Tips, guides and reports for people repairing televisions and electronic equipment

TELEVISION

AND HOME ELECTRONICS REPAIR

MARCH 2001 £3.00

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Fault reports

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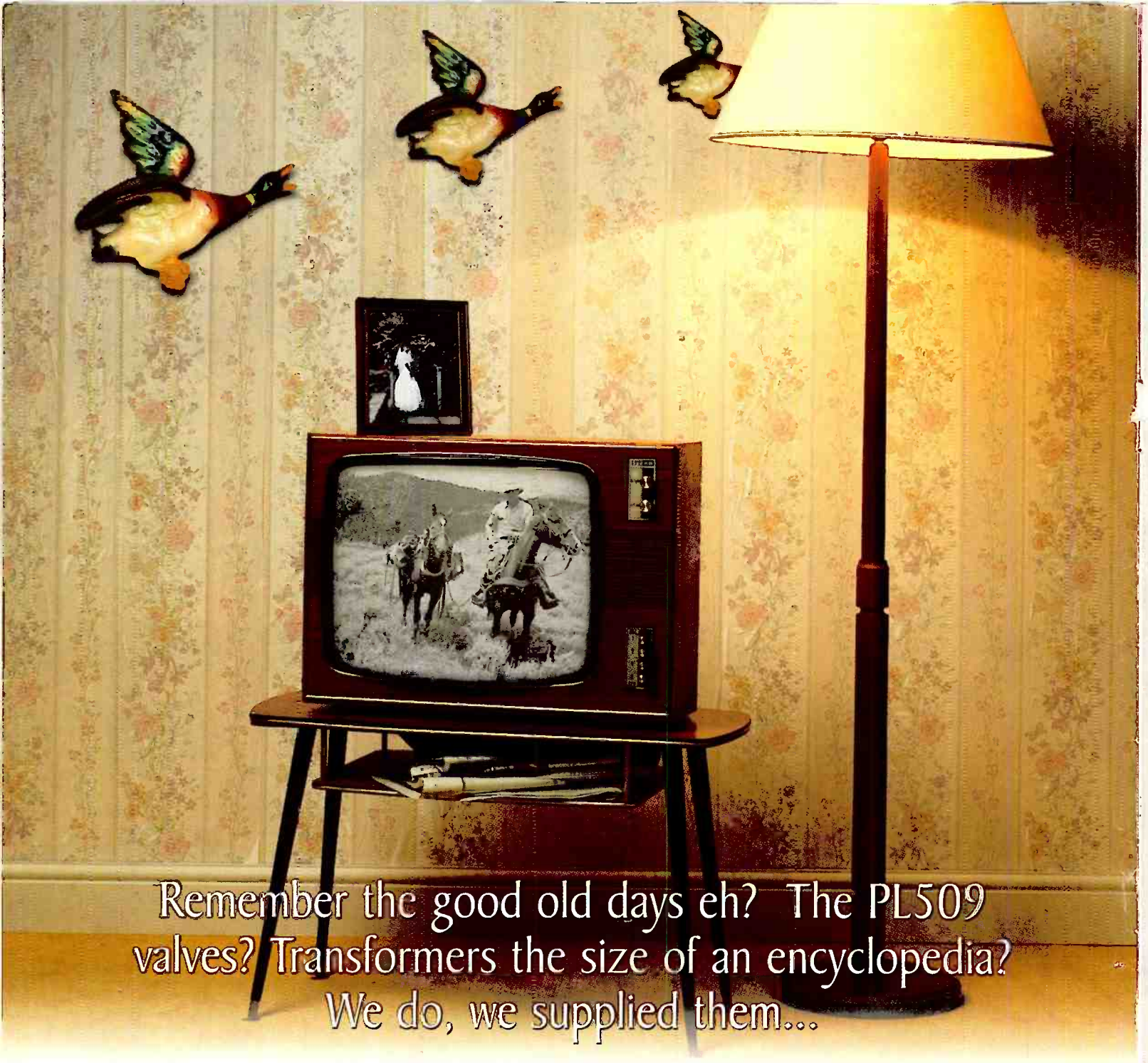

Those certainly were the days..? Remember all those service components we were forever seeking, the PL509's, PY500, used them by the bucket load back then we did. The 3.9ohm we all kept in our pocket! The push button units we all cleaned and retuned, only to return to replace pretty soon. And, remember the smell of rotten eggs as the customer opened the door, sending us straight back to the van for a tripler or more. Ah yes the memories of the seventies.

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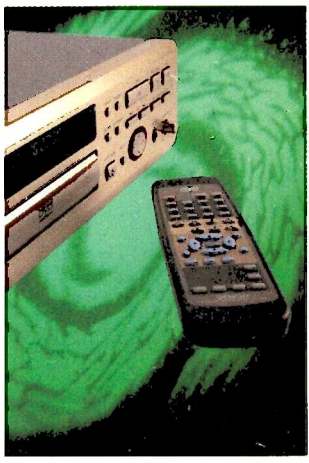

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Next issue, dated April, on sale March 14th.

DIFFICULTY GETTING THE TECHNICAL INFORMATION YOU NEED ?

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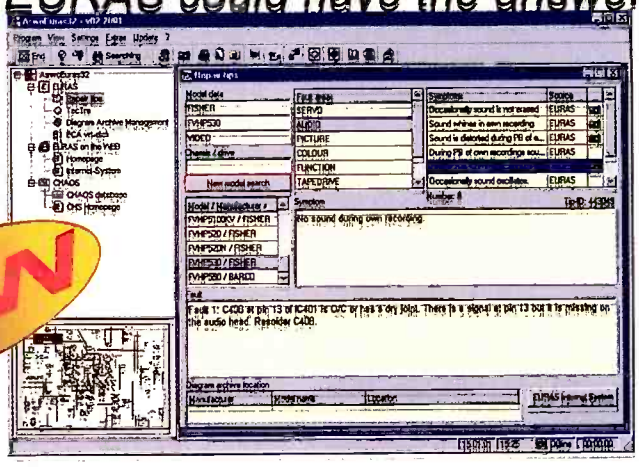

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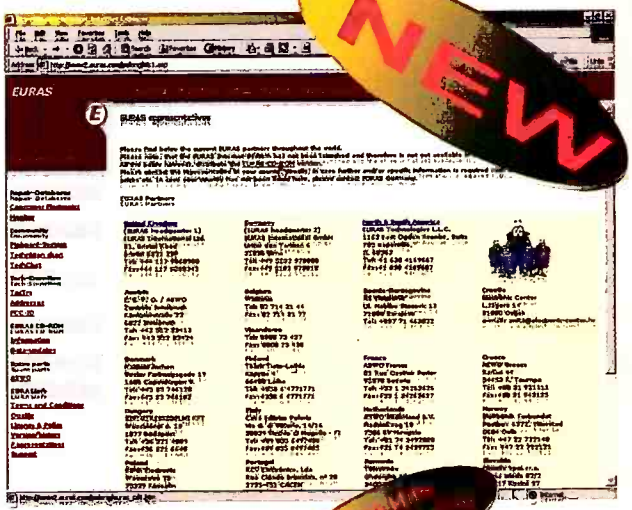

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EURAS

HP and management

The recent death of William Hewlett, co-founder of Hewlett-Packard, draws attention to this remarkable firm and its achievements. William Hewlett and his partner David Packard were both students of Professor Frederick Terman at Stanford University in the late Thirties. Professor Terman (1900-1988) is renowned for his contributions to basic computer theory. It was Terman who, in 1939, persuaded his two promising students Hewlett and Packard to form a company to manufacture scientific instruments and test equipment. The firm was started in a one-car garage in Palo Alto, at the edge of the Stanford University campus. The garage is still there, preserved as a historical landmark with a bronze plaque that states, boldly, the "Birthplace of Silicon Valley".

HP's first product was an audio oscillator, valve-based of course, that was to achieve fame by contributing to the state-of-the-art soundtrack for Disney's *Fantasia*, in 1940. Over subsequent decades Hewlett-Packard was to grow to become Silicon Valley's largest employer, with sales approaching $50bn a year and some 88,000 employees worldwide. How was this achieved?

The company evolved along with electronics itself. Perhaps its biggest change came in the Eighties, when Hewlett-Packard transformed itself from a manufacturer of instrumentation to a computer company. After a slow start as a PC manufacturer, it became the leading US brand. It was also one of the first companies to start selling hand-held calculators. At a later stage is became a major manufacturer of printers. Last year the test equipment side of the business was dropped. But more extraordinary perhaps than all this was the contribution made by Hewlett and Packard to management style. This is explained in a book written by David Packard, *The HP Way: How Bill Hewlett and I built our company.*

In addition to being brilliant entrepreneurs and fine engineers, Bill Hewlett and David Packard became management gurus. They realised, at an early stage, that the lifeblood of their company would be a steady stream of innovative products, few of which would last for more than a few years as marketable items, and that to encourage their employees a new approach to management would be required. The new approach was radical indeed when it was adopted in the Fifties and Sixties. It involved free coffee and soft drinks, a casual dress code, an informal relationship with colleagues, profit sharing, health benefits, flexitime and teleworking amongst other things. One famed element of the HP Way was called "management by walking about". I remember falling about laughing when I first read that. I could, I thought, become an excellent manager myself if all I had to do was walk about. Simple. But that, of course, was to miss the point completely. The idea was to be able to consult and keep in touch with staff (in the early days staff picnics had been considered an important part of the HP Way). Managers had, traditionally, tended to distance themselves from their staff: to sit in an office and issue orders. This would clearly not do in the sort of innovative culture HP sought in order to become and remain a leader in a fast-moving industry. Productivity, in particular, was essential. And, as William Hewlett wrote in 1982, "productivity will come only when better understanding and better relationships exist between management and the workforce". The role of managers should be to lead rather than direct. There were other major aspects of the HP Way, including much more open relationships with suppliers and even rival companies, and 'networking' to generate clusters of related technology companies.

All this makes an interesting contrast with what we know of the early days of TV development in the early Thirties, when a very close guard on what you were doing was considered to be essential to eventual commercial success. The new approach took a long time to find its way to this side of the Atlantic. One can't help wondering whether the rather sad histories of the likes of EMI, AEI and GEC would have been different had they known about the benefits of the HP Way.

A new slant for *Television*

You may have noticed that *Television* has, from this issue, been renamed *Television and home electronics repair*. We've made this change to reflect the magazine's diversification into new areas of repair work.

The fresh title does not signal a stepping up of diversification but rather a milestone in the magazine's evolution. Television will remain the magazine's main focus, but the push into new and growing areas of electronics repair is set to continue.

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INDEXES AND BINDERS
Indexes for Vols. 38 to 50 are available at £3.50 each from SoftCopy Ltd., who can also supply an thirteen-year consolidated index on computer disc. For further details see page 313.
Binders that hold twelve issues of *Television* are available for £6.50 each from Television Binders, 78 Whalley Road, Wilpshire, Blackburn BB1 9LF. Make cheques payable to "Television Binders".

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REED BUSINESS INFORMATION

TELETOPICS

ONdigital's first million

ONdigital succeeded in reaching its target of one million subscribers by the end of 2000, two years after it started broadcasting. At December 31st there were 1,012,000 subscribers, and the company expects to add a further million by the end of the year. There was an increase of 83 per cent during the year 2000. The company admits that the present churn rate (subscription cancellations) of 15-20 per cent is cause for concern, but claims that its growth rate has been "faster than Sky, faster than any cable company, faster than Vodafone or Orange or Cellnet".

ONdigital is working with other major terrestrial broadcasters on a digital information campaign designed to help viewers understand what digital TV is all about, while DTTV coverage is being extended through a transmitter upgrade programme. As a result of work at the Crystal Palace group of transmitters, a million more London households can now receive terrestrial digital TV: transmitter changes in the north west and south west will shortly extend coverage to another two million households.

There are now some 70,000 subscribers to the ONnet internet service, and 56 brands have signed up to provide content for the ONnet portal. ONdigital began broadcasting Channel 4's new entertainment channel E4 in January, and will launch a new premium sports channel this autumn.

Matsushita's advanced TV

Matsushita has launched an advanced TV set, Model TH-36H100, in Japan. It's described as a BS (Broadcast Satellite) HDTV receiver with a built-in hard-disk recorder. The 36in. 16:9 Super Slim tube is claimed to be the thinnest flat HDTV CRT – the set is just 45cm deep, approximately 77 per cent less than other equivalent-screen models. The integrated 30Gbyte hard-disk video recorder can store up to five hours of video in standard digital mode or up to 25 hours in analogue mode. It has a track-and-play feature that enables the user to play back a programme while it's being recorded, and there's an advanced search system. The set has 750-line progressive-scan circuitry that up-converts both interlaced and progressive-scan 525-line pictures.

There's an IEEE 1394 interface for connecting devices such as a D-VHS recorder, a DVD home-theatre system or a DV camcorder. In addition the new SD Memory Card can be used to display still JPEG images and audio stored on this type of card.

Matsushita is also launching this month in Japan, under its Panasonic brand, a BS Digital LCD TV. This has a 15·2in. LCD screen, an integrated DVD audio/video player and internet access, also an IEEE 1394 interface connector. The new range includes a hard-disk recorder, Model NV-HRD1000.

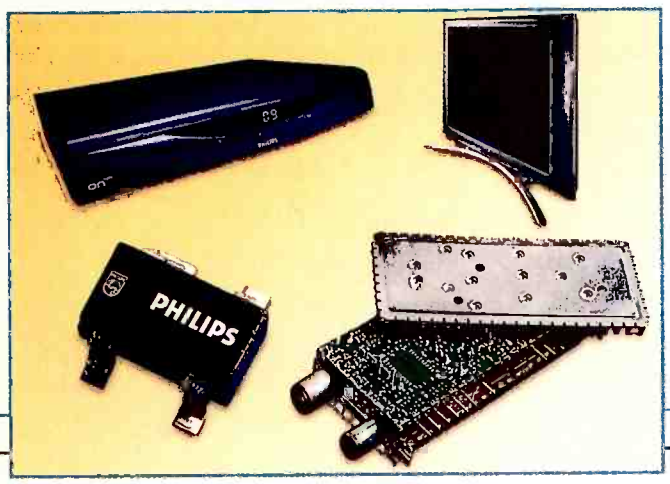
There are no UK launch details for these products. Panasonic has however launched in the UK the TH42PW3B plasma-display TV, which weighs 29·5kg and is just 89mm thick. It's claimed to be 25 per cent more efficient than its predecessor, and thus doesn't require fan cooling. As a result there's totally-silent running. It uses Panasonic's Real Black Drive System, which the company developed to overcome the problem of achieving true black with a plasma display. This reduces black illumination to provide a contrast ratio of 3,000:1, five times better than with previous Panasonic plasma displays. There's also Advanced Plasma AI, which boosts the dynamic range. This, in conjunction with the Asymmetrical Cell Structure panel, delivers a peak brightness level 70 per cent higher than previous plasma displays. Because motion blur and excessive picture noise are particularly distracting with a 42in. screen, a circuit that constantly examines the incoming signal to assess these factors is incorporated. The display can also be used as a computer monitor, with resolution up to UXGA (1,600 x 1,200 pixels). A 50in. version is to follow shortly.

Television Index and Directory

SoftCopy Ltd. has revised the range of discs and services available to readers. The new *Television Index and Directory 2001*, in CD-ROM form, contains over 13,000 fault reports, searchable by make and model, plus the text of 156 test cases and 165 major servicing articles from thirteen years' issues of *Television*. There's a spares guide, a TV transmitter list and several other useful reference sources. For further details refer to the SoftCopy panel on page 313. The new arrangements came into effect last month and simplify the range of products on offer.

New MOSFETs for TV/VCR tuners

Philips Semiconductors has launched a new range of four enhancement-mode n-channel dual-gate MOSFETs for use in TV and VCR tuners at VHF and UHF. They have been designed to reduce noise and cross-modulation and operate with a supply voltage in the range 3-9V. The BF1201 is optimised for low cross-modulation, the BF1202 for low noise. These are available with SOT143, SOT143R or SOT343 encapsulation.



The BF1203 and BF1204 were developed to meet particular customer requirements but are now generally available. The BF1203 is a combination of two different dual-gate MOSFET amplifiers in a single micro-miniature SOT363 package while the BF1204 is a combination of two equal dual-gate amplifiers. These two-in-one devices have common source and gate two connections.

The MOSFETs feature superior cross-modulation performance with AGC and a high forward-transfer admittance-to-capacitance ratio. The source and substrate are interconnected, and integrated diodes between the gates and source protect against input voltage surges. Internal bias circuits ensure good DC stabilisation.

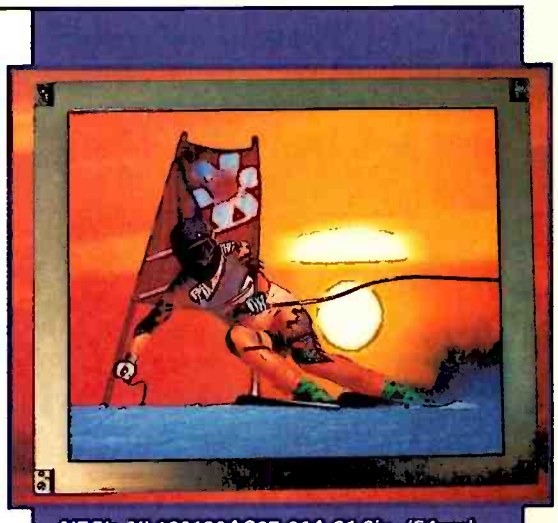
New soldering equipment from JBC

Two new soldering products have been introduced by JBC Ltd. UK, the PA4200 hot tweezers with dual control unit (AD4200), and the up-rated (version 2) AD2200 power control unit.

The tweezer system comprises tweezers, dual control unit and stand. Each leg of the tweezers has built-in temperature control/sensing to ensure that an even temperature is applied to the device for reworking. A range of twelve cartridges is available to suit the most common ICs and QFP/PLCC devices. There's also a cable-stripper cartridge suitable for cable diameters up to a maximum of 3·5mm. The AD4200 dual control unit is rated at 135W and has dual ports to facilitate simultaneous use of 20W and 50W Advanced JBC hand pieces if required.

Version 2 of the AD2200 power control unit has been uprated to 55W with temperature selection in 25°C settings – the maximum operating temperature is now 371°C (700°F). Accuracy has been improved to ±5 per cent. There's a new range of hand pieces (AD2210 20W, AD2245 50W) and a selection of 25 soldering cartridges with tip sizes from 0·2-4·6mm and others for specialised applications (ICs, chip components etc.). When the new hand pieces are used with the new cartridges the potential between earth and tip is now less than 2mV, thus meeting the requirements of MIL-SPEC-2000.

The full range of JBC soldering and desoldering products is available from CPC Ltd., Preston, and Willow Vale Electronics Ltd., Birmingham. For further information contact Max Hofmann at JBC Ltd. UK on 0161 474 0299.



NEC's NL160120AC27-01A 21·3in. (54cm) TFT LCD flat-screen display module, which provides high resolution with a wide viewing angle for use in high-end monitor applications, is now available from Sunrise Electronics. Resolution is up to 1,600 x 1,200 pixels in full colour, with eleven scanning modes. The viewing angle is up to 170° left-right, up-down. A replaceable direct-inverter type backlight is used. The module comes with a CRT-compatible interface board capable of discriminating between multiple input signals and display control dot-clock signal output according to the number of elements to be displayed. For further information apply to Sunrise Electronics Ltd., The Stocks, Cosgrove, Milton Keynes MK19 7JD. Phone 1908 263 999, fax 01908 263 003 or check at www.sunrise.co.uk

Cable TV

NTL, which reached a total of over half a million digital subscribers just before Christmas, is to raise the prices of some of its digital packages over the next few months "in line with similar BSkyB increases". The company says that its cable modem service is going "really well": during the fourth quarter last year it tripled the number of its cable modem internet access subscribers. NTL and internet broadcaster MyMovies have formed a partnership that makes it possible for NTL subscribers to watch MyMovies via three methods – digital TV, telephone modem or a broadband PC connection. MyMovies offers feature-length films on a video-on-demand basis.

Telewest has announced that it is to end its exclusive STB supply agreement with Pace.

New from Thomson Multimedia

Thomson Multimedia has launched the first range of Thomson TAK interactive TV sets in France – TAK is 70/30 per cent owned by Thomson and Microsoft respectively. The sets enable viewers, easily and without a subscription, to send and receive e-mails, display a TV programme guide, consult additional information on current and future programmes at any time, interact with programmes, access the internet and take advantage of many personalised information and entertainment services. The new services are available 24 hours a day.

At the Las Vegas CES Thomson Multimedia announced a new MP3 coding-decoding (CODEC) format that provides improved sound at lower bit rates. The new format, still under development, should be ready for implementation in mid 2001. Called mp3PRO, it uses audio compression technology developed by Coding Technologies to provide 128kbits/sec performance at a 64kbits/sec rate, nearly doubling the digital music capacity of a typical flash memory. With lower bit rates, mp3PRO also offers internet radio broadcasters the ability to lower their bandwidth costs while at the same time offering CD quality in the MP3 format. The new format is compatible with current MP3 content and players: MP3 content can be decoded by an mp3PRO player, while content coded in mp3PRO format can be played back by an MP3 player, but to experience the quality enhancements provided by the new format an mp3PRO compatible player is required.

DoMiNo

C-Cube has announced a new processor technology, called DoMiNo (Digital Media Networks), that undertakes audio, video and network processing in next-generation STBs and DVD products. The DoMiNo technology provides high display quality, encoding, decoding, transcoding, transrating, AV streaming, digital rights management, copy protection and AV network connectivity in a single, flexible design. Consumers have the freedom to view or listen to digital content in the format best suited to a particular device or situation. The AV streaming capability, in combination with integral transport stream demultiplexers and other broadband network interfaces, can be used for interactive TV and video-on-demand applications via broadband cable, satellite or digital subscriber line (DSL). The integrated IEEE 1394 interface provides simple networking with other consumer electronic devices.

Astra's 2001 launches

SES (Société Européene des Satellites S.A.) has reached agreement with International Launch Services to launch Astra 2C and 1K from the Baikonour Cosmodrome in Kazakhstan. Astra 2C will be launched into orbit at 28·2°E in June and 1K into orbit at 19·2°E in December.

Astra 2C will have 32 transponders operating in the 10·7-11·2GHz and 11·7-12·2GHz bands. It's intended to provide additional digital transmission and back-up capacity. Astra 1K, with Ku- and Ka-band capacity, will be the most powerful and versatile Astra satellite to date. Its functions will be to provide full replacement capacity in the 10·7-11·7GHz band; provide two-beam coverage, one over the Iberian peninsula, the other over Continental Europe with coverage extended to include European Russia; and provide Ka-band return path capabilities, with an extended footprint into Eastern Europe, and full back-up for the existing Ka-band facilities aboard Astra 1H.

WHAT A LIFE

Lots of TV sets – and their odd owners. Is the stock fault back with us? Keep the e-mails up! Donald Bullock's servicing commentary

"Are you Mr Bullock hisself?" asked the rather dishevelled lady who had just slid through the door.

I nodded wearily.

"Well, Mr Brown, I've got a problem." She fished a Mitsubishi HSB12 VCR from one of the plastic bags she was carrying. "He goes like this" she said as she stretched and gyrated sideways, this way and that.

I reached for a job card and wrote "Mitsubishi recorder, picture pulling".

"By the way, I'm Mrs Hindle. My husband, Mr Hindle, is a surgeon."

I looked at her for a moment, before she departed, then wrote that down too.

When Paul came in I handed him the recorder and the card.

"Oh, this belong to Danny Hindle, the wild scruff who lops trees. His wife is as nutty as a fruitcake.

