations for the start of satellite transmission. Three transponders aboard Astra 2D have been leased for ten years, and a contract has been signed with NTL to uplink all fifteen ITV services. Connections from regional studios will be via the NTL fibre network. This deal puts in place the technical infrastructure for ITV satellite transmissions.

Reception would be via Sky dishes and digiboxes, but there has been a problem over conditional access – ITV and BSkyB cannot agree on terms. ITV could, presumably, make its own arrangements. A relatively minor problem is the location of ITV in the electronic programme guide. Each of the regional franchises will require a separate channel. Another problem is that the ITV signals will reach other countries in northern Europe. ITV has had to negotiate with its programme providers to cater for this, with mixed results. The owners of the Champions League rights for example have refused to agree; when matches are screened by ITV satellite viewers will be directed to switch to the terrestrial service.

Success with ITV via satellite could raise questions about the long-term viability of ITV Digital transmissions.

BSkyB has switched off its analogue transmissions. It has been estimated that some 100,000 subscribers hadn’t transferred and the unit is expected to switch off. BSkyB now has over 5.5m digital subscribers.

DVD recorders launched

DVD recorders have now been launched in the UK. Philips was first off the mark with the DVR1000, which conforms to the DVD+RW standard. It was initially sold at Harrods but has since been rolled out nationally. The price is about £1,300, with blank discs £15 each. The DVR1000 can record up to four hours of video on a 4.7Gbyte disc and has an integrated TV tuner.

Panasonic’s DMR-E20 is also now available, at under £1,000. It conforms to the DVD-RAM and DVD-R standards, has extra-long recording times of up to twelve hours, and features a Time Slip function. This enables it to record one programme and play another simultaneously. The Chasing Playback function enables the user to watch from the beginning a recording that has already started while the machine continues to record.

For further information on these and other DVD recorders, see the Berlin Radio Show report, page 18.

STBs

Pace has announced a new low-cost home gateway (STB), Model DTR500, that enables viewers to receive digital terrestrial TV without a pay-TV service subscription. To save space it can be used horizontally or vertically. Its style is radically different from the traditional STB, and it’s much smaller.

Microsoft and Philips have released details of an advanced interactive cable STB. It’s based on the Philips Nexperia Digital Video Platform (DVP) and Microsoft TV Advanced software, and incorporates the Philips CryptoWorks conditional-access system. The new cable STB enables network operators to offer a wide range of interactive TV services and applications, including enhanced TV, high-speed internet access, a customisable user interface, digital video recording, multiplayer games, an EPG, Windows Media audio and video streaming and complete home networking services.

Bristol-based Cabot Communications, which is owned by Turkish setmaker Vestel, is developing a low-cost STB that gives access to the free-to-view channels. Called PING (Plug in and Go), the unit is expected to be available early in 2002. Vestel was founded in 1984 and has one of the largest TV manufacturing plants in Europe, with an output last year of 53m sets. Its 90 per cent of which were exported. The company is mainly an OEM source for other brands. It also manufactures white goods.
CD copy-protection systems

The music industry is testing four new copy-protection systems that are designed to prevent consumers copying CDs on CD-ROM drives and make it impossible for PCM audio files to be converted to compressed file formats like MP3 for storage on a computer hard disk. The systems all exploit the subtle differences between the basic Red Book CD standard, the Yellow Book standard for CD-ROM and the Orange Book standard for CD recorders. CD audio players read the header information on a disc and then play a continuous data stream. In contrast a CD-ROM drive reads data from various sectors on a disc. By adding extra data on an audio CD during production, the copy-protection system can confuse a CD-ROM drive. As a result the disc either doesn’t play at all or any copied music files become corrupted.

The copy-protection system developed by Israeli company Midbar Technology, known as Cactus Data Shield (CDS), works by modifying data on an audio CD – the music data itself is untouched. Midbar can provide several different options for music companies, enabling them to control the degree to which music is playable by domestic equipment. With CDS100, an audio CD can be played only by an audio CD deck – a CD-ROM drive cannot read the discs. CDS200 allows a disc to be played by either an audio CD deck or a CD-ROM drive, but the audio files cannot be copied or used with ‘ripper’ software to produce compressed music files such as MP3. A third option, designed for users who play music from a PC hard drive or an MP3 player, adds compressed and copy-protected music files to a CD disc.

The Sunncomms MediaCloq system prevents users ‘ripping’ CD files and offers an optional downloading system that allows a user to play music tracks via a CD hard drive.

Sony’s DADC key2audio system allows protected discs to be used with audio CD players, DVD-Video players, portable CD players, in-car systems and games consoles like PlayStation 2, but prevents consumers playing a disc with a CD-ROM, DVD-ROM, CD-R or CD-RW drive, whether in a home PC or a hi-fi system. It uses a special data signature that prevents CD playback and copying with a PC. A download option is available.

Macrovision and the Israeli company TTR plan to produce SafeAudio, which works by adding a data signature to the main audio channel. This signature corrupts files that are copied or ‘ripped’.

The developers all claim that their systems don’t affect sound quality and say that there is high compatibility with standard CD players. Over 2.2 million CDs have been sold in Europe with the new copy-protection systems secretly encoded on them.

Hitachi withdraws from CE

Hitachi is to “spin off” its consumer-electronics and some of its industrial equipment operations. It is not exactly clear what the spin-off will entail, but from next April the consumer-electronics operation will become a separate as yet unnamed company.

Hitachi’s consumer-electronics business is expected to make a substantial operating loss for the year to next March. It accounts for only some 12.5 per cent of Hitachi sales, but is Japan’s second-largest CE business. The new company will oversee 21 factories, two in Japan and 19 overseas, and will work in conjunction with Matsushita Electric, with which an alliance was agreed in May to develop digital applications.

Pace sells service division

Following its decision to outsource virtually all STB production, Pace Micro Technology has sold its UK service and repair division to the French company A Novo Group, which has set up a UK subsidiary General Electronique UK Ltd. This will operate at Pace’s Saltaire, West Yorkshire headquarters. Pace will continue to employ about 700 at Saltaire on R&D, sales and marketing.

A Novo Group, a global provider of repair and maintenance services, has been providing Pace’s overseas servicing requirements.

U-View’s move

U-View Ltd., publisher of the popular TV and video circuit diagram books, has moved. The address is now PO Box 595, Doncaster, Yorkshire DN5 7XW. There are new telephone and fax numbers, 01302 337 208 and 01302 724 852 respectively. You can e-mail to u_view_tech@biopenworld.com.

Television servicing book 6 has recently been published as a spiral-bound two-volume set at £99 or as a CD-ROM at £79.

TiVo

The price of the TiVo hard-disk digital video recorder in the UK has been reduced to £299 from £399. The additional £10 monthly or £199 product lifetime subscriptions remain the same.

BSkyB has acquired part of a convertible equity stake in TiVo. If further warrants are exercised, BSkyB could end up with more than 8.5 per cent of TiVo. US broadcasters NBC and Discovery also have stakes in TiVo. BSkyB has extended its UK marketing agreement with TiVo for another year, until September 2003 – the original agreement was for two years. BSkyB promotes the sale of TiVo boxes in exchange for a portion of the revenue they generate in sales and monthly rental fees.

Satellite radio

Satellite digital radio broadcaster WorldSpace (see Television June page 466 and Teleoptics August) has appointed Nevada Distribution as official UK distributor of receivers for its service. Dealers requiring information should contact the Nevada sales desk on 02392 313 095. For further information visit the Nevada website at www.nevada.co.uk.

Test card website

Just about every test card from Baird’s original up to the latest 16:9 aspect ratio type can be seen at the following website: www.meldrum.co.uk/mhp/testcard/...
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### Fault Finding & Reference Books

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- **Jaeger 2001 Semiconductor Comparison Book**
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### Fuses

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

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WHAT A LIFE

Some TV and VCR faults, a moan about the state of TV programs and presentation, and a spoilt radio-cassette recorder design. Donald Bullock’s servicing commentary

When I arrived at the workshop one morning Steven had a massive 32in. Fidelity set on the bench. The complaints were field collapse and EW-correction trouble. He had a look at the EW circuit and found the TDA8145 chip faulty, with its 3-3Ω (safety type) feed resistor R711 open-circuit. Some checks in the field output section revealed that C620 (0-471.1F, 250V) was short-circuit. Replacements restored correct scanning, but he needed help returning the heavy set and asked me to give him a hand.

“IT belongs to a nice old couple. I know their son Glen” Steven said, “he’s been abroad these last six months.”

We took the set back and installed it. Then the old, rather frail, couple settled back to watch it. Steven noticed a photograph of Glen on the sideboard. “Oh look” he said to me, “there’s Glen.”

“What?” cried the old couple as they stumbled up out of their chairs and looked out of the windows, first one then the other. “Can’t see him. Where is he?”

Steven had to explain and calm them down.

A Goodmans 1410

When we got back Mrs Daymoore was waiting with her son Billy. “Hello Mr Bullet” she said, “tell Mr Bullet about it, Billy.”

“E’s all wonky” the boy said without paying much attention.

I decided to try to get him to be a bit more explicit and interested. “How wonky?” I asked, “slightly wonky, very wonky, wonky in what way?”

“Wonky as hell” he replied.

“Billy!” Mrs Daymoore cried, “be quiet now and put the set on Mr Bullet’s counter.”

Billy lifted a Goodmans 1410 from the floor and placed it on the counter.

“Now explain what the trouble is to Mr Bullet” she continued.

Billy looked at me defiantly. “Blank screen an’ lots o’ sound” he hissed.

“That’s better” Mrs Daymoore said, “Mr Bullet will wonder wherever you was bruin up.”

I said goodbye to them as Paul took the back off the set. Fortunately it uses the Ferguson TX805 chassis, so we didn’t expect much trouble. When Paul advanced the setting of the first anode control a raster appeared, with no vision.

Steven looked over. “Had one like that last week” he said, “it was the MS2038SP jungle chip IL01. But we don’t have one left.”

“Might as well make a few checks before we order one” Paul said. He decided to carry out some meter checks on the CRT base panel and soon found that the 12V base bias for the RGB output transistors was missing. The cause was easy enough to find. RT40 (68kΩ, 0-5W) was open-circuit. A replacement restored the picture.

Capacitor trouble

“Ugh, oh dear, phew!” Mr Milton said as he hurried to his chair. “It belongs to a nice old couple. I know their son Glen” Steven said, “he’s been abroad these last six months.”

Steven spun round. “How did you know that?” he asked.

“How did you know that?” I asked. “Genius” I replied.

Steven advanced the setting of the first anode control. “Notice I didn’t mark it before altering the setting” he said.

“Why not?” I asked.

“Cleverness” he replied, brushing his nails on his lapel.

I nodded understandingly. I also noticed that there was field collapse, and that C405 (0-22μF, 400V) in the line scan circuit had exploded.

“IT’ll be C405” I said.

Steven spun round. “How did you know that?” he asked.

“Genius” I replied.

A replacement capacitor restored normal operation.

Bouncing and rolling

Meanwhile Paul was battling with an Hitachi C2119T (G7PS chassis). It seemed to have a good picture, and the sound was all right. But occasionally the picture would begin to bounce and roll. “I’ve replaced the field timebase chip and a few other field timebase components” he said. “once or twice I thought I’d cured the fault, but it’s still the same.”

After a while Steven joined in, but the nasty intermittent fault persisted. I wondered whether it was a sync fault, but the line synchronisation seemed to be stable enough. Then I noticed a sideways twitch and, at the same time, slight video degradation. So the brief fault involved the field and line sync and video quality.

“There’s intermittent IF instability” I said.

Steven tapped the IF cans until he found the one that produced the fault condition. It wasn’t earthed securely. Once that had been put right the fault had gone.

More picture trouble

At the time I had a Toshiba VCR on the bench. Model V219B. This was another case of an intermittently poor picture. I discovered that the symptom could be controlled to some extent by pressing the deck down here and there. In fact the deck sits on a copper earthing plate, which is at the back of the machine behind the drum: it wasn’t making reliable contact.

Cleaning and flexing the plate cleared the trouble, but it’s something to bear in mind. Next time I get a problem of this sort I’ll install a thick, flexible bonding strip.

A moan

Just why are we inflicted with such terrible television? I’ve been a bit restricted recently by damage to an ankle, and have found myself spending more time than I usually do stuck in front of the TV set. Since the last figures were announced, programme makers have been expressing concern about the decline in the number of viewers. But I find it hard to believe that they are seriously worried. If they were, surely they would do something about it? And I don’t mean just about the poor programmes, but the awful presentation as well.

The programmes mostly seem to assume that viewers have no or very little intelligence. The characters have a limited vocabulary, and engage in a lot of swearing. Now I don’t mind the odd well-chosen expletive where the context calls for it, or maybe to emphasise a point. In fact I was brought up in the
Valve Radio and Audio Repair

A practical manual for collectors, owners, dealers and service engineers * Essential Information for all radio and audio enthusiasts *

This book is not only an essential read for every professional working with antique radio and gramophone equipment, but also dealers, collectors and valve technology enthusiasts the world over. The emphasis is firmly on the practicability of repairing and restoring, so technical content is kept to a minimum, and always explained in a way that can be followed by readers with no background in electronics. Those who have a good grounding in electronics, but wish to learn more about the practical aspects, will benefit from the emphasis given to hands-on repair work, covering mechanical as well as electrical aspects of servicing. Repair techniques are also illustrated throughout.

This book is an expanded and updated version of Chas Miller's classic Practical Handbook of Valve Radio Repair. Full coverage of valve amplifiers will add to its appeal to all audio enthusiasts who appreciate the sound quality of valve equipment.

An unfortunate purchase

While I'm in a complaining mood, let me tell you about an unfortunate purchase I made recently. I had been working on a factual book called The Legend of Clapham and, while out taking notes, I came across an old boy who had lived through it all. He asked me into his home and I soon found that though he was a font of knowledge his enthusiasm kept running away with him. My pen simply couldn't keep up. So I stopped him and popped out to buy a small recorder.

I couldn't find one locally and had to settle for a radio-cassette recorder. It wasn't that small but was an attractive piece of equipment and the LW/MW/VHF radio side worked well. It had a built-in microphone. I also bought a couple of branded tapes. Then I went back to the old boy.

He seemed a bit peevish. "It's getting on and I have to get down to my local fare long" he said. I nodded understandingly, set everything up, made a test recording then played it back. The results were disastrous. He sounded as if he was talking from inside a waterfall. So I called a halt, went back to the shop and changed the machine.

On my return I had to start all over again. But the replacement was no different. I took out my pad and prepared to take notes.

At this the old boy became testy. Told me that he was worth being recorded, that it had all made him extra thirsty, that he wanted a pint and was fed up with me and my tricks. He then threw me out.

I took the radio-cassette recorder to the workshop and gave it another try. Its recordings had a louder noise level than the audio content. When a prerecorded tape or a piece of unrecorded tape was played however the noise level was acceptable.

On investigation I found that the machine has a little block of permanent magnet that serves as the erase head. When I used a small rubber band to hold the magnet clear of the tape the recordings were excellent.

I then gave the rest of the radio-cassette recorder a once-over. It was really well made, and would have been excellent value had the makers spent a few extra pence and fitted a conventional erase head. Paring down costs is essential to produce competitive products, but in this case the result was that an otherwise excellent machine could have been made useless. I took it back.

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Where's mobile TV going?

Douglas Clarkson outlines progress on the emerging European standard for mobile television.

The rapid worldwide telecommunications expansion is presently highly focused on the European scene. In particular, the adoption of the DVB-T standard for terrestrial digital television (DVB-T; ETS 300744) has paved the way to using this standard for development of broadcast services for mobile receivers.

In order to co-ordinate the introduction of such services, the 'Motivate' mobile digital terrestrial television consortium was launched in May 1998. It consists of 17 broadcasters, network operators and manufacturers of professional and domestic equipment. Within this array, the lead agency is T-NOVA – formerly Deutsche Telekom Bcrkom. In the UK, the lead organisation is the BBC.

Future markets
Investment in future systems of public transportation – busses, trains, trams, etc. – is on the increase. Also, manufacturers are looking for new ways to enhance passenger comfort and convenience in private vehicles. As a result, mobile receivers have been identified as a future potential growth market.

Car manufacturers are already contemplating how best to introduce such media technology into vehicles in the not too distant future.

Generally, such receivers will be travelling somewhere between 50km/h and 500km/h. Standard analogue broadcast signals however cannot be successfully...
received while the receiver is moving - hence the need for a special standard.

In the rapidly evolving world of global communications, the data stream of digital television could carry data, speech, Internet pages, as well as TV in MPEG-2 transmit stream. This implies a broadening range of uses for TV signal systems.

Understanding of how a DVB-T broadcast signal is transmitted from a moving location is improving. In theory, such transmissions would allow systems in motion to act as sources of DVB-T signals. In an increasingly interactive world, this area of technology may yield some interesting results in the future. As yet though, it is almost totally unexploited.

**Receiving signals on the move**

As a standard, however, with many configurable components, a great deal of work is required to optimise receiver characteristics to ensure picture quality of appropriate standard is achieved.

The problem with decoding of signals relates to the doppler effect. It causes a frequency shift between the transmitter and configured receiver. Also, different environments can result in a complex mix of direct and reflected signals that would naturally pose problems for stationary reception.

**Tests and measurements**

A key part of the Motivate project has been the development of an experimental system. In this system, transmitter signals are 'doctored' with additive white gaussian noise and receiver characteristics are determined. This has allowed extensive tests to be undertaken as 'static' testing.

One of the problems with determining the 'quality' of receiver systems is to agree a practical equivalent of image quality. One initial marker was that of SFP, or subjective failure point. This corresponds to one visible error in the receiver video during an observation period of 20 seconds.