Sandstorm and buzzing

As he settled to the VCR, a dry little woman came in with a 14in. Sharp colour set and a wiry little lad. It was a Model 37AM-23H (5BSA chassis).

"Hello, dear. This set ain't half misbehaving isself. Picture looks like a sandstorm and the sound buzzes like a hornet."

"Hornet, buzzing?" I said "maybe it's caught up in the sandstorm."

As I laughed at my brilliant joke she doubled up and hooted twice, like an impatient train. "Ooo that's clever. I must remember that one. Caught up in a hornet. Good!"

The boy looked up. "'Er's bin on the rough again" he said, "an if 'er don't stop, our dad'll give her another bashin'."

The woman stopped laughing and lent over to her boy. "You just shut your mouth, or I'll yank your 'ead off" she grated, "and 'ere's something to be going on with." She rammed her thumb into his ribs, then turned to me a smiled.

"Funny, isn't he? And so sweet. I'll pop in tomorrow for the telly."

Repairs

When she'd gone Steven plugged her set in. The picture was grainy and the sound was buzzing madly. And it wouldn't go into the tuning mode via the menu.

"Another one" he said, "that makes about four this past month. It'll be the EPROM chip IC1002. I'll put the set in the service mode."

He held down the volume up, volume down and channel up buttons as he switched on, then tried to program it. Some of the functions failed to respond. The AGC was haywire too. A new EPROM cured the trouble, and I left him setting up the height and picture positioning.

Meanwhile Paul was attending to the Mitsubishi VCR. The playback picture was distorted and continued to pull about in the E-E mode. In addition the colour kept dropping out. After a while he discovered that C2X2 (10µF, 50V) in the tuner module was leaking electrolyte all over the board. Its value had fallen to 3µF. A clean up and a new electrolytic capacitor cured the fault.

Farmer Willersey

As Paul was reassembling the VCR Farmer Willersey staggered in, carrying a 28in. Hitachi colour set. "This set's driving me to drink" he announced. "What with 'im, an' mad cow disease and my old sow, it's no wonder I settle in the cider barn and pull meself a few."

"What's up with the old sow?" I asked."

He straightened himself up and looked at me sternly. "You're talking about my wife" he replied.

So I changed tack and asked him about the set's troubles.

"I turns 'im on and sits down to see the vets or the funny-fellow cooks, right?"

"Don't you watch anything else?" I asked.

"There ain't nuthin' else, is there?" he scowled, "it's always the vets or the funny-fellow cooks on everywhere all the time, innit?"

I nodded glumly "Pretty well" I replied.

"So there I am, sat down, and what 'appens? Off he went. So I goes over an' smacks 'im one. On 'e comes. Sometimes 'e lasts two minutes, maybe three, never more. So I pastes him again, but he don't last no longer. After a while I gets tired of it and goes to bed. I didn't part with near six hunerd quid for a life like that" he said.

When he'd gone Steven took the back off the set, which was a 46TN series model, and went straight for R719. It's half hidden by the chassis cradle. Sure enough there was a dry-joint at one end. Once it had been resoldered the set worked faultlessly. R719 is part of the protection system – it's in the network that monitors conditions in the line output stage.

Visitors

Mrs Merryweather then came in with her sickening cat and its battery-operated mouse.

"Ah Steven" she cried, "how lucky to find you. My Tibbles is *so* unhappy today. His little mouse won't play. I can't stand seeing him so lost. 'Tibbles' I said 'we'll go and see that nice Steven, that's what we'll do. He'll soon have it right for us'."

As Steven applied himself to the mouse I struggled with the giant Hitachi set, to get it out of the way. Then Greeneyes brought in our tea, and Mr Flighty came in. He grinned at her.

"My, you look ravishing today." He looked over at me, bent double and snorting with the effort required to move the Hitachi set. "Good God, he's deteriorated. Can't he walk no better than that? You ought to get him looked at."

As Greeneyes smiled sweetly I straightened up and surveyed him coldly.

"I've got a little problem with this Goodmans 2580" he said, "no sound."

I made out a job card, waved him out and turned to Greeneyes.

"One of those flashy types" I commented.

Steven, now free of Mrs Merryweather, her cat and its mouse, opened the 2580. "Another common one" he said "it'll be the surface-mounted BC848B transistor in the sound mute stage, TS90." A replacement restored the sound.

"Charge him forty pounds" I said.

"That would be criminal" said Greeneyes.

"But sweet" I replied.

"We've had a lot of these recurring faults recently" Steven said. "When the Japs first flooded the market, stock faults seemed to be a thing of the past. We reckoned we'd have to work harder than ever for our money. Now stock faults seem to be common again. Maybe it's because the sets are coming from all over the place."

Walter Wingnut

Old Walter Wingnut tottered in with a Sony KV21M3U colour set (BE4 chassis).

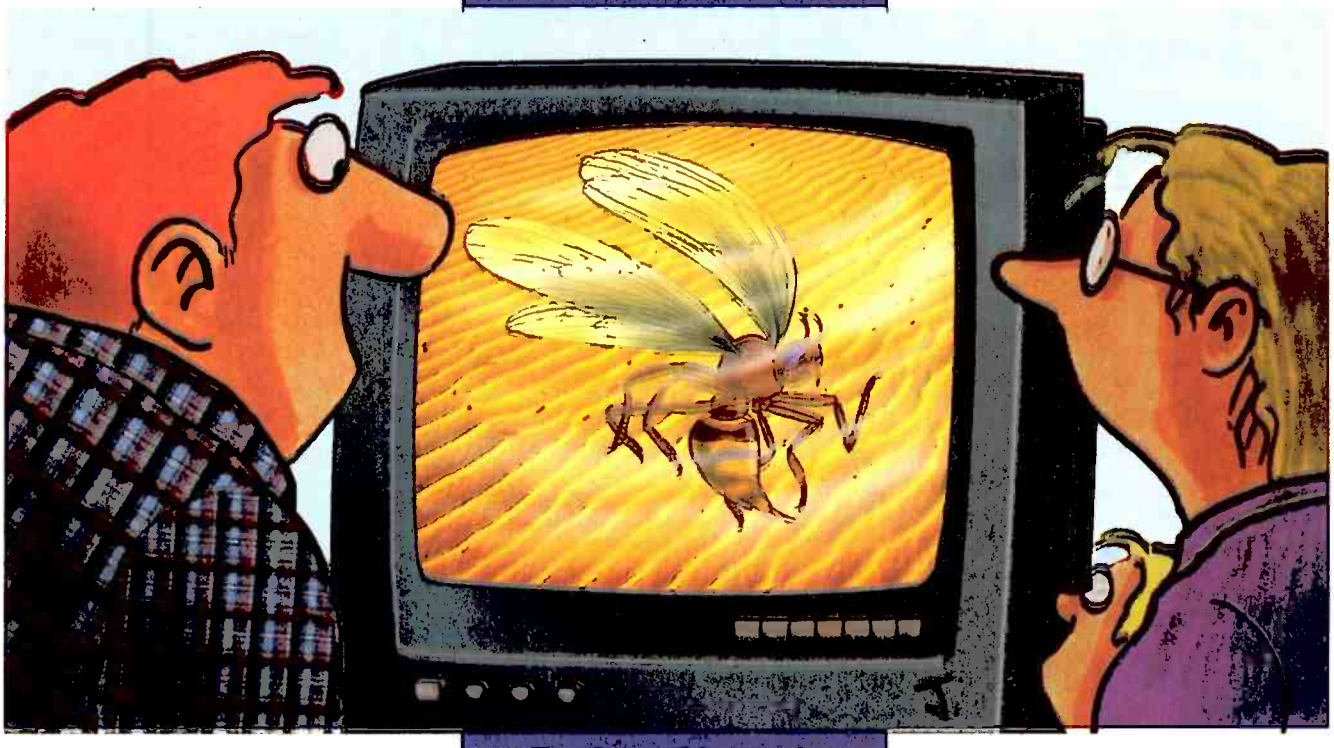
"Haven't seen you for a long time Walter" I breezed as I studied his protruding ears. "What's new?"

"I've taken to liking Horlicks" he said, "and, oh yes, the missus has run off with the milkman."

"Good God" I replied, "had you any idea that might happen?"

"None at all" he said, "I used to 'ave nothin' but cocoa every night."

"Your missus and the milkman" I persisted, "wasn't there any warning?"



"Hello, dear. This set ain't half misbehaving isself. Picture looks like a sandstorm and the sound buzzes like a hornet."

"Oh, arr, I yeard 'is pony 'an trap clopping down the lane to the house."

I looked at him. He was grinning contentedly. "Walter" I said, "what's up with the Sony?"

"Picture went so dark I 'ad to put the light off to see it. Then he went into a line acrost an' that was that."

I decided to take on Walter's set. One fault or two I wondered? The sets that use this chassis tend to develop beam-limiter trouble. So I checked for shorts in this area and discovered that C823 (0·022µF, 250V) was leaky – the reading was 50Ω. A replacement restored the brightness and revealed field collapse. I headed for the field output chip IC501, but since Paul had just used the last one I decided to be a bit more scientific and reached for the meter. Checks showed that its supply was missing. The cause was traced to the fusible surge-limiter resistor in the 24V supply, R814 (0·47Ω, 0·25W). It does suffer in this set, and Sony has introduced an improved type, part no. 1-249-443-11. We did have some of these in stock: fitting one completed the repair.

A Bavarian

Mrs Weiner came in nursing a shaggy little dog. As she approached me it nipped my hand.

"That voss naughty, Heinz" she said to the mutt. "You mustn't bite Mr Bullock. He don't like it."

"You're dead right" I muttered under my breath."

"My set is in ze car. It's faulty, but I gut vun from my own country" she said.

Paul brought it in. It was a Grundig P37-070 (CUC7301 chassis).

"So you bought it in Germany?" I smiled.

Her face hardened. She dropped the dog and stood bolt upright. "I come from Bavaria" she said, "not Germany."

"Oh, right" I said.

She picked up the dog and it nipped my hand again.

"No more, Heinz. Mr Bullock vill get mad."

Could be right I thought.

Steven tackled the set. The picture was pulled across to the right, and he noticed that the line output transformer was quite warm. A replacement made no difference and ran just as warm, so he carried out some checks in the line driver stage. There was nothing wrong here either, and the TDA8362A multifunction chip IC150, which incorporates the timebase generators, appeared to be OK. The line drive signal appears at pin 37 and is passed to the driver stage via the surface-mounted BC858B transistor CT169, which was leaky collector-to-emitter. A replacement cured the trouble.

Mrs Weiner called to collect her set next day. "I've had a talk with Heinz" she confided, "he's promised never to nip you again Mr Bullock."

"Oh, I don't really mind" I smiled, rocking my shoulders.

But as she turned round to fish in her bag Heinz nipped me again, under the chin. So I gave him an upper-cut, under his chops. This sent him yelping and cavorting around the shop.

"Heinz, Heinz. Stop it you silly boy" she cried. "Mr Bullock won't hurt you. He's our friend." Then, smiling apologetically, she turned to me. "He can be as silly as silly at times Mr Bullock. Anyone would think he's been hurt. Now stop it Heinz, stop it."

E-mail

My January column brought a fine crop of e-mail messages. Most supported my grumble about the BBC's falling standard of programmes in recent years. Tony Blakemore reckons that they regard our collective IQ as about 50 and fashion their programmes and presentations accordingly. Gerald Adams thanks God for the on-off switch. Bob Meade from Suffolk speaks of the "sad state of our programmes today", and Steve Pendlebury agrees. David Else warms to the re-showing of the *Two Ronnies* recordings. Far better, he comments, than the "rubbish and foul language" we suffer these days.

My own view is that the BBC simply reflects our society today. It's been dumbed-down and there are no standards. There are far too many empty-headed, shallow people about nowadays: the BBC has its full share. Lord Reith must be spinning in his grave.

My thanks to all who have sent e-mails. I'll reply to each one as soon as my sons have shown me how to switch on the new computer! If you are thinking of sending me one (an e-mail, not a son), do tell me where you hail from and give me some background news. I've become quite nosy lately. Greeneyes reckons it's part of the process of growing ancient.

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100uF	CAP66	85p	10
220uF	CAP67	175p	10
330uF	CAP68	245p	10
470uF	CAP69	435p	10
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47uF	CAP82	95p	10
68uF	CAP83	130p	5
100uF	CAP84	120p	10
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3.3uF	CAP95	50p	5
4.7uF	CAP96	50p	5
10uF	CAP97	95p	10
22uF	CAP98	105p	10
33uF	CAP99	155p	5
47uF	CAP100	175p	10
100uF	CAP101	210p	10
220uF	CAP102	600p	5
470uF	CAP103	600p	5
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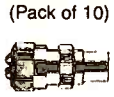

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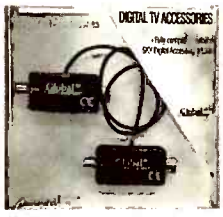

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BU2525AF	220p	BUZ80	135p	MJ11015	250p	TIP121	35p	HA13153A	900p	STK4171	900p	STR4512	400p	TDA1175	175p	TEA2018A	80p
BU2525D	240p	BUZ80AF	200p	MJ11016	300p	TIP122	30p	HA13155	920p	STK4172 II	680p	STR50103A	260p	TDA1180	120p	TEA2037	200p
BU2527AF	400p	BUZ90A	180p	MJ15003	250p	TIP125	30p	HA13157	950p	STK4191 II	900p	STR54041	320p	TDA1518BQ	240p	TEA2164	160p
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A LOOK AT DVD

Edgar Beddow describes the basic DVD technology and specification, and provides some initial information on player servicing

The following article provides an introduction to DVD technology plus some practical information on experience to date with players. As a playback medium, the Digital Versatile Disc offers features and a picture-definition quality far in excess of that provided by VHS video cassette recorders. Library VHS tapes are available only in the standard, not Super, format, so at best you are watching a picture with 240-line resolution. It's a great pity, because most movies are shot using 35mm film which provides very high definition. This is immediately lost with conversion to VHS video.

DVD players can also play back CD audio discs and the lower-quality CD-video disc. They have the ability to display a scene shot from different angles, though some discs are not encoded with this feature. A section that shows the viewer how the picture was made is often included. Perfect still pictures and quick access to any section of a film are other features, but this list is by no means exhaustive.

Some suggest that DVD will replace the CD payer completely, but most hi-fi enthusiasts don't agree: the CD player is exclusive to audio, and the dedicated decoding circuitry design provides very high-quality sound reproduction.

It might be thought that a DVD player is just a CD unit with a video card. In some respects this is true, since both use the basic technology of a laser that scans digital data encoded on a reflective disc. But there are some important differences, which affect the design of the laser unit. Table 1 provides a comparison between the two systems.

Optical arrangements

Because of the need for a DVD player to be able to play both types of disc, a special single-lens optical system is generally used. The pickup incorporates a hologram that generates, from a single laser beam, two spots of light – one for DVD and the other for CD playback. Light from a single semiconductor laser is reflected by a half mirror, entering an objective lens with integrated hologram. Part of the laser beam is focused by the lens only: this portion forms the DVD light spot. The beam also passes through the holographic section and, under the combined influence of the lens and hologram, a second light spot for CD playback is formed.

The light reflected from the disc is focused on to a set of photodetectors in the usual way, except that two sets of diodes (inner and outer) are used. It is obvious that the DVD light spot will be severely diffracted by a CD, and the converse is true. The player can therefore detect which type of disc has been inserted – by checking the focus position (inner or outer) from which the RF signal comes. The system also detects and compares the quantity of reflected light at the focal point: DVD is greater than CD.

The machine plays dual-layer discs by stopping the focus and tracking

servos and applying a drive signal to re-focus the lens on the second layer. The focus and tracking signals then work on the target layer in the normal manner. The moving time between layers is several tens of milliseconds. Detection of a dual- or single-layer DVD is achieved by measuring the light output, which is approximately 30 per cent lower with a dual- than a single-layer disc.

Other pickup systems include the dual-lens device, where a kick pulse is applied to change the lens over depending on the type of disc inserted. A unit that has two separate pickups in a single assembly is also encountered. This requires two dedicated circuits.

There is also a system that uses two lasers with different wavelengths (650 and 780nm). A wavelength filter selects the relevant beam.

Servo systems

The servo systems in a DVD player are, basically, very similar to those in a CD unit. But because of the much greater track density greater accuracy is required. The tracking servo uses a phase-difference system with a four-split photodetector. Provided the light beam passes the pits along their centre line, there will be no phase difference between the two diagonal pairs of detectors. Should eccentricity be present however, or the servo drifts, a phase difference will occur. This is converted to a voltage that serves as the tracking signal.

Although the shape of the signal pits with different discs may vary by only several nanometres, this nevertheless has an influence on the accuracy of the servo systems. To offset this, DVD players use learning servos. The focus and tracking servos are optimally adjusted for each disc, so that offsets don't occur even when there is external disturbance or dust on the disc. The digital servos perform these adjustments very quickly and accurately.

Data compression

From the servicing point of view there is little point in learning about data compression techniques. Decoding is carried out entirely on chip, and either works or doesn't. As with so many things nowadays, you cannot get into the circuit to analyse what's going on. All you can do is to check voltages and data lines. As the subject is not without interest however, I'll attempt a brief description.

A two-hour programme of uncompressed CCIR 601 serial digital video generates roughly 144GB of data. As the capacity of a DVD is 4·7GB, a compression of some 40:1 has somehow to be achieved. The Motion Picture Expert Group (MPEG) developed the MPEG-2 video compression system to provide this. Basically, anything that is stationary for more than a few frames in a moving picture need not be transmitted frequently. Only changing images need updating. It's obvious that fast-moving images need a much faster data rate to avoid the movement becoming jerky. By comparing the changes that occur frame by frame, and removing as much repetitive information as possible, the data storage requirements can be dramatically reduced.

An MPEG-2 data stream consists of groups of three types of frames, I, P and B, with typically twelve frames per group in the following order: I B B P B B P B B P B B. The I (Intra) frames are single, compressed frames that contain all the spatial information required in a video frame (after spatial redundancy). P (Predictive) frames are computer-based on the nearest previous I or P frame. They are more highly compressed than the I frames, and provide the basis for calculation of the B frames. B (Bi-directional) frames are based on both past and subsequent frames. The I frames are the essential building blocks of the MPEG-2 sequence. To prevent picture break up, I frame forcing is used at scene changes. The data is then subjected to statistical redundancy and other processing for error correction.

Some images are straightforward to compress, others more difficult. Images with little or no movement are easy to predict, so the compression ratio is high. Fast-moving images are more difficult to predict, so a large amount of information is required. On average, complex images are encoded at 10Mbits/sec while simple ones require about 2Mbits/sec.

This variable bit-rate technology provides a very high resolution, in excess of 500 lines. It's far superior to the video CD which, because of it uses a fixed-rate system, can achieve a resolution of only 240 lines.

When you consider the amount of compression employed, the picture quality is remarkable. It does justice to the quality of the 35mm film stock originally used to make the film.

Audio

Digital surround-sound systems were covered in Ian Martin's excellent article in the December 1999 issue. Suffice it to say here that DVD players use the Dolby AC3 system, with some capable of decoding DTS (Digital Theatre Sound). This provides full 5.1 surround sound when connected to a system as described by Ian.

DTS is interesting in that the film stock has a code to synchronise the projector with a CD-ROM which provides the sound. If the system were to be adopted universally, it would not be necessary to print different-language versions of a film: a standard copy would be used with the appropriate sound disc.

Servicing

Most problems seem to relate to the optical block, or 'basic engine' as

Table 1: Comparison between the DVD and CD formats

Parameter	*DVD*	*CD*
Disc diameter	120mm	120mm
Disc construction	Two 0·6mm plates bonded together	Single 1·2mm plate
Track pitch	0·74µm	1·6µm
Max pit length	0·4µm	0·9µm
Linear velocity (CLV)	3·49m/sec	1·3m/sec
Storage capacity*	4·7GB	0·65GB
Modulation	8-16	8-14
Laser wavelength	650 or 635nm	780nm
Numerical aperture of lens	0·6	0·45
Light spot diameter	0·56µm	0·9µm

*Single-sided disc, unformatted. Storage capacity with a single-sided, dual-layer DVD is 8·5GB and with a double-sided DVD 9·5GB.

Philips call it. The symptoms can be various, from intermittent picture freezing to failure to read a disc. Remember that in normal operation the disc will be rotating a lot faster than a CD. Pickup replacement is usually straightforward. Some laser units have more than one shorting link to provide protection from static.

It's quite common to find that a unit has been re-chipped to get over the regional-coding problem. This invalidates the maker's warranty, so there's a nice, chargeable repair! The re-chipping is sometimes not very carefully carried out. It's worth checking whether a replacement IC has been soldered correctly.

Some models, from Pioneer in particular, require a service remote-control unit for setting up. Most have some sort of service software built in. Philips' players have a comprehensive service menu that runs self-checks on the various modules, but doesn't provide diagnosis to component level. A more detailed analysis is possible when the appropriate service software and a PC are available.

Panel swapping is not normally possible as most manufacturers don't supply boards, even under guarantee. Component-level repair is usually requested. Philips used to offer a mono (decoder) panel replacement service, by returning the complete module to Eindhoven, but this is no longer available. I wonder what customers will say when they find out that while the technology is becoming ever more complex most manufacturers, including Philips, are making repairs increasingly difficult?

Failure of a player to produce sound can be caused by software corruption, which can sometimes be cured be re-initialising the player in the service mode. Connecting a suitable amplifier to the optical output can provide a clue as to where the fault lies: if sound is heard, the problem must be farther downstream from the AC3 decoder. It is also possible to connect a MiniDisc recorder to this output and check whether sound can be heard when it's set to record. A CD will have to be inserted for this test.

As DTS audio is not compatible with AC3, it's important to check that the player is not set to this mode when a non-DTS disc is being played.

Recordable DVD

The recordable DVD situation is not clear at present, with no agreement on a suitable format. The most promising technology appears to be the DVD+RW format backed by Philips and Sony who, of course, were co-inventors of the CD format. These rewritable discs can be read by existing DVD players and DVD-ROM drives, and can currently store up to 3GB of data, with a full 4·7GB version expected later this year. There are two competing systems, DVD-RAM which is favoured by Panasonic, Toshiba and others; and DVD–RW, which has been developed by Pioneer.

It's interesting that the existence of DVD has not so far diminished interest in VHS tape recorders. New models are still coming along, and millions of machines are out there providing sterling service.

It will be very interesting to see what happens in the future. ■

This year, BBC Television will be celebrating its 65th anniversary. But, asks Don McLean, who is celebrating the more important milestone of the world's first demonstration of television, which had its 75th anniversary this January?

Television before the TUBE

On 23 February 2000, the United States National Academy of Engineering announced its top 20 Greatest Engineering Achievements of the 20th Century. They placed radio and television in 6th position, behind electrification, the car, the aeroplane, water supply and distribution and electronics.

At the press conference, Professor Neil Armstrong said, "Engineering helped create a world in which no injustice could be hidden." Interestingly, the engineering that landed him on the moon and explored our solar system came in 12th place, **Fig. 1**.

Baird Company engineers at the Crystal Palace laboratories prepare for the competition with Marconi EMI for the provision of a television engineering solution for BBC high definition television, 1936. The camera shown here is an electron tube design, using the US Farnsworth dissector. Courtesy of R M Herbert.

Facsimile first

Though television only became practicable in the 20th century, the desire for it is probably as old as humankind itself. To be able to view some representation of a scene remotely has captured imaginations through the ages. No one person or company can take credit for the result since development of the concepts for 'distant vision' took place progressively.

The earliest feasible system for sending and receiving images was mechanically scanned facsimile, **Fig. 2**. In that precursor to television from the mid-19th century, we see all the recognisable engineering functions such as scanning, synchronisation, and even digital transmission and digital coding.

Origins

Though facsimile became practical in the late Victorian and the Edwardian eras, television was a different problem. How could a real-life scene be converted to electricity, moved from a remote place to the viewer using cable or the 'ether' and then reconstructed for viewing at a distant site – and all of this in an instant?

Inspired by the discovery of the light properties of selenium, 19th century inventors dreamt of mirroring Mother Nature, in modelling what the eye and brain did. However, it became obvious that replicating the eye was just not practicable.

Making such a replica would have entailed having the scene projected onto an area arrayed with several thousand photo-detectors. Each photo-detector would send its respective signal to an equivalent display. The prospect of having several thousand detectors and displays connected via several

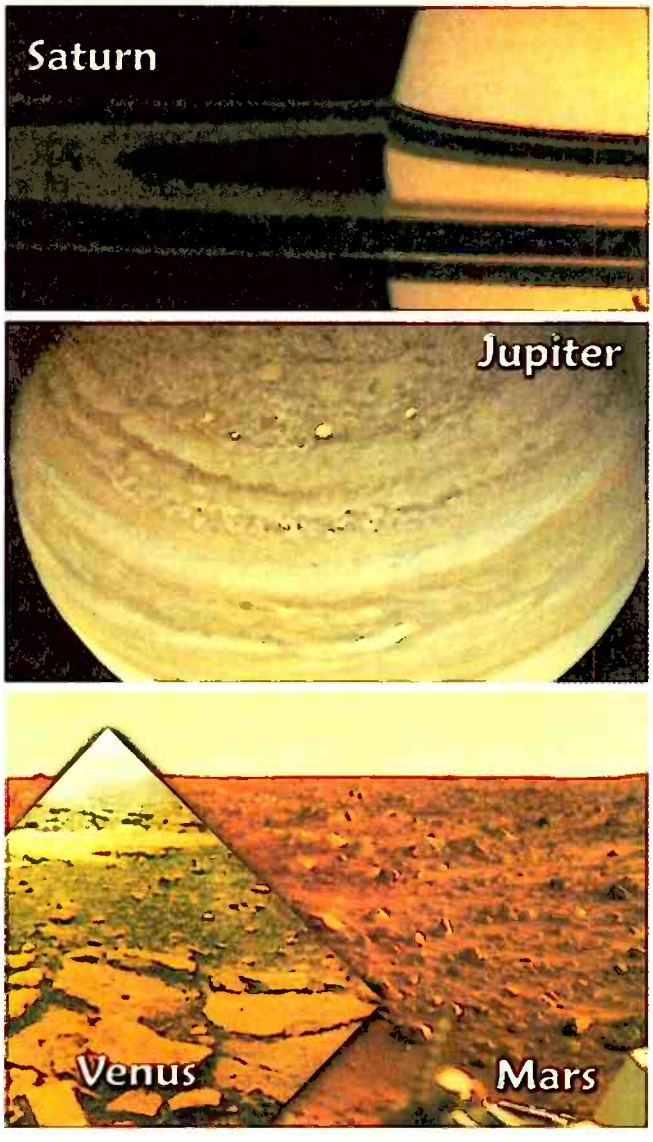


Fig. 1. Though mechanically scanned television has attracted derision, such a system can be in many ways superior to electronic scanning. Few realise that the first pictures from the surfaces of Venus and Mars and the first pictures from spacecraft passing Jupiter and Saturn were all scanned mechanically. Courtesy of JPL/NASA and the V. I. Vernadski Institute

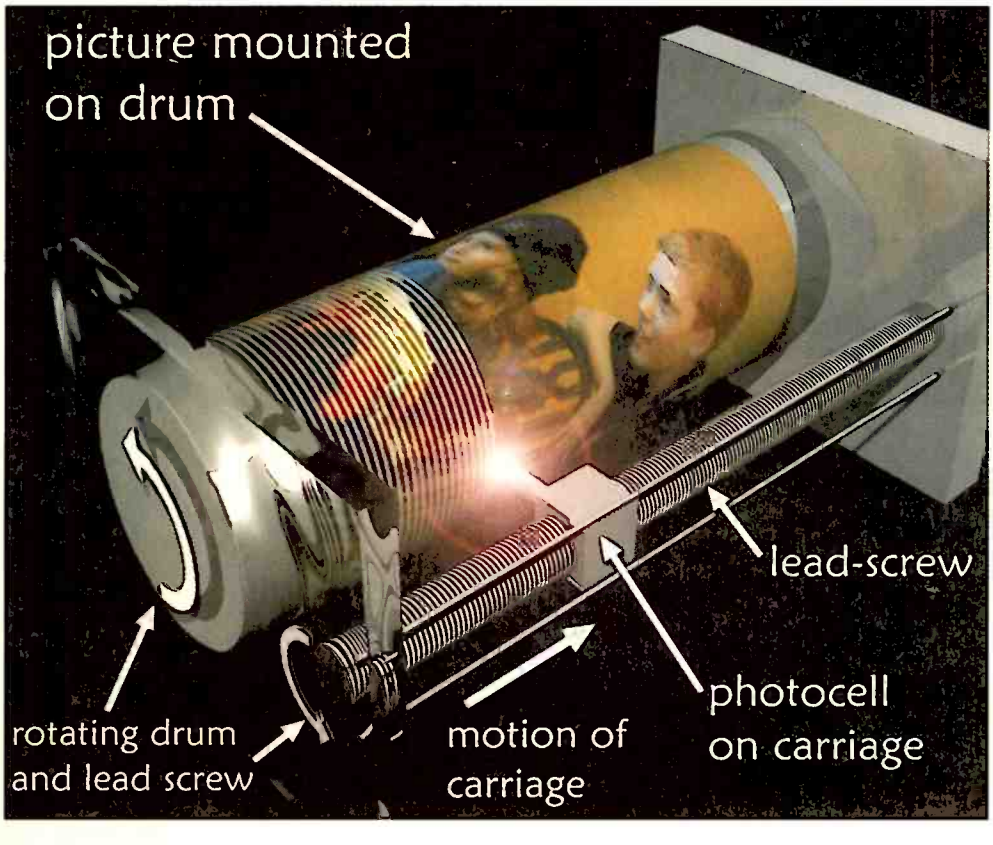


Fig. 2. Originally conceived by Alexander Bain in 1843, the drum facsimile pioneered scanning and synchronisation that was to become the heart of the first television systems.

thousand pairs of wires across long distances simply failed the practicality test.

Today though, we see that this concept was perfectly valid, but a century ahead of its time. For the last 30 years, all solid-state television cameras have used exactly this idea: a matrix of separate light detectors – not several thousand but several hundred thousand – on the surface of a silicon chip. Each is separately 'wired' to its equivalent in a matrix of storage cells, **Fig. 3**.

Television's early development required a different approach. This used scanning as already practised for facsimile.

As with facsimile, the challenge was in synchronising the scanning sequence on both camera and display. Unlike facsimile, television needed a fast enough and sensitive enough photocell to generate enough pictures per second to render natural motion in a natural scene.

One of the more practical devices for scanning – the Nipkow disc of 1884, **Fig. 4** – provided a simple and efficient means of sweeping the image over a single photo-detector. Without electronics to boost the faint signal, the Nipkow disc languished until, some forty years later, it became the method of choice for television scanning. It was used in some form or another by most of the early television pioneers.

Paths to practicality

The challenge of achieving practical television showed in the vast number of solutions proposed as being practicable – if only they could be made to work. Most notable amongst these early thinkers was a prolific Scottish-born inventor, Alan A C Swinton.

In June 1908, in a letter to the science journal 'Nature', Swinton suggested a means to develop television using cathode ray tubes – his own area of expertise, **Fig. 5**. What he had done was to clear away the dead-end ideas and focus directly on the areas that needed research.

Swinton's ideas remained the outline description of electronic valve-based television systems from the 1930s for the next 40 years. However, our current advanced digital technology solutions for television have gone beyond the predictions of Swinton. Surprisingly, the concepts of the 19th century thinkers have now become far more relevant to today's television than Swinton's vision.

In the 1920s, the spread of practical valve electronics opened the way for two paths to television. One path used the newly developed valve electronics to provide amplification – the missing link from the scanning solution of the previous century. This was based on scanning the image mechanically using Nipkow discs, mirror-drums and other quaint Victorian inventions.

The other path saw the new field of electronics providing the complete answer to television. Very little of this latter approach already existed, but the success of the cathode-ray tube ensured its use as the display device.

The major challenge for both approaches lay in making a practical television camera. The mechanical approach already provided a way to scan a scene. But it fundamentally lacked a suitable photo-detector and electronic amplifier. The fully electronic approach had to start completely from scratch.

Enter Baird

The path to implementing practical television in Britain started in a quiet town on the south coast. There, a Scotsman was recuperating from his last business venture – selling soap.

John Logie Baird was the first of many inventors to achieve practical television based on mechanical scanning. He had his first crude television images – no more than shadowgraphs – by the end of 1923. This was very soon after electronic valves had become available and affordable to the public.

Just over 75 years ago, on 26 January 1926, Baird demonstrated a working television system operating at 32 lines per frame at around 5 frames per second, to members of the Royal Institution.

From the outset, Baird's thinking was to envisage television as exploiting the existing broadcast radio infrastructure, minimising development costs and the costs to the consumer. All that the consumer had to buy for television would be a second medium-wave radio to receive the vision signal and a display attachment – the 'Televisor' – that would ideally have a Baird brand name on the front.

From 1926 to 1929, Baird focused on exploring his new medium through a series of demonstrations of its potential. His mechanical system of scanning and the single photo-detector provided a level of flexibility that would not be possible in electronic television for decades to come.

Baird experimented in video recording, demonstrated colour television, television in infra-red, 'telecine' (converting film to a television signal) and cinema television (projecting a television image onto a cinema theatre screen).

However, while Baird was leading Britain into the new television age, the components for an electronic television system were being researched and developed in corporate laboratories around the globe.

BBC Television

The first BBC television service started in 1932 on the only system readily available – Baird's 30-line system.

By 1932, the system was mature and of a high professional quality. Its benefits to the BBC were that it was fully developed and used only an additional broadcast radio frequency on the medium wave. All that was needed was the camera and electronics from Baird in the studio, and an additional medium wave radio and a television display in the home, **Fig. 6**.

With this system, the BBC explored its artistic ideas. It also learned how to adapt to the immediacy, and sheer openness of television, pioneering the techniques of live television programme making.

The advent of electronic television

The electronic camera took many years to develop, **Fig. 7**. It made its first appearance in the UK in the mid-1930s as an individually handcrafted experimental device.

Without doubt, the camera was the key to high definition television. Equally important, however, was the entire infrastructure for broadcast television – none of which existed at the start of the 1930s.

For high-definition television, this meant not just the camera, but also the special cables, the signal amplifiers, the vision switching, distribution and, most important of all, a special broadcast transmitter. Without the wide-band transmitter, high definition television would remain a curiosity.

At the receiving end, there were the self-contained receiving sets for vision and sound. This would be where the manufacturers would really make their money. Although there would only be one set of studios for a time, there was the potential for millions of receivers.

Those developments in electronic television led to the launch of a high-definition television service by the BBC in late 1936. This comprised an on-air competition

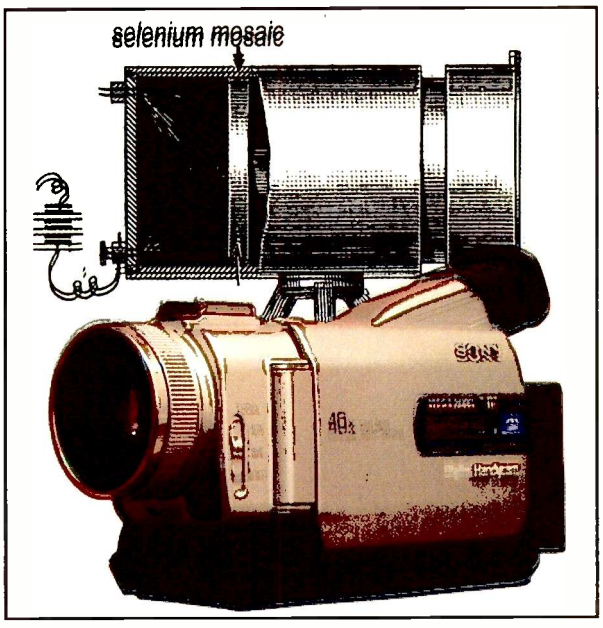


Fig. 3. Ayrton & Perry in the UK and Carey in the USA proposed imaging systems using arrays of selenium photocells. Although 120 years of technological development separate today's digital camcorder from Carey's 1880 scheme, they both employ the same principle of using imaging arrays for the camera.

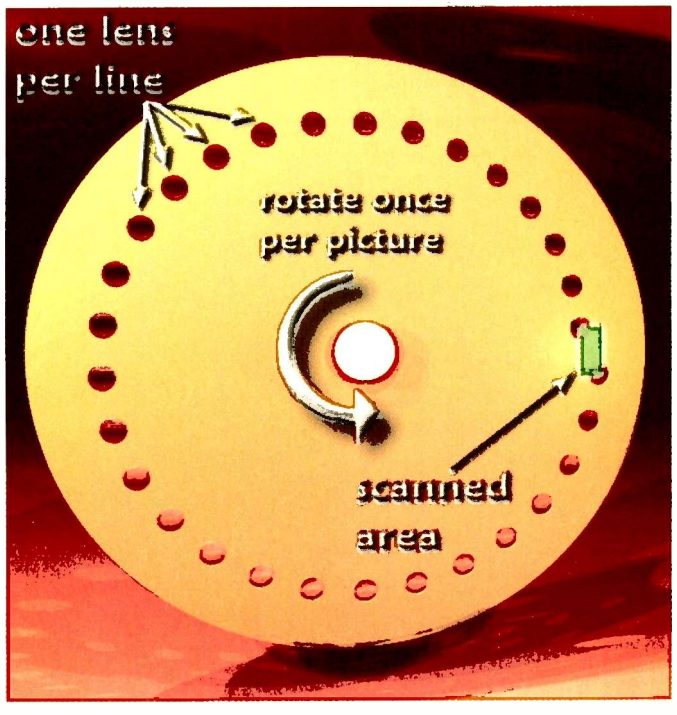


Fig. 4. A Nipkow disc of lenses for use as a camera, configured here for the Baird 30-line system. Each lens corresponds to one line of the image. One complete turn of the disc generates one complete image of 30-lines. The area being scanned is shown on the right, with line scanning vertically upwards.

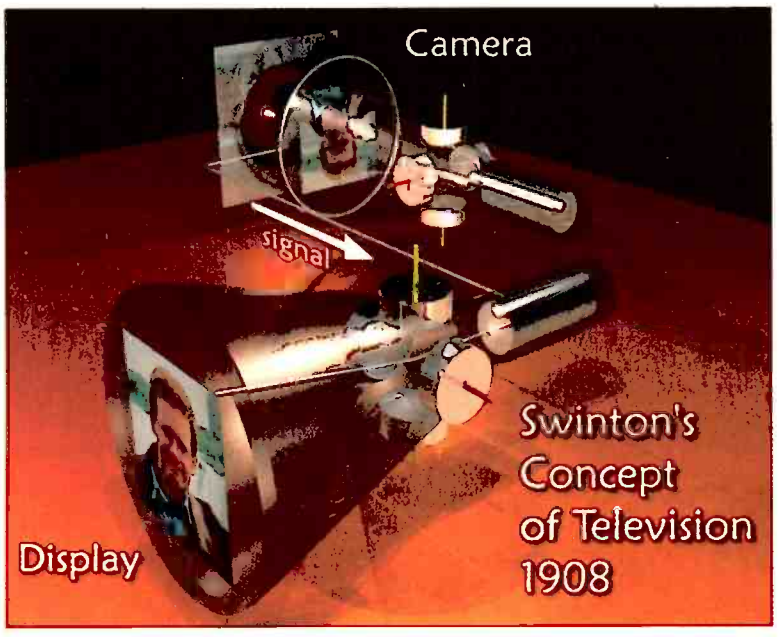


Fig. 5. Swinton's concept of using cathode ray tubes for both camera and display was discussed in a letter to Nature in 1908. The proposed system was as shown here with the horizontal and vertical scans being driven by waveform generators common to both tubes. Such a system became the basis for electronic television from the mid 1930s for the next 50 years.

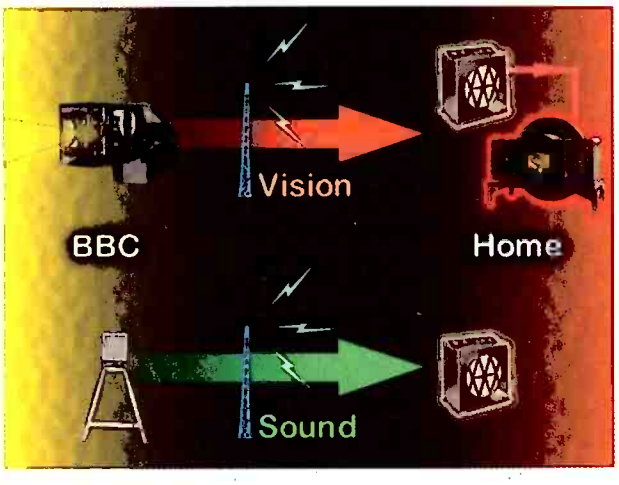
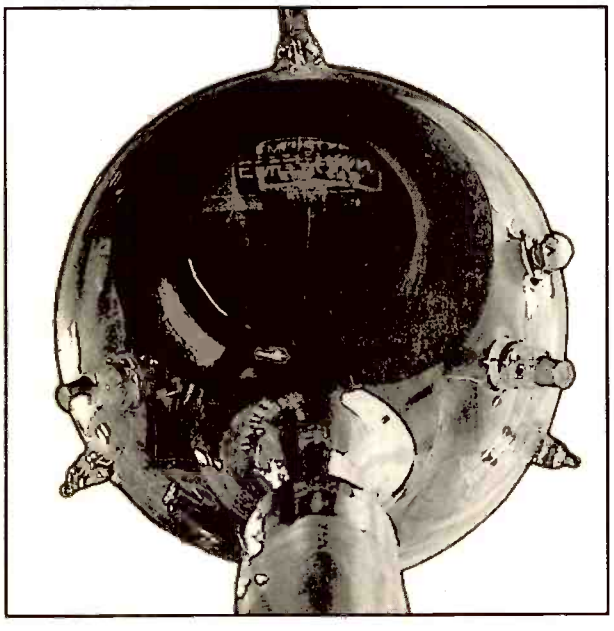


Fig. 6. The BBC's first Television Service opened in 1932 with Baird's 30-line system, which was by then mature. With the vision signal so low in bandwidth that it could be treated like audio, the BBC Television Service only needed a camera in the studio, a spare medium-wave transmitter, an extra radio set in the home and a display ***adaptor – the Baird Televisor. The 30-line system's major benefit was that no new equipment or technology had to be developed.***



between the offerings of the Baird Company and EMI.

EMI's all-electronic 405-line interlaced system was selected in February 1937 as being simply better all round than the Baird Company's 240-line progressive-scan format. Supported by the 405-line television standard, the BBC exploited the latest developments in electronics. The company created a service that was able to meet the demands and needs of British television broadcasting for at least the next 25 years.

At the start of the dual-standard service in 1936, the scale of change in cost, scope and systems totally overshadowed all the excellent and professional work done before on mechanical systems. We therefore tend to forget that broadcast television started much earlier.

Publicity focuses on the anniversary of 'the start of BBC Television' in November 1936, which this year will be the 65th. Strictly speaking, this is the anniversary of the start of the BBC's second television service, on dual-standard 405-lines interlaced and 240-lines progressive-scan.

For the more important milestone of the world's first demonstration of television, which celebrated its 75th anniversary on 26th January, the day passed unnoticed by most.■

Fig. 7. Looking more like a work of art, the Emitron electron tube camera was central to the successful Marconi EMI offering that brought 405-line TV to the British public from 1936 onwards. Here the electron gun assembly is at the bottom of the picture. A lens, not shown, focuses the image onto the photosensitive target, just visible as the plate inside the dark-rimmed optical window.

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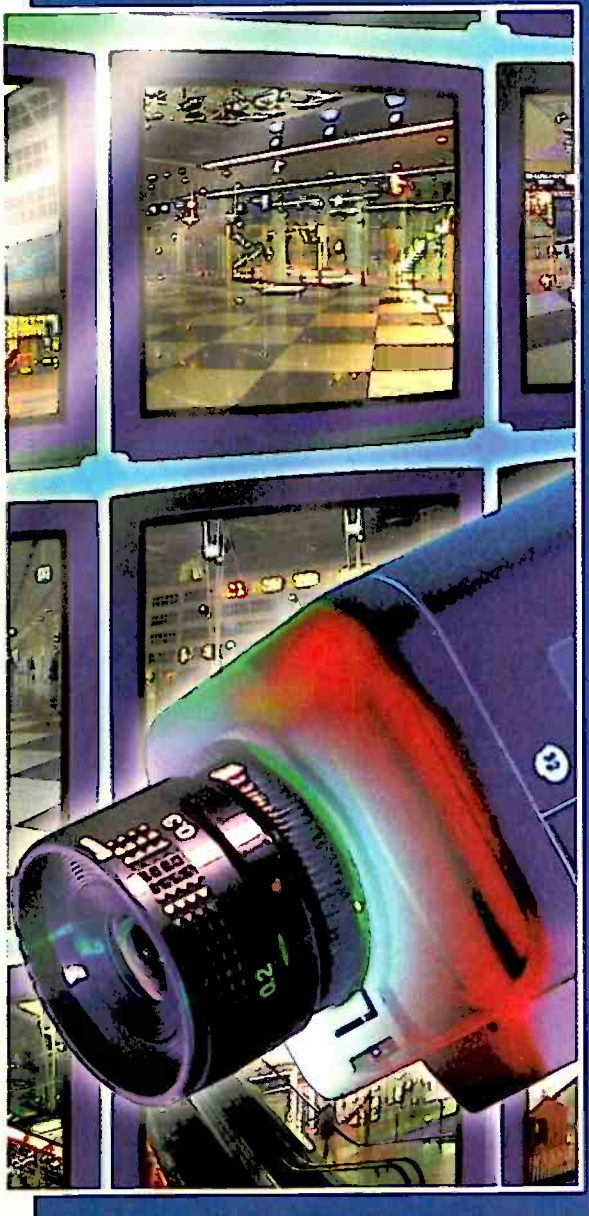
In this third article – written for those of you wanting to branch out into CCTV installation and repair – Joe Cieszynski looks at the importance of closed-circuit TV camera lenses, and explains how to make sure you get the right one for the job.

Repair and install CCTV



The importance of selecting the correct lens cannot be emphasised enough because the best video equipment in the world will only produce mediocre results if incorrect or poor quality lenses are used.

Basic terms

The theory behind optical lenses is very complex and is outside the scope of this type of article. However it is important for a CCTV installer to be familiar with the common terminology relating to lenses. So before discussing the practical considerations relating to lens selection, I'll define the basic terms.

A high quality lens assembly will include a number of optical devices, and the light may cross over a few times as it passes through this assembly. The point where the final cross over takes place is called the secondary principal point or the nodal point. The distance between this and the image device, measured in millimetres, is called the focal length, denoted by *f*.

If you project two lines from the secondary principal point to the imager, you can determine the angle of view – θ in **Fig 1**. This angle is determined by two factors; the focal length, and the format size.