This still, however, remains a subjective measurement and a more quantifiable parameter has been used instead. Known as ESR, this parameter is defined as the probability that a certain second contains one or more errors in MPEG-TS packets.

In order to standardise on test processes, various receiver topologies are defined for laboratory tests. These include typical rural area, typical urban reception and DVB-T mobile profile. The DVB-T profile has about 20 designated variations of bit rate, FFT guard interval and constellation.

In future, it is likely that broadcasters will identify the nature of the mobile service area, determining the optimum transmitter characteristics accordingly.

A key aspect of how a receiver operates is indicated in Fig. 1. Here, the expression C/N indicates the minimum signal required for adequate reception. For slow speeds, the required C/N value is relatively independent of doppler frequency. With increasing frequency though, a practical limit of signal is identified. This constitutes the absolute maximum speed of a receiver.

For the purpose of test systems, omnidirectional antennae at 1.5 m above ground level have been used. Date rates up to 15MHz can be used in such transmissions.

In trials of a range of receivers in November 1998 and November 1999, so-called second-generation signal receivers fared best in general. Also dual-input receivers generally fared better than single-end receivers.

**Fig. 1. Key response of carrier versus noise with doppler frequency, which can be used to define the limits of mobile reception.**

**Fig. 2. Extreme levels of carrier-to-noise response for specific receiver systems at specific signal configuration - indicating in general the differences between the first and second generation chip sets.**
The range of performances observed for the various systems, however, indicated that further enhancement of receiver technology is needed to enhance synchronisation algorithms.

For a range of receivers tested, baseline values of C/N differed by around 6dB for a specific generic classification of signal. Figure 2 indicates the typical extreme limits of C/N responses. It shows, generally, the differences between first and second-generation chip sets. A response with a high level of C/N baseline will tend also to have a low value of maximum speed of mobile reception.

Field trials demonstrating such technology to the public have been undertaken – with the more recent being at Helsinki in November 1999 during the Information Society Technology conference. City trams were fitted with innovative TV sets with a 30 minute ‘show’. This test clearly showed the technical viability of mobile DVB-T reception.

Watch this spot
The Motivate project has produced documentation on a ‘Reference receiver model’ in order to help receivers manufacturers to further improve their equipment for mobile reception. It has also produced implementation guidelines to help broadcasters apply networks for mobile video receivers.

The development of DVB-T for the mobile environment is likely to result in the creation of a new market for TV technology, both in the development and supply of suitable receiver systems but also in the expansion of tailored TV broadcast channels. At the manufacturer level, this opens the way to new products. Already Nokia has developed a product called ‘Media Screen’ for portable reception.

While there may be other standards of digital TV capable of being used with mobile receivers, considerable progress has been made within Europe in developing systems for mobile reception. Within the not too distant future, this should see the introduction onto the market of a range of relevant products – and the service needs associated with this.

For more information...
http://b5www.berkom.de/MOTIVATE/
http://www.infowin.org/ACTS/IEN/NEWSCLIPS/arch1998981001de.htm
http://www.bbc.co.uk/rd/projects/motivate/

ACTS (Advanced Communications Technologies Services) MOTIVATE (MObile Television & Innovative Receivers)

What is Motivate?
Motivate, or Mobile Television and Innovative Receivers in full, has been set up to investigate mobile reception of digital terrestrial TV signals in single-frequency (SFN) and multi-frequency (MFN) networks. It involves the new open standard for data and multimedia broadcasting DVB-T.

These networks will offer customers new features, such as broadband interactive multimedia networks with data rates of 15Mbit/s. Receivers using this standard could be integrated into TV sets, lap tops and cars to provide a user interface for ‘information-society’ applications. The rapid development of DVB-T infrastructure in Europe will also provide components and services for wireless and hybrid networks.

Motivate will verify the flexibility and suitability of the DVB-T standard for mobile reception. Support will also be provided for implementing DVB-T in countries outside Europe.

The main objectives of Motivate are to:
1. analyse the theoretical performance limits of DVB-T for mobile reception and implement optimised receivers,
2. study, implement and test efficient algorithms for mobile and portable SFN reception,
3. test state-of-the-art DVB-T receivers for mobile reception,
4. set-up a pilot network to measure mobile channel characteristics and mobile coverage in urban and suburban networks,
5. set-up and carry out major demonstrations to present DVB-T in major national and international events (e.g. IBC'98, IFA'99, NAB'99),
6. support integration, promotion and dissemination of results of other ACTS projects working on DVB-T,
7. verify the open API for DVB-T receivers,
8. provide guidelines for the implementation of a mobile DVB-T service.

The impact of DVB-T
The DVB-T standard was developed in Europe and has advantages over competing proposals – especially for mobile reception and higher data rates. It is clear that the world-wide competition between the European DVB-T standard and other proposals will have a major impact on European industry and broadcasters.

Peter Christ, Deutsche Telekom Berkom GmbH

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The Internationale Funkausstellung 2001

The IFA, held biennially in Berlin, is the world's largest consumer electronics exhibition, where many new developments are given their first public showing. George Cole reports on this year's event.

The 2001 Internationale Funkausstellung (IFA) attracted 915 exhibitors from forty countries. There were 160,000 square meters of display space. This year's big themes included the Multimedia Home Platform, plasma displays, recordable DVDs and hard-disk video systems.

The Multimedia Home Platform

Sony claimed that its new KD-32NS10DB Integrated Digital Television (IDTV) receiver is the first commercially available model in the world to use the Multimedia Home Platform (MHP), which is a DVB standard. MHP is an open interactive broadcasting standard that's supported by over 300 DVB members, including manufacturers, broadcasters, telecommunications companies and service providers. Its aim is to provide a common standard for interactive TV and the internet via digital TV services.

A digital receiver requires an interface, or API (Application Programming Interface), on which its applications can be based. Interactive applications include an Electronic Programme Guide (EPG), home shopping and home banking. Until the advent of the MHP, most pay-TV and set-top box manufacturers used different operating systems and types of middleware (interactive TV software that sits between the user interface and the interactive application). Examples of such middleware include OpenTV, MHEG, Liberate, Mediahighway and Microsoft TV. As a result, multimedia applications could run on only certain set-top boxes and had to be customised for specific software requirements. MHP's open software architecture enables interactive services to be provided for digital TV viewers regardless of the service source or the digital receiver manufacturer. This should mean that viewers will not have to change their set-top boxes to access an interactive service from another provider, though I suspect that it may not be so simple in practice.

Sony had on show a number of MHP applications, including an advanced EPG, new text services and an interactive sports system. Following their introduction in
Germany this autumn, Sony plans to launch MHP-compatible IDTV sets in other European countries during 2002. Other features of the KD-32NS100B include a flat-screen FD Trinitron Wega CRT; Digital Reality Creation-Multi Function (DRC-MF) which increases the picture resolution by up to four times; 100Hz processing; and Virtual Dolby Surround Sound. Panasonic is of course also an MHP supporter. The company had on show an MHP-compatible set-top box developed for the Free Universe Network (FUN), an alliance of German broadcasters and electronics companies that provide free-to-air digital TV.

Philips had on show an MHP set-top box that's to be launched in Germany later this year. The company also showed an interactive TV advertisement that used MHP technology.

In order to ensure interoperability between different MHP products, the DVB Project has established a self-compliance test scheme for manufacturers. But the problem facing MHP is that it requires a lot of memory in a set-top box, and there's a legacy of millions of set-top boxes that have only small amounts of RAM. Whether digital broadcasters will rush to upgrade them remains to be seen.

**Flat-screen TVs**

You couldn't move for large, flat-screen TVs at the IFA. It's now clear that sets using several different types of flat-screen technology will be made available to consumers, with plasma used for the largest screen sizes.

Many setmakers showed plasma or liquid-crystal display (LCD) TV sets and monitors. The Panasonic TH-50PFHW3E was noteworthy, with its 50in. plasma screen that provides a 1,366 x 768 pixel resolution and a contrast ratio of 3,000:1. A TV tuner, Model TU-PTA100ES, is available as an optional extra – the tuner also serves as a video processor and line doubler. The depth of the TH-50PHW3E is 9.8cm and its weight 45kg. Sony unveiled its first plasma screen for the consumer entertainment market, Model PFM-42B1: it's a 42in. panel with 315 pixels and a depth of just 8.3cm. The Philips 32PF9964 is a 32in. plasma screen. This is smaller than many of the plasma TVs on the market, but Philips believes that there is a market for plasma TV in this size – not least because the price will be much lower than in the 40in. and over screen sizes. Thomson's plasma offerings included three models in the Wysius series, with 42, 50 and 61in. screens. Earlier this year Thomson formed an alliance with NEC to develop plasma technology.

Sharp, which is better known for its LCD technology, had two plasma TV sets on show, Models PZ-50HV2E and PZ-43HV2E (the first two numbers denote the screen size in inches). Both have a viewing angle of 160°, a contrast ratio of 800:1 and can achieve a brightness level of 350cd/m². Each set is PAL/SECAM/NTSC compatible, and there are four video and three scart sockets.

Pioneer showed two new plasma TVs, Models PDP-50HDE (50in.) and PDP-403HDE (43in.). These are analogue sets with Nicam decoders. Pioneer has worked with Sharp in developing flat-screen technology.

Samsung also had 50 and 42in. plasma sets, Models PS-50P2H and PS-42P2H respectively. Hitachi's 32in. widescreen CL32-PD2100 Plamation-series plasma TV includes Alternative Lighting of Surface (ALSIS) drive technology, which effectively doubles the screen resolution while using the same number of electrodes as conventional PDP technology. It's also claimed to increase longevity. The tuner is housed in a separate off-board unit and is equipped to act as a switching controller for AV sources like DVD and digital satellite. It has three scart sockets. The CL-32P2D2100 is now available in the UK.

Not surprisingly, Sharp also had a number of LCD TVs at IFA, with 13, 16 and 20in. screen sizes. There was also a prototype 30in. model. Philips showed two LCD TV sets, with 15 and 20in. screens; they will be launched in the UK next year. There were three LCD sets on the Samsung stand, Models LW-24E15W, LW-17E24C and LW-15E23C, the first two numbers denoting screen size in inches. The largest set has a 16.9 display.

Pioneer showed its Organic Electroluminescence (OLE) display technology, which was invented by Kodak then developed by Pioneer. The claim is that OLE is superior to LCD technology, but the cost is very high and Pioneer's prototypes to date have a screen size of only 7in.

**Projection TV technology**

There were many projection TV sets on display, including the Samsung Models SP-55W3HF (50in.) and SP-47W3HF (47in.). Their features include 100Hz scanning, a RealFlect system and automatic convergence setting for optimum picture quality. With two tuners, the sets can display pictures from two separate transmissions on the same screen. The Sharp XV-29000EF video projector is the first to use the new 16:9 version of Texas Instruments' Digital Light Processing (DLP) technology. This is based on a large IC that's covered with thousands of micromirrors to reflect incident light: each micromirror functions as a separate light switch, representing a display pixel. The resolution is 1,280 x 720 pixels.

There was a lot of interest in Liquid Crystal on Silicon (LCOS) projection technology, which uses a silicon chip rather than thin-film transistors (TFTs), the advantage being a faster switching speed. JVC uses the technology in the latest version of its D-ILA (Direct-drive Image Light Amplification) system. This ultra-high resolution projection technology, called QXGA D-ILA, has 3.2mpixel resolution, the aim being to provide full-quality HDTV displays. JVC says it plans to launch the technology commercially by the end of the year. Philips and Hitachi are
also developing LCOS displays, and had prototype projectors on show. The Sony KP-48PS2 and KP-61PS2 are 4:3 projection TV models with 48 and 61in. screens respectively. They use Sony’s DRC-MF technology (see earlier mention of this) and a Pro-Optic system that’s designed to improve brightness and definition.

**CRT developments**

Don’t let these developments lead you to conclude that the days of the CRT are numbered. Far from it. Setmakers were showing many Real Flat CRT models, several of them combined TV-DVD systems. Thomson’s display included TV/DVD models with 14, 25 and 36in. screens, while Samsung’s Model DW-21G6DV has a 21in. screen. Philips showed three large-screen TV/DVD sets, Models 28PW6816, 28PW6826 and 32PW6826 (28 and 32in. screens): all have a Real Flat CRT, a 100-page teletext memory with twin-page display, and are CD-R/RW compatible.

But some of the most interesting developments take place backstage at the IFA. At this year’s show Philips revealed two new CRT developments. The first, Pixel Plus, uses digital technology to double the number of horizontal lines and increase the vertical resolution. Philips says its system works better than similar formats, such as Sony’s DRC-MF, because it is better at handling fast-moving images. The proof will be in the viewing, when the first sets to include Pixel Plus are launched early next year. The other development, shown by Philips Components, is a short-neck CRT which reduces the depth of a 32in. CRT by about 10cm. Philips does not claim that this is a major development but, with a newly-designed casing, it does mean that a large-screen CRT set can look more compact.

**DVD recorders**

As many readers will know, there are several competing recordable (or, to be more accurate, rewritable) DVD formats, namely DVD-RAM, DVD-RW and DVD+RW. The latter is an as-yet unofficial format which has been developed by Sony, Philips and a handful of PC and CD-R/RW manufacturers. It nevertheless claims higher compatibility with existing DVD-Video players than the official formats.

The group of companies promoting DVD+RW, known as the DVD+RW Alliance, was very active at the IFA. Philips has coined the phrase Twin Way to describe DVD+RW’s compatibility. It says that DVD+RW recorders will play DVD-Video discs, and that most DVD-ROM drives and DVD-Video players (at least 90 per cent) will read DVD+RW discs. The company also points out that the DVD+RW specifications are similar to DVD-Video: both use a 650nm wavelength laser with the same numerical aperture (0.6), and the discs have the same track pitch (0.74μm) and reflectivity (18-30 per cent, the same as a dual-layer DVD-Video disc).

Philips’ first DVD+RW recorder, Model DVDR1000, will record up to four hours of MPEG-2 video on a 4.7Gbyte disc, either off-air using an internal multi-standard tuner or direct from a camcorder via an IEEE 1394 (FireWire) interface. Analogue sources can be copied via S-video or scart sockets. A recording format called Constrained Variable bit Recording (CVR) is used. This is claimed to combine two MPEG-2 video recording formats, Constant Bit Rate (CBR) and Variable Bit Rate (VBR). The former provides the best picture quality at the price of reduced disc capacity. VBR uses the available disc capacity more efficiently but, as there is little relationship between the playing time and capacity, disc-space management is made more difficult. CVR uses as few bits per second as possible, to improve efficiency, and makes wide bit-rate variations over short time spans possible. Philips says that it also offers the reliability of CBR, by making it possible to record at an average bit rate over longer time spans.

Philips also took the opportunity provided by the IFA to announce double-sided DVD+RW discs with a capacity of 9.4Gbytes. They have a recording time of up to eight hours per disc, depending on choice of recording quality. Philips says that the new discs will be ideal for off-loading PC data when the hard disk(s) are full, for example with large files such as videos or high-resolution digital still images.

The official recordable DVD formats were also well represented at the IFA. The Recordable DVD Council, a group of 66 companies that support the official DVD recording formats, announced plans to launch a worldwide programme to promote their products.

Panasonic had on show its first DVD-RAM recorder, Model DMR-E20, which uses both DVD-RAM and DVD-R technology. DVD-RAM discs can be rewritten up to 100,000 times: DVD-R discs are for single recordings, which can be played by an ordinary DVD-Video player. The latter is an important point, because DVD-RAM discs cannot be played by a standard DVD-Video player as, with one exception, they use a protective caddy. Panasonic and Toshiba say that they will launch DVD-Video players that are compatible with DVD-RAM discs, but these will be expensive. DVD-R provides a relatively inexpensive way of making recordings that can be played by any DVD-Video machine. In the EP mode a 9.4Gbyte DVD-RAM disc can record up to twelve hours of material, while a 4.7Gbyte DVD-R disc can store up to six hours of material.

The DMR-E20 automatically selects from four recording modes to obtain the highest picture quality for the remaining record time. It also has a smart time-slip feature, called...
provides a sharper edge to video images by Enhancer (DVE) which, Sony says, players: both incorporate a Digital Video NS700P are combined DVD/SADC discs. Sony's DVP-NS900V and DVP- with MP3-encoded discs and CD-R/RW channel SACD discs. It is also compatible DVD-Video, DVD-Audio and multi-Video discs. Pioneer's DV -747A can read IFA did more than simply play DVD- Many of the DVD players on show at the same day and at the same time every week, record a programme that's shown on the same day and at the same time every week, feature is useful for those who want to program the timer automatically without any user intervention. Pioneer says that this feature is useful for those who want to make VHS copies of DVD discs – provided they are not copy-protected. Other features include Dolby Virtual Surround, three-step digital zoom and EP playback (in the PAL mode). Samsung was another company with a combined DVD/VHS machine, Model SV-DVD1E. Philips had on show a range of DVD Video players that are compatible with CD-R/RW discs and MP3 files. The number of companies offering these features with DVD-Video players shows the extent to which consumers are using PCs to record, on CDs, MP3 files that have been converted from audio CD PCM files or downloaded from the internet. Panasonic's DVD-LA95 is claimed to be the world's first DVD player that can read DVD-RAM discs, though the company stresses that compatibility cannot be guaranteed with recordings made on other DVD-RAM recorders.

Sony's DVP-F21 DVD-Video player can be stacked either horizontally or vertically.

**Hard-disk video**

The VHS format is being challenged by recordable DVD and now hard-disk video systems as well. Hard-disk video recorders like TiVo, Sky+ and JVC's HM-HSS1, which combines an S-VHS deck with a 40Gbyte hard disk, are already on sale, but the IFA showed that these are just the start of a new generation of hard-disk video products.

JVC also had on show Models AV-32DD and AV-28DD2, 32 and 28in. TV sets respectively that have a built-in 20Gbyte hard disk for recording TV programmes. Up to twenty hours of programming can be minimising imperfections such as overshooting. If you looked hard enough you could find DVD-Audio players, such as JVC's XV-FA92, XV-FA90 and XV-SA72.

Sharp's DV-NC55H is a combined DVD player and Nicam VHS recorder which is also compatible with S-VHS recordings and MP3 files. The company points out that its machine enables users to make VHS copies of DVD discs – provided they are not copy-protected. Other features include Dolby Virtual Surround, three-step digital zoom and EP playback (in the PAL mode). Samsung was another company with a combined DVD/VHS machine, Model SV-DVD1E. Philips had on show a range of DVD Video players that are compatible with CD-R/RW discs and MP3 files. The number of companies offering these features with DVD-Video players shows the extent to which consumers are using PCs to record, on CDs, MP3 files that have been converted from audio CD PCM files or downloaded from the internet. Panasonic's DVD-LA95 is claimed to be the world's first DVD player that can read DVD-RAM discs, though the company stresses that compatibility cannot be guaranteed with recordings made on other DVD-RAM recorders.

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**Table 1: Main features of the Panasonic DMR-E20 DVD-RAM recorder.**

<table>
<thead>
<tr>
<th>Feature</th>
<th>Panasonic DMR-E20 DVD-RAM recorder</th>
</tr>
</thead>
<tbody>
<tr>
<td>Recording media</td>
<td>DVD-RAM, DVD-R</td>
</tr>
<tr>
<td>Playback format</td>
<td>Video MPEG-2, audio Dolby Digital 2.0</td>
</tr>
<tr>
<td>Video compatibility</td>
<td>DVD-RAM, DVD-R, DVD-Video, Audio-CD,</td>
</tr>
<tr>
<td>Horizontal resolution</td>
<td>&gt;500 lines</td>
</tr>
<tr>
<td>Video DA converter</td>
<td>27MHz/10 bits</td>
</tr>
<tr>
<td>Audio DA converter</td>
<td>96kHz/24 bits</td>
</tr>
<tr>
<td>Front connectors</td>
<td>DV input, S video, A/V</td>
</tr>
<tr>
<td>Back connectors</td>
<td>Scart (RGB, S and composite video), S video;</td>
</tr>
<tr>
<td>Digital output (optical)</td>
<td>PCM audio, Dolby Digital/DTSCD, MPEG-2 sound</td>
</tr>
<tr>
<td>Timer recording</td>
<td>VideoPlus, FR mode, one-touch recording, time-slip function, digital noise reduction, subtitles, angle of vision information, sound channel selection, Virtual Surround Sound, dialogue language mode, direct navigator, playlist playback, Q-link, menu controls (GUI), joystick remote control, PAL hyperband tuner, automatic channel programming with 99-channel storage.</td>
</tr>
</tbody>
</table>

**The Panasonic NV-HDB1EC hard-disk recorder with integrated digital satellite receiver.**
recorded on the disk. These two sets went on sale in Japan last summer, but no UK launch date has so far been suggested. A number of TV marketing managers have hinted that similar products will go on sale in the UK within twelve months however. Panasonic’s NV-HDB1EC is a hard-disk video recorder with an integrated digital satellite receiver and an 80Gbyte disk. Its features are summarised in Table 2. It goes on sale in Europe this autumn. Thomson’s UDR (Unlimited Digital Recorder) is a set-top box with an integrated hard disk that can store up to 40 hours of TV programming or 8,000 images.

**Camcorders**

Hitachi recently launched a camcorder that uses the DVD-RAM format. But if you thought this was the beginning of the end for new tape-based camcorder formats you are wrong. Sony unveiled the MicroMV format at the IFA. It uses video cassettes that are 70 per cent smaller than standard MiniDV cassettes. While the MiniDV format uses a version of the JPEG video compression format, MicroMV uses MPEG-2 compression. Each MicroMV cassette has 64kbits of resident memory for storing information on what has been recorded on the tape, such as the length of the clips and the remaining record time. There is also a multi-picture function that shows still images from up to eleven clips. Sony says that a 60min. cassette can be searched in just four minutes, using the camcorder’s LCD screen as a monitor. An MPEGMovie AD feature enables users to make short video clips (up to 260 seconds in length) and store them on a Memory Stick card for transfer to a PC. MicroMV’s bit rate is just 12Mbits/sec, less than half that of MiniDV, thus saving storage space on a PC hard drive. Sony’s first two MicroMV camcorders are Models DCR-IP7 and DCR-IP5.

Sony has also launched camcorders that use Bluetooth wireless technology. This is a standard short-range (between 10-100m) wireless connection system designed to remove the need for many of the connecting leads and cables used today. Models DCR-PC120 and DCR-PC115 are MiniDV camcorders that can also be used for internet access when combined with a Bluetooth-enabled GSM or GPRS mobile phone. Another option is to use a modem adaptor with Bluetooth capability for connection to a fixed-line socket. The DCR-PC120 can even be used for reading e-mails and exploring the internet. Panasonic also had two Bluetooth camcorders, Models NV-MX8 and NV-MX2, on show.

The Sharp VL-NZ101H is the company’s smallest Viewcam model to date – it’s about 50 per cent smaller than the previous model. Features include an 800,000-pixel CCD imager, a 3in. colour LCD monitor, and 10x optical zoom. It has a memory card slot for SD or MultiMedia cards, which can be used to store digital still images.

**Memory cards**

Panasonic announced a 256Mbyte SD memory card – previous SD memory cards had a maximum storage capacity of 64Mbytes. In addition to its greater storage capacity the 256Mbyte SD card has a read/write transfer rate of 10Mbits/sec, five times faster than with the 64Mbyte card. The new card should be available later this year. Panasonic intends to introduce a 512Mbyte card in early 2002, a 1Gbyte card in early 2003, a 2Gbyte card in 2004 and a 4Gbyte card in 2005. The latter will be able store DVD-quality feature movies. A summary of SD card capacities and features is given in Table 3.

SD cards are designed for use with a wide range of products, including digital camcorders, digital cameras, portable audio equipment, mobile phones, PDAs (Personal Digital Assistants) and PCs. The current cards can store music, voice, still pictures, text and other data: the new 256Mbyte card can also be used to store MPEG video. Panasonic plans to launch or announce 37 SD-enabled models in 19 product categories.

Sony announced that 174 companies now support its Memory Stick format, the company is developing larger-capacity Memory Stick cards.

Prototype digital camcorders that store moving images on memory cards rather than tape or disc may well be on show at the next IFA.

---

Table 2: Main features of the Panasonic NV-HDB1EC hard-disk video recorder.

<table>
<thead>
<tr>
<th>Feature</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Storage medium</td>
<td>80Gbyte hard disk</td>
</tr>
<tr>
<td>Max. recording time</td>
<td>45 hours</td>
</tr>
<tr>
<td>Recording format</td>
<td>Video MPEG-2TS, audio MPEG-1 Layer 2</td>
</tr>
<tr>
<td>Tuner</td>
<td>DVB-S</td>
</tr>
<tr>
<td>Cue and review</td>
<td>x3, x6, x12, x24, x300</td>
</tr>
<tr>
<td>Timer system</td>
<td>Premium EPG and manual programming</td>
</tr>
<tr>
<td>User menus</td>
<td>GUI (Graphical User Interface) in seven languages</td>
</tr>
</tbody>
</table>

Functions include Direct Navigator video archive system; time-shifted viewing; live TV pause; dubbing; one-touch recording; bookmark skip; cue and review; favourites list. The remote control unit is a multi-brand type.

Terminals: Two scart sockets; S-Video output socket; three RCA AV output sockets; optical Dolby Digital output terminal; two RCA audio output sockets; RF in/out terminals.

---

Table 3: SD memory card capacities and features.

<table>
<thead>
<tr>
<th>Type</th>
<th>64MB</th>
<th>256MB</th>
<th>512MB</th>
<th>TGB</th>
<th>2GB</th>
<th>4GB</th>
</tr>
</thead>
<tbody>
<tr>
<td>Approx. no. of JPEG photos*</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>normal</td>
<td>160</td>
<td>640</td>
<td>1,280</td>
<td>2,500</td>
<td>5,000</td>
<td>10,000</td>
</tr>
<tr>
<td>fine</td>
<td>100</td>
<td>400</td>
<td>800</td>
<td>1,560</td>
<td>3,125</td>
<td>6,250</td>
</tr>
<tr>
<td>Approx. video time†</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MPEG-4, 384kbits/sec</td>
<td>22</td>
<td>90</td>
<td>180</td>
<td>360</td>
<td>720</td>
<td>1,440</td>
</tr>
<tr>
<td>MPEG-2, 4Mbits/sec</td>
<td>2</td>
<td>9</td>
<td>18</td>
<td>36</td>
<td>72</td>
<td>144</td>
</tr>
<tr>
<td>Approx. audio time†‡</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>normal, 96kbits/sec</td>
<td>86</td>
<td>344</td>
<td>688</td>
<td>1,343</td>
<td>2,686</td>
<td>5,372</td>
</tr>
<tr>
<td>fine, 128kbits/sec</td>
<td>64</td>
<td>256</td>
<td>512</td>
<td>1,000</td>
<td>2,000</td>
<td>4,000</td>
</tr>
</tbody>
</table>

*1,200 x 900 pixels. † Minutes, ‡ AAC, MP3.
Alan Dent continues with his coverage of fault possibilities with these chassis, this time dealing with the tuner, the signal processing circuitry and the audio circuitry.

Luminance and no picture faults
Composite video leaves the jungle module at pin 6 and passes to pin 16 of the TDA8453A luminance delay and chroma filtering chip IC109. There are two luminance outputs from this IC. The output at pin 6 goes to pin 25 of the TDA8391 colour decoder chip IC111 for matrixing with the chroma signals. The delay output at pin 4 passes to TR120/121 which provide inverted and non-inverted sync feeds. The non-inverted output goes to pin 27 of the SAA5231 text generator chip IC110 for text sync. It leaves IC110 at pin 1 and returns to the jungle module at pin 13. The inverted output from TR120/121 goes via TR122 to pin 19 of scart socket AV1. If the set is non-text, the inverted output from TR120/121 goes direct to pin 13 of the jungle module.

No luminance and no OSD: Check that the 8V supply to the 5V regulator IC103 (7805) is present. If not, R139 (0.22Ω fusible) could be open-circuit or D122 (BY297) leaky. Check the sandcastle pulses at pin 15 of the jungle module, pin 8 of IC111 or pin 15 of IC113. If distorted or of incorrect amplitude, check that the pulses at the junction of R151/C157/R152/C155 are of 20V peak-to-peak amplitude. If not, C155 (1nF) could be leaky. If necessary disconnect the sandcastle inputs at IC111 and IC113 and check the pulse amplitude at the junction of R173/R151/C157: this should be 300V peak-to-peak. R173 (270kΩ) high in value causes a droop on the trailing edge of the top pulse, R121 or R151 (both 270kΩ) high in value causes the bottom level to be distorted. If the sandcastle pulse modifies when pin 8 of IC111 is lifted but is not clean and square, check R121/R151.

No luminance, OSD OK: Pin 2 of the jungle module should be low for TV, high for AV. The switching source is pin 16 of the audio switch module. Pin 36 of the microcontroller chip IC117 should be low for TV, high for AV. This output is inverted by TR116 then fed to pin 2 of the audio switch module where it's inverted again by TR903 before appearing at pin 16. Pin 15 of the audio switch module should be at 0V. If not, the video from pin 6 of IC109 will be inhibited.

Very weak luminance, poor sync, OSD OK: Check whether R010 (2.2kΩ) on the jungle module is open-circuit, then check whether C295 or C210 (both 101.1F) is leaky. TR120 (JC501P) is leaky collector-to-emitter, or R230 (561Ω) is open-circuit. The non-inverted output goes to pin 16. If there is no 2FC output at pin 28 of IC111 there will be no luma output at pins 4 and 6 of IC109. There should be a 400mV 2FC signal at pin 12 of IC109. Causes of loss of the 2FC signal are XL102 (4.43MHz) faulty or C203 (15pF) open-circuit.

No raster until the first anode voltage is increased: The TDA8391 colour decoder and luminance/chrominance matrixing chip IC111 could be faulty. The first anode voltage will be difficult to set, because the brightness oscillates. IC111 usually fails as a result of flashover from the line output transformer to chassis.

There could be a fault in the dark-current feedback conditions between pins 6/11/14 of IC601 on the CRT base and pin 10 of IC111 via pin 4 of CON600. For an average still picture there should be 1V DC at the cathode of zener diode D604. Check whether pin 10 of IC111 or pin 4 of
CON600 is open-circuit. 
C256 (1μF) which decouples pin 11 of IC111 could be leaky.
Pin 24 (beam limiting) of IC111 should be at 4.5V nominal. If the voltage is lower, check R160 (8-2x2Ω), D134 (1N4148), R333 (1kΩ) and C299 (33µF).
On early chassis (Clarivox), check the earth connections to the jungle module. These can break rather easily if the module is handled roughly.

Uncontrollable brightness: Check whether pin 5 of IC111 is open-circuit and filter components R317 (33kΩ), R206 (18kΩ) and C299 (470µF).

No picture when the SVHS switch SW100 is operated: D138 (1N4148) is open-circuit.

No luminance from/to a scart socket pin: Check relevant signal path.

Negative picture: See jungle module section.

Interference on picture as volume is increased: Lead PL107, PL108 trapped in CRT P band.

Colour decoder
The colour decoder section is quite complex, involving three ICs: IC111 (TDA8391) is the decoder, IC113 (TDA8451A) is a digital chroma delay line and IC109 (TDA8453A) provides chroma filtering and luminance delay. Some fault conditions have been listed in the luminance/no picture section. Auto grey-scale correction is used to minimise colour drift as the set ages. Here are some specific colour decoding faults.

No colour: IC113 could be faulty. If its 12V supply at pin 3 is missing check whether R337 (100Ω) is open-circuit. If there's a monochrome picture with a ragged display check C202 (100nF) for leakage.

One primary colour missing: No output from the relevant pin of IC111 (13 red, 15 blue, 17 green). Check the relevant clamp capacitors C257 red, C253 blue and C252 green (all 470nF) for leakage. Also see CRT base panel section.

Chroma unstable at transitions: Check whether R253 (3.3kΩ) or C243 (1µF), which are connected in series with pin 5 (PLL) of IC113, is open-circuit.

Magenta and cyan only: If the chroma from IC111 to IC113 and back is OK there's an internal fault in IC111.

Noisy chroma: Can occur when the focus lead connection at the line output transformer isn't seated correctly.

Audio circuitry
The sound IF circuitry is centred on IC002 (TDA2545A), which is part of the jungle module. Its input comes from the quasi-parallel SAW filter SF001. The output at pin 12 of IC002 is passed to pin 8 of the Nicam module. There is also a mono path via CF100 to IC114 (U829B), then to pin 10 of the Nicam module. IC505 (4066) on the Nicam module carries out mono/stereo switching. The outputs at pins 11 and 12 of the Nicam module go to the audio switch module, which routes audio signals to and from the scart sockets, and to IC115 (TDA8425). This switching chip is connected to the P/C bus: it also controls the volume, tone and various other controls.

In versions 1 and 2 of the chassis the audio output chip IC116 (TDA2009A) is fed via a mute module. In version 3 the mute circuit is on the main panel and works in conjunction with IC116, which is type TDA2616 (see Fig. 4).

The TDA2009A chip’s audio output pins are 8 and 10: the outputs are fed to the speakers via 2,000µF coupling capacitors (C236 and C288). With the TDA2616 chip the output pins are 4 and 6 and the coupling capacitors are 1,000µF (same circuit reference numbers).

The following numbers is a guide to audio fault-finding, based on workshop experience.

No sound: Check the 26V supply from the chopper circuit to IC116. If missing, R133, D108 or the PCB track from the power supply around the edge of the main board could be open-circuit.

Use an oscilloscope to trace the audio from pins 11 and 12 of the Nicam module to pins 18 and 20 of IC115, then from pins 9 and 13 of IC115 to pins 1 and 9 of the TDA2616 audio chip or, in earlier versions, pins 1 and 5 of the TDA2009A chip via the audio mute module (audio in at pins 4 and 6, out at pins 1 and 2, with the mute input at pin 5 – pin 3 provides the chassis connection for the mute circuit). If muting is active, check the ident pulse at pin 29 of the microcontroller chip IC117. This comes from pin 5 of the jungle module (pin 14 of IC001). Pin 2 of IC117 goes high for muting. In version 3 muting is applied to pin 2 of the TDA2616 IC via TR135 (IC501P), which could be short-circuit – see Fig. 4.

Intermittent muting could occur with early chassis because pin 12 of the microcontroller chip IC117 was left floating: it should be connected to chassis.

If there’s no audio from IC115, check C237 (100µF) which could be leaky. It’s connected to pin 2.

No sound when AV is selected: IC115 is probably faulty.

No mono sound, stereo OK: R517 (10kΩ) on the Nicam module open-circuit.

IC116 getting hot: Can be caused by RF oscillation at the output pins. Check whether any of the following are open-circuit: C286 or C287 (both 0.1µF), R257 or R258 (both 1Ω, fusible). With the TDA2616 chip, check C282 (100µF) which is connected to pins 3 and 8. Shorted speaker leads etc. will probably destroy IC116.

Distorted mono sound: L107 could be off-tune or CF100 or C297 (1nF) faulty.

Mono audio missing: TR111 (IC501P) could be faulty or R248 (2.2kΩ) open-circuit. TR111 is an emitter-follower between the output from IC114 and pin 10 of the Nicam module. It also provides a feed to the AV2 scart socket.

Low-level mono audio/distorted Nicam: Check whether pins 2 and 3 of the audio switch module are shorted.