Last month I looked at the various format sizes of CCD imager used in CCTV cameras, these being primarily $^1/_3$ inch and $^1/_2$ inch, with more expensive cameras employing $^2/_3$ inch. Assuming for now that you are fitting a lens format that is the same size as the imager, then you can see from **Fig. 2** that the angle of view is greater for larger format sizes.

The angle of view has a direct bearing on the field of view. Field of view, illustrated in **Fig. 3**, is the area that is viewed by the lens, and is determined by the relationship between the angle of view, and the distance from the lens to the primary object to be viewed.

For any given format size, a short focal length gives a wide field of view, however objects at any distance from the camera appear very small. The focal length is increased by moving the lens, and thus the secondary principal point, away from the image device. This reduces the field of view but allows the camera to zoom in on an object.

Table 1 relates a range of focal lengths to the approximate angle of view for the common format lenses. Included in this table are the angles of view for the $^1/_4$-inch format CCD, which has become increasingly common with the development of technology such as the FIT chip which has greater light gathering ability.

Mounted within the lens, the mechanical iris comprises a number of plates, or lamella, that slide as they are rotated, **Fig 4**. The aperture is the opening in the iris. The size of the aperture opening is known as the F stop and is denoted by the F number. The larger the F number, the smaller the aperture and hence the less light falling on the imager.

A larger aperture gives a faster response from the CCD or tube imager. Thus, an F stop of 1.4 is said to be a fast lens speed, whereas an F stop of 8 is a very slow lens speed.

Lens format

In the previous article on this topic, I looked at the various CCD image

device formats, i.e. $^1/_3$ inch, $^1/_2$ inch, $^2/_3$ inch and 1 inch, and their associated horizontal and vertical dimensions. However it is important to note that the actual dimensions of the CCD are smaller than the stated format size.

Take for example the $^1/_2$-inch format CCD. You might expect the diagonal dimension to be $^1/_2$ inch – i.e. 12.5mm. However it is only 8mm. The same rule applies to the other three image device formats. One reason for this is to avoid using the light output from the outer edges of the lens as this is where maximum optical distortion occurs. An example of the relationship between lens and image device is illustrated in **Fig. 5**.

So what happens when the lens/camera formats have been incorrectly matched? In **Fig. 6a)** the lens format is smaller than the camera format, and so the image does not fill the display. This produces a porthole effect on the displayed picture, rather like in the days of the old monochrome television where the scan coils had been pulled back.

Figure 6b) illustrates the condition where the lens format is larger than the camera format. In this case the image fills the monitor screen, however not all of the image produced by the lens is being used. This is not necessarily a bad thing because by only utilising the centre area of the lens there will be minimal optical distortion. However this does mean that the area viewed on the monitor will be reduced, and this might compromise the CCTV system performance.

Lens mounts

I have shown that the distance between the back of the lens and the image device is important. Thus it follows that during the manufacture of cameras and lenses the physical size of the mounting between the two is critical if this distance is to be maintained.

For many years the industry standard for all types of camera, i.e. film, photographic, and video, was the C mount lens. This standard screw fitting ensured that the distance from the back flange surface to the focal point, known as the flange back distance, was a constant17.526mm, **Fig. 7**. This large distance means that the lens is considerably large, which posed a problem for the CCTV industry which was looking for a smaller lens, even at the expense of quality.

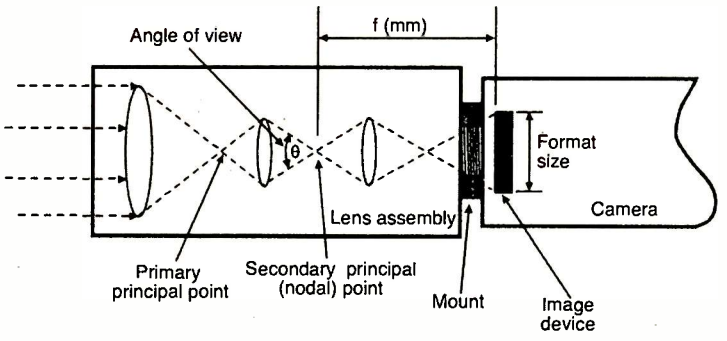


Fig. 1. Shows a simple fixed lens illustrating the main features of CCTV lens systems.

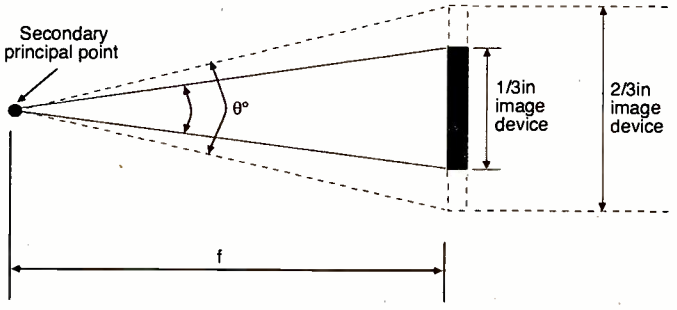


Fig. 2. Angle of view (q) changes for different format size lens/image device.

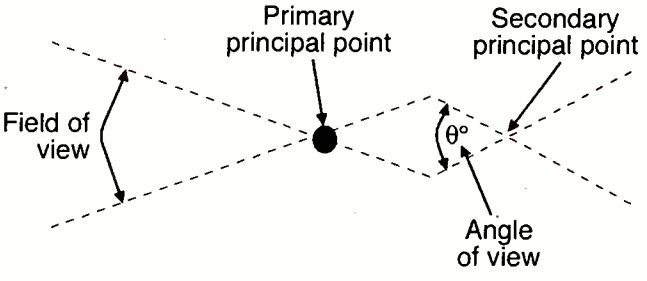


Fig. 3. Relationship between the angle view and the field of view.

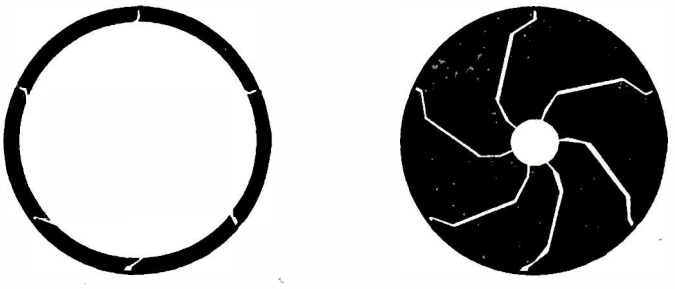


Fig. 4. Sliding plates perform the function of a mechanical iris.

Fig. 5. Scale drawing showing the relative dimensions of a $^1/_2$in format CCD against the circular image from a $^1/_2$in format lens.

Pentax came up with the answer in the CS mount. This mount has a flange back distance of just 12.5mm, making the lens assembly much shorter and smaller in diameter. The drawback with this reduced distance is that, unlike the C mount, the outer area of the glass is used, resulting in greater optical distortion.

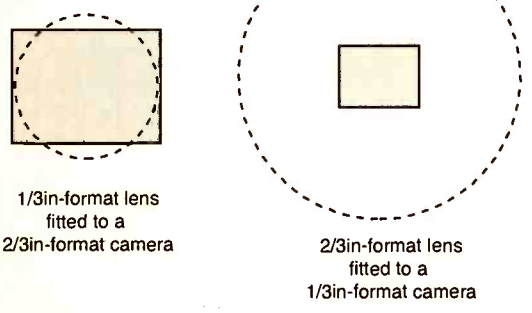
The CS mount has become an industry standard and the majority of cameras are designed to take a CS lens. However if picture quality demands, it is possible to fit a C mount lens to a CS mount camera by using a 5mm adaptor ring. It is not possible for a CS lens to work with a C mount camera.

Some cameras have the CCD

imager mounted on an adjustable bracket which allows it to move forwards and back. This is to enable both C and CS lenses to be employed without the need for an adaptor.

Note that if the mount is set to the C position and a CS lens is fitted it will not be possible to focus the lens. Where this adjustment is included, it can complicate the focussing adjustment when setting up zoom lenses. Even if it is set to the correct position, fine adjustment – so called back focussing – may be required to obtain correct focus throughout the zoom range.

Fig. 6. Two examples of mixed lens and camera formats, drawn to scale.



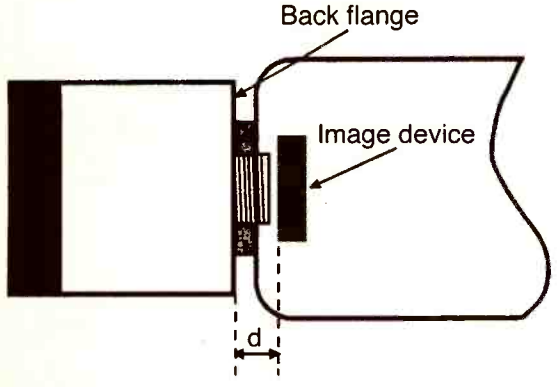
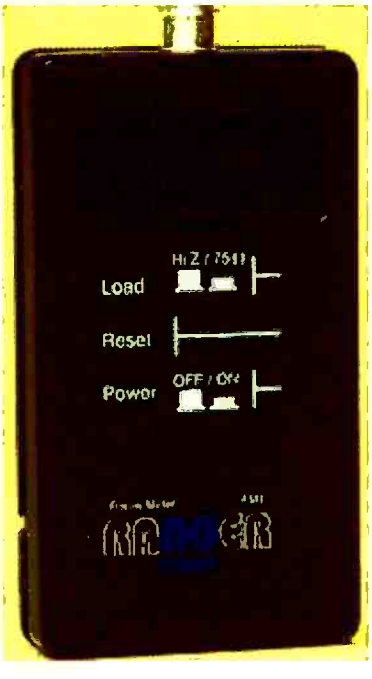


Fig. 7. For a C mount, d is 17.5mm while for a CS mount, d is 12.5mm.

Fig. 8. Hand-held focus meter. The LED bar display indicates the peak in high frequency video information that occurs when optimum focus is achieved.



Back-focus adjustment

Ideally, back focus should be adjusted in twilight conditions when the iris is open and the camera is at its most sensitive. If it isn't, you may find that the focus is good in daylight but poor at dusk and under artificial lighting.

Of course, it may not be practicable to perform adjustments at dusk. Another method is to fix a neutral-density (ND) filter in front of the lens to simulate a dusk condition. Such filters are available from most large CCTV equipment wholesalers.

As with many adjustment procedures, there is more than one acceptable method for obtaining correct back focus. However if you have never performed this before, then I would recommend the following procedure:

1. Manually open the iris, or fit an ND filter, or work in low light conditions.
2. Select a target at the maximum operational range for the particular lens.
3. Adjust the lens focus to 'Far'.
4. Set the zoom to maximum wide angle.
5. Move the back focus adjustment on the camera forwards and backwards until optimum focus is obtained.
6. Set the zoom to full telephoto.
7. Adjust the lens focus for optimum results.
8. Set the zoom to maximum wide angle.
9. Re-adjust the back focus for optimum results.
10. Repeat steps 4 to 9 until optimum focus is obtained at all points between wide and telephoto.

Of course, in order to perform this adjustment you need to be watching a picture – something that may be difficult when you are atop a five-metre tower in the pouring rain! Portable weatherproof monitors are available for this purpose, however they tend to be very expensive. You should be able to make your own though with a bit of ingenuity.

Any small-screen receiver with suitable video input should suffice, but it needs to be battery powered. If you happen to have a working Rigonda Starlet, it may be worth a lot to a CCTV engineer if modified to take a CCIR standard composite video signal. Don't forget to construct a hood for use in bright conditions.

An effective alternative to a monitor is a focus meter like that produced by NG Systems, **Fig. 8**. This simple hand-held unit analyses the frequency components in the incoming video signal and produces a corresponding indication on a LED bar display.

The greater the amount of hf input, the higher the display value. Thus, as the image comes into focus the LED display level rises, peaking at optimum focus before falling off again as the lens moves past the optimum position.

Lens calculations

I have shown how the focal length of a lens affects the field of view. However, the installer has to look at this the other way around. Having decided on the desired field of view for a particular camera angle, the installer has to determine the focal length that will produce this field of view.

Basically, there are four ways of determining the focal length; by calculation, by using a lens calculator, by using a device known as a lens finder, or by applying years of experience. Relying on your experience though is risky and is not recommended where the cost of the lens involved is in the order of thousands of pounds.

Calculations are based on simple geometry involving the dimensions of the CCD format size, the size of the object or area to be viewed and the distance of the object from the camera. The relationship between these parameters and the focal length is expressed as:

$$\frac{w}{W} = \frac{h}{H} = \frac{f}{D}$$

Here, w is the width of CCD format, W the width of object or area, h the height of CCD format, H the height of object or area, f is the focal length of lens and D is the distance of object from camera.

For example, if an object which is 2.5m high and 15m from the camera is required to fill the monitor screen, and the lens format is $^1/_2$ inch, the required focal length can be found from:

$$f = \frac{h}{H} \times D$$

With the aid of Fig. 1 from the previous article, you will find that the height of $^1/_2$ inch format CCD image device is 4.8 mm. Therefore the focal length will be:

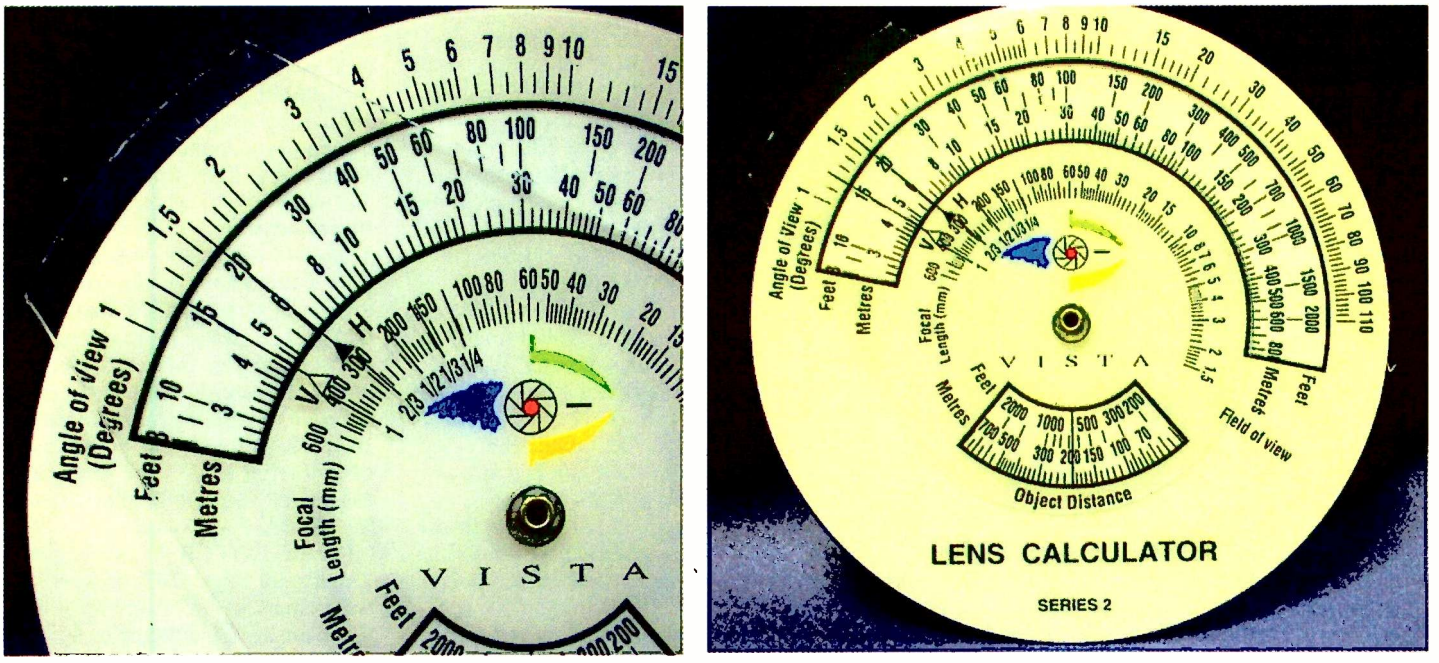


Fig. 9. Typical lens calculator for CCTV installers.

$$f = \frac{4.8}{2500} \times 15000 = 28.8mm$$

Of course, this is similar to calculating a resistor value where you have to settle for the closest available value. In this case you would more than likely use a 30mm lens.

Once you get into the calculations it becomes somewhat repetitive and not too difficult to perform. However to speed the process up there are a number of calculator tools available. Some catalogues have look-up tables, and some manufacturers have produced lens calculators. One of these, produced by Vista, is illustrated in **Fig. 9**.

Zoom lenses

Zoom lenses tend to be expensive, and there is little point in installing them unless the system has telemetry control to operate the lens. As a result, the installer who only works on smaller systems might well never encounter them.

A zoom lens normally uses low voltage DC motors to move the zoom lens group (focal length) and the front lens group (focus). Typical operating voltages for these motors are between 5 - 12V DC, the control voltage originating from the telemetry controller, which varies between manufacturers.

It is important to check that the lenses selected for use with a control system are compatible. For example, if the lens employs 5V motors, and the control unit is applying 12V when zoom or focus are operating, the lenses will react very quickly (!) however the life may be somewhat short.

Conversely, 12V motors operating at 5V will be sluggish, if there is any response at all.

The zoom lens incorporates a gear box to reduce the drive speed and raise the torque at the output. This means that limit switches must be included in the circuit to prevent over-driving which would damage the gear mechanism. The usual circuit arrangement is shown in **Fig. 10**.

Because it is anticipated that a zoom lens will be used primarily in systems employing telemetry, many of these have feedback outputs to enable pre-set zoom positions to be programmed into the control unit.

Modern units can store a number of pre-set positions in their memory; indeed, some can store up to one hundred positions. Yet in reality five is about the most that is required. When would you need one camera to have one hundred pre-programmed zoom positions. And how on earth would the operator remember which one to use for each angle viewing anyway?

A typical feedback circuit arrangement is shown in **Fig. 11**.

Filtering

A CCD is sensitive to infra-red (IR) light. In the case of colour cameras this would cause major problems with colour balance if the light were not filtered. Hence, all colour cameras employed in CCTV are fitted with an internal IR filter.

This is not the case with some monochrome cameras because there are situations where the IR sensitivity can be used to an advantage. For example, where it is not desirable to light the area under surveillance with white light, IR spotlights can be used along with an unfiltered monochrome camera.

In cases where you need to set the focus on a camera intended primarily for IR operation, the work

Table 1. Angle of view for common focal-length lenses. As a rule, an angle between 25° and 35° is considered to be 'standard'; i.e., similar to that perceived by the human eye. Angles less than 25°are telephoto, or zoom. Angles gréater than 35° are wide angle.

Focal length	Format		
	1/4in	1/3in	1/2in
2.8mm	64°	80°	97°
4.0mm	45°	60°	–
6.0mm	30°	38°	57°
8.0mm	23°	30°	40°
12.0mm	15°	20°	30°
16.0mm	11°	15°	22°
25.0mm	7°	10°	14°
50.0mm	4°	5°	7°
75.0mm	2°	3°	5°

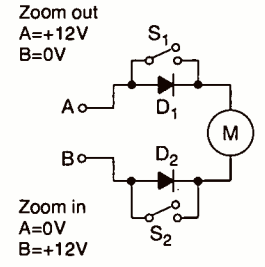


Fig. 10. Limit switch arrangement employed in zoom, focus and iris motor circuits. In telephoto mode, S_1 is open while in 'wide' mode, S_2 is open.

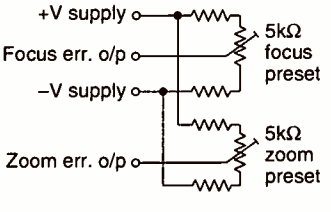


Fig. 11. Positional feedback from lens to control circuit enables a number of pre-set zoom (and associated focus) positions to be stored in memory. A similar arrangement would be used in the pan/tilt head to store in a 360° patrol area.

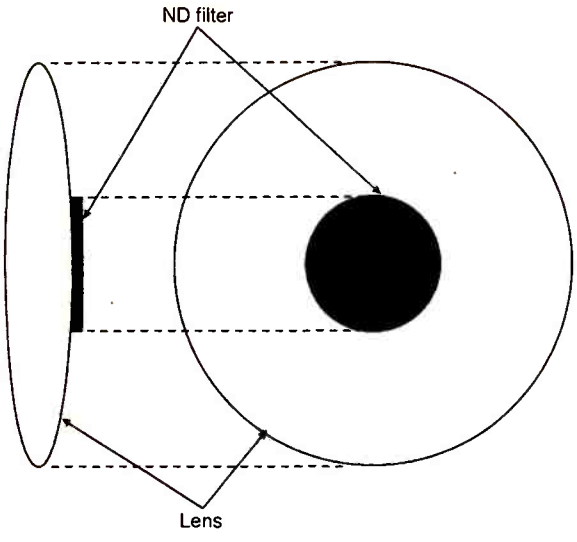


Fig. 12. Principle of the neutral-density spot filter.

can be performed during daylight hours by fixing an IR pass filter in front of the lens. This removes visible light and makes the camera a true infra-red device.

The problem with an unfiltered camera is that the image can appear somewhat over-exposed during daylight hours. Where you have used an unfiltered camera and do not need the IR performance, you may find it advantageous to fit an external IR cut filter to the lens.

You may also find it helpful to temporarily fit an IR filter while adjusting the focus. By removing the IR light input, a more accurate focussing point is found.

Neutral-density spot filters are essential when using a lens with a large number of F-stop positions in conditions where the lighting levels alter considerably. In such cases, as the lighting levels increase and the aperture closes down, you will find that the aperture diameter can become as small as 0.1mm.

It is not possible for the auto-iris servo to control such as small aperture, as an error of just 0.05mm will result in a 25% change in light input. The result will be that the iris servo will hunt.

An ND spot filter, **Fig. 12**, does not cover the entire lens area. Rather, it becomes increasingly effective towards the centre of the lens. Thus when the iris is wide open the filter has little effect. However as the light input increases and the iris closes down, the filter begins to act, reducing the amount by which the iris must close to produce the desired reduction in light input.

In summary

There are still other aspects of CCTV that I have not covered in this set of three articles. These include telemetry, multiplexing, switching, video motion detection, not to mention the European regulations relating to the industry. However these are out of the scope of this series as they are generally associated with medium to large installations.

For the TV/VCR service engineer looking for other areas of work to supplement his or her diminishing domestic equipment servicing workload, I hope that I have given adequate insight into CCTV principles and technology to enable them to decide first of all if this is for them, and then have some idea of where to begin. ■

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Input capacitance	40pF+oscilloscope capacitance
Working voltage	600V DC or pk-pk AC
Switch position 2	
Bandwidth	DC to 150MHz
Rise time	2.4ns
Input resistance	10MΩ ±1% if oscilloscope i/p is 1MΩ
Input capacitance	12pF if oscilloscope i/p is 20pF
Compensation range	10-60pF
Working voltage	600V DC or pk-pk AC

Switch position 'Ref'
Probe tip grounded via 9MΩ, scope i/p grounded

A simple switch-mode power supply can be modified to act as a Ni-Cad battery charger. Ian Field describes the pulse-charging principle, which has various advantages and helps when charging batteries made from salvaged cells

Ni-Cad battery charging

The following article describes the Ni-Cad battery charger I am at present using, with information on the results obtained with batteries of various types.