Sound plop at power-off: This applies to the version 3 chassis only – there is no anti-plop circuit with the TDA2009A chip. Fig. 4 shows the muting and anti-plop circuit.
used with the TDA2616 audio output chip. If the anti-plop circuit doesn’t work, TR136 (JC101P) could be faulty or R375 (100k0) open-circuit. The 16V supply could be missing from the topside track. Check open-circuit. The 16V supply could be (JC101P) could be faulty or R375 (100k0) 

Nicam module

The Nicam decoder used in UK sets is in one module that’s connected to the microcontroller chip IC117 via the IC bus. There are few faults here.

Nicam sound: If the LED or on-screen display shows no Nicam signal, the carrier or data PLL isn’t locked. If the LED or on-screen display show nothing wrong, check the audio outputs at pins 6 and 8 of the TDA1543 DA converter IC502. If audio is present here, check through IC503 and TL505 (4066) and the associated components. If there’s no audio output from IC502, check IC501 (SAA7280), IC504 (TDA8732) and the associated components.

Nicam drop-out: L503/4 may be the wrong value – should be 1mH (applies to versions 1 and 2 only).

The help wanted column is intended to assist readers who require a part, circuit etc. that’s not generally available. Requests are published at the discretion of the editor. Send them to the editorial department – do not write to or phone the advertisement department about this feature.
Ian Field describes a simple Ni-Cad battery pulse-charger circuit based on the use of a conventional iron-cored mains transformer.

The principle of Ni-Cad battery pulse charging and its advantages were described in an article of mine in the March 2001 issue of *Television*. That article also outlined a way of modifying a typical AC adaptor/small PC switch-mode power supply to provide pulse charging.

Many people will probably not be keen to mutilate a direct off-line switch-mode power supply for the purpose. So I've drawn up a basic pulse-charger circuit that's based on the use of a conventional iron-cored mains transformer. It can be built from scratch at very little cost. Alternatively a conventional-type mains adaptor or 'cheap-and-nasty' commercial Ni-Cad charger could easily be modified: a commercial Ni-Cad charger has the advantages of a built-in transformer and battery bays, and a current-limiting resistor of value correct to suit the size of cells that fit the bays.

**Circuit description**

The new circuit is shown in Fig. 1. Some of the resistor values depend on the number of cells, so these have been left to the constructor to determine in accordance with the particular application. The transformer shown feeds a bridge rectifier. Alternatively a transformer with a centre-tapped secondary winding to feed a single-phase, full-wave rectifier circuit could be used.

Resistors R1, R2 and R3 with transistor Q1 form a zero-voltage detector. The ratio of R1 and R2 is chosen to provide sufficient base bias to saturate Q1 for any sinewave amplitude value that exceeds ten per cent of the peak value. Thus Q1 switches off only briefly at the zero crossing point. The MOSFET switching transistor Q2 can then conduct. Its gate is driven by the differentiating network C1/R4: R3 must provide sufficient charging current for C1 so that the voltage developed across R4 is at least the gate-threshold voltage for Q2, enabling it to switch on. Differentiator-coupling is required because otherwise, if the mains supply was interrupted, the zero-voltage detector circuit would interpret this as being a permanent zero-crossing condition and Q2 would be permanently switched on, which would be catastrophic for the battery! To maximise its useful effect, the brief discharge pulse produced by Q2 must be as high-current as can be accommodated. The zener diode D6 is included to protect the MOSFET's gate from being driven negatively when Q1 switches off, and to discharge C1 so that it is ready to produce the next charging spike to switch Q2 on.

D5 is included to isolate the battery voltage from the half-wave output from the bridge rectifier, otherwise the zero-crossing detector wouldn't work. The current-limiting resistor R5 will already be present if a commercial Ni-Cad charger is being modified. Otherwise, its value must be calculated to limit the charging current to a value appropriate for the cells being charged.

The value of the shunt resistor R6 will be very low. The idea is to make the very brief current pulses when Q2 switches on as high as practicable. R6 is included mainly to protect the MOSFET, which should be the highest-current type ready to hand.

**Performance**

The performance of this design is unlikely to come anywhere close to that of the HF type previously described, but it is very simple to build. I doubt whether there is any danger that it would harm a lead-acid battery, so it might be worth trying the unit with a lead-acid battery which has become so sulphated that a normal battery charger can't get any charging current started.

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*Fig. 1: Simple Ni-Cad battery pulse-charger circuit based on the use of an iron-cored mains transformer.*
This month K.F. Ibrahim describes the system control, A/V decoder, audio processing and user interface sections of a DVD player.
information.

Digital video and audio outputs are usually also fed to coaxial or fibre connector ports. To simplify matters this is not shown in Fig. 18.

A crystal oscillator generates the 27MHz system clock. There’s also an external chip-clock input.

**Audio processing**

The DVD system enables three audio encoding techniques to be used: MPEG-2, Dolby Digital (AC-3) and linear PCM. Fig. 19 shows in block diagram form the elements of a DVD player audio processing system.

The audio decoder that provides left/right stereo or multi-channel sound has three main outputs: the L/R data, a bit clock which indicates the bit rate of the data stream, and an L/R clock (the left and right channels are sampled in turn, hence the need for this clock). There are extra outputs when multi-channel audio is present. It feeds a two-channel DAC to obtain left and right stereo outputs, and a multi-channel audio digital signal processor (DSP) which can provide up to seven outputs with MPEG sound and 5.1 channels with Dolby Digital (see pages 652-4 September for more on the audio formats).

The audio decoder also feeds a downmixer which is used where a simple two-channel stereo output is required from Dolby Digital. Downmixing involves matrixing the centre- and surround-channel information on to the main stereo channels. This is satisfactory as a basic process, and can be improved by tweaking for optimum results.

With MPEG sound encoding the centre- and surround-channel information is already matrixed on to the main channels, so downmixing is unnecessary.

The linear PCM sound encoding format is the same as that used with audio CDs. There is no data compression, hence the high bit rate. Up to eight channels can be produced by the audio DSP with linear PCM.

**The user interface**

A dedicated microcontroller chip is used as an interface between the user controls and the rest of the player (syscon etc.). It has its own individual clock and is
powered by an ever 3.3V supply. Fig. 20 shows in block-diagram form this section of the player.

The functions of the interface microcontroller chip are as follows:

1. To control the power supply operation. When a player is switched on from cold, only the ‘ever’ voltages are produced and the power supply is in the standby mode. The user interface chip receives a power-detect signal from the power supply. When the chip detects an on request, it provides a power-control high signal. This brings the power supply out of the standby mode, switching on the other DC supplies.

2. To receive and decode inputs from the front-panel button switches.

3. To receive and decode the output from the IR remote-control receiver.

4. To control the front-panel display.

5. To initiate switching of the input/output ports as required.

6. To provide video and audio muting as required.

7. Communication with the syscon microprocessor chip.

**DVD player outputs**

There are various analogue video outputs from a DVD player. The scart connector provides RGB and composite video/blanking/sync (CVBS) outputs. There are separate luminance and chrominance (S-Video) outputs. And phono connectors (usually yellow) provide composite video. S-video provides the best quality video. RGB is second best, while composite video is comparatively poor.

Analogue audio is provided as stereo from the scart socket, stereo from phono sockets, up to eight surround sound channels or Dolby Digital 5.1.

Raw digitally-coded audio outputs are available at coaxial and optical-fibre output sockets for feeding to an external decoder/amplifier, e.g. Dolby Digital.

**Video formats**

Video is available in two formats: 4:3 (1.33:1) and 16:9 (1.78:1) – the latter is known as widescreen. Films are usually 1.85:1 or wider, hence the need for conversion. This may involve black borders (mattes) at the sides or top/bottom, or cropping the sides and top/bottom of the picture. The various video display possibilities are as follows:

1. Full frame, where the material is shot and displayed in the 4:3 format.
2. Pan and scan, where the picture is made, regardless of its shape, to fill the 4:3 format by selecting part of the image for display.
3. Letterbox, which is a method of showing widescreen video on a 4:3 format screen. Widescreen (16:9 or wider) is made to fit the screen by adding mattes at the top and bottom.
4. Widescreen, where the recording and display is in this format.

Film can be anamorphically squeezed into 4:3 format then ‘unsqueezed’ by the TV receiver to full 16:9 format. TV receivers may provide conversion that stretches the image, the result being distorted dimensions, as when an anamorphic image is displayed as 4:3. In this case the image will be squashed horizontally, with elongated figures. Another, more common, example is when a 4:3 image is stretched horizontally to fit a 16:9 widescreen display. This all makes a mockery of the sophisticated circuitry designed to ensure good display linearity.

**Next month**

In next month’s instalment we will concentrate on fault-finding procedures.

K.F. Ibrahim is Senior Lecturer at the College of North West London and is author of several books, including Digital Television and Television Receivers.
Servicing Audio and Hi-Fi Equipment

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Motor homes offer many opportunities for installation work. Tom Baker describes step replacement with an electrically-operated version.

In a previous article (July) I discussed fitting radio/CD systems in caravans and motor homes and mentioned how important it is to hide all wires and make the job a neat one, as space is at a premium. Motor homes are similar to caravans in a lot of ways but, depending on age and type, the difference can be as great as chalk and cheese. Motor homes can range in value from a few thousand to over sixty thousand pounds.

Some people can be intimidated by a sort of palace on wheels, and won't consider doing any work on such vehicles. But there are lots of extras that can be fitted, and many owners who are ready to purchase them but don't have the ability or wish to carry out installation. Here are just a few examples, to whet your appetite: satellite navigation systems; Sky satellite dishes; tow bars; reversing cameras; reversing detectors; electric steps; and air-conditioning units. I've fitted them all - except for satellite navigation - and can assure you that once you have made up your mind where to install a unit the rest is relatively easy. If you should feel over-whelmed by a job, just say to yourself "it's only a poshed up delivery van", because basically that's what a motor home is.

By this I mean that they are all built on a commercial van chassis. So there's lots of space underneath to run wires. And because there is, in effect, a caravan stuck on top,
there's lots of wooden flooring to clip the wires to.

**Safety**

Now to the serious bit. Make sure that when you run wires underneath a vehicle you don't leave any cabling which could chafe on the chassis. If you think there's a possibility that it might, either re-route it or put it inside some plastic conduit designed for the purpose. The conduit has a slit up the middle to enable you to get it over the wire. You cannot be too careful about this because, unlike a caravan, a motor home has a big battery in it. There might in fact be two or three to run accessories, and they don't switch off when the ignition key is taken out.

In addition, always make sure that whatever you fit is connected to its own fuse or fuses. I emphasise this because I have seen at first hand what a burnt out motor home looks like. Believe me, it's not a pretty sight. The one I'm thinking about was set alight by vandals, but it was enough to make me think much more about electrical safety with motor homes.

**Electric door steps**

Now for this month's main topic, fitting a step that's controlled (extended/retracted) by an electric motor. I don't know whether any of you listen to Terry Wogan in the mornings on Radio 2: I do, and one of the catch phrases he uses is "is it me?" I seem to be saying this more often myself as I get older. It happened to me last week when I was asked by a customer to fit an electric step to his motor home. He said that as it already had a mechanical step that could be pulled out fitting a motorised version should, apart from the wiring, be a doddle.

So I ordered one and, when it arrived, I studied the instructions. These told me how easy it was to fit the step and wire it up, and I convinced myself that it really would be a doddle. Three days later I phoned the customer to tell him that the step had arrived, and arranged to collect his motor home and take it back to my workshop for fitting.

It was only when I started to remove the existing step that the feeling I'd taken on something I shouldn't have come over me. I took a closer look and noticed that the fixing screws were eight and a half inches away from the ones on the new step! The phrase "is it me?" came to the front of my mind. What I'd not thought about was that some motor homes have deep fibreglass skirts along the bottom and sides, so that you don't see the chassis structure on which the motor home is built.

The step I had obtained was designed to be fitted to either a wooden or metal floor and was, therefore, flat at the top for flush fitting. But the floor that confronted me was eight and a half inches away, up in the air, behind the skirt.

Not being the type of person to give up, I took both steps around to my friend John, the blacksmith, and showed him my problem. Then I let him look at the steps. After a pause for a laugh he suggested making two extension pieces to enable the new step to fit. The accompanying photographs show how this turned out.

While John made the extension brackets I sorted out the wiring. This wasn't just a case of a live and an earth wire. There was also a live wire from the ignition switch, so that the step retracts automatically when the vehicle is started up – this is a safety feature. I took these connections directly from the main fuse box, but for added protection fitted individual in-line fuses as well.

Then I ran the cables out through the engine compartment and re-wrapped them to the existing loom, taking them underneath the vehicle and again tie-wrapping to the underside – so that they wouldn't flap about and risk chafing against something. You have to bear in mind that if there's a big diesel engine there will be a lot of vibration, while the vehicle might travel over some very rough terrain. It will spend most of its life on roads.

John eventually brought the step back and, after I'd spent another half an hour on my back underneath the vehicle, the step was firmly attached to it. I connected the relay to the switch then, having followed all the manufacturer's instructions, it was time to test the installation. I was impressed when it worked first time.

I had to charge the customer £30 on top of the quoted price for the extra brackets. Fortunately he appreciated that the problem couldn't have been foreseen and was happy to pay.

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**Next time**

A job I'm often asked to carry out is to fit a rear-mounted camera system to enable the driver to see what's behind when reversing. I'll cover this in the next instalment in the series.

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The omnistep is available from Hayes Leisure Ltd. of Birmingham (0121 5263 433) and Broadview Blinds of Poole, Dorset (01202 679 012).
**LETTERS**

Send letters to “Television”, Cumulus Business Media, Anne Boleyn House, 9-13 Ewell Road, Cheam, Surrey SM3 8BZ

or e-mail tessa2@btinternet.com using the subject heading ‘Television Letters’.

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

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

Please send ONLY text intended for the letters page. Correspondence relating to subscriptions and other matters must be sent to the office address given above.

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**Terrestrial digital TV**

In his letter in the October issue Geoff Darby suggested that ITV Digital is doomed. The satellite alternative, Sky Television, has yet to make a profit however, and there are stories that its pictures disappear during thunderstorms. As for the stunningly good Sky pictures on the major channels, because of the very nature of digital TV the ITV Digital pictures are also stunningly good on all channels!

Being interested in TV engineering but loath to pay a subscription to watch, I decided that what I needed was a dual-standard analogue/digital TV set, rather like in the 405/625-line days. I eventually discovered that Argos has been selling a 28in. Bush analogue/digital set for £395 – plus a free one-year subscription for some pay channels.

To check that I would be able to receive terrestrial digital TV, I managed to borrow a set-top box. This confirmed that reception was possible. But because of the wide spread of the channels I had to purchase an ITV Digital recommended wideband aerial. Having installed this in place of my previous aerial, I was in a position to obtain the Bush TV set. I did, and have been very impressed with the results: stunningly good widescreen pictures in either analogue or digital form, a good choice of local and national programmes, several FTA channels, the EPG, and only one remote-control handset required.

I had to do some work to get this service, but I do live thirty miles from the transmitter. What baffles me is that the availability of dual-standard sets is so poorly publicised. At the price I paid, I’m sure that many people would take up the terrestrial digital TV option. After all, you get very affordable widescreen TV.

I could go on about digital TV issues, but I believe that terrestrial TV is here to stay and will ultimately be most people’s choice of TV.

Incidentally, children’s analogue portables will still be very useful for PlayStations, Nintendos and the like.

Mike Bellis,
Burton Latimer, Northants.

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**Vintage radio repairs**

I enjoyed the articles on vintage radio repairs, having started to work as a service engineer in 1955 when this was the usual job, also because for some years now I’ve been restoring and collecting valve radio receivers. The following additional points may help those interested in this type of work.

First, most valve radio receivers didn’t have a fuse or, if they did, it was often overrated. I always fit a fuse in the live supply, before the switch, then check the maximum current drawn by the set. This is usually about 300mA. I fit an anti-surge type rated at about 100mA higher than the measured maximum current. It provides extra safety and protects the usually irreplaceable mains transformer from the effects of short-circuits – valve rectifiers are infamous for spectacular shorting.

Secondly, open-circuit line cords, barretters and droppers in AC/DC radios can be dealt with by fitting a motor-run capacitor in series with the heater chain instead. In my experience this should have a value of between 2µF and 3µF. Start with 2µF and monitor the heater voltage as you slowly increase the input from a variac. If the heater voltage is low with a 240V input, add 0.1, 0.22 or 0.47µF tubular capacitors, rated at 1kV, until the voltage is correct or just under. If the voltage reaches its correct level with an input of less than 240V, start with a 1µF or 1.5µF capacitor. After each addition to the capacitance, start checking again with the variac at zero. A 470kΩ resistor must be fitted across the capacitor terminals to provide a discharge path, otherwise a small shock may be received if the pins of the plugtop are touched when it is removed with the receiver’s on/off switch in the on position. As a test I pulled the plug with the resistor fitted: it took about two seconds to connect the meter probes, by which time any charge had gone. A finger test was quicker but still OK. Always check each set modified in this way.

A bonus is that the capacitor runs cold, reducing the heat generated in the heater circuit to just that produced by the valves.

My last restoration was a Masteradio Model D110, a small set dating from about 1946 with a Bakelite case. It originally had a line cord and required a capacitance value of 2.22µF. Most in capacitors can be obtained from CPC – see page 314 of the 2001 catalogue. I use the plastic-case type, either tag or wire-ended depending on which is easier to fit.

John Langley,
Bury St Edmunds, Suffolk.