Charger circuit

The basis of the charger is an Olivetti AC adaptor, Model LT7-700005-06. Fig. 1 shows the circuit – it should also be helpful to anyone who has to repair one. The circuit had to be traced out as it wasn't available. Apart from the transistors there are no component reference numbers because the PCB doesn't carry any. I added transistor reference numbers simply to be able to provide a brief account of the circuit operation. Q3 is of course the chopper transistor, which is connected as a blocking oscillator. Q1 provides error-voltage sensing at its emitter: it adjusts the DC conditions at the base of Q3. Q2 is included to provide excess-current protection.

This switch-mode power supply arrangement is very common in small PCs and AC adaptors. The quality and choice of component types used left plenty of room for improvement. But the case, which is only slightly larger than a cigarette packet, doesn't provide much space to accommodate any changes.

Evolution

The unit was originally modified to keep an ailing lead-acid 12V battery 'fresh' between uses. Apart from the Z12 zener diode across the output, the regulation isn't great! With the zener diode removed and the output rectifier replaced with an adequately-rated Schottky-barrier type, I found that the off-load output voltage could rise to 13·91V. This was perfect for the purpose. When the lead-acid battery eventually died a Ni-Cad type was used instead. Since most of the Ni-Cad battery systems in use here have been built up from cells salvaged from scrap laptop packs, some of these aren't marvellous either. So the maintenance charger was still required.

Unfortunately it produced disappointing results with Ni-Cad packs because there was insufficient charge current. A modification I often use when adapting a chopper power supply for Ni-Cad battery charging deliberately allows reverse spikes with the charge current. This seems to reduce the so-called 'memory effect' and give new life to cells that would otherwise have been discarded.

Initial modifications

The first item to receive attention was the 10µF, 50V sampling capacitor that provides Q1's emitter voltage. In the event of failure of the power supply this is one of the most common causes. Normally I fit a non-electrolytic alternative – 10µF Mylar or polycarbonate capacitors are not uncommon in monitor work, and a few become available from salvage operations. But I'd none that were small enough for this application. As luck would have it however I found, on a scrap LCD drive panel, some

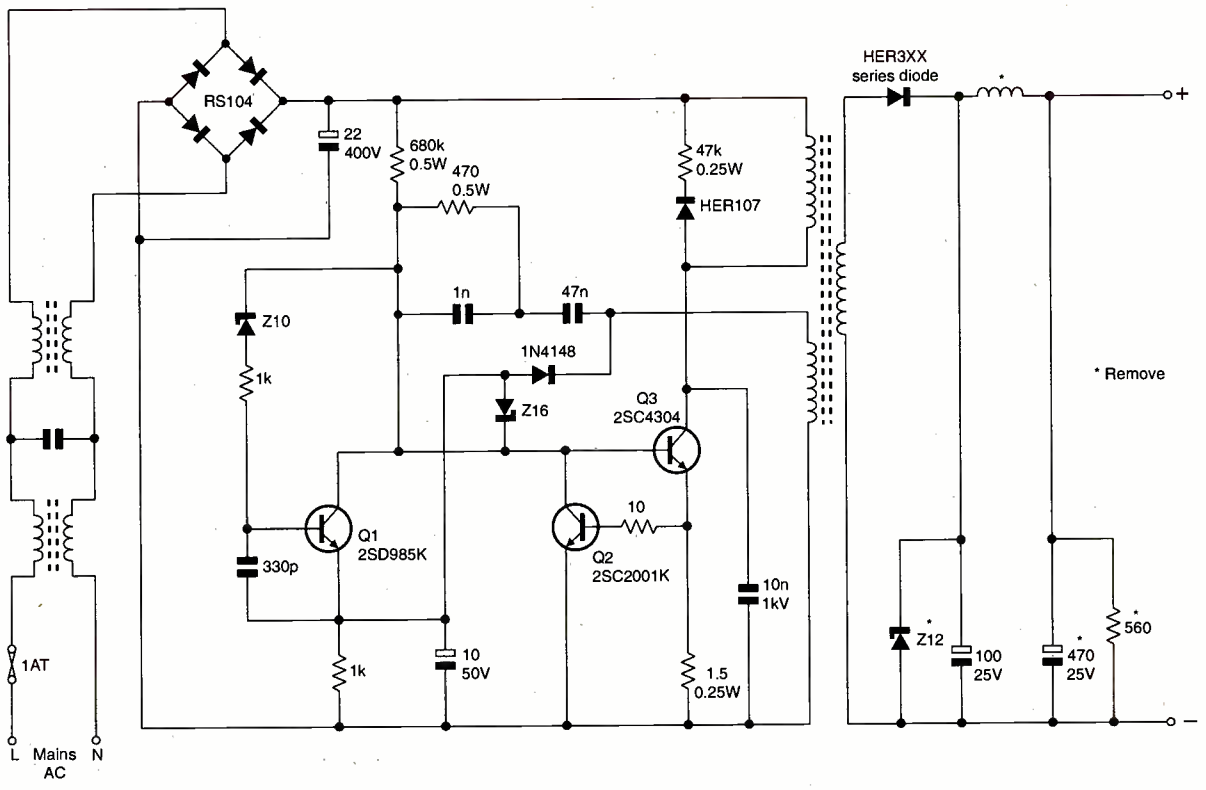


Fig. 1: Circuit diagram of the Olivetti LT7-700005-06 AC adaptor. This type of circuit is widely used in small PCs and AC adaptors.

tiny surface-mount chip ceramics that measured between 3 and 4µF. So I used a leaded 1µF multilayer chip ceramic capacitor as a 'lead frame' on which to mount three of these ceramics. The total measured capacitance read 12µF. Had these items not been available, I would have made up as much of the total capacitance as space permitted with non-electrolytic capacitors and made up the difference with an electrolytic, possibly a tantalum bead type.

As there are only four electrolytics in the power supply, it's worth adding non-electrolytic 'ESR shunts' to them all. The two electrolytics on the secondary side of the circuit were not good-quality components. Both were replaced with HF, low-ESR types.

The value of the 680kΩ, 0·5W start-up/bias resistor had begun to rise (it was >700kΩ), and the 47kΩ 0·25W snubber resistor had begun to discolour. So these and any components whose leads had been cropped so short that there was a possibility of solder reliability problems were replaced.

I'd already replaced the output rectifier with a Schottky type to provide a slight output voltage boost. But care is needed here. As the power supply is a 'forward-conduction flyback converter', the flyback voltage is many times the forward voltage. The Schottky-barrier diode must be able to withstand the sum of the two.

To determine the diode's rating, fit a negative-voltage rectifier temporarily to act as a peak rectifier, see Fig. 2. I found that the resultant sum, as shown, came to 63·1V. This slightly exceeds the rating of the 31DQ06, which was the best I could find at the time, but I nevertheless got away with it. This could well be because the subsequent modification for Ni-Cad 'pulse charging' attenuates the flyback pulses considerably.

Pulse charging

The method I use for pulse charging Ni-Cad cells is one I've been developing for a number of years. The power supply to be modified must have a normal output at least similar to the battery's freshly charged terminal voltage. Negative current spikes are obtained by using a capacitor-coupled (voltage-doubling/current-limiting) rectifier.

At first glance the added circuit (see Fig. 3) would appear to provide only a current-limited voltage boost. But, with a high-frequency switch-mode power supply, minority-carrier storage (recovery-reverse conduction) in rectifier D1 produces a significant reverse-current spike at each zero-crossing point between forward conduction and reverse blocking.

Normally, with a precisely-regulated switch-mode power supply, an additional current-limiting resistor is required in the positive line to prevent excessive current being dumped in the Ni-Cad cells. With this particular power supply however the regulation is so poor that it was a struggle to get enough current (four D cells), so no additional resistor is required.

Fig. 3 shows the added circuitry. C1 (0·047µF, 250V) is the coupling capacitor and D2, D3 are extra diodes. I use a pair of FMU16S diodes but any fast rectifier that's rated at 8-16A and has a trr of <100nsec, with TO220 encapsulation, can be used. The reverse-spike effect can be enhanced by using a Schottky diode in position D2:

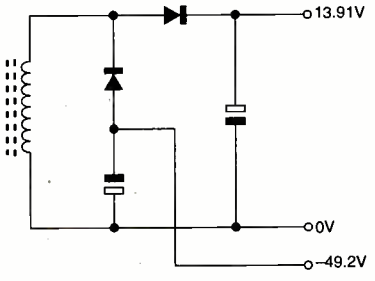


Fig. 2: Negative rectifier circuit added temporarily to measure the peak flyback voltage.

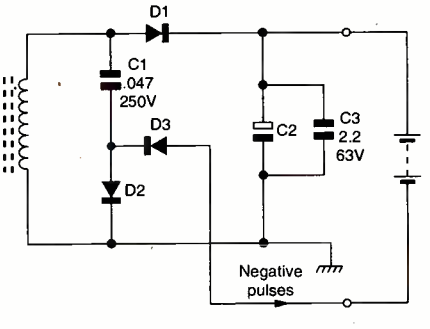


Fig. 3: Modifications to the secondary side of the switch-mode power supply to provide pulse charging.

D3 must be an ordinary silicon rectifier. C3, a 2·2µF, 63V multilayer chip capacitor, was added to improve the pulse response.

This circuit will be familiar to anyone who works on microwave ovens. When the output waveform from the transformer is of such polarity that the shunt diode D2 is conductive, C1 is charged to the peak volt-

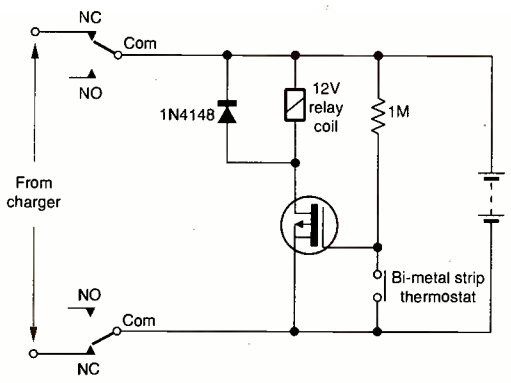


Fig. 4: Relay circuit to switch off the charger.

age on that half-cycle. When the polarity of the waveform reverses, the voltage across C1 is added to the secondary-winding voltage and the series diode D3 passes the sum of the two voltages to the load.

In this application the circuit is not actually a voltage-doubler, as the forward voltage is very much less than the flyback voltage.

Two factors limit the current. First, the coupling capacitor C1 works in a similar way to the 'wattless-dropper' used in the heater supply in some early Thorn hybrid TV sets: the large capacitive reactance value (Xc) in relation to the load resistance produces a small current change with relatively large changes in load voltage (pseudo constant current!). Secondly, the flyback energy is not all that great, and can be loaded down with less impact on the operation of the switch-mode power supply than overloading the forward-conduction current. In fact overloading the flyback pulse is beneficial to many components in the power supply. It reduces the risk of voltage breakdown with the chopper transistor and transformer windings, and the snubber network resistor runs noticeably cooler. Much of the energy taken in this way would otherwise have been wasted as heat.

Further modification

The modifications so far worked well enough, but I recalled that Ni-Cad batteries prefer a fully-charged terminal voltage nearer 1·42V/cell. The off-load output (13·91V) fell to about 12·7V on load with a charged but settled battery – the battery should have settled at nearer to 13·8V. Changing the Z10 zener diode in the error-sensing circuit (Q1) to a 12V type cured this problem.

As this modification is a severe misuse of the original AC adaptor, which ran fairly warm to start with, a hole was cut in its casing to accommodate a microprocessor cooling fan. With a couple of airflow exit holes drilled well away from any live components, the fan provided cooling well in excess of what was actually needed.

Experiment

As I wanted to establish the highest possible 'freshly-charged terminal voltage', I left a battery charging overnight with a separate fan to cool it. The terminal voltage stopped increasing at 14·16V (ten 4,000Ah D cells).

Protection

If a battery is left on charge after reaching full capacity it will overheat. Ni-Cad cells are easily damaged by over charging, especially when they overheat. So it's wise to use an encapsulated bimetal-strip thermostat to disconnect the charger when the battery gets hot. As the thermostat cannot handle fast charging current, I adapted it to control a relay.

If only the thermostat and a relay were used, the relay would have to be energised while the battery is cool and released when it's hot. The obvious problem here is that the relay coil is permanently connected to the battery. When it has finished flattening the battery, you have to jump-start the battery to energise the relay to connect the charger!

The solution is to use a MOSFET and a 1MΩ resistor, see Fig. 4. Almost any MOSFET will do. I use an ISO-TO220 type for convenient assembly and choose a low-specification type (<4A, <400V etc.). When the battery is cool and the thermostat is closed, the relay is released. This leaves the battery connected to the charger via the normally-closed (NC) contacts. The current drain via the 1MΩ gate-bias resistor is not significant in comparison with the 'self-discharge' inherent with a Ni-Cad cell. When the battery overheats, the thermostat opens. The 1MΩ resistor then increases the MOSFET's gate bias. It conducts, energising the relay and thus disconnecting the charger.

Most thermostats are rated at 75°C, but some are rated at less. The batteries won't tolerate fast charging up to 75°C, so the lower-temperature type must be used. You can get away with 75° C for a slower charge rate, but at some risk!

Notes on use

Most of the Ni-Cad batteries I use are made up from good cells salvaged from scrap laptop battery packs. Thus in any one battery the cells will be of different ages with different use histories – and will usually come from an assortment of different manufacturers! Also, in some cases the golden rule "never connect Ni-Cad battery packs in parallel" is broken. A battery that consists of ten 4,000Ah D cells is just adequate. When only 2,400Ah C cells are available, these are used as two groups of ten cells with the two groups in parallel. Several batteries are used in rotation, because the application draws occasional peak currents about twice the value stated in the data sheet as being the maximum permissible.

Despite this misuse, some of the poorer cells have been 'reawakened'. But some have deteriorated. Presumably some cells with failing capacity have had reverse voltage forced upon them during the peaks of current demand, which does nothing to improve their ailing condition! Occasionally a pack has shorted cells. A short jab with a high-current, constant-voltage charger usually 'unsticks' such cells, but the cure tends to be only temporary.

The worst of the operable battery packs was used during prototype testing of the pulse charger, this being the ten 4,000Ah D cell pack. It was consistently outperformed by the pack that consists of two C-type batteries in parallel. Not only was the difference too great to be accounted for by the theoretical 800mAh extra capacity of the two banks of C cells, the D pack was also sluggish on peak-current demand and tended to self-discharge to a barely operable state in two-three hours.

The exact chemical mechanism acted on by the pulse charger is a complete mystery to me, but it is clearly beneficial. Although it's widely stated that, unlike a lead-acid accumulator, the internal resistance

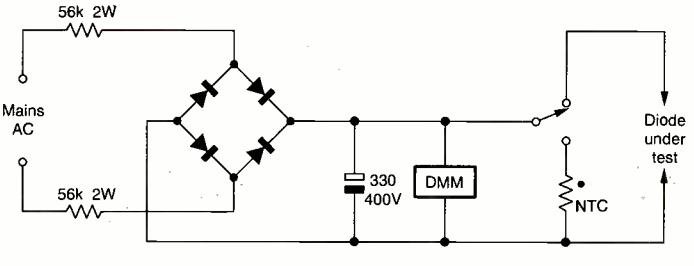


Fig. 5: Zener voltage checker circuit.

of a Ni-Cad cell changes little with the state of charge, this is not true of the AC impedance. The pulse amplitude across a flat cell or one with reduced capacity is greater than that with a fully charged cell in good condition. As a result, the weaker cells absorb more of the pulse energy than the stronger cells, which makes it all the more fortunate that the pulse energy has a good effect on the cell's performance.

It seems that the so-called 'memory effect' is the most common cause of reduced cell capacity. Some batteries that are made up from cells salvaged from a variety of sources will include cells that have various depths of 'memory effect'. Since the weakest cells automatically receive most treatment, they rapidly equalise with the better cells. After an overnight pulse charge, what had been the worst-performing battery pack had taken the lead and become the best-performing pack!

The battery load includes a starter motor. Although it's smaller than a car starter motor, the starting current is still about twice the maximum stated in the data sheets for D cells. The D pack has been transformed from barely adequate to starting briskly at the touch of a button. All the other packs used for this application are being given a charge/treatment with the pulse charger.

Use of the charger with AA cells has, in the past, produced a life expectancy of under two years with cells that operate two-three hours every day. When you consider that these cells were not only second-hand but salvaged from scrap battery packs, that's probably not bad! The C- and D-type cells are being worked much harder, so only time will tell what the life expectancy can be from their 'rebirth'. But anything that can revive scrap Ni-Cad cells well enough to operate a 0·425kW starter motor has to be worth a look!

Off-load voltage

While writing this a battery pack was hooked up on the bench with a DVM to monitor the terminal voltage. As I watched the voltage steadily rise, and from time to time placed a hand on the battery to feel its temperature, it occurred to me that if and when the thermostat circuit tripped the no-load voltage would rise beyond the safe rating of the 31DQ06 Shottky-barrier rectifier. Since I had increased the voltage of the zener diode in the regulator circuit from Z10 to Z12, the off-load voltage had increased from 13·91V to nearly 17V.

A search through the Schottky-barrier diode drawer produced a few higher-current 60V diodes but mostly 40 and 45V types – except for a couple of SB30-09s in ISO-TO220 packages. My age-old, trusted zener checker (see Fig. 5) revealed that these rectifiers 'avalanched' (correct term?) at between 120-130V

The zener checker's 330µF capacitor must be discharged after testing a device and before connecting another one. If the stored voltage is higher than the next device's breakdown voltage, it will be destroyed. The charging current is low enough for the avalanche voltages of small-signal diodes such as the 1N4148 and OA91 to be tested without fear of damage, provided secure connections are made to the device under test – an intermittent crocodile clip will enable the capacitor voltage to exceed the diode's reverse breakdown voltage.

NiMH batteries

It's claimed that these do not suffer from the 'memory effect', so their revival will not produce the huge improvement that can be gained with Ni-Cad batteries. The pulse-charging method does however 'cram' the available capacity better. ■

DVD training at the College of NW London

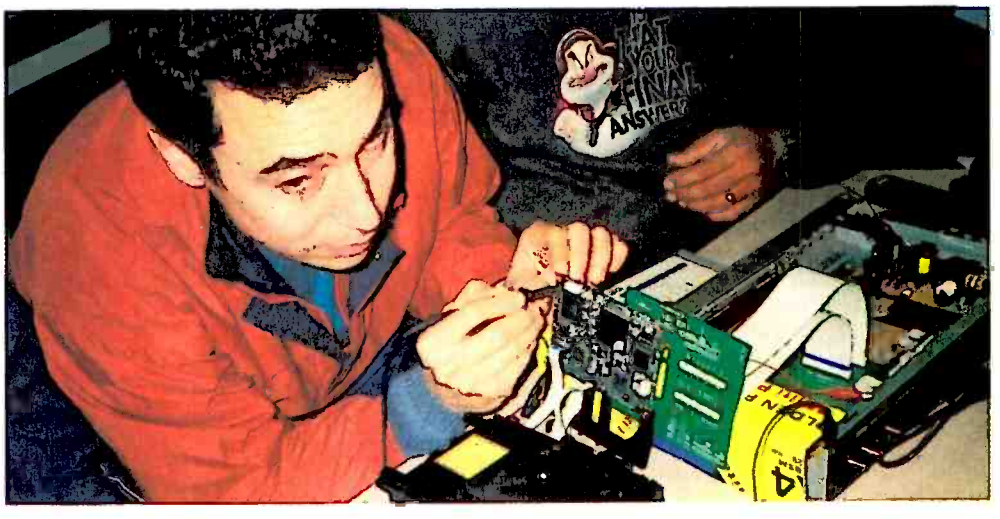
Building on its success with digital TV servicing courses, the College of North West London is introducing similar courses on DVD players. The demise of electronic servicing has been greatly exaggerated: the College has found that there is still a healthy demand for training.

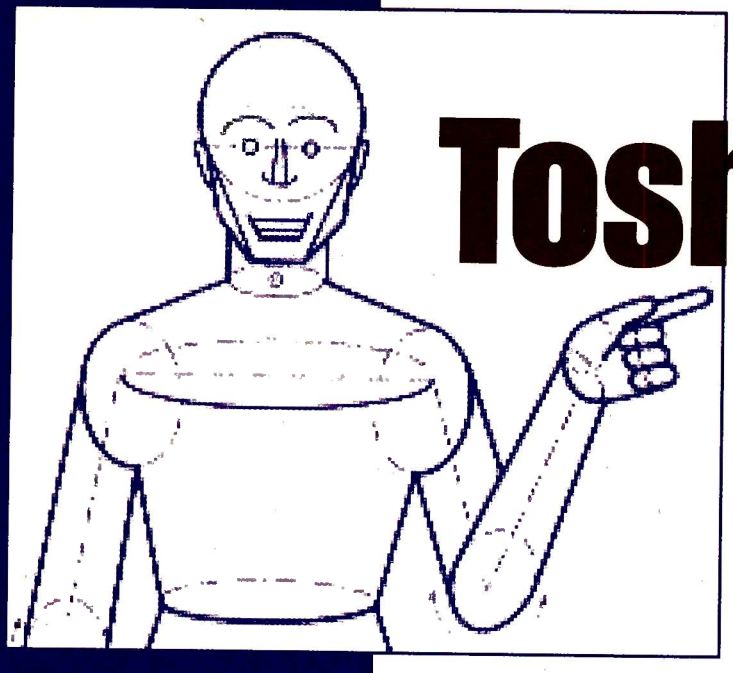
The College has been running City and Guilds accredited courses on the operation and servicing of digital TV set-top boxes for two years, since DTV was first introduced in the UK, and is now moving into other digital applications. "We are setting up new, up-to-date facilities to deliver high-quality training in the fields of digital and microprocessor applications in both the domestic and industrial fields" explains Fawzi Ibrahim, Senior Lecturer at the College's School of Electrical and Electronic Engineering. Developments in processing and control have changed the face of electronic servicing. To cope with today's equipment, service engineers need to update their knowledge and skills frequently. The College has set itself the task of meeting this need. Its students come from around the UK and abroad, and it is now offering courses for other colleges to run.

The College's courses in the electronics field have proved to be very popular. They cover general electronic servicing, specialised PC repair and networking, and of course digital TV. The latest addition, on the operation and repair of DVD players, is initially being offered as a two-day short course for practising engineers. It covers signal processing, servo and system control, servicing and fault-finding, and will start during the spring term. There will be full mainstream courses on DVD players from September.

For further details phone Sylvia Garvin on 020 8208 5440 or e-mail

sylvia.garvin@cnwl.ac.uk





Toshiba Service Briefs

More know-how from Toshiba, based on Technical Bulletins AH80, AH81 and AH82

TV Sets

Models 1782TB, 2180TB and 2181TB

Very occasional pulling on teletext subtitles: Increase the value of RB06 from 560kΩ to 1MΩ.

Models 2145DB and 2545DB

Subtle and continual changes in the contrast level may occur when playing back DVD recordings with Macrovision protection (anti-copying system): An improvement can be obtained by adding a 47kΩ resistor between pins 54 and 61 (11·6V supply) of the TA88088N chip IC501. Fig. 1 shows the resistor in position, with a plastic sleeve for insulation.

Model 2163DB (C6S chassis)

No line sync from cold, channel display permanently on, sound mute appears only momentarily, can't enter the service mode: CB12 (560pF) in the circuit that feeds sync pulses to pin 34 of the microcontroller chip QA01 has gone very low in value. Fit a replacement.

Models 2539DB, 2939DB and 3339DB

Subtle and continual changes in the contrast level may occur when playing back DVD recordings with Macrovision protection (anti-copying system): An improvement can be obtained by fitting a 10kΩ resistor between pins 54 and 61 (11·9V supply) of the TA8783N chip IC501 and increasing the value of R211 from 1kΩ to 4·7kΩ. R211 is connected from pin 54 of IC501 to chassis. Use a plastic sleeve to insulate the added resistor.

Models 2557DB, 2857DB, 2577DB, 2877DB, 3357DB and 3377DB

Set dead with the green LED flashing on and off every three seconds: There's no line drive, probably because D431 (1N4148) is open-circuit, removing the 9V supply to pin 22 of the TA1222AN chip IC501. The part no. for D431 is 23115599.

Service tip: It's a temptation, when servicing a set with power supply excess-current protection, to disable the protection circuits as a way of revealing the cause of the fault. This is not wise however as it could lead to further component failure. In these sets breakdown of the field output stage – Q301 (TA8427K) etc. – will almost always result in the set reverting to standby (protection mode) because of excess current drawn from the 27V supply. The best way to tackle this fault is to turn the tube's A1/G2 control to minimum, then lift R327, the surge-limiting resistor in the 27V supply. If the A1/G2 potentiometer is then slowly increased and field collapse is visible, the diagnosis has been confirmed.

The same principle of isolating supplies can be applied to audio output stages and the convergence circuits in projection TV sets.

Model 2812DB

Reduced width and a slight tearing effect at the edges of the picture: C424 (4·7µF, 100V) in the EW modulator drive circuit on DPC board U904A has fallen in value. Fit a replacement, part no. 24676479.

Model 3377DB (C7SS chassis)

Hiss from the left or right main speaker at volume level 1: The fault is in the IF Multiplex and Audio (IMA) processor module H002, type MVGS48. Replace the module, part no. 23148275.

Model 3387DB

Picture limiting in bright areas with all inputs: CZ16 (1µF, 50V), the DC blocking capacitor at the A-D input to pin 3 of the comb-filter IC QZ01, is leaky. Replace this capacitor, part no. 24206010.

Model 3787DB

Power supply tripping and no power LED operation: If a quick check on the supply lines reveals that they all go high briefly before the power supply subsequently shuts down, C833 is open-circuit. It's part of the soft-start circuit: the failure allows the power supply outputs to rise above their normal levels at power supply start-up. Replace C833, which is 4·7µF or, in some sets, 10µF.

Power supply tripping very lightly, all outputs present with no obvious under- or over-voltages: Q802's collector voltage is much lower than the normal 35V because reservoir capacitor C819 (22µF, 100V) has fallen in value. As a result Q802 cannot perform its normal function, which is to prevent the voltage at pin 9 of IC801 falling below the minimum 6V. Replace C819.

Models 28MW7DB/G and 32MW7DB/G

Various picture symptoms. Freeze frame of noise. Line speed off but freeze frame or no sync and slow-motion picture: VD pulse output at pin 31 of IC501, feeding the up-converter, of low amplitude – 0·9V p-p instead of 5V p-p. Replace IC501 (Q501), part no. B0385990.

Models 28W8DB and 28W93DB

Power supply tripping with red and green LEDs on the front panel flashing on and off at one second intervals: Q802's collector voltage is much lower than the normal 35V because reservoir capacitor C819 (22µF, 100V) has fallen in value. As a result Q802 cannot perform its normal function, which is to prevent the voltage at pin 9 of IC801 falling below the minimum 6V. Replace C819.

Model 32WD98B (C9SS chassis)

Squealing noise when the set is switched to standby. When coming out of standby there's only a small, unlocked raster on the screen – sometimes almost locked, but with bad east/west distortion. Sometimes set won't come on at all: The STR-F6668B chopper chip Q801 is faulty. Replace it, part no. 23135008.

Models 40PW8DB/G and 56PW8DB/G

Faint vertical lines on the left-hand side of the screen, fading towards the centre: Damping resistor R441 (1kΩ) across L441 open-circuit. Replace R441, part no. 24532102.

Model 40WH08B (C00P chassis)

Set stuck in the standby mode (red LED at front illuminated): The main chopper power supply can fail as a result of a spurious mains pulse. To confirm this, check whether R821 (see Fig. 2) is open-circuit. If so it's likely that bridge rectifier D802 will also have failed. Replace these items and, to ensure reliability against spurious mains pulses, fit an extra resistor R804 in the power supply filter circuit on the deflection PCB, see Fig. 2, right-hand side. These components are included in repair kit 40WHREPKIT which can be ordered from the Toshiba Spares Department (check on 01276 694 000).

VCRs

Models V229B, V429B, V709B and V729B

White, flashing horizontal interference specs on the playback picture: This happens when the earthing spring makes poor contact with the mechanism base plate. A suggested cure that involved fitting a separate earthing wire was described in Toshiba Technical

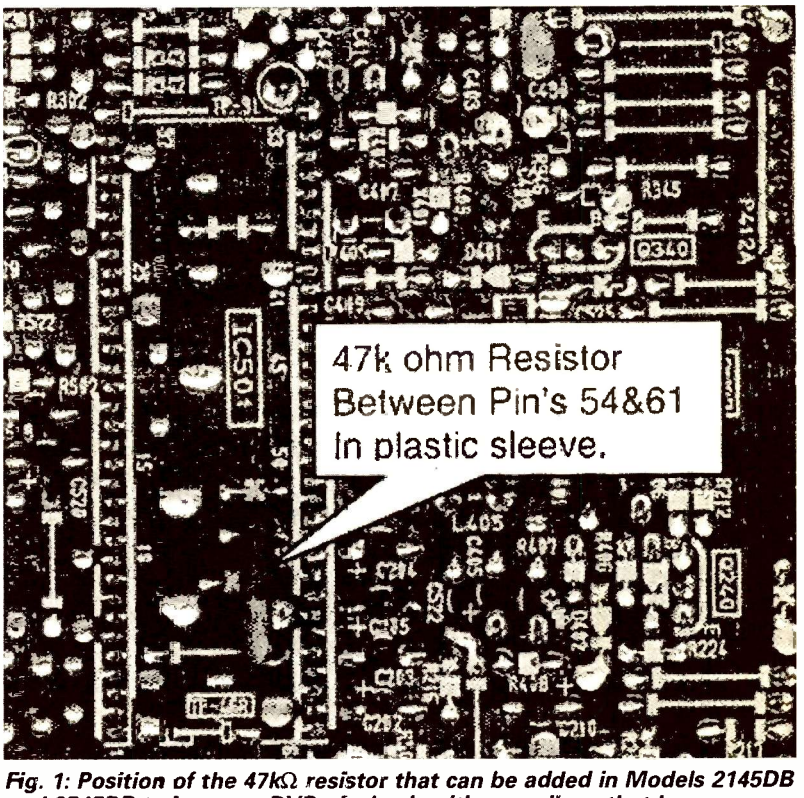


Fig. 1: Position of the 47kΩ resistor that can be added in Models 2145DB and 2545DB to improve DVD playback with recordings that have Macrovision protection.

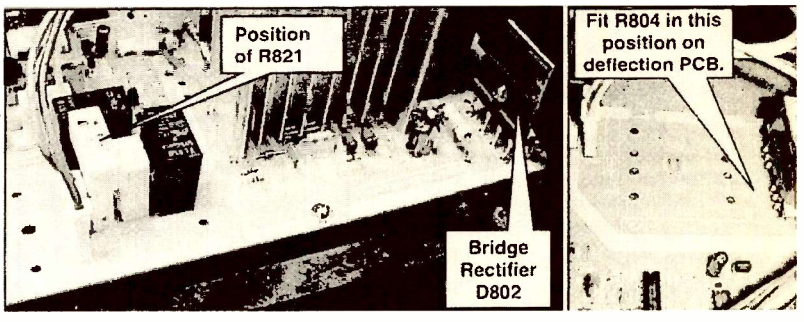


Fig. 2: Left, positions of R821 and D802 in TV Model 40WH08B (C00P chassis). Right, where the extra resistor R804 in repair kit 40WHREP-KIT should be added to provide increased protection against spurious mains pulses.

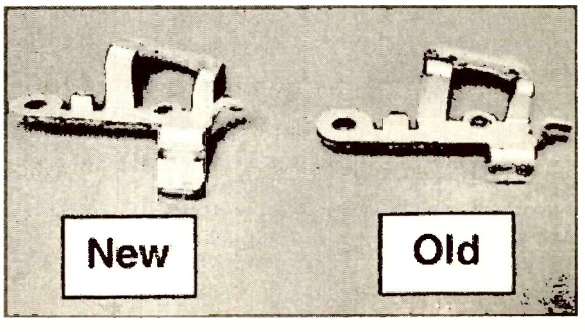


Fig. 3: The new and old cylinder mounting plates used in VCR Models V229B, V429B, V709B and V729B.

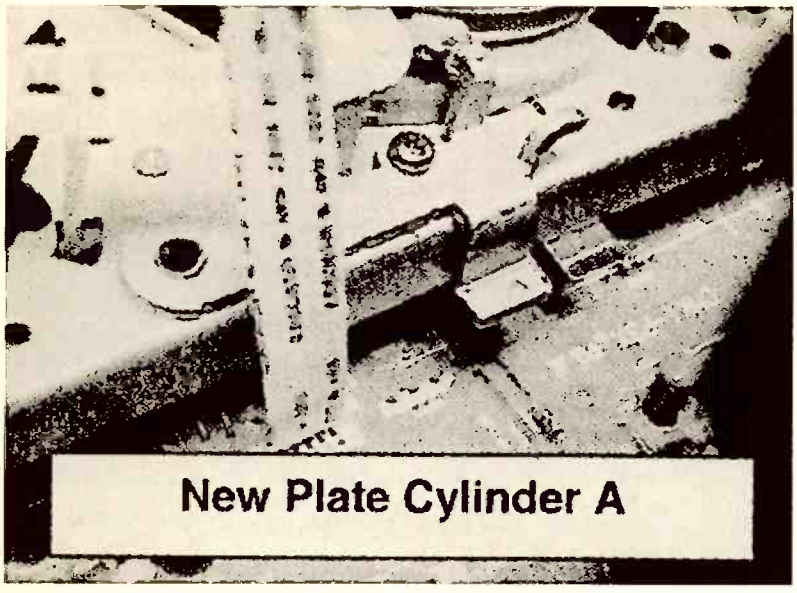


Fig. 4: The new Plate Cylinder A in position.

Bulletin AH78 (see also *Television* May 2000, page 411). To provide better earthing, a new type of cylinder mounting plate, called Plate Cylinder A, has been developed. The separate earthing wire is not required when this is fitted. Plate Cylinder A should now be used to cure the problem. The part no. is 70373461. Fig. 3 shows the new and old parts, Fig. 4 the new part in position.

Model V726B

Capstan motor runs backwards in standby: The capstan motor should be stationary in standby because the PWM at pin 99 of IT001 is at 0V, though the capstan direction output F/R is high (reverse). If the 2·5V capstan motor reference supply at pin 42 of IT001 is low there will be a slight imbalance in the motor drive output, producing reverse motor rotation. The fault occurs when CT031 (47µF, 16V) is leaky. Replace this capacitor to cure the problem.

Models V726B, V727B, V856B and V857B

No record colour: This fault will be present when diode DV029, type LL4448, is leaky. To confirm the diagnosis, check the DC voltage at pin 29 of the Y/C signal processor chip ICV01. The correct voltage here is 2·1V. A lower voltage indicates a leaky diode. Fit a replacement: the diode is a surface-mounted device, part no. 70010965.

Electronic Service Aids

A set of three CD-ROMs has been introduced by Toshiba. The titles are: *Service Manuals*, part no. SMCD001, which contains service manuals for 1999-2000 models; *Technical Bulletins*, part no. TBCD0001, which contains Toshiba Technical Bulletins for the last six years; and *Training CD ROM*, part no. TCD0001, which contains training courses DVD99 and TV99. Check with Toshiba (01276 694 000) for prices and availability.

All service manuals and Technical Bulletins are in Adobe Acrobat PDF format. The two discs will autorun from boot-up with Acrobat 4 installed on disk. TBCD0001 also includes an index search feature. The two training courses are supplied in HTML format, which can be run from a web browser or Power Point format.

Test Case 459

TV and video servicing provides plenty of variety – at least it does at the Test Case workshop. In the two previous episodes reported here we have seen the effects of low carrier-to-noise ratio with digital TV reception and were fooled (temporarily!) by memory chip amnesia in a modern microcomputer-controlled TV set. The latest saga relates to a veteran (about fifteen years old) 21in. Toshiba TV set, Model 211T4B. Should it have gone straight into the skip? No, for three reasons. First, Mr Allen had just bought a new remote-control zapper for it. Secondly, his dad had got used to the old set and "couldn't get his head around a new one" (Mr Allen's words). And finally because at present money was too tight in the Allen household to stretch to a new set. Indeed, it was hoped that the job could be done for less than £45 . . .

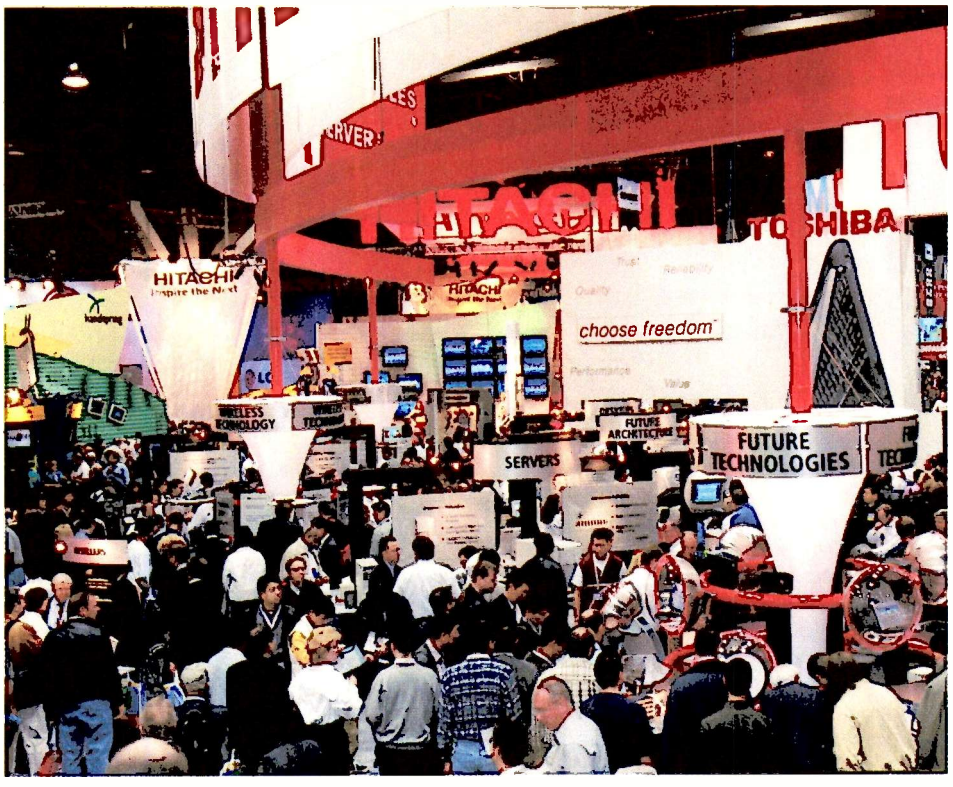
What job? Well, the set's pictures were without colour. The set produced good black-and-white pictures for its age, and we were told that the colour had become erratic before disappearing altogether. When we opened the set and consulted the service manual we found that the chroma signal decoding (and timebase drive signal generation) is carried out by a 42-pin TA7699AP chip, IC501. There's no I^2C bus, so IC501 relies on DC voltages at various pins to carry out brightness, colour and contrast control. As a first check the voltage at the colour control pin, 7, was monitored: it varied up and down as the colour control keys on the zapper and on the set's front panel were pressed.

On then to the chip's chroma input pin, 5, where there was a good subcarrier signal – about 600mV peak-to-peak with a colour-bar signal fed in from the bench pattern generator. The output from IC501 to the chroma delay line/matrixing circuit should emerge at pin 8, but there was no signal here. So it must have been getting lost somewhere within the chip, maybe because of the action of the colour-killer, or maybe because the chroma amplifier was open-circuit. If the killer had come into operation, there was the possibility that the subcarrier oscillator had gone off frequency. A check at the 4·43MHz crystal showed that it was running at the correct rate, or at least very close to it. There was, then, a growing possibility that the chip itself was responsible for the fault. We were getting perilously close to Mr Allen's £45 limit!

A TA7699AP chip was discovered in the stores. It was rather dusty, and the pins showed evidence of having been soldered before. But a little label provided assurance that it was OK. The initials on it belonged to someone who had long since left our employ, TS.

The replacement TA7699AP was fitted in the set, but there was still no colour. Regular readers of Test Case will not be too surprised about that! Maybe TS had been down his road before, for all we know. If so he might have put a note in the service manual.

In fact the cause of the fault was not in the chip itself, nor in any part of the chroma signal chain. Which fundamental factor had been overlooked? And which component was responsible? For the answer, turn to page 313.



The Comdex Fall 2000 show, held in Las Vegas late last year, was billed as the world's largest computer show. This time it was dominated by recordable DVD formats, solid-state recording systems and wireless technology. George Cole reports

Comdex Fall 2000

The DVD standard is set by the DVD Forum, which is composed of computer, consumer electronics and media companies. After setting the DVD-Video and DVD-ROM standards, the Forum set up a working group to establish specifications for recordable and rewritable DVD formats. These are designed for storing computer data and video, and are thus intended for PC drives and home video recorders.

The DVD Recordable (DVD-R) format was developed in 1997, mainly by Pioneer. It uses a 3·95Gbyte disc, though version 2 of the standard includes 4·7Gbyte discs. DVD-R is mainly used in professional fields, for authoring and mastering, though Pioneer also sees it as a consumer format.

As with audio CD-R discs, recordable DVD discs enable users to carry out multiple recording sessions but, once data is recorded on a disc, it cannot be erased, edited or altered. Rewritable formats enable the user to overwrite the recorded data and thus provide similar flexibility to a video tape or hard disc. Two official rewritable formats have been developed, DVD-RAM and DVD-RW. The former was launched in 1998, with 2·6Gbyte discs. In 1999 4·7Gbyte discs became part of the DVD-RAM format, and double-sided 9·4Gbyte discs were added in 2000.

DVD-RAM is supported by Toshiba, Panasonic, Hitachi and Samsung. DVD-RAM drives, home video recorders and even camcorders have been launched in Japan and the USA. According to Panasonic, about a million DVD-RAM drives were sold worldwide in 1999: sales of 3·5m were forecast for 2000. The DVD-RW format is an extension of DVD-R, supported by Pioneer and Sharp. The first DVD-RW video recorders were launched in Japan in 1999.

Although Sony and Philips are part of the DVD Forum and played a part in the development of the recordable DVD specifications, the two companies broke away and, with Ricoh, Mitsubishi Chemical, Verbatim, Yamaha and Hewlett-Packard, developed an alternative rewritable format called DVD+RW (the DVD Forum frown on this description, as DVD+RW is an 'unofficial format').

Over the past two years prototype DVD+RW drives and video recorders have been on display at trade shows around the world, and the first products are set to be launched in late 2001. A question mark hangs over DVD+RW however. Although Sony helped to develop the format, the company has no plans to launch DVD+RW drives or video recorders and has said it considers the data capacity of existing rewritable DVD formats to be too small. Sony, Philips and others are developing high-density rewritable disc formats that use blue laser technology.

Rewritable disc technology

Although the three rewritable DVD formats use a variety of file structures, modulation systems and track layouts there are some fundamental similarities. They all use the UDF (Universal Disc Format), which is more flexible than the ISO 9960 format used by most of the CD family. All offer discs with 4·7Gbyte data capacity, which is sufficient for storing up to four hours of MPEG-2 video on a single-sided disc – the longer the recording time, the lower the picture quality. And all formats use the phase-change disc technology. With all rewritable DVD formats the disc structure is similar to that of CD-RW discs, so discs can be manufactured with existing disc pressing equipment.

Current phase-change systems use a 650nm wavelength laser and a recording layer that consists of an alloy of silver, indium, antimony and tellerium. Fig. 1 shows the structure of a DVD-RW disc: the other rewritable DVD formats use a similar construction. During the record process the laser focuses on the recording layer, heating it to a high temperature

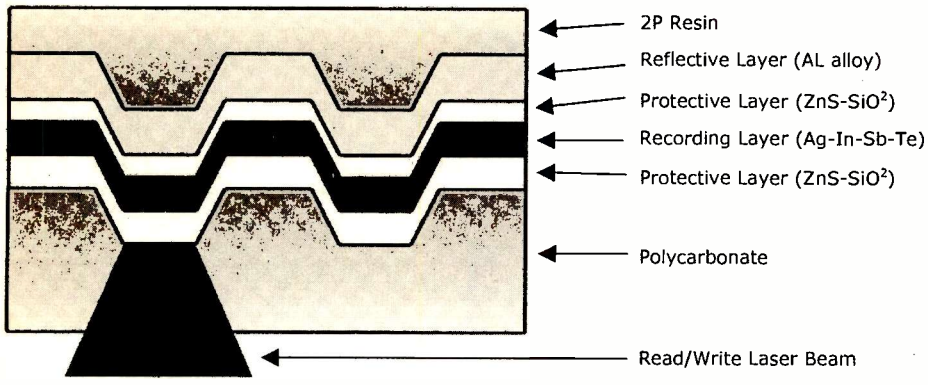


Fig. 1: Structure of a DVD-RW disc.

(between 500-700°C) at which the atoms change to a liquid state. When cooled quickly, they revert to an amorphous state. When the phase-change layer is heated to below the melting point but above the crystalline temperature (200°C), the atoms revert back to a crystalline state.

The amorphous and crystalline states have different refraction indexes, which enables them to be distinguished optically (see Fig. 2). The writing laser has two power levels. The lower one erases any previously recorded dark spots by converting them to a blank (reflective) state. The higher one makes the surface of the disc less reflective: as a result, data is written on the phase-change recording layer. This process, known as direct overwriting, means that data can be erased and written during a single pass.

Fig. 3 shows that the recording layer is modulated by a series of short pulses rather than simply following an input signal's 'on' pulse. This system makes it easier to control the size and shape of the recorded dark spot, as it helps to prevent too much surface heat being generated during the recording process – excessive heat could melt the disc, changing the shape of the dark spot.

The phase-change recording system creates a disc with a reflectivity ratio of 18-30 per cent, which is the same as a dual-layer DVD-ROM disc. As both DVD-Video players and DVD-ROM drives are designed to be able to read dual-layer discs they should, theoretically at least, be able to read phase-change recordings. DVD-RW discs are designed to provide up to 1,000 rewriting cycles: DVD-RAM discs provide 100,000 rewrites, while DVD+RW is somewhere between these two figures.

A DVD-RW disc has a spiral track with a groove, the data being placed inside the groove. The physical address system uses this microscopic groove, which the laser follows. This ensures consistent data spacing. The groove's walls are modulated by a constant sinusoidal pattern which the drive can read and compare with an oscillator, to ensure precise disc rotation. The modulated pattern is referred to as a 'wobbled groove', because the groove's walls appear to wobble. This wobble signal is used only for recording. A pre-formatted addressing system, known as 'land pre-pit', is used to identify the address where the data blocks are to be written (see Fig. 4).

DVD-RW also offers an incremental writing system, whereby data can be written on to a disc from start to finish or as a series of new data sessions. The latter enables new data segments to be inserted anywhere within a previously recorded boundary, a process known as restricted overwriting. But discs recorded in this way cannot be read by a conventional DVD-ROM drive until they have been 'finalised' (converted to a compatible file format). Once a DVD-RW disc has been finalised it cannot be used for further recording. A DVD-RW drive can read unfinalised discs however.