I must disagree with one point made in the articles on restoring vintage radio sets. It was stated that a silicon diode as a replacement for a valve rectifier will cause disaster, because a silicon diode is fully active from the moment of switch-on while a valve rectifier heats up slowly, in fact more slowly than the rest of the valves in the set. As a result the HT does not rise excessively, because by the time it reaches a maximum value it’s loaded down by the operation of the other valves. But a directly-heated rectifier comes to life in a fraction of a second. In my experience this should have a value of between 2µF and 3µF. Start with 2µF and monitor the heater voltage as you slowly increase the input from a variac. If the heater voltage is low with a 240V input, add 0.1, 0.22 or 0.47µF tubular capacitors, rated at 1kV, until the voltage is correct or just under. If the voltage reaches its correct level with an input of less than 240V, start with a 1µF or 1.5µF capacitor. After each addition to the capacitance, start checking again with the variac at zero. A 470kΩ resistor must be fitted across the capacitor terminals to provide a discharge path, otherwise a small shock may be received if the pins of the plugtop are touched when it is removed with the receiver’s on/off switch in the on position. As a test I pulled the plug with the resistor fitted: it took about two seconds to connect the meter probes, by which time any charge had gone. A finger test was quicker but still OK. Always check each set modified in this way.

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John Langley,
Bury St Edmunds, Suffolk.
Li F! disposal. rates arc payment enough for waste We don't get free rubbish collection. Our pay rates, which are a form of taxation. simple facts are as follows. All businesses allocate responsibility for waste disposal government appears to be anxious to subject seems to have been missed. The One of the most important points on this Recycling brown goods
Bedale, North Yorkshire.

Editorial comment: We have never come across a TV set; hybrid or whatever, that uses a silicon HT rectifier without a surge limiter resistor. This is a basic design recommendation. It would seem a sensible precaution to use a series resistor of appropriate wattage with a silicon rectifier whatever the nature of the equipment.

The child-lock problem
Things have come a long way since you had to tune your telly by adjusting a 100Ω potentiometer for each channel in turn. It was back-breaking work, but you had to do it only once - unless your four-year old son rearranged the pots while you were out. Fortunately we now have chips that save our poor fingers from those abrasive little thumbs wheels. But they often incorporate clever childlocks that would keep MI5 out. So you may have to phone the Helpline and, surprise, surprise, be held in a queue, listening to a birdy song for half an hour.

Reproduction transistors
My thanks to David Benson and Ian Johnson (Letters, August) for their suggestions on alternative replacement transistors for use in the Quad 303 power amplifier.

I have recently repaired a Quad 303 that had one channel short-circuit. The U17219/U17229 pre-driver transistors were replaced with a BC546B and BC556B, while 2N3057H transistors were used to replace the 38494 transistors in the output stage. I used types BD139 and BD140, fitted with small bolt-on heatsinks, to replace the 38495/38496 driver transistors in the audio circuit and the power supply regulator, as these have proved reliable as driver transistors in the Armstrong 626 receiver I rebuilt several years ago. The regulator output transistor was replaced with an MJ1503.

The small electrolytic capacitors in the 303 and the associated 33 control unit all had to be replaced. Many of them were leaking electrolyte, while the bootstrap capacitor in one of the output stages was misaligned. The tuning indicator uses an FM discriminator coil being badly worn. This was caused by the original coil becoming magnetised. The tuning indicator was also out of adjustment.

The owner assures me that the repair was not the plastic toy industry, fitted kitchens, plastic food containers or what have you?

The servicing trade should certainly not be expected to contribute towards the cost of dealing with this problem. If extra cost was imposed on manufacturers and importers, at least the products would be more expensive to buy and therefore worth repairing. This would also reduce the trade deficit.

John Hopkins, Felixstowe, Suffolk.

If extra has to be paid, why should the electronics industry be singled out? Why not the plastic toy industry, fitted kitchens, plastic food containers or what have you?

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DX and Satellite Reception


1/8/01 RAI (Italy) ch. IA; Tele-A (Italy) ch. E2-.
2/8/01 LRT (Lithuania) ch. R2; RAI IA; NRK (Norway) E3; C+ (Canal Plus) L2.
3/8/01 RAI IA, B; RTP (Portugal) E3.
4/8/01 TBK (Belarus); SVT (Sweden) E2; RAI IA, B.
5/8/01 TVE (Spain) E2-4; TVA (Italy) E3-; Tele-A E2-; RAI IA; RTL Klub (Hungary) R2; HRT (Croatia) E4; IRIB (Iran) E2.
6/8/01 SVT E2, 3; RTP E2, 3; TVE E2, 3.
7/8/01 RAI IA; TVA E3-; Tele-A E2-; TVE E3, 4; RTP E2-4.
8/8/01 RAI IA.
9/8/01 RAI IA, B; TVA E3-; Tele-A E2-; TVE E3, RTP E2, 3.
10/8/01 RAI IA, B; RTL Klub R2; TVE E2-4; RTP E2, 3; C+ L2; ARD (Germany) E2.
11/8/01 TVE E4; RAI IA; Tele-A E2-.
12/8/01 TVE E2-4; RTP E2, 3; RAI IA; TVA E3.
13/8/01 RAI IA.
14/8/01 TVA E3-.
16/8/01 NRK E2; SVT E2-4.
19/8/01 TVE E2; RAI IA, B; TVE E3-; Tele-A E2-; SLO (Slovenia) E3; HRT E4; PTP (Russia) R2.
20/8/01 TVE E3, 4; RTP E3.
22/8/01 TVA E3-.
30/8/01 Unidentified ch. R2 and 3 signals, mainly a.m.

The Iranian reception on the 5th was logged by Cyril Willis (King’s Lynn) at 1645 hours.

The amateur radio publication Six News reports a daytime (1745-1807 GMT) SpE opening on June 10th, with contacts at 50MHz between operators in USA/Canada (west coast) and France/the Netherlands/the UK.

There is sad news of the death of Major Ken Ellis, G8KW, MBE on June 28th, aged 92. He was a true pioneer with VHF signal propagation and had a remarkable military career during World War II, particularly in the Middle East.

Satellite sightings

Dutch amateur P16ALK has been operating a downlink via Eutelsat W2 (16°E) at 12-729GHz, with SR 2,000 and FEC 3/4. A recent check produced instant lock at 100 per cent signal level. P16ALK was centre screen with an inlay surround of...
screens showing other live TV amateurs, test cards and related video content. A scrolling banner advised on a change of frequency to 12-7472GHz, with SR 2,000 and FEC 7/8. I'm not sure about the purpose of the P16ALK downlink.

The APT news feeder via Hot Bird (13°E) at 12-5811GHz H, SR 5,632, FEC 3/4 (service identification currently SATLINK) has been providing footage and interviews on the Israeli/Palestinian problem for European networks throughout the day and evening.

Dramatic live pictures of the shuttle Discovery docking with the International Space Station were downlinked on August 12th and fed from Houston across the Atlantic via NSS K (21.5°W). Reuters carried the report at 11-462GHz V (5,632, 3/4). There were pictures from inside the shuttle and the ISS.

A new service, called Atlantic Satellite, has come into use via NSS K at 11-487GHz H (5,632, 3/4), which is a BT lease. While I was monitoring 11-462GHz (Reuters) recently the Fox News Channel appeared, with an unusual news item about a motorised paraglider landing on the Statue of Liberty. His arrival brought helicopters, firemen and police. He was brought down and arrested.

Golf and horse racing were prominent during the month. The Globeast NSS K feeder at 11-590GHz V (20,145, 3/4) carried the Arlington Million race on the 18th from Arlington Park, Illinois. On the same day there was horse racing via Eutelsat II F3 (21.5°E) from Deauville, France. This was at 11-663GHz H from about 1300 hours. Some races were encrypted.

I manage to receive United Media's early evening downlinks for Meridian and Anglia via my 2m dish, though the signal (NSS K at 10-998GHz) is marginal when it's raining. During mid-August the Meridian truck TES-42 suddenly produced encrypted signals, i.e. no pictures, whereas Anglia's truck TES-42 remained in the clear. An auto search on the 28th revealed that the symbol rate had changed from 5,632 to 5,750.

Nick B (Sutton) confirms my feeling that NSS K has reduced the downlink signal levels at certain frequencies. The Reuters downlink at 11-462GHz has been troublesome recently, as has Globeast at 11-590GHz, with picture freezing and squaring. The signal levels were previously excellent. This could be to discourage news-feed monitoring by non-subscribing broadcasters, or alternatively because of satellite ageing or drift within its orbital slot.

The Pakistani channel ARY Digital is being transmitted, along with Zee Cinema, via Hot Bird (13°E) at 12-7472GHz H (27,500, 3/4) in the clear, whereas from 28°E it's encrypted as premium channel package content. Edmund Spicer (Littlehampton) mentions that the Spanish news channel Canal 24 Horas, which was transmitted by Hot Bird as a PAL signal, has been replaced by a Relevision digital package (clear MPEG) that consists of TVE-Internacional, TVE-Internacional Asia, Hispavision, Can al Clasico and Nostalgia. This is at 11-785GHz (27,500, 3/4).

Roy Carmen (Dorking) reports that two FTA downlinks have appeared via Eutelsat W3 (7°E) with coverage of the situation in Macedonia. They are EBU Skopje Path 1 and EBU Path 2, at 10-974 and 10-982GHz V. SR is 6,666, FEC 7/8 and there are common PIDs, V 308, A 256 and PCR 8190. The downlinks are fired up only when needed.

Broadcast news

N. America: Over thirty per cent (413) of US commercial TV stations are unlikely to meet the deadline of May 1st, 2002 for the start of DTT transmissions in parallel with their analogue services, though 200 at least of these stations expect to make a start within twelve months. NAB has sought DTT extensions from the FCC. Test DTT transmissions at Montreal, Canada started on August 1st.

Russia: The Moscow regional station TV Tsentr is extending its coverage to adjoining states - the Ukraine, Belarus and Moldova.

The potential audience is some 74m people.

The main Russian network radio and TV organisations are to join to form the Russian Television and Radio Broadcasting Network (RTRS). Up to a hundred transmission centres plus satellite teleport and the distribution infrastructure will be included. The aim is to improve operation across the system and avoid possible collapse of parts. Some SUS400m is understood to be required to replace worn-out equipment.
Satellite reception at VHF

Over the past twenty five years this column has covered satellite TV reception as it has evolved, starting with the 860MHz transmissions of ATS-6 to the Indian sub-continent in 1976 onwards, then C band (4GHz) transmissions, which started in the early Eighties, and subsequently Ku band (11-12.75GHz) transmissions. Now Ka band (17-21 GHz) beams of communication are available to the public. The Chelcom log-periodic VHF array Roger has been using for Fleetsatcom reception. The washing-up liquid container protects plug connections. A further plastic cover at the front of the array protects an encapsulated cable connection.

Switzerland: TV4, the commercial TV channel, is seeking more national DTT licences. It has held a national and regional licence since early 1999 and plans to start a news channel, possibly in partnership with CNN, and TV4 Sport.

Mauritius: The Mauritian Independent Broadcasting Authority recently however, following letters from Hugh Cocks (Algarve, Portugal) and comments from Christian Mass (chief editor of Tele-Satellite), I’ve been checking on the 240-270MHz VHF band. It’s a very quiet part of the spectrum, which is officially allocated to Tactical Military Communications and US Forces satcoms activity. Between 248.85-269.95MHz there are downlinks from the military satellites US AFSAATCOM and US FLTSATCOM FLEET. These satellites provide a simple means of communication between distant bases, ships at sea etc. and those back home, also military and data communications, encrypted of course. Remote signals are uplinked to a satellite at say 300MHz, then downlinked at 250MHz. But the satellites also relay, unintentionally, broadcast radio programming and pirate voice communications. Beam coverage is global.

Satellite news

Eutelsat has acquired a 21.5 per cent interest in Hispasat. The two satellite operators have formed a joint venture to launch a new satellite, Amazonas, which should arrive at 61°W some time during 2003. Meanwhile Eutelsat’s Atlantic Bird 2 should have arrived at 8°W by the time that this is read, with Atlantic Bird 1 due to follow in the first quarter of 2002. This programme is aimed at building up Eutelsat’s transatlantic capabilities and developing business in the Americas.

Satellite signal reception. A test pattern at 4.624GHz (SR 2.222, FEC 1/2). The new Indian satellite InSat 3B has an additional ‘upper’ C band extension, 4.5-7.5GHz. At present there is only a single transmission, a test pattern at 4624MHz (SR 2.222, FEC 1/2). The usual extended C band is 3-4.4GHz.


£1 BARGAIN PACKS

Selected Items

PIECO ELECTRIC SOUNDER, also operates as a microphone. Approximately 35mm diameter, easily mountable, 2 for £1. Order Ref: 1084.

LIQUID CRYSTAL DISPLAY on p.c.b. with i.c.s. etc. to drive. Also contains 8 of 5 figures or letters with data. Order Ref: 1955.

30A PANEL MOUNTING TOGGLE SWITCH. Double-pole, Order Ref: 106.


HIGH POWER 3in SPEAKER 11W 8ohm. Order Ref: 246.

MEDIUM WAVE PERMEABILITY TUNER. It's almost complete a radio with circuit. Order Ref: 247.

HEATING ELEMENT, mains voltage 100W, brass encased. Order Ref: 8.

MAINS MOTOR with gearbox giving 1 rev per 24 hours. Order Ref: 80.


CERAMIC WAVE-CHANGE SWITCH. 12-pole, 3-way with with ring, Order Ref: 306.

REVERSING SWITCH, 20A double-pole or 40A single-pole. Order Ref: 343.

LUMINOUS PUSH-ON PUSH-OFF SWITCHES. Pack of 2. Order Ref: 373.


PAUXOX PANEL. Approximately 12in. x 12in. Order Ref: 98.

CLOCKWORK MOTOR. Suitable for up to 6 hours. Order Ref: 1038.

TRANSISTOR DRIVER TRANSFORMER. Make's ref. No LT44, impedance ratio 20k to 1k ohm; centre tapped, 50p. Order Ref: 1229.

HIGH CURRENT RELAY, 12v. Order Ref: 1063.

CONTACT MOUNTING PANEL, operates with slightest touch, pack of 2. Order Ref: 861.

HVAC NUMICATOR TUBE. HVAC ref XS6. Order Ref: 869.


5K POT, standard size with DP switch, good length 1in. spindle, pack of 2. Order Ref: 11R24.


OPTO-CONTACT on p.c.b., size 2in. x 1in., pack of 2. Order Ref: 302.

COMPONENT MOUNTING PANEL, heavy paxolin. 10in. x 2in., 32 pairs of brass pillars for soldering binding components. Order Ref: 7FC2.

HIGH SPEED CONTACTS, normal 2 contacts from top, heavy thinned fine meshed, between thimble make to be at least 25A, pack of 2. Order Ref: FC73.

BRIDGE RECTIFIER, ideal for 12V to 24V charger at 5A, pack of 2. Order Ref: 1070.

TEST PRODS FOR MULTIMETER with 6mm sockets. Good length flexible lead. Order Ref: DB6.

LUMINOUS ROCKER SWITCH, approximately 30mm square. Pack of 2. Order Ref: 394.

MES LAMPHOLDERS slide on 1in. tag, pack of 10. Order Ref: 1054.

HALL EFFECT DEVICES, mounted on small heat-proof holder. Order Ref: 1022.

12V POLARISED RELAY, 2 changeover contacts. Order Ref: 1032.

PROJECT CASE, 75mm x 66mm x 35mm. Order Ref: 865.

WHITE PROJECT BOX, 75mm x 115mm x 35mm. Order Ref: 106.

PROJECT TRANSFORMER, 12V-6V-12V, 6W. Order Ref: 715.

THIS MONTH'S SPECIAL

IT IS A DIGITAL MULTITESTER, complete with backrest to stand it and its hand-held free test pro holder. This tester measures: d.c. volts up to 1000V and a.c. volts up to 750, d.c. current up to 1 A and resistance up to 2 M. Also tests transistors and diodes, and has an internal buzzer for continual tests. Comes complete with test probes, batteries and instructions. Price £6.99, Order Ref: 7P28.

12 THIN LEADS, 12 assorted sizes vary between 0.6mm and 1.6mm. Order Ref: 126.

 Even THINNER LEADS, 12 that vary between 0.4mm and 0.6mm. Order Ref: 129.

BT PLUG WITH TWIN SOCKET. Enables you to plug test leads into the Order Ref: 2000 for all normal BT plugs. Price £1.50, Order Ref: 13P60.

D.C. MOTOR WITH GEARBOX. Size 60mm long, 30mm diameter. Very powerful, operates off any voltage between 6V and 24V. Order Ref: 137.

FLASHER RECESSO. Ideal for putting on a van, a tractor or any vehicle that should always be used. Uses a Xenon tube and has an amber coloured dome. Sealed fixing base is included so unit can be put away or design a special fixture. £35. Order Ref: 13P60.

REMOVABLE BASE. FOR P.R. USE ONLY. Easy to fit. Price £1, Order Ref: 3P27.

VACUUM TUBE TWINNING BEACON. Ideal for putting on a van, a tractor or any vehicle that should always be used. Uses a Xenon tube and has an amber coloured dome. Sealed fixing base is included so unit can be put away or design a special fixture. £35. Order Ref: 13P60.

MOTOR SPEED CONTROLLER. Relays for c. motors, r.m.s. 50V d.c. or 24V and any power up to 150W. Produces the speed by intermittent full voltage pulse so there should be no loss of power. Order Ref: 129.

BALANCE ASSEMBLY KITS. Japanese made, when assembled ideal for chemical experiments, complete with tweezers and 6 weights 0.5 to 5 grams. Price £2. Order Ref: 3P17.

REPAIRABLE RELAYS. We have some of the above tested but slightly faulty, not working on all ranges, should be repairable, we supply diagram. £3. Order Ref: 3P17.