Another system, called 'border zone recording', enables short boundary zones to be placed before and after a recording session. A DVD-RW compatible drive or player can read the data but will not attempt to read beyond the boundary. This allows a DVD-RW disc to be read by a player before the disc is filled up.

DVD-RAM uses a wobbled land and groove recording system with data stored in both the groove and the land between the groove. The format uses address sectors moulded into the disc for positional location purposes, with the data packets written between the address sectors. DVD-RAM supporters claim that this recording system is more robust than DVD-RW, which uses error-correction blocks. DVD-RAM can handle data groups up to sixteen times smaller than for DVD-RW. If the write head is jarred for example it will usually be knocked to another track section and continue writing.

The DVD-RAM write head determines if it is off-track when it passes a new address sector (2kbyte size), which means that in the worse case only one physical sector of data (2kbytes) will be written in the wrong location, compared with DVD-RW which under extreme conditions can have up to eight sectors (24kbytes) in the wrong location – because the DVD-RW head has to travel at least one eighth of a track rotation before is can determine that it's in the wrong location. Fig. 5 compares DVD-RAM and DVD-RW track structures.

Discs an be damaged by dust and scratches. They then become more error-prone. DVD-RAM uses a system called 'data slipping' to counteract this. It works by reserving spaces within the spiral track. If a sector becomes damaged, the data stream between the damaged area and the reserved sector is shifted to the free area. This shifting continues until the damaged area is passed. The system, also known as 'defect sector management', is also used by PC hard drives.

Panasonic says it's wrong to assume that the effect of damage to a DVD disc is worse than that with a CD disc. While DVD has a higher data capacity, it uses highly sophisticated error-detection and correction systems that are ten times more powerful than those used with CD formats. And because DVD-RAM uses redundant addressing and redundant timing information, data recovery is more reliable.

DVD+RW uses the same 8-16 modulation system and Reed-Solomon error correction as DVD-ROM. It is this similarity that enables DVD+RW to provide such a high compatibility level with DVD-ROM and DVD-Video. DVD+RW offers both constant linear velocity (CLV) and constant angular velocity (CAV) recording. The latter, which is also used by hard drives, provides random access. The format also uses a recording system known as 'lossless linking'. The DVD+RW format allows video to be encoded with a variable bit rate: because the writing process occurs at a constant bit rate, this means that it has to operate under stop/start conditions.

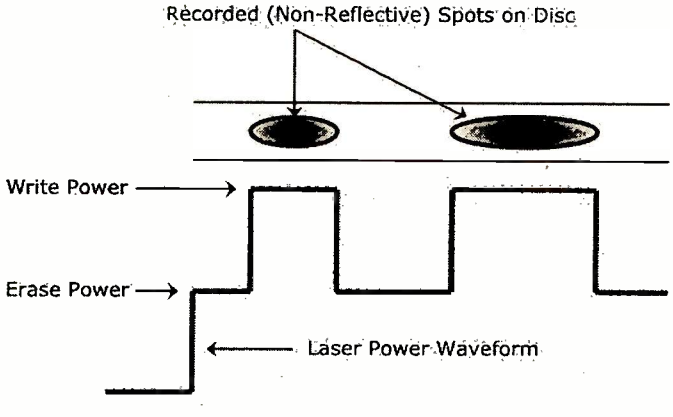


Fig. 2: The phase-change recording principle.

This could create a linking loss, with the pauses producing large areas of corrupted data (2kbytes in size). However DVD+RW allows the writing process to be suspended without any linking loss. For this to happen, each data block must be written in the correct position to an accuracy of within one micron. This is achieved by mastering the groove with a high wobble frequency (817kHz), which enables the writing to be stopped and started at an accurately defined position. Fig. 6 shows how the lossless-linking system works.

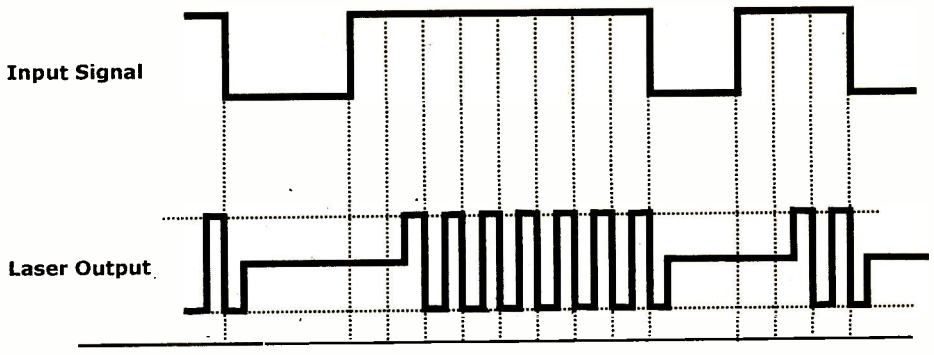


Fig. 3: Comparison between the input data signal and laser output for recording.

DVD-RAM

There was a DVD-RAM pavilion at Comdex 2000, with about sixty exhibitors representing hardware companies such as Panasonic, Hitachi, Toshiba and Samsung, media companies such as TDK, Maxell, FujiFilm, Kodak, Ritek and others, and a sprinkling of multimedia authoring software companies.

There are six main DVD-RAM drive manufacturers, Hitachi, Toshiba, Panasonic, Samsung, Teac, Aopen and LG, with most drives selling for less than $600. Panasonic also showed a high-capacity 9·4Gbyte drive, Model LF-D201U, which can read and write on double-sided discs.

There was plenty of DVD-RAM media material on show, with Type 1 non-removable discs (housed in a protective caddy) at about $30 each. A Type 2 removable 4·7Gbyte disc costs about $40. 9·4Gbyte discs cost bout £50, and non-cartridge DVD-RAM discs about $25. The latter two types of disc can be read by DVD-ROM drives, but once a Type 2 DVD-RAM disc has been removed from its caddy it cannot be used for further recordings. A 4·7Gbyte DVD-RAM disc can store up to 4,700 full-colour images (640 x 480, 24bits/pixel), two hours of MPEG-2 video at DVD-Video quality, or more than seven hours of CD-quality audio. Some twelve media manufacturers are now producing DVD-RAM discs.

Consumer DVD-RAM products attracted a lot of interest on the show floor. The Panasonic DMR-E10 DVD-RAM home video recorder sells for about $3,000. A Panasonic rep said the product was "the replacement for your VCR", though the prices of both hardware and media (about $30/£20 per disc) will have to fall considerably before VHS comes under threat.

Hitachi's DV-RX2000 DVD-RAM recorder has four recording speeds and stores up to four hours of video on a 4·7Gbyte disc: it is to go on sale in the USA early this year and will cost about $2,000. The tiny DZ-MV100A DVD camcorder was next to it. This records up to two hours of MPEG-2 video on an 8cm DVD-RAM disc that will cost about $30.

DVD-RW and DVD-R

Pioneer had a massive stand that was crammed with DVD products. The DVD-RW format was centre stage. All

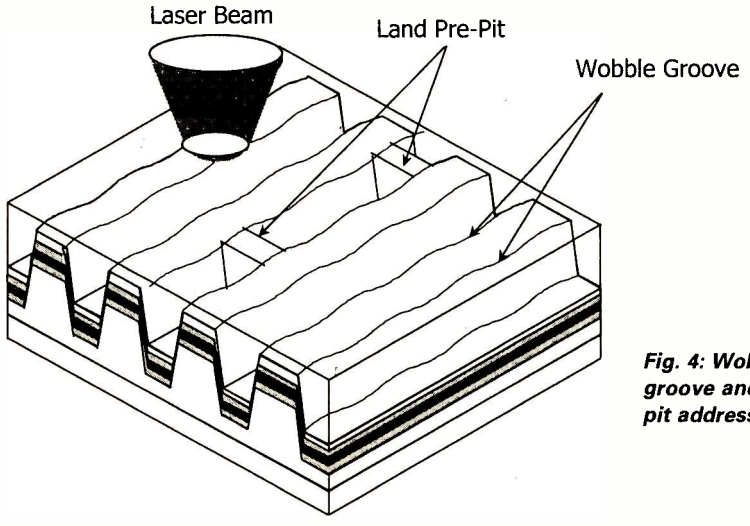


Fig. 4: Wobbled groove and land pre-pit addressing.

recordable DVD companies stress the compatibility of their products with existing DVD-ROM drives and DVD-Video players. Pioneer admitted that there had been a problem initially: some drives or players assumed that DVD-RW discs had two layers, searched for the second and, when they couldn't find it, refused to play the disc. A minor modification to the drive's firmware has apparently solved this problem.

Another problem was that version 1.0 of DVD-R, which was sold only in Japan, had a pre-obscured or embossed area of the disc to ensure that encryption keys used to protect prerecorded video titles couldn't be recorded. However nearly all DVD-Video players and DVD-ROM drives couldn't read this area, creating playability problems. This was corrected in version 1.1 of the DVD-RW format by making the embossed area readable and at the same time ensuring copy protection.

There was another problem with first-generation home DVD-RW recorders which used a single recording mode, Video Recording Format (VRF), that provides MiniDisc-type editing features such as selective erasure, track division, combining and shifting. Unfortunately VRF is not compatible with existing DVD-Video players. With second-generation DVD-RW recorders however there are two recording modes, VRF and DVD-Video, which is compatible. Pioneer adds that future DVD-Video players will probably be VRF-compatible as well.

Pioneer showed the first combined DVD-RW/DVD-R/CD-R + CD/RW drive, which has 2x and 1x writing speeds for DVD-R, 1x for DVD-RW, 8x for CD-R and 4x for CD/RW. It can also read DVD-ROM and CD-ROM discs. The new drive will be available to other manufacturers on an OEM basis during the first quarter of this year.

Pioneer's consumer products included the DVR-2000, a massive machine finished in champagne gold and expected to cost about $2,500 when launched in the USA in early 2001. Sitting on top was the tiny PDV-LC20, a portable DVD player that's also compatible with DVD-RW discs. The DVR-2000 can also write on DVD-R discs. Pioneer believes that this format could become the video equivalent of CD-R once media prices are low enough: a consumer DVD-R disc will sell for about $15 but should soon fall below the $10 (£7) barrier. The DVR-2000 was also connected to a consumer digital camcorder, showing how the format could be used for storing home movies.

Remember the LaserDisc barcode system? It's back, only this time as the DVD barcode system. Pioneer is selling barcode software for both Windows PCs (9x and NT) and Mac computers, allowing users to produce barcodes to control a DVD player. The barcodes are swiped with a light-pen to play back a specific scene, chapter or title. Pioneer is aiming this

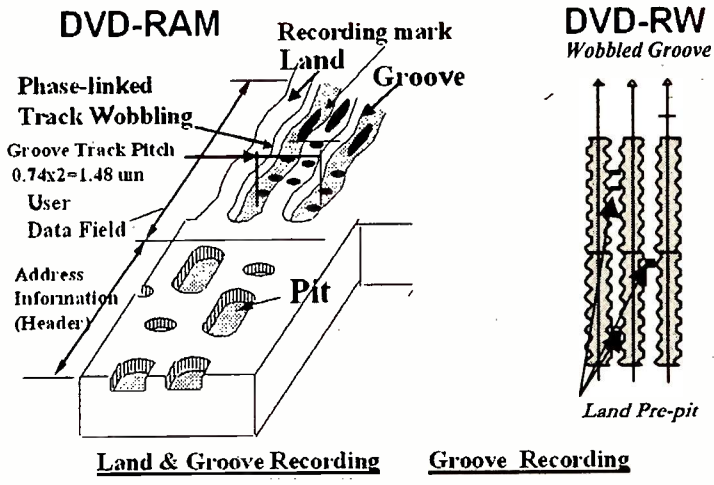


Fig. 5: Comparison between DVD-RAM and DVD-RW recording.

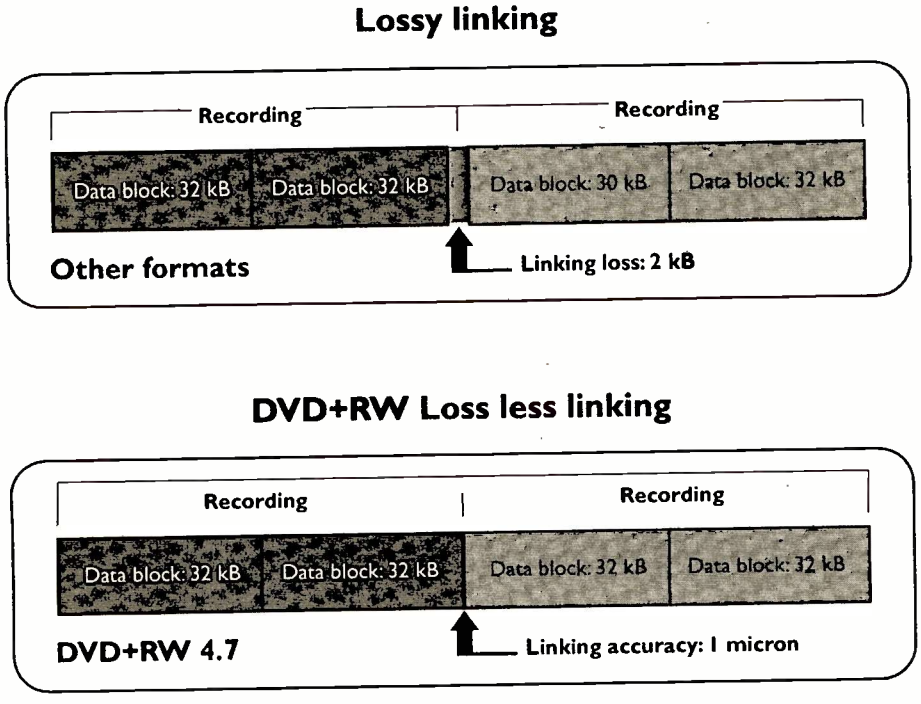


Fig. 6: Lossy and lossless linking.

Pioneer's DVR-2000 DVD-RW recorder with, on top, the tiny PDV-LC20 portable DVD player that's DVD-RW compatible.

software at the educational and training markets, but some US retailers are now using DVD barcodes for point-of-sale applications.

DVD+RW

A special breakfast briefing was held to demonstrate the DVD+RW format and provide the latest news. Philips, Hewlett-Packard and Ricoh all presented prototype players and drives. The theme of the briefing was "compatibility and convergence". It's ironic that although DVD+RW is an 'unofficial' DVD format it claims to provide the highest compatibility with DVD-Video and DVD-ROM. According to the DVD-RW group any recordable DVD format should provide recordings that can be read by both consumer DVD players and PC DVD-ROM drives, and that DVD recorders should be backwards-compatible with existing DVD discs.

DVD+RW discs have the same physical parameters and system margins as dual-layer DVD-Video discs, and should thus be compatible with most DVD players and drives. During the briefing a recording was made using a DVD+RW drive and played by a standard, off-the-shelf consumer player.

According to the DVD+RW format backers DVD+RW drives and players can read DVD+RW, DVD-RW, DVD-R, DVD-ROM, DVD-Video, CD/RW, CD-R and audio CD discs: this will be the key to selling the format to both professionals and consumers. The first DVD+RW recorders, drives and media are expected to be launched this autumn. Incidentally Philips Semiconductors had an optical disc recorder on its stand. It wasn't DVD+RW however but a Super Video CD/Video CD recorder from DataVideo, which uses Philips' Trimedia chip.

Internet DVD

Florida-based IDVDBox Inc. showed its I²DVD (Interactive-Internet DVD), which enables users to play DVD-Video titles, use e-mail, access the internet via a home TV set and also play audio CDs and MP3 music files. It has a wireless keyboard, a built-in 56k modem and can also be connected to a USB-Ethernet adaptor, to an Ethernet port or cable modem. Web pages can be overlaid on the main picture, and users can attach a ten-second clip from a DVD-Video title and e-mail it.

PlanetWeb showed its IDVD player, an internet unit that consists of a DVD player, a web browser, additional RAM, a modem and keyboard. It's designed to bring both on-line and off-line entertainment into the living room. It can also be used to access embedded PC Friendly content, which often includes games, screenplays and videos designed to be seen via a DVD-ROM drive.

Super CD-R/RW

TDK and Calimetrics held a meeting at a hotel suite to demonstrate the latter's ML (MultiLevel recording) technology, which can be used to create recordable and rewritable discs with three times the capacity and three times the writing speed of existing CD-R/RW discs. Those present at the demonstrations included drive and media manufacturers, IC manufacturers, OEM suppliers, software developers and analysts. The companies say that ML technology is a bridge between existing CD-R/RW discs and recordable DVD formats.

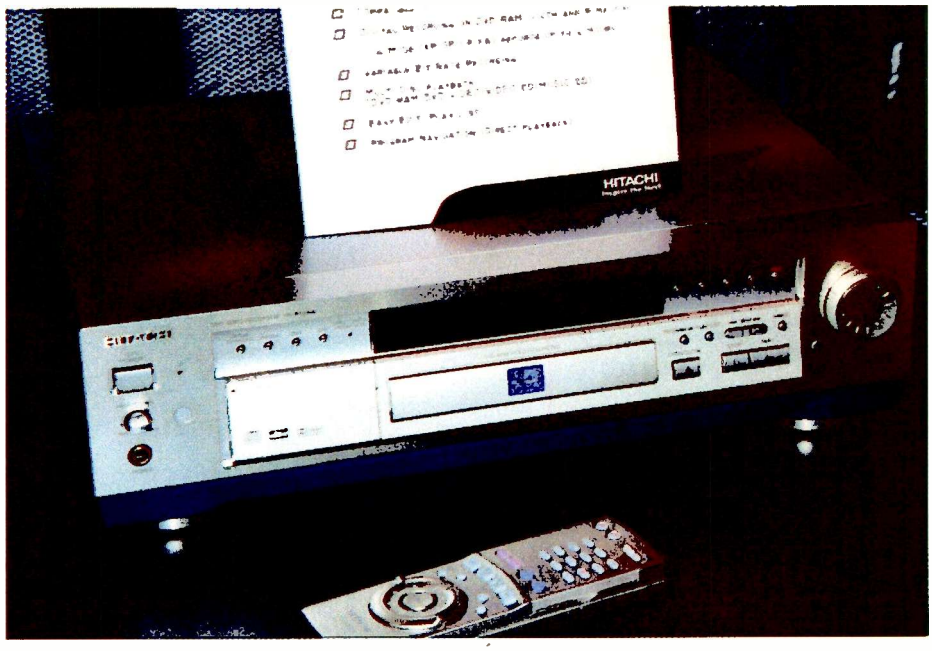
Memory Stick

There was plenty of solid-state recording media on show at Comdex, with old technologies like SmartMedia and MuliMedia Memory cards and newer developments such as Sony's Memory Stick and the Panasonic/Sandisk/ Toshiba SD Memory Card. According to Sony some ten million Memory Stick compatible products were in use at the end of 2000, including digital cameras, PCs, audio players and electronic robots like Aibo. Sony expects the figure to rise to a hundred million within three years.

Over 116 companies now use Memory Sticks in their products. There was a pavilion with many new products at Comdex, and Sony used the occasion to announce some new Memory Stick developments. A larger, 128Mbyte Memory Stick is to be launched this spring, and the data transfer rate is being increased by a factor of eight to 20Mbytes/sec – the first products will arrive next year. Memory Stick Duo, a miniature, compatible version of Memory Stick, will be launched in the middle of this year. It will herald new, compact products such as wristwatch audio players. Sony's stand had a huge collection Memory Stick expansion modules, including GPS and finger-print modules, which are to be launched later in the year.

Sony is now selling a 15in. LCD TV set in Japan with a built-in Memory Stick slot that enables still images to be displayed on the screen. There is also a Memory Stick compatible hi-fi system. Japanese Telecom companies NTT, DoCoMo and KDDI have introduced combined mobile phones/Memory Stick audio players. These were also on display at Comdex.

US company SmartDisk had on show a clever adapator that enables audio recordings stored on a Memory Stick to be played back via a standard audio cassette deck. You slot the Memory Stick into the top of a cassette shell and insert this in the drawer. The adaptor doesn't use tape but does have a normal tape head that engages with the cassette playback head. Digital music files are converted to an analogue signal for feeding to the tape head. The adaptor has a control-loop system that engages with the cassette deck's capstan, enabling it to determine the position, speed and direction of the music track. Users have standard tape features such as fast forward, rewind, track search and auto reverse. It's possible to bookmark a track that plays automatically when you reinsert the adaptor. The company has developed a similar device for use with MMC cards.



Hitachi's DVD-RAM recorder.

SD Memory card

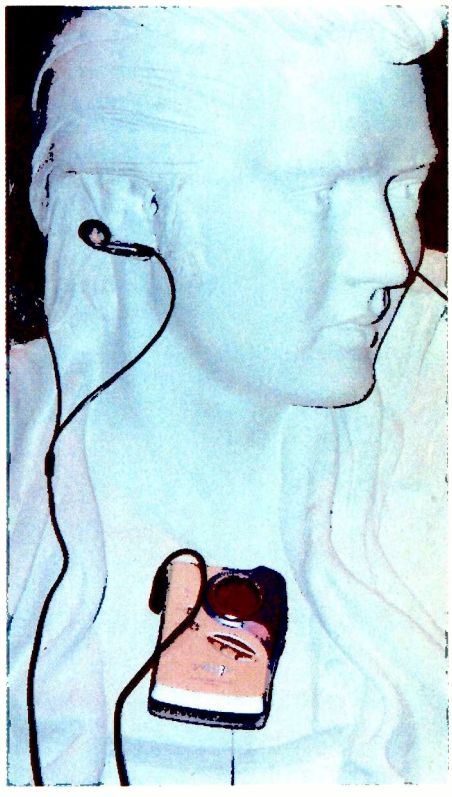
The Toshiba stand had a large collection of prototype SD Memory card products including audio players, PDAs and digital cameras. Toshiba says that 1Gbyte cards will be available by 2002, and that cards which include Bluetooth wireless technology are under development. Also expect to see Toshiba laptops with an SD card slot: a prototype on the stand had two SD card slots.

Panasonic's SD products included a prototype AV computer, the CF-E1. It has a built-in 15in. LCD screen and a PC card slot that's compatible with SD card adaptors. The PV-DC3000 digital camera can be used with both MMC and SD cards. Panasonic also had on show SD audio players in the form of wrist watches and wireless headphones. The company even demonstrated the future of SD, in the form of a prototype 256Mbyte card that can store half an hour of MPEG-4 video, 1,000 digital still images or four hours of near CD-quality audio.

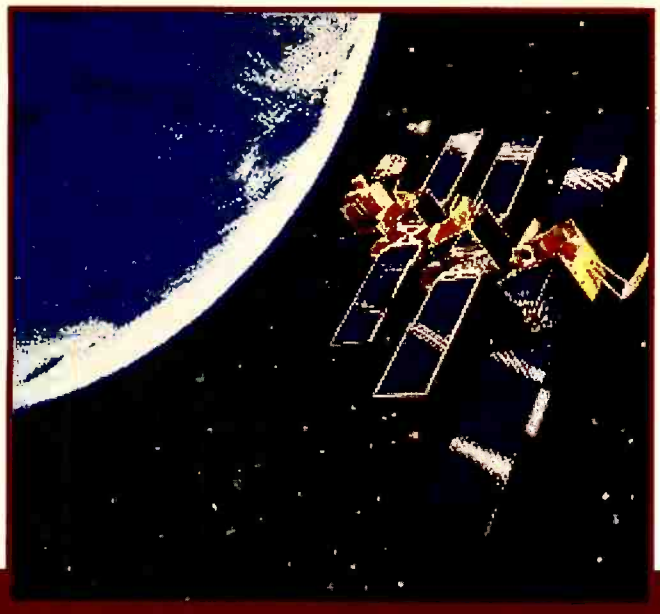
Wireless technology

Two wireless technologies were widely displayed at Comdex. Bluetooth is an international standard that's supported by hundreds of computer, electronics and IC companies. It provides short-range (between 10-100m) wireless links between various devices, for example a laptop PC and a printer. The data transfer speed is 1Mbits/sec. Toshiba showed Bluetooth PC cards, and the company says that the technology will be integrated into products such as portable PCs, printers and data projectors this year.