THIS IS A DUAL VOLTAGE TRANSFORMER. It is 55VA so that is over 4A each end. Lead length 36cm, £2.50 per pack, 10 packs for £25 including carriage. Order Ref: 2P34.

LOW VOLTAGE TRANSFORMER. It is 12V and 6A. For use with a.c. mains. Order Ref: 9.5P5.


LOT OF 10 LEADS, 2 each of 5 assorted colours with insulated crocodile clips on each end. Lead length 36cm, £2 per set. Order Ref: 2P45.

LOW VOLTAGE TRANSFORMER. It is 12V and 6A. For use with a.c. mains. Order Ref: 9.5P5.

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FINDING

Sharp 51AT-15H (5BSA chassis)
I've had a batch of these sets in for repair, all with the same intermittent fault – they would go off, accompanied by a screeching noise and corruption of the EEPROM's AGC and AFT settings so that, when the set came back on, it was off tune. In each set the cause of the fault was Q708 (BC338-40) in the switched 5V supply. I used a BD131 (different pin connections) as a replacement, because it's a power transistor which is designed to get hot – the BC338 isn't.

To reprogram the NVM, tune the set to a station on auto. When the AFT comes into operation it will take the set off tune. So fine tune the set for the best picture and store this setting. Then put the set in the service mode and go to the AFT adjustment. When the remote-control unit's 'key' symbol is pressed, the NVM's AFT data will be programmed automatically. M.D.

Hitachi C2846TN
This set came in because it was tripping. In between trips the HT supply would peak at 170V. If a 100W bulb was just touched on the HT rail the set would come on with the HT correct at 150V.

With the set now working, I was able to carry out some checks in the voltage error amplifier circuit. Although it worked all right when the set was in operation, insufficient optocoupler current caused poor regulation at switch on. Hence the tripping. The cause of the trouble was R951 (8 2kΩ), which provides the supply to the anode of the optocoupler's diode section. It had risen in value to 22kΩ. M.D.

Akai CT2579N (Nokia Compact DE chassis)
This set had a massively oversized picture. The symptom was rather like an old monochrome set when the DY87 EHT rectifier's emission was low. As the picture size didn't alter when the brightness level changed I ruled out the diode-split line output transformer. The cause of the trouble was traced to a dry-joint at C513, which is one of the two parallel-connected line scan-correction capacitors. M.D.

Ferguson D14R (TX807 chassis)
If, at switch on, you get a burst of EHT then the set reverts to standby, check the 0.68Ω safety resistor RP68. In this particular set it was open-circuit. It's near the line output transformer. M.D.

Watson FA3629B
This set is fitted with the new Vestel 11AK20SE chassis. The fault was no sound, and on investigation I found that R829 (47Ω) in the feed to the TDA2822M audio output chip IC301 was open-circuit. As there was a low-resistance reading between the IC's supply pin and chassis I decided that it was faulty and replaced both these items.

The method of entering the service mode with this model is the same as with the previous one: go to install in the customer menu then press the remote-control unit's 4.7.2.5 buttons. M.D.

Toshiba 2855DB
There was a blank raster and no sound – no on-screen displays either. On investigation I found that the 5V supply was absent because an SOC1000 circuit protector (equivalent to a 1 A fuse) was open-circuit. Once this had been replaced the set worked perfectly with an input via the scart socket, but not with an aerial input.

These sets have a digitally-controlled tuner which has constant 5V and 32V supplies – there is no variable 0-33V tuning supply. It was the third of these tuners, type UF812BL, that I've had with this fault symptom. The tuner, part no. 23321196, is made by Sony and is repairable by MCES. J.H.
Cathay CTV3000
The problem with this set was line drift as it warmed up. After a lot of heating and freezing around the TA7696A colour decoder, the base generator chip C232 was found to be connected to pin 33, which was suspect. A replacement cured the fault. J.H.

Philips GR.4 chassis
There was sound but no raster. The tube's heaters were alight, and EHT was present. The first anode voltage was quite low, and nothing happened when it was increased. When I looked at the screen after a few minutes with the light off, however, I could see a faint display of line collapse. There were no signs of any dry-joints or burn-ups on the board, so I carefully popped the scan-coil connector out of its plastic moulding and took a peek. There were two whacking great dry-joints. Once I'd resoldered all the joints there was a good picture. J.H.

Bush 2051T
This is the first of these Turkish-made sets I've seen. It led me right up the garden path. The customer had snapped off the aerial socket, and this was the only problem he had mentioned. I repaired the socket and switched on, to be greeted by a high-pitched squealing noise from the power supply.

I looked all over for short-circuits, but couldn't find any. There was no 12V supply, and while checking this out (I'd no circuit diagram) I realised that the set was in standby. The 12V supply comes from pin 8 of the 9-pin DIP IC101. Pin 4 is the switch pin. When I pressed the PR+ button at the front of the set it started up and ran quietly. It put it in standby and it squealed like a stuck pig.

There are four small electrolytic capacitors in the power supply, C114 (100µF), C113 (22µF), C115 (220µF) and C116 (10µF). They all tested OK when checked with a capacitance meter, but replacements cured the fault.

The customer said it wasn't doing that before, of course. J.H.

Sharp DVS103H (Euro DS1 chassis)
If the set is slow to come on, with Q700 (BF487) in the start-up circuit over-heating, replace C707 (22µF, 50V) and C713 (1µF, 50V) B.F.

Panasonic Alpha 4 Chassis
There was field cramping and a buzz on the sound. The TDA3654 field output chip was faulty. B.F.

JVC JCx Chassis
The sound was OK but there was no picture. When the setting of the A1/G2 control was advanced there was a blank white raster, and teletext could be displayed. The TDA4580 RGB video controller chip was faulty. B.F.

Aiwa VXT1450K
The fault with this TV/VCR combi unit was a field collapse. The cause was traced to FR812 (3-90, 1W fusible) which was open-circuit. No reason for its failure could be found. A long soak test after fitting a replacement proved that all was now OK. B.F.

Sanyo ED1 Chassis
When this set was first switched on the picture was blacked out except for about two inches across the bottom of the screen. The cause of the trouble was traced to poor connections at Q453. Although they looked OK, resoldering them was the answer. Q453 is in the standby switching circuit that controls the supply to the line driver stage. B.F.

Sharp CS Chassis
The reported fault was distorted sound from one channel - the sound would mute normally without noise. When you get this problem, replace the surface-mounted zener diodes (27V or 24V dependent on model) across the inputs to the sound output transistors. It's advisable, in the interest of reliability, to replace the transistors as well. If the fault persists, replace the two 1N4933 diodes across the output transistors. G.S.

Sharp 59CS-D8H
Various symptoms were reported with this set: the picture was slow to appear, text would keep coming on, and there was a bad buzz on sound. Much to my surprise all three faults showed up almost immediately. The cause of all these problems was C714 (1000µF, 16V), which is the reservoir capacitor for the 5V supplies. It had blown up. G.S.

Toshiba 2939DB
The speaker symbols would appear erratically on the screen and the set suffered from Nicam dropout. The cure for this problem is to change the values of three components on the Nicam board. Replace RD12 (100kΩ) with a 33kΩ, 0.5W resistor; replace RD11 (2 kΩ) with a 1.8kΩ, 0.5W resistor; and replace CD18 (22µF) with a 47nF capacitor. If the Nicam board has to be replaced, it's part no. is 2336-9729. P.S.

JVC AV25G81EK (MX Chassis)
Stuck in standby faults can be tricky to diagnose. I normally disconnect pins 5 and 6 of the EEPROM chip and see what happens. If the set bursts into life, as this one did, the EEPROM chip is probably faulty. It's IC704 (part no. CAT535104HP) in this model. P.S.

Hitachi CS2544TN (G100 chassis)
The set was dead with the fuse in the mains plug blown. It's becoming a common fault: the on/off switch starts to arc or burn. The sets are easily recognisable because of their mahogany cabinets. P.S.

Bush 2568NTX
The symptoms were lack of width with EW bowing. A nice easy one for a change. R629 (2.7Ω, 0.5W) was open-circuit. P.S.

Mitsubishi CT25M3TX (Euro 14 chassis)
This set was going berserk. It was reluctant to come out of standby, wouldn't stop at stations and the graphics were going crazy. C955 (2.2µF, 25V) on the secondary side of the power supply was leaking and had damaged the EE/ROM circuit. A new capacitor and X24C04P memory chip put matters right. P.S.

Philips 25PT4103
The power supply and EHT were pulsating at a low rate. I found that R3425 (12Ω) in the line drive circuit had gone high in value. G.Bu.

Philips 32PW9763/05 (MD2.25E chassis)
This set was stuck in standby with the red LED flashing. The behaviour of the LEDs provides vital information. If the red LED flashes at 5Hz it's a protection fault indication from the main microcontroller chip, which lives on the control and teletext subpanel. If the LED flashes at 1-25Hz the fault is more likely to be in the control circuit itself.

I attempted to read out any error codes, using the Philips dealer service tool, but no information was available. Back to basics! The standby 5V supply was present, and the 5V and 5V supplies, which feed the control board, appeared briefly during the start-up phase. The 'main-is-alive' line, which runs between the main and standby processors, provides further valuable information. When I checked the waveform on it at pin 36 of the standby processor, using the waveform in the service manual as a guide, I saw that the bottom part of the pulse was missing. This suggested a main processor fault. I had a spare control board available, so I swapped over the plugable NVROM and software ROM ICs and soldered it in. The set then came to life, proving that the fault was on the control panel.

A replacement main processor (it's a 64-pin flatpack device) didn't help, so I
removed the feature box for better access to the control board. It should be written large on every workshop wall that a microcontroller chip requires three things: power, clock pulses and a reset. In this case the reset line, at pin 53, was stuck high because the 3.3V zener diode D6227 was open-circuit. A new surface-mounted zener diode restored correct operation.

Why did all this take so long? The control board is hidden away behind the screened feature box and is very difficult to check while in place. If the set is dead (or nearly so), removing the feature box will not make matters any worse, as the error will not be detected. With hindsight, making the control PCB a plug-in type would have made our lives easier. R.Be.

Panasonic TX21S1T

This set worked normally at start up but, over several minutes, the brightness then increased until excessive beam current made it trip. After checking various possibilities I replaced the line output transformer, which turned out to have a fault in its A1 supply section. Shortly afterwards a TX21S3T came in with identical symptoms. The cure was the same, though the two models use different LOPTs. R.Be.

Sony KVX2532U (AE1B chassis)

The customer complained that the picture broke up when the aerial lead was disturbed. As an afterthought he mentioned that teletext didn’t work. It appeared that the luminance signal was being lost when the aerial socket was moved. When text was selected, the display attempted a few words then gave up, not even managing to advance the clock.

I decided to look for the cause of the text problem first, as this was not intermittent. The text board plugs into the motherboard, and is surrounded by clip-on screening cans. As the metalwork was very short of solder where it met the earth print, I resoldered all the lugs then refitted the board. This appeared to cure the problem. I went on to look for the cause of the luminance fault, resoldering connections on board A (signals) and its connectors - these have caused problems in the past. When I refitted board A however the text fault was back and was worse than ever!

I examined the text board with a microscope and found that there were dry-joints at most of the ICs. The SAA5231 chip, whose task is to extract the text information from the video waveform, was the worst affected. Resoldering all the ICs on the text board cured both faults.

A similar problem with screening cans occurs with the Sony AE1C chassis, at board B1 which carries the colour decoder and digital comb filter chips. Resoldering here can cure a variety of colour faults. R.Be.

JVC AV25S1EK (MX II chassis)

The picture was unstable with line jitter. For some reason it was worse with BBC1. An oscilloscope check showed that the video output from the IF module had ragged sync pulses. Further investigation led me to the 1µF electrolytic reservoir capacitor for the AGC feed. A replacement cured the fault. R.Be.

Sanyo CBP2180A (A5 chassis)

Before you condemn the output IC because of a field fault, check L451 (33mH). It can go open-circuit, often intermittently, causing all sorts of odd displays. G.D.

Hitachi C2546TN

This set came in because it was tripping. I replaced R950 (68kΩ), R951 (12kΩ) and R952 (82kΩ), which are all in the power supply voltage error detection circuitry and are rated at 0.5W, then attended to the usual dry-joints. This cured the tripping but there was no colour, though the screen took on a red cast as the setting of the colour control was advanced. I first suspected the 4.43MHz crystal, but the cause turned out to be the TDA4665 digital delay line chip IC501. G.D.

Sanyo 25MT2

This set would come on for a few seconds then trip off, with the standby light flashing. By repeatedly switching out of standby a good picture and sound could be obtained during those few seconds. The microcontroller chip’s protection circuit (pin 45) monitors the 9V and 24V outputs from the power supply, the 200V supply derived from the line output transformer, and the beam current. I noticed that C662 (470µF, 16V) was leaking, but a replacement cured the problem. Repeated blowing of the output stage peaking transistor can be type BUT56A or type BUT12A. G.R.

Grundig CUC3400 chassis

This chassis uses a combined follower/input output stage. Repeated blowing of the transistor (T661) was cured by replacing IC55 (TDA3640), R666 (fit type RGP300M), R637 (1kΩ preset), C661 (47µF, 63V), D662 (ZPD3.9V), R661 (10 carbon) and C667. The latter is either (47gF, 63V), D662 (fit type IDA3640), D666 (fit type IDA3640), R637 (1kΩ preset), C661 (47µF, 63V), R662 (ZPD3.9V), R661 (10 carbon) and C667. The latter is either 0.15gF or 2.2µF depending on the transistor/transformer combination. The transistor can be type BUT56A or type BUT12A. G.R.

Mitsubishi CT2146TX (Euro 6 chassis)

There was no line drive, though no reason for its absence could immediately be established. My eye was drawn to some carbonised glue around the field output chip IC401 however. When this was scraped away the cause of the fault could be seen: the earth track from the line generator circuitry had been almost completely eaten away. R.Bu.

Bush 3114A

If the standby light is on but the set is otherwise dead, check whether R502 (330kΩ) is open-circuit. When R502 fails the STR50103 chip doesn’t start up. R.Bu.
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Mitsubishi Diamond + 91
This monitor seemed to be completely dead. The cause of the trouble was on the primary side of the power supply, where zener diode D904 was short-circuit. It’s adjacent to the mains switch, T.M.

Mitsubishi Diamond Pro 67TXV
There was a colour fault with this monitor: the display’s blue content was missing. A cold check on the RGB output transistors revealed the cause. Q6B4, type 2SC3593, was short-circuit base-to-emitter. A replacement transistor and resoldering the CRT base pins completed the repair. T.M.

Mitsubishi Diamond Pro 720
This monitor powered up then produced a display that had a predominant blue cast. Checks on the RGB panel led me to suspect the M527/42ASP chip. A replacement cleared the fault. T.M.

Intergraph TXT5F68
This Matsushita-manufactured monitor’s display had disappeared while its owner was otherwise occupied. Inspection revealed that the tube’s heaters were out. The supply comes via an 0.47µ resistor, R664, which was open-circuit. I also replaced the reservoir capacitor C564 (2.20µF, 16V). A prolonged soak test confirmed that everything was then OK. R.B.

CTX 1785GM
The LED lit and the relay operated. Then there were arcing noises from the separate power supply board. On removal of the board, which is mounted vertically, I found that the chopper transformer had almost fallen off. Transformer removal, retinning and resoldering restored normal operation. R.B.

Compaq CD5522
The monitor was dead, though the computer seemed to be booting up. On investigation I found that the 2SD1739 line output transistor was short-circuit all round. A 2SC742 or an S2055 can be used as the replacement. When this transistor fails, check for dry-joints at the line output transformer’s terminals, the scan coil connector and the line output stage’s tuning capacitor. Also check the 220µF, 50V capacitor in the output transformer’s base circuit. Its capacitance value can decrease. A.R-W.

IBM 8512
There are three versions of this monitor, V, 002 and 003. They can be quickly identified by the connector at the monitor end of the signals cable and the type of line output transistor fitted. The three different cable types are as follows: one with ten-way socket and moulded strain relief; one with male connector and moulded strain relief; and one six-way socket plus one four-way socket and double-spade earth connector.

The early type is of fully-screened construction with a separate chopper power supply at the side. This provides two outputs, 180V to the main PCB and 130V to the CRT base panel. If the monitor seems to run all right for a couple of minutes or so then an acrid smell and smoke from the vicinity of the LOPT are noticed, check C525 (22µF, 250V, high-temperature type) which becomes leaky.

We’ve had several faults with the 002 version, as follows:
(1) Dead with the chopper power supply screaming. In this event check C226 (100nF) which is at the back of the line output transistor. It can be short-circuit, open-circuit or dry-jointed.
(2) Dead with the mains fuse F100 open-circuit and the 2SD1739 line output transistor Q202 short-circuit. Replace the fuse then, before fitting a new line output transistor, connect a dummy load across the 89.5V line. If the voltage is high, replace the three small electrolytic capacitors in the power supply. These are C112 (47µF, 25V), C114 (100µF, 16V) and C117 (6.47µF, 50V).
(3) Dead with F100 open-circuit. Check R101 (2.7Ω), R104 (4.7kΩ, 7W) and/or R105 (470Ω, 3W) for value change (high or low) or open-circuit and Q/RHS100 (BUZ280A) short-circuit.
(4) Dead with the 2SD1739 line output transistor Q202 short-circuit. Replace Q202 and check its base drive coupling capacitor C225 (10µF, 50V) which dries up. A.R-W.

CTX 1769SE
The mains fuse had blown, but there was no sign of a cause on the primary side of the power supply. I decided to replace the fuse, power up and check the pulses at the pins of the UC3842 chopper control chip. Before doing so I removed the chopper MOSFET to avoid inadvertent power supply operation. Everything seemed normal except for a smell of burning! Its cause was the BT169D thyristor Q101 (T092 type), which feeds the start-up supply to the UC3842 chip. This was a red herring however, since Q101 is there to supply the chip only briefly. Once the power supply starts up, the feedback winding on the chopper transformer provides the supply for the chip. It also biases Q103 on to short Q101’s gate to chassis.

When I refitted the chopper MOSFET and powered up again the front LED glowed briefly then went out. There was little else. Line output and B+ chopper transistor failure is common with this chassis, but very seldom blows the mains fuse. So I suspected a fault elsewhere.
This hunch was confirmed when I discovered that D110 (BYM26C) on the secondary side of the power supply was short-circuit. L.F.

**Compaq V70 Model 621**

Although this 17in. monitor’s power supply was running the front LED was not illuminated. Unfortunately there were no tell-tale noises or smells to provide a clue. I let the power supply run for a short time and tried touch tests to see if anything was excessively hot. As there were no untoward temperatures I switched off, checked the electronics on the secondary side of the power supply to ensure that they were not holding dangerous charges, then set about checking the power semiconductor devices in the timebase output stages.

Q502 (2SC5088) in the EHT generator circuit was very leaky. Unfortunately I’d none in stock. The nearest I could find was a 2SC5129. A DMM diode-check showed that this device didn’t have an integral damper diode. Since the original was virtually short-circuit, it was impossible to apply the same test. So I examined the circuitry and found that there was an external damper diode. The 2SC5129 should therefore do.

After fitting it I gave the monitor an extended soak test — these monitors occasionally suffer from mysterious repeat failures soon after repair. I’ve found that the 2SC55XX family of transistors can raise reliability questions, failing in use but testing OK out of circuit. The most common cause of trouble appears to be insulation failure of the casing. These transistors seem to have a low tolerance to misapplication such as being mounted on a heatsink that hasn’t been deburred during manufacture or inadequate application of heatsink compound. I had made sure that I wasn’t guilty of either of these, and the 2SC5129 proved to be a suitable replacement.

A point to watch with this chassis is that if you are testing it with the bottom metal plate removed the brightness and contrast controls rest on the bench surface like wheels. The bottom edge of the on/off button does as well, usually keeping the tact switch permanently pressed. All this can cause frustration, for example when the monitor is moved sideways and the brightness and contrast controls are out of zero. Slackening the single fixing screw on the on/off tact switch sub-PCB assembly will eliminate inadvertent operation during bench work, but remember to retighten it before final reassembly.

Some owners have added a note to the fault description saying that the degaussing buzz at switch-on is alarmingly loud. This loud noise is caused by the top run of the degaussing coil slamming against the steel frame mounted around the CRT’s rimband. The assembly includes a thick plastic sheet to prevent the coil chaffing against the steel shroud, which acts as an acoustic resonator! A couple of rubber wedges salvaged from the yoke of a scrap CRT are perfect for this purpose. Wedge them between the plastic sheet and the metal shroud, holding the plastic sheet firmly against the CRT bowl to stop it flapping about. The degaussing buzz will then be more like that experienced with other monitors. Some wedges are made of organic rubber. This eventually decomposes, becoming a conductive residue, so fit the wedges well clear of the EHT cap.

Another point to watch is C183 (10nF, 1kV) on the CRT panel. Despite its large diameter, it’s very thin for a 1kV disc ceramic. Occasionally this item starts to break down intermittently, giving rise to perplexing symptoms. L.F.

**Tatung C7BTR**

The report said: “Went too wide. Tried to adjust it, but it popped and went off.” On investigation I found that the chopper transistor was short-circuit and that fusible resistors R808 (0.22Ω) and R867 (0.2Ω) were blown. I replaced these items and also the UC3842 chopper control chip in case it too was faulty. This restored operation, but there was still excessive width with no control. The cause was traced to D434 (DMV32). It’s a dual-diode in the line output stage. There was a leak between pins 2 and 3. G.B.

**Time X70**

The width was much reduced, with wavy sides and poor pincushion correction. The geometry and size controls had some effect, and the customer had said that the situation improved slowly as the monitor warmed up. The cause of the trouble was found in the supply regulator for the line output stage: C334 (47μF, 250V) was open. The circuit was made by CTX. G.B.

**Acer VP14500A**

This monitor was totally dead with the BU2508DF line output transistor Q410 short-circuit. When it was replaced the unit worked for a second, went pop, then the green disappeared from the display! Video transistors Q908 (2SD756) and Q911 (2SD716) on the tube base panel had gone short-circuit with loading resistors R920 and R928 (both 33kΩ, 1/8W) burnt up. Replacement of these items restored the green. G.M.

**Viglen CA1726**

This big old monitor was dead apart from light from a green LED at the front. The power supply system is on a separate PCB. There are two separate supplies on this PCB. The one that generates the low voltages was OK, but the one that generates the higher voltages had blown up.

The chopper QET6 Q6 (2SK956) was short-circuit, along with its driver transistor Q7 (2SA966) and the UC3842 control chip IC3. As a result the fusible resistor R23 (0.56Ω, 1W) was open-circuit.

The power supply functioned once replacements had been fitted, but there was still no screen display. Big dry-joints at the scan plug to the CRT yoke, on the separate deflection PCB, were the cause of this. G.M.

**Acer 7276e**

This monitor came in with a note which said it was dead. In fact there was power briefly: the front LED lit up green for about one second before it went out. On investigation I found that the 2SC5048 line output transistor Q302 was short-circuit — it had blown the 3A wire-ended fuse J013. Replacement of these two items produced a perfect display. G.M.

**Hyundai HL5854B**

There was excessive width with E.W. bowing. The cause was traced to D308 (UF5408) in the E.W. diode modulator circuit. It was leaky. G.M.

**Philips 4CM8270/25T**

I’d had a number of cases where the BU2525A line output transistor in these 15in. monitors has failed (short-circuit). There seems to be no obvious cause, so I’m wondering whether the heatsink is inadequate or the transistors are coming to the end of their life. The symptoms are usually no display and ticking — or there may be just no display. D.R.

**Hewlett-Packard D2814A**

This 15in. SVGA monitor would work for a couple of hours or so then the frame scanning would cease. The cause was found to be a dry-joint at C3, which is near the frame output chip. Resoldering cured the fault, proved by a soak test that lasted for several hours. I resoldered some other dodgy-looking joints in the frame-output stage area, and also resoldered the legs of the line output transformer. D.R.

**Jean VP1555 (type JS1E)**

This monitor was completely dead. On investigation I found that there was a large burn mark in the area surrounding the JFET chopper transistor Q801 (K2645). I replaced this, along with IC801 (8-pin DIL package) which was cracked, resistor R812 (240kΩ) which had blown, diode D808 (BA159) and fuse F801 (2.5AT). The monitor then worked normally. D.R.
We welcome fault reports from readers - payment for each fault is made after publication. See page 42 for details of where and how to send reports.

**VCR CLINIC**

Reports from
Michael Dranfield
Eugene Trundle
Michael Maurice
John Coombes
and
Bob Flynn

**Samsung SI1240**
There was no capstan motor rotation. On investigation I found that the tiny 10μF, 25V electrolytic capacitor on the motor PCB had leaked electrolyte which had eaten away the 12V supply track. This is a very common fault with Sharp machines, but I've never previously come across it with any other make of video. M.D.

**Crown CRV97**
This Daewoo machine failed to come back on after a thunderstorm and power cut. Simple I thought: just replace the μF capacitor in the power supply. When I did this the VCR came back on but wouldn't rewind or fast-forward very well, while the drum ran too slowly and hunted.

After ruling out the power supply I scoped the drum speed control signal at pin 3 of IC501. Its mark-space ratio was all over the place. Perhaps the EEPROM, IC503, had been corrupted. But when I scoped its serial clock line I found that the clock frequency was drifting erratically. Now the EEPROM data is clocked by the microcontroller chip, which has an external 16MHz clock crystal, X501. When I connected a frequency counter, via a x10 probe, across X501 the VCR’s fluorescent display went off. This suggested that the crystal was faulty, and indeed a replacement provided a complete cure. I obtained it from Farnell Electronic Components - part no. 485-093. M.D.

**Panasonic K mechanism**
The cause of failure to accept a tape and no tape eject with F03 shown in the display is often, but not always, a cracked loading motor coupling. Sometimes a faulty mode switch gives the same symptoms. It's advisable to replace both items. M.M.

**Toshiba V703B**
The sound was very poor with a definite wow. I had to replace the capstan motor and the pinch-roller assembly. M.M.

**JVC HR5900**
The customer said that this machine would sometimes switch itself off. It had received previous attention - the mode switch, pinch roller and control plate had been replaced.
In view of the symptoms I decided to replace both end-of-tape sensors and both reel sensors. A check with the customer a few days later confirmed that all was now well. M.M.

**Toshiba V854**
There was no audio from this machine and the record indicators were flat out. The cause of the trouble was the multi-standard MSP3410 sound processor chip IC03. It's on the MPX board. J.C.

**Sony SLVE520U**
There are several power supply causes of the no results symptom, but a common one is circuit protector PR512. Note that it has been uprated to 1.25A from 1A. J.C.

**GoldStar GSEQ210 (D17 series deck)**
Tape damage is usually caused by a faulty pinch gear and take-up lever. The damage occurs when a cassette is ejected. If the old-type parts are fitted, the take-up guide will be in a forward position after replacement of the pinch gear and the take-up lever will position the guide so that it faces to the left of the deck. When first installing the unit remember that the guide may look as if it's in the wrong position but is actually set correctly. J.C.

**Ferguson FV11**
There was no mechanical operation and checks soon revealed that there were no 5V and 12V outputs from the STK5481 chip IC1. A replacement restored the voltages but there was still no reel motor operation. The cause was traced to Q605 (2SC2560). J.C.

**Aiwa HVFX1500**
This machine wouldn't eject tapes. The cause was a cassette housing fault. When I dismantled the unit I found that the slide lever was broken. It's item 429 in the parts layout in the service manual. J.C.

**Sony SVL625**
A problem you can get with these machines is cutting out in playback or record. The VCR may work in playback or record for several minutes, then just stop. The cause is faulty sensors, HP001 and HP002. Check them by replacement. J.C.

**Sanyo VHR776E**
This machine was dead and a quick check revealed that the 2.5A mains fuse F5001 had blown. The cause turned out to be the BC10 mains bridge rectifier D5001, which was short-circuit between the positive pin and one mains input pin. J.C.

**Mitsubishi HSM40V**
This machine would leave a loop of tape when a cassette was ejected, especially after rewind. The usual cause is the mode switch, but not this time. Replacement of the idler reel assembly, item C035 in the diagram, cured the problem. Rewind operation was still a bit noisy however. This was cured by cleaning and lubricating the shaft of the take-up gear spool, item C031. B.F.

**Hitachi VT410**
This old-timer showed no signs of life. On investigation I found that there were no switched voltage outputs from the power chip because it wasn't getting a power-on signal. The fault was eventually cured by replacing the LA7935 chip on the VST tuning panel. Hardly an obvious cause! B.F.
No Astra 2D
A local satellite TV installer came to see me about a problem he had encountered with a SkyDigital installation on the outskirts of town. The owner of the house had insisted on having the dish mounted on his chimney, so that it was “as high as possible to get the best picture”. The installer advised against this, but the customer had insisted – and even paid extra.

When the dish had been installed as requested it was found that the Disney programmes and others transmitted by Astra 2D couldn’t be received. The installer then tried replacing the LNB, the cable, the dish and the receiver. Despite these checks, the fault was still present.

The installer had proved that there was nothing wrong with the equipment. So an external factor had to be the cause of the problem. There are some GPO communications dishes and other equipment at a site about a mile west of the town. As a test, I suggested that the dish should be positioned at ground level.

Next day the installer phoned me to say that he had done as I suggested, and that the ‘missing’ channels could now be received.

Digibox bugs
A customer returned the Grundig GDS310/2 Sky digibox I’d sold him a week previously. He wanted it for the FTV (free to view) programmes only, and had phoned 08702 438 000 to request a smart card. This had arrived three days later. He then phoned again to get the card ‘authorised’ with his digibox. He did this three times, but the card still didn’t work.

I asked him to leave the card and the receiver with me, then phoned the card centre and provided the customer’s post code and details of the card number and the digibox. The receiver was left connected to my workshop test dish while a signal was to be retransmitted via satellite. But after 24 hours the fault was still there. When I used my own Sky card for the ‘basic’ Sky programmes the digibox worked. I phoned again, and a new card was promised.

The customer had also complained that the digibox cracked and popped when a menu was on the screen. I checked this and found that he was correct. On making some enquiries I learnt that most or all Grundig receivers are doing this right now. There are just random clicks and pops instead of background music. The fault lies with the latest software, which “will be corrected eventually”. In the meantime, Grundig digibox owners are advised to select “Background Music OFF” in the services audio menu.

An HDD repair
I was having one of those slack days when customers stay away in droves. It was a good opportunity to take a look at an external SCSI hard-disk drive (HDD) I’d bought for £5 at a computer fair some time back and put into storage. Before applying mains power I had a quick look inside.

Everything appeared to be OK, but when I connected 230V AC I could hear the power supply squealing. Checks showed that there were no output voltages from it.

The label indicated that the HDD had been manufactured by Micronet Technology Inc in Los Angeles, California. There was a model number, MS-540, but I had little hope of getting any information for it. I’ve had plenty of experience fixing switch-mode power supplies however, so I was undeterred. On investigation the most likely culprit was the electrolytic capacitor C7 (100µF, 25V) next to the heatsink (see photograph above right). When I checked it with my Genie-Plus ESR meter I obtained a reading of over 35Ω, which proved that my guess was correct. A replacement restored normal power supply operation but, as a precaution, I replaced all the other electrolytic capacitors as well.

An external SCSI HDD power-supply box such as this one is worth about £40 without a hard-disk drive. So it’s easy to make a profit when the fault is as simple to locate and remedy as this one was.
Don't we just love intermittent faults? Take the case of Mr Hurst. We had already paid him two visits, with difficulties over settling the call-out bills, to check his quite new Samsung TV Model CI683CNX. He had told us that at rare intervals the picture would become "all lines and squiggly" - but it never did so when anyone technical was there to see the effect. He finally brought the set to the workshop, complete with an off-screen photograph that showed the fault symptom. The picture is reproduced alongside: it illustrates the result of some very nasty happening in the line scanning department. If only more customers could help us in this way when the fault is intermittent!

The set was put on the soak-test bench and left to run while Television Ted looked out the service manual. This says that the model is fitted with the SS1A chassis. In fact the chassis was type SCT12B, which is covered by a different manual altogether - that for Model CI6844N. The set doggedly refused to show us the fault, but Mr Hurst's photograph suggested that the line oscillator was running at the wrong frequency when the fault occurred. So Ted waded into this department, which is in the TDA8375 (IC201) area. Physical and thermal provocation produced little effect, though the excellent picture moved a little to the left and to the right between the extremes of temperature to which the chip and its peripheral components were subjected by our TV trouble-shooter.

The recalcitrant Samsung set was then left to run, which it did happily for the rest of the day with no problems showing up. It did the same during the next day - and the one after that. Meanwhile, the photo was taped to the top of the screen. On day four the fault appeared soon after the set was switched on. The display it produced was torn and distorted, and a squeal came from within. Fearing for the health of the line output transistor, Ted hastily switched the set off. He then hooked up a dual-trace oscilloscope, with one probe connected to pin 40 (line drive) of IC201 and the other connected to a line output transformer pin to monitor the flyback pulses there. When he switched the set on again all was well on the TV and scope screens. This situation lasted for a couple of hours, then the gremlin struck again.

Three workshop boffins, Ted, Sage and Real Technician, instantly gathered around the oscilloscope, which showed that the IC continued to churn out correctly-timed drive pulses. The line output transformer produced a jagged and torn waveform however. It looked as bad, in its way, as the on-screen display. Could the cause of the problem have been the line output transformer perhaps, or possibly the flyback tuning capacitor? Maybe the scan-yoke coils were faulty? In fact the cause was none of these things, and the repair called for little in the way of materials.

What was the cause of this fault, and why was it so elusive? For the solution, turn to page 56.
Grundig GDS200
This digibox was stuck in standby following an electrical storm. A replacement modem panel confirmed that the main PCB was undamaged and that the fault was on the original modem panel. No surprise really.
I replaced the DSP1670 modem chip, but the box failed to reboot. Further tests showed that there was no 5V supply at the CSP1034AH chip U1, and that choke L5 was open-circuit. In this event check the resistance across C26. I found that there was a dead short, which was caused by the CSP1034AH chip. A replacement chip and choke restored normal operation.
If you use a choke from a scrap board as a replacement for L5 make sure it’s the correct one, marked 100. The other chokes, marked 101, have too high a DC resistance and will drop the 5V supply to 3.5V. M.D.

Amstrad DRX100
This digibox’s picture would sometimes freeze. When it happened the box would remain in this state until the mains supply was disconnected. If power was then reapplied the box wouldn’t come out of standby.
Because of the intermittent nature of the fault it was some weeks before I found the cause, which was poor soldering at the flash memory chips U200 and U202. The soldering looked perfect even when a magnifying glass was used to inspect it, but reflowing the joints cured the fault.
M.D.

Pace 2200
A number of these digiboxes came in for repair following a major lightning strike hereabouts. Every one of them was stuck in standby, and in each case a frequency counter connected to the modem crystal via a x10 probe indicated that the DSP1675 modem chip had died.
The chip is available from Pace (part no. 903-0016751) at a very reasonable price – about £17. In addition, Pace

Photo 1: The Services menu.
Photo 2: The System Setup menu.
strongly recommends replacing several other components on the telephone line side. They may appear to be perfectly OK, but replacing them could avoid a comeback at a later date. The components (U852, Q850, D852 and D800) are available as a kit, part no. 265-230A2B. At less than £2 trade it would be silly not to replace them. You will sometimes find the top blown off the optocoupler U852.