Wireless standard IEEE 802.11b is for Ethernet connections, providing higher data rates (2-11Mbits/sec) than Bluetooth and an operating range of 100-250m. A number of companies have formed WECA, the Wireless Ethernet Connectivity Alliance, and are promoting the standard under the more catchy phrase Wi-Fi (Wireless Fidelity). Wi-Fi can be used for home network systems that link computers, consumer electronics products and domestic appliances. ■



Elvis demonstrates an MP3 player by LG.

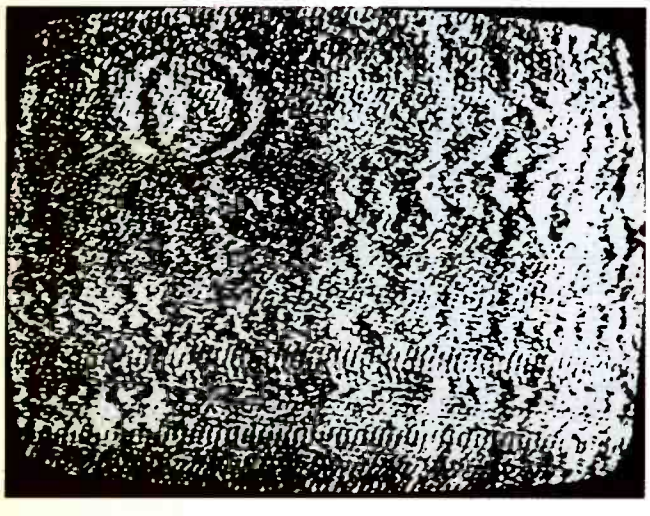


Terrestrial DX and satellite TV reception. News about broadcasting and satellite changes. The chopper power supply interference problem. Use of satellites for language learning. Roger Bunney reports

DX and Satellite Reception

There was lots of dramatic DX-TV reception at the end of the year 2000. The high and rising sunspot activity continued into December, ensuring good F2-layer conditions during the first three weeks. But it was difficult to identify the signals. Reference to my own and other DXers' logs shows that ch. E2 (48·25MHz) and ch. R1 (49·75MHz) signals were present at good strength on the 2nd, 4th, 5th, 7th, 8th, 9th, 13th, 14th, 15th, 19th and 23rd. A check with a narrowband scanner would often show that several ch. E2 and some strong ch. R1 video carriers were present but, frustratingly, they couldn't be received using a wideband TV set.

The signals were mostly impossible to identify, even by using a scanner and video offset data, since they arrived via several paths and the screen images were a ghostly mess. The signal levels were exceptional on December 19th however.



F2-layer reception in the UK, at 0815 GMT on December 14th. Were the ch. E2 signals from the Middle East or SE Asia?

As a result, video was received at up to ch. E3 and there was clear Arabic audio from a ch. E2 source, likely to have been Iran. The accompanying picture shows a relatively good-quality image received at 0815 on December 14th, during a programme pause. This was on ch. E2 and was followed by a male announcer in a suit. The same logo was seen on December 19th, this time on ch. E3. The simultaneous ch. E2 signal was different, with Arabic audio – likely to have been from IRIB (Iran).

The signals seemed to die away over the Christmas period. When I checked on January 1st the MUF was about 35·9MHz. Despite my continued monitoring of NZ ch. 1 and Australia ch. 0 there was not even a video buzz on my scanner! Ryn Muntjewerff (The Netherlands) and Cyril Willis (King's Lynn) both reported excellent reception periods, but again with signal identification problems. No North American reception was reported. It's a good idea to use your scanner to check at 35·22 and 35·58MHz for rising transatlantic MUFs – they are both very active paging allocations.

The Geminids meteor shower on December 13-14th was very active, with many Band I signal pings. Iain Menzies (Aberdeen) commented "excellent, at times almost constant signals on FM 87·6".

Satellite sightings

December 2000 was a rather quiet month. There was even more flooding in the UK than in November, and a rather late white Christmas with temperatures well below freezing brought an end to an eventful year. On a personal note, Test Valley flooding became dramatic here at Romsey. We had a sandbag issue: another two feet and I might have paddled to work! A week later the waters had vanished.

Sat-zappers could have previewed the Queen's Christmas broadcast as the tape was played out at 1900 on Christmas Eve via the Reuters NSS K (21·5°W) lease (11·566GHz H, SR 5,632, FEC 3/4). This was done to supply various TV stations that would play it back on the 25th.

The various Arabic channels via Arabsat 3A (26°E) provided interesting items. Most Arabic countries transmit their national TV channels via this satellite, which can be well received in the UK using a 1 or 1·2m dish. On December 22nd a live OB on the Al Manar channel showed long military processions, with the military personnel walking/stamping on Israeli and US flags that were stretched across the thoroughfare. The event was Jerusalem Day, in Beirut. Peace talks continued on/off with virtually no progress as aggression continued. On December 17th the Iraqi Space Channel showed President Saddam making an impassioned speech, interspersed with footage of Iraqi forces. Iraq has recently purchased several thousand Sony PlayStations, apparently to use the computing power for military purposes. Al Manar is available in digital form at 11·785GHz V (SR 27,500, FEC 3/4) and in analogue form at 11·120GHz V with audio at

6·6MHz. The Iraqi Space Channel is at 11·933GHz V (analogue) with the audio again at 6·6MHz.

Still with Arabsat 3A, the Yemen TV channel (11·767GHz H, SR 27,500, FEC 3/4) presented a rural game show on the 16th. It was held in pretty wild countryside and involved the building of storage structures by competing teams. A large and vociferous crowd was present. The event was sponsored by Choco Wafers.

Analogue TV is still alive. A check on the EBU news exchange carrier Eutelsat W3 (36°E) at 2100 on the 22nd produced a floodlit football match between the Italian teams L'Aquila and Giulianova. This was at 11·173GHz H. There was no audio, which I assume was via a digital carrier within the transmission – it wasn't SIS (sound-in-syncs). The identification 'I54 – L'Aquila' followed the match. A digital scan at 2200 produced a moving graphic caption, Telia, with no audio. This was at 11·471GHz H (SR 27,500, FEC 3/4).

The latest Shuttle flight to the International Space Station took place in early December. A transmission on December 2nd-3rd via NSS K (21·5°W) showed astronauts constructing the section that deploys the 250ft wide solar panels. This was at 11·462GHz V (SR 5,632, FEC 3/4). Remarkable to see Houston Group Control adjusting the camera on an astronaut's helmet as he floated in space.

Big Brother was a hit in the UK. The Germans appear to be finding their version of the prolonged series even more riveting – it's carried late most evenings by RTL+ (check the relevant Astra analogue channel at 19·2°E). Roy Carmen has found that certain RTL+ OB feeder links are carried via Kopernikus at 28·5°E. This is at 12·680GHz V, using the unusual SR 5,998 and FEC 3/4. This orbital slot is also used by Eutelsat II F4: Hugh Cocks reports that Czech TV programming with radio stations is now available at 11·553GHz H (SR 27,500, FEC 3/4).

In early December the new Europe*Star-1 (45°E) and Europe*Star-B (47·5°E) were both carrying out tests in clear analogue form. Their first digital customers appeared later in the month.

News items

UK: The Local Broadcasting Group (LPG) has spent some £7·5m on acquiring TV broadcasting rights in 36 areas throughout the UK. This is over 50 per cent of the RSL-TV licences that have been issued. Areas include York, the Clyde, Aberdeen, Edinburgh, Inverness, Taunton and Herts. So far only two LPG stations are in operation, and it will be at least two years before the rest begin transmissions. LPG makes an interesting comparison with LITN (the Local Independent Television Network), which represents the interests of the small RSL-TV stations.

Spain: Commercial digital terrestrial TV channels should soon be on-air. Licences have been awarded to NETV and VEO Television. Other DTTV stations are already transmitting at UHF.

Luxembourg: With expansion Europe-wide in mind, the RTL media group is merging its technical broadcasting services to form a single operation. It includes the Cologne Broadcasting Centre, Pearson TV operations in London and Paris and RTL's broadcasting base in Luxembourg.

Germany: More terrestrial and satellite TV channels are promised. RTL is understood to be planning to launch a news plus entertainment channel within twelve months; the Berlin commercial station 1DE will be launching a news, documentary and movie channel once a transmission licence has been approved; and Tele-Munchen is to open a drama/soap channel early this year, the content supplemented by the main parent channel, with analogue transmissions.

Hong Kong: Gareth Foster reports that Chinese mainland stations bordering Hong Kong are using system I transmissions (the UK standard, with 6MHz sound-vision carrier spacing), enabling mainland viewers to watch both the local Chinese and Hong Kong channels. Generally China uses system D (with 6·5MHz sound-vision spacing).

Test cards: As mentioned in Teletopics last month, artist David McKeran is holding an exhibition of test card paintings at the Radlett Centre, 1 Aldenham Avenue, Radlett, Herts, The exhibition ends on February 24th. Admission is free.

Interference from PSUs

Interference radiation from chopper power supplies has been mentioned in several recent issues of the Australasian trade magazine *SatFACTS*. Use of a linear power supply, with mains transformer, is rare nowadays, at least in satellite receivers. But unfortunately many chopper power supplies produce interference that affects radio and TV reception. Once the power supply has been laid out on a commercial PCB it's very difficult, if not impossible, to reduce interference radiation. The principles of correct PCB layout were outlined by Ray Porter last month (see pages 224-5). The interference may be radiated from the mains lead or even be

An Al Manar transmission via Arabsat 3A (26°, digital), showing a military parade through Beirut with US and Israeli flags across the pathway.

A team challenge game shown by Yemen TV, again via Arabsat 3A.

mixed in with the output from the RF modulator. Receivers no longer have a three-core mains lead and an earthed case.

My RSD ODM300 digital satellite receiver produces RF splodges every 100kHz or so from MW through to low VHF. In contrast the Korean-made Humax IRCI5400 digital receiver, which is popular in Australia, produces no measurable interference at its RF output socket. Anyone care to suggest possible remedies?

Satellite news

EuroNews will be available at 28°E from about Easter time, bringing another 24-hour news channel to UK screens.

The major satellite operators are turning to the broadband/VSAT and internet market (VSAT = Very Small Aperture Terminals, for one- and two-way communication). Intelsat is to offer services via 804 at 64°E, the new APR-2 at 110·5°E and 902, which is due to take up position at 60°E this summer. Eutelsat's proposed eBird at 25·5°E, now at the planning stage, will be dedicated to such services, using VSATs designed by the Norwegian NERA group. In addition Hot Birds 8 and 9, designed to upgrade/replace capacity at 13°E, will provide broadband/VSAT operation. Immarsat is to launch a broadband mobile data service within the next eighteen months: it's building a new earth station to uplink data to the Thuraya satellite system.

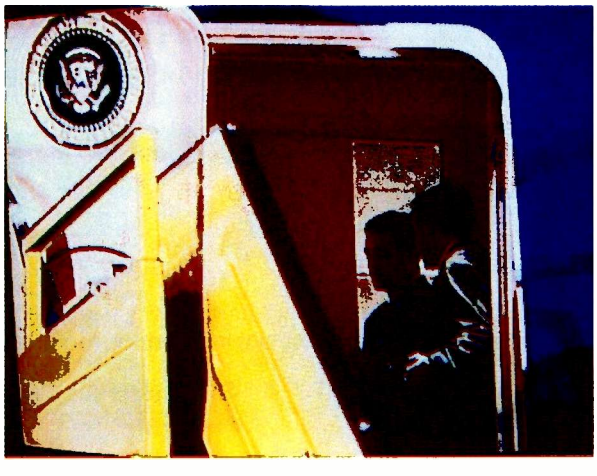
Eutelsat is also participating in an educational project with Italian universities, using Ka band (18GHz) capacity aboard Italsat F2 at 13°E. Later this year Hot Bird 6 will offer Ka-band services at 13°E.

Star TV Asia is to close down its Hong Kong pay-TV/FTA services via AsiaSat 3S (105·5°E) despite having nearly half a million subscribers. The problem is that Hong Kong is also served by Thaicom UBC, which offers thirty plus channels including Star TV material sold on. Reception of UBC is not officially 'legal' in Hong Kong, but the equipment is readily available – and aerial riggers often disguise UBC dishes with Star TV stickers! Most of the IRDs that Sky/Star supplied were without a modem and couldn't be used interactively. This seems to have been a commercial error.

AsiaSat 3S is to be joined by AsiaSat 5 in a year's time. This will add Ku band capacity and extend C-band operation down to 3·4GHz.

SES Astra is seeking a partnership with Spanish operator Hispasat at 30°W. Within the next two-three years Hispasat is to launch the Amazon satellite, which is authorised to serve the Latin American/Brazilian market. Presumably SES's idea is to gain a foothold in this region.

A shot from President Clinton's visit to Hanoi, seen via NSS K (21·5°W). This digital TV picture shows FBI security personnel providing advice before Bill dismounts from Air Force 1. It's part of an FBI security recording that was fed back to Washington.



Learning languages by satellite

Those learning foreign languages find that watching TV in the language concerned is a great help. French TV is easily received in the southern UK using very basic (analogue) equipment. Other national TV services are available from Spain, Portugal, Italy, Turkey, Scandinavia, Russia and the former Eastern block countries, and numerous Arabic channels from across North Africa and the Middle East can be received. Fortunately many overseas transmissions are downlinked in both analogue and digital form. It's likely that many will continue to use analogue transmission for the next half decade. Receivers will be cheap.

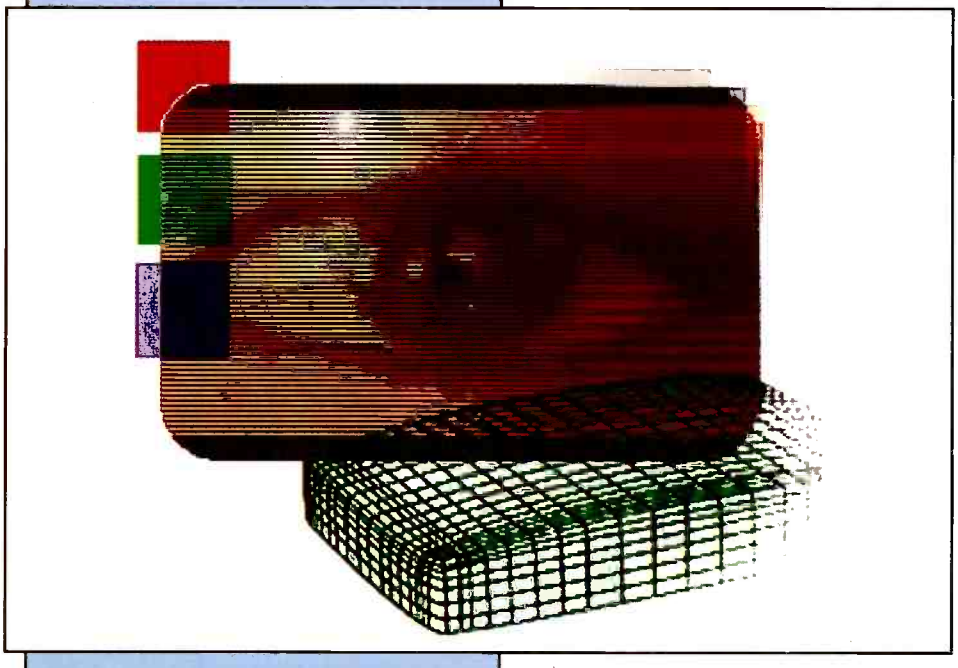
Schools can start or improve a language laboratory by installing suitable receiving equipment. There's the possibility of business here for those aware of what could be offered.

A French-language student I know at Littlehampton checked the Telecom satellite at 5°W and found that TF1, France 2, France 3, La Cinquieme, M6 and Arte are all available in the clear as Secam analogue signals in the 12·50-12·75GHz band with vertical polarisation. Canal Plus is also available, but is mostly scrambled and has differently spaced audio subcarriers. TV5 is available but in PAL with horizontal polarisation. In West Sussex all you need for the former channels is a fixed 80cm Astra dish, a Telecom LNB (no polariser) and an analogue receiver. All are available cheaply. You are then in business for black-and-white TV reception. A Secam TV set would bring colour, which could also be obtained by using a transcoder to convert from Secam to PAL. Cost is nominal. For a particular language a fixed dish will generally be OK – German-language channels are available at 19·2°E for example and will continue to be transmitted in analogue form for some years.

If you are interested in Italian, the RAI Uno, Due and Tre channels are all available at 13°E (the Hot Bird slot) in PAL analogue form with vertical polarisation and 7·02/7·20MHz audio. So, in the southern UK, a simple installation with an 80cm dish is all that's required – no polariser. The Spanish TVE and Portuguese RTP services are also available from Hot Bird: TVE uses horizontal polarisation and RTP vertical, so a polariser will be required unless you want only one language. If you are interested in Spanish regional transmissions, consider Hispasat's digital signals from 30°W. The Hot Bird slot provides many national broadcasts – check the Eutelsat channel listings or those at the back of *What Satellite TV* magazine.

For Arabic channels, check at 16°E (Eutelsat) and 26°E (Arabsat). For Turkish channels, check at 10°E and 42°E. You'll find channels for most languages up there somewhere! But check out the encryption used.

Hot Bird listings can be obtained from Eutelsat Public Relations, 70 Rue Balard, F-75502 PARIS Cedex 15, France. You can e-mail infomaster@eutelsat.com or consult the internet pages at http://www.eutelsat.com



TV FAULT FINDING

Reports from
Michael Dranfield
P. Salkeld
Graham Richards
Colin J. Guy
Gerald Smith
Denis Foley
Pete Gurney, LCGI
Michael Maurice
Bob McClenning
Gary Laidler and
John Hopkins

We welcome fault reports from readers – payment for each fault is made shortly after publication. See page 298 for details of where and how to send reports.

Ferguson ICC8 chassis

Despite having been in the TV servicing business for over twenty years I still come across strange faults that surprise me. According to its owner, this set's contrast had become very low "all at once". Now a common source of trouble with these sets is the 39kΩ feedback resistors in the RGB output stages, on the CRT base panel. When one of them goes high in value it can play all sorts of tricks via the auto grey-scale circuit – even make it look as if the tube's emission is very low. I replaced all three resistors, but this made the fault even worse! The picture was now visible only when the room was darkened.

I spent a long time looking for the cause of the fault and eventually discovered that the 1kΩ flashover protection resistors in series with the tube's cathodes were open-circuit (RT26 red, RT46 green and RT66 blue). Not just one, all three! Stray capacitive coupling must have been producing what little picture there was.

Replacement resistors restored the picture. When I took the set back I questioned its owner again. The answer was still the same, "all at once". **M.D.**

Philips 28PW662B/05 (GR2.4 chassis)

This set was tripping. After some fruitless checks I decided to disconnect the electronic trip by desoldering pin 2M37 on the power control module. The set then came on, but the picture brightness was varying. A check on the first anode voltage revealed that the focus/A1 control, which is part of the line output transformer, was faulty. As the trip is connected to the beam-current sensing via transistor Tr7591, I assumed that a new line output transformer would cure the problem. Wrong! All it did was to cure the brightness problem: the set continued to trip when pin 2M37 was reconnected.

The trip is also linked to the audio output stage. It monitors the continuity of the +16V and –16V supplies. The –16V supply was missing because circuit protector CP1601 (2·5A) was open-circuit. This was in turn caused by the fact that the TDA1521 audio output chip IC7240 was short-circuit. I hadn't noticed that the audio was missing, mainly because the large speaker is mounted in the back of the cabinet. **M.D.**

De Graff D59HZ5

This set wouldn't come on. The power supply was running however, and the two green LEDs at the front were flashing on and off. Scope checks around the microcontroller chip revealed that the data on the serial data line was of very low amplitude.

A number of different devices are connected to this bus. Checking one after another, I eventually disconnected the serial data pin of the MC44130P chip. The set then came on, but with no sound. My equivalents book shows that the MC44130P is a sound processor chip. I'd not come across it before, but a replacement restored the sound. **M.D.**

Akura CX240

If there's a snowy raster with only two inches of field scanning, replace R842 (39kΩ, 1W) in the line output stage. **M.D.**

Panasonic TC2185 (Z3 chassis)

This set, which has a comprehensive protection circuit, tripped out two seconds after being switched on. When pin 15 (protection) of the IF/colour decoder/timebase generator chip IC101 goes high, the set shuts down. The cause of the trouble was traced to R560 (270kΩ) in the network that monitors the 185V supply to the RGB output stages. It had risen in value to 470kΩ. As a result, there was insufficient voltage to hold D555 cut off. R560 is right next to the line output transformer. **M.D.**

Ferguson T49F (TX91 chassis)

For crushed video with poor luminance,

replace the BC858B surface-mounted transistor TV01 – even if it tests OK. **M.D.**

Beko 30128T

This 28in. set was dead but produced a faint ticking noise. Some cold checks soon revealed that the BU508DF line output transistor was short-circuit. My experience has been that there is always a cause when this type of transistor fails. Sure enough further investigation showed that C140 (22nF, 630V) was open-circuit. CHS stock a suitable capacitor, code no. P40407. **P.S.**

Sony KV28DS60U (GE1A chassis)

If there's lack of width and east/west distortion, replace circuit protector PS1502 on board D1. Sony has uprated it from 1A to 2A. **P.S.**

Panasonic TX25/29AD2 (Euro 2 chassis)

A common problem with these sets is reluctance to enter or leave the standby mode. Relay RL6101, which is activated by the microcontroller chip, suffers from sticking contacts. You can remove the plastic cap and spray cleaning fluid on the contacts, but it's better to fit a replacement. The part no. is TSE10818. **P.S.**

Sony KV28WS2U (BE3D chassis)

It looks as if this is going to be a common problem with these widescreen sets – I've had three in one week. The LED flashes twice, pauses, then flashes twice again and so on. One's first thought might be the LOPT. However in every case I've had the cause has been the M24C32-MW6T EPROM chip IC2. It's an eight-leg surface-mounted device on the side panel, under a screening can. The part no. is 875952494. **P.S.**

Amstrad CTV3128N

There was field collapse with a narrow display and no sound. Checks around the TDA8361A IF/colour decoder/timebase generator chip IC1101 showed that its 8V supply was missing at pin 10. The other supply at pin 36 was obviously OK because this feeds the line generator section of the IC. The cause of the missing supply was L300 (1·3µH) which was open-circuit. I was able to salvage one from a scrap chassis. **G.R.**

Panasonic TX28W2 (Alpha 3 chassis)

The problem was field collapse. As the AN5521 field output chip seemed to be OK I carried out some tests around the TDA2579A timebase generator chip. This brought me to C400, which is connected to pin 2 (field feedback). It's one of those 10nF, 50V capacitors that tend to develop leakage. A replacement restored perfect field scanning. **G.R.**

Bang and Olufsen 3386A

This set came out of standby but remained lifeless, though it tried to come on when I swung out the PSU/EHT panel. Resoldering connectors P22, P23 and P25 on board 46 (control PCB for the power supply) cured the problem. **G.R.**

Sony KVS2942U (AE2F chassis)

Multi PIP and photo mode are some of the features of this set. It would come on, but before the tube had warmed up the EHT etc