A new DSP1675 chip and kit cured every one of these damaged digiboxes.

Digital TV update
A number of digital channels have been moved between transponder multiplexes since the full listing last month (page 753). There are also some new channels. The changes are listed in Table 1 - the EPG number is shown in brackets after the channel name. The Money Channel (EPG 516) and the Computer Channel/ Dot TV (567) are no longer being transmitted. Eurobird’s D4S transponder (11.527GHz) has been activated and test transmissions are being run. Channel 5 has been conducting widescreen tests using its normal transponder (3 – 11.758GHz H).

Radio stations Big Blue and The Saint are encrypted. From observations, they appear to be within the EPG only with viewing cards for addresses in London and the South East (Big Blue) and the South (The Saint). With other cards for English post code addresses the channels can be added via the Extra Channels menu. The stations are blocked with cards for Scottish, Welsh and Irish addresses. They are not available with a free-to-air viewing card: a minimum Sky subscription contract is required. C.H.

Euronews language
Euronews (EPG 528, 11-680GHz V) is normally received in the UK in English. It can also be received by a digibox in other languages however. To alter the language, press the Services button and select option 4, System Setup (see Photo 1). Then select option 3, Languages & Subtitles (see Photo 2). Scroll through the various languages in the Favourite Language/Audio menu, then save the changed settings in the usual digibox manner. All other channels in the EPG should remain in English or the original language.

Though other languages are listed in the EPG, they do not appear to be able to cater for this requirement at the moment. If you want to receive in these languages it’s best to use a free-to-air digital receiver. Enter the Euronews frequency (11-680GHz V, SR 27,500, FEC 2/3). Normally all receivable languages can be scrolled through via the Audio or Alternative Audio menu. C.H.

Table 1: Latest digital channel changes.

<table>
<thead>
<tr>
<th>Channel and EPG</th>
<th>Sat</th>
<th>TP now</th>
<th>Frequency (GHz)/pol</th>
</tr>
</thead>
<tbody>
<tr>
<td>Big Blue* (898)</td>
<td>2B</td>
<td>32</td>
<td>12-324 V</td>
</tr>
<tr>
<td>Channel Health (193)</td>
<td>EB</td>
<td>D7S</td>
<td>11-585 V</td>
</tr>
<tr>
<td>Club Asia* (895)</td>
<td>2B</td>
<td>32</td>
<td>12-324 V</td>
</tr>
<tr>
<td>Eurosport (420)</td>
<td>2A</td>
<td>8</td>
<td>11-856 V</td>
</tr>
<tr>
<td>Eurosport News* (420)</td>
<td>2D</td>
<td>55</td>
<td>10-921 H</td>
</tr>
<tr>
<td>EUROTV* (897)</td>
<td>2B</td>
<td>32</td>
<td>12-324 V</td>
</tr>
<tr>
<td>Fox Kids (610)</td>
<td>2B</td>
<td>29</td>
<td>12-266 H</td>
</tr>
<tr>
<td>Granada Plus (118)</td>
<td>2A</td>
<td>27</td>
<td>12-226 H</td>
</tr>
<tr>
<td>History Channel (561)</td>
<td>2B</td>
<td>29</td>
<td>12-188 H</td>
</tr>
<tr>
<td>History Channel + 1 (562)</td>
<td>2B</td>
<td>25</td>
<td>12-188 H</td>
</tr>
<tr>
<td>Kiss (450)</td>
<td>2B</td>
<td>35</td>
<td>12-382 H</td>
</tr>
<tr>
<td>Magic* (452)</td>
<td>2B</td>
<td>35</td>
<td>12-382 H</td>
</tr>
<tr>
<td>Muslim TV* (675)</td>
<td>EB</td>
<td>D11S</td>
<td>11-662 H</td>
</tr>
<tr>
<td>Nat Geographic + 1 (559)</td>
<td>2A</td>
<td>8</td>
<td>11-856 V</td>
</tr>
<tr>
<td>Nickelodeon (604)</td>
<td>2B</td>
<td>34</td>
<td>11-363 H</td>
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<tr>
<td>PCNE Chinese (673)</td>
<td>EB</td>
<td>D3S</td>
<td>11-508 H</td>
</tr>
<tr>
<td>Rapture (658)</td>
<td>2A</td>
<td>27</td>
<td>12-226 H</td>
</tr>
<tr>
<td>Sky MovieMax 2 (309)</td>
<td>2A</td>
<td>11</td>
<td>11-914 H</td>
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<tr>
<td>Sky MovieMax 4 (311)</td>
<td>2B</td>
<td>20</td>
<td>12-090 V</td>
</tr>
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<td>Sky MovieMax 5 (312)</td>
<td>2B</td>
<td>7</td>
<td>11-836 H</td>
</tr>
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<td>Sky One (106)†</td>
<td>2B</td>
<td>19</td>
<td>12-070 V</td>
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<tr>
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<td>2A</td>
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<td>11-914 H</td>
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<td>Sri Lanka TV* (681)</td>
<td>2B</td>
<td>37</td>
<td>12-422 H</td>
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<tr>
<td>Star Plus (672)</td>
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<td>12-363 V</td>
</tr>
<tr>
<td>Tara (178)</td>
<td>2B</td>
<td>29</td>
<td>12-266 H</td>
</tr>
<tr>
<td>The Saint* (899)</td>
<td>2B</td>
<td>32</td>
<td>12-324 V</td>
</tr>
</tbody>
</table>

* New channel. † Sky One UK, Ireland and cable share transponder 19. See Photo 4.

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

French, German or Spanish. Euronews can be received in other languages, such as Italian and Portuguese, but digiboxes do not appear to be able to cater for this requirement at the moment. If you want to receive in these languages it’s best to use a free-to-air digital receiver. Enter the Euronews frequency (11-680GHz V, SR 27,500, FEC 2/3). Normally all receivable languages can be scrolled through via the Audio or Alternative Audio menu. C.H. ■
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Baird 30 Line Recordings
http://www.dfm.dircon.co.uk
For history buffs and the curious here's a fascinating site containing early TV recordings and their background.

BBC
http://www.bbc.co.uk/enginfo
If you need any help with your reception go to this site – both of the addresses point here. There's special advice for people with loft installations, and caravanners and boating enthusiasts.

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As the leading distributor for the TV... Video and Audio trade in Ireland, we supply over 2000 shops & service dept with Audio-Video and TV spares, Semiconductors, Test Equipment, Service Manuals, Remote Controls etc. At present we stock over 30,000 different lines.

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http://www.mmwafercards.com

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Sky digital repairs
http://www.horizonsatellites.co.uk
The Horizon site gives details of our range of products and services including Sky Digital Receiver Repairs.

Servicing Advice
http://www.repairfaq.org/REPAIR/F_Repair.html
Here are some frequently asked questions about servicing consumer electronic equipment, with a US bias. But there's some good material on monitors and CD players and CD-ROM drives. (thanks to David Edwards for this information)

Switch-it-on
http://www.switch-it-on.co.uk
We sell multi-region dvd players to trade and public, also lv, videos, hifi and playstation 2. We design our own upgrades on dvd and we sell all spare parts. All makes and most models stocked.

Service Engineers Forum
http://www.E-repair.co.uk
The forum is now visited by Thousands of engineers every week, over 3000 pages of content including new repair tips, servicing articles, circuits, help, for sale, wanted & industry news sections, open access to the site is free to all engineers. Our product mailing list is also available free of charge for engineers without net access, ring Mike on 0151 522 0053 with your address details.

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The Service Engineers Forum
http://www.E-repair.co.uk.
A brand new site dedicated to the needs of service engineers containing detailed servicing articles, circuits & repair tips. The site also includes for sale, wanted & special offer sections, industry news & much more. An impressive site well worth visiting. For customers without net access, servicing product details are also available by ringing Mike on 0151 522 0053

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UK Mailing List Group
http://www.egroups.com/list/uktvrrepair
Following on from the newsgroup discussion last month there is a UK Email group for TV technicians where you can send an Email to everyone in the group.

There's just over 30 people in the group at present. For more details and how to register look at the egROUP home page. Just a general comment though you do have to be careful who you give your Email address to so that you can avoid "spaming" - that is getting lots of unwanted email about dubious Russian site (amongst others).

PSA
http://www.psaparts.com
This web site gives details of various specialist parts for repairers, from rare semiconductors to compute batteries and printer parts. The vast majority of items are in stock, and can be purchased online via this site's shopping facility.

Repairworld
http://www.repairworld.com
Repairworld is a US based fault report database which is updated bi-weekly. It operates on a subscription basis and describes itself as an "affordable solution for all technicians". There is apparently no minimum number of months for which you have to subscribe. You can see some samples of the material for free, monitors, VCR, DVD and Camcorders being of particular relevance to UK users. The site provides a "chat room" where you can talk via your keyboard to others "in the room".

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End of text for this issue.
HYUNDAI C320
This car radio/cassette unit suddenly failed, with no display or operation. It's a
well-made piece of equipment that's rea-
sonably easy to work on. The problem
was caused by flux residues that bridged
the tracks from the microcontroller chip
to the display. This was easy to spot, as
the board was otherwise very clean. Use
of isopropyl alcohol to clean up cleared
the fault.
I suspect that the owner or his garage
mechanic disconnected the battery, after
which the microcontroller chip failed to
reset. R.Bu.

JVC UX-V10/V30R
I've had two of these in recently, both
with the same basic problem. With the
first, which was the -V10 version, the
 cassette deck clattered back and forth and
sometimes jammed, but never did as it
was asked. The cause of this bizarre
behaviour was the 'trigger arm', which is
the link between the deck solenoid and
the cam gear. It's item 35 in the exploded
view, and was displaced from its clip.
To get at it you have to remove the
deco and the PCB that's attached to it. Remove the forward flywheel, after
removing the drive belt and the plastic
flywheel retainer washer at the base of
the capstan shaft. The trigger arm is then
clearly visible, and can be clicked back
into place. Reassembly is the reverse of
the dismantling procedure.
The second one was a -V30R version.
Its tape deck was dead because the 5-6Ω
safety resistor R9101, which is located
close to CN304 on the main PCB, had
failed. Once it had been replaced I had
the clattering deck symptom, the cause
again being displacement of the trigger
arm. G.D.

SONY HCD-H1500
This unit appeared to be dead, but checks
in the power supply showed that the
basic outputs were present and correct.
The cause of the trouble was that the 5V
supply to the microcontroller chip was
missing, because regulator Q791 was
faulty. It's mounted on the main, not the
power supply, PCB. Basic operation was
restored once this item had been replaced
but, curiously, there were no displays.
The cause of this final problem was the
24V zener diode D910, which was short-
circuit. It provides the reference for the
-24V display supply regulator Q903,
which is on the power supply PCB. G.D.

SONY HCD-715
This personal CD player would play a
disc when one was inserted, but none of
the operate buttons at the top had any
effect. In addition the LC display, which
shares a PCB with the switches, had
some missing segments. The control and
display panel is connected to the main
PCB by a flexible cable, which had two
open-circuit leads. A complete new
switch unit was required - fortunately the
player was still under warranty. R.B.

JVC RD MDS
This very impressive portable system
comes equipped with a built-in sub-
woofer arrangement that will fill a room
with sound. Wisely, the manufacturer has
designed it so that it cannot be run from
internal batteries!
The MiniDisc section played discs
without problems, except that new
recordings suffered from intermittent
skipping. After removing about a hun-
dred screws to take out the MiniDisc
unit, I was expecting to find a problem
with the magnetic overwrite head. But
nothing seemed to be wrong. Time for
measurements. The unit was reassembled
and the service manual consulted. I used
the remote-control unit to get into the
service mode, then used our Sony power
tester to check the laser power. The
tester is a modified MiniDisc caddy that
you insert like a disc.
The laser power for recording on a
MiniDisc is about ten times the read
power, as the surface of the disc has to be
heated to above the Curie point to enable
the magnetic head to imprint a new
recording. In this case the write power
was 20 per cent low. Resetting to the cor-
rect value gave good results with both
playback and recording.
Next time I'll check the laser power
before dismantling the set! R.B.

SONY HCD-RX90
There were problems with the CD section
of this audio system. Discs would focus
and spin, but refused to play. The track-
ing servo was working overtime, and the
pickup was very noisy. After replacing
the pickup and a number of components
in the servo circuit I decided to consult
Sony Technical, who said that the cause
could be the flexible printed circuit
which connects the pickup to board BD.
Apparently it fails quite often. A replace-
ment was immediately effective. R.B.

STUDIOMASTER MIXDOWN
GOLD DECK
We have these studio recording decks in
for investigation on several occasions, the
complaint being no or intermittent output.
Go straight to the insert jack sockets,
without checking for anything else.
Resistive switching contact here causes
the fault. It's probably as well to replace
the sockets whenever a unit comes in for
service. R.J.F.
PC systems.

Peter Marlow discusses the convergence between TV and

The PC and the TV

Mark Paul provides a guide to the technology and its

Broadband technology

This digital TV chassis was designed for use in large-

Guide to the Panasonic E-5 chassis

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Answer to Test Case 467

– page 47 –

The line output stage has to generate a linear ramp current

waveform. It's produced by the transformer when the line

output transistor or the efficiency diode is conductive, returning the earthy end of the primary winding to chassis. The flyback pulse, which drives the beam to the left-hand side of the screen to start the next line scan, is produced by the transformer and its associated tuning capacitor. For correct operation the line output transistor must be switched on and off quickly, providing a low-resistance path to chassis when it's on.

It was in this area that the fault in the Samsung TV set lay. The 2SD1887 line output transistor Q401 was sometimes unable to switch on fully and cleanly because of a dry-joint at the earthy end of the line driver transformer's secondary winding. The defect was barely visible and very difficult to prove, even by physical disturbance at the lead-out pin and the PCB. A tiny tell-tale ring was just visible at the joint however.

Ted could have simply resoldered the joint, but he would have been unsure that the problem had been effectively cured. Instead, he open-circuited the connection completely and inserted a resistor with a value of just a few ohms. When the set was repowered the fault symptom was present on the screen, thus proving the diagnosis. Ted switched off, removed the test resistor then thoroughly cleaned, tinned and resoldered all four pins of the line driver transformer (T401). The fault hasn't recurred despite Mr Hurst's conviction that it would. Perhaps we should issue complimentary Polaroid cameras to other customers whose sets produce horrid intermittent problems!
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<table>
<thead>
<tr>
<th>Track</th>
<th>Title</th>
<th>Artist</th>
<th>Year</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Washington Post March</td>
<td>Band</td>
<td>1909</td>
</tr>
<tr>
<td>2</td>
<td>Good Old Summertime</td>
<td>The American Quartet</td>
<td>1904</td>
</tr>
<tr>
<td>3</td>
<td>Marriage Bells, Bells &amp; xylophone duet</td>
<td>Burckhardt &amp; Daab with orchestra</td>
<td>1913</td>
</tr>
<tr>
<td>4</td>
<td>The Volunteer Organist</td>
<td>Peter Dawson</td>
<td>1913</td>
</tr>
<tr>
<td>5</td>
<td>Dialogue For Three</td>
<td>Flute, Oboe and Clarinet</td>
<td>1913</td>
</tr>
<tr>
<td>6</td>
<td>The Toymaker’s Dream</td>
<td>Vocal, B.A. Rohe and his orchestra</td>
<td>1929</td>
</tr>
<tr>
<td>7</td>
<td>As I Sat Upon My Dear Old Mother’s Knee</td>
<td>Will Oakland</td>
<td>1913</td>
</tr>
<tr>
<td>8</td>
<td>Light As A Feather</td>
<td>Bells solo, Charles Daab with orchestra</td>
<td>1912</td>
</tr>
<tr>
<td>9</td>
<td>On Her Pic-Pic-Piccolo</td>
<td>Billy Williams</td>
<td>1913</td>
</tr>
<tr>
<td>10</td>
<td>Polka Des English’s</td>
<td>Artist unknown</td>
<td>1900</td>
</tr>
<tr>
<td>11</td>
<td>Somebody’s Coming To My House</td>
<td>Waiter Van Brunt</td>
<td>1913</td>
</tr>
<tr>
<td>12</td>
<td>Bonny Scotland Medley</td>
<td>Xylophone solo, Charles Daab with orchestra</td>
<td>1914</td>
</tr>
<tr>
<td>13</td>
<td>Doin’ the Raccoon</td>
<td>Billy Murray</td>
<td>1929</td>
</tr>
<tr>
<td>14</td>
<td>Luce Mia</td>
<td>Francesco Daddi</td>
<td>1913</td>
</tr>
<tr>
<td>15</td>
<td>The Olio Minstrel</td>
<td>2nd part</td>
<td>1913</td>
</tr>
<tr>
<td>16</td>
<td>Peg O’ My Heart</td>
<td>Walter Van Brunt</td>
<td>1913</td>
</tr>
<tr>
<td>17</td>
<td>Auf Dem Mississippi</td>
<td>Johann Strauss orchestra</td>
<td>1913</td>
</tr>
<tr>
<td>18</td>
<td>I’m Looking For A Sweetheart And I Think You’ll Do</td>
<td>Ada Jones &amp; Billy Murray</td>
<td>1913</td>
</tr>
<tr>
<td>19</td>
<td>Intermezzo</td>
<td>Violin solo, Stroud Haxton</td>
<td>1910</td>
</tr>
<tr>
<td>20</td>
<td>A Juanita</td>
<td>Abrego and Picazo</td>
<td>1913</td>
</tr>
<tr>
<td>21</td>
<td>All Alone</td>
<td>Ada Jones</td>
<td>1911</td>
</tr>
</tbody>
</table>

21 tracks – 72 minutes of music. Published by Electronics World. All recordings reproduced by Joe Pengelly.
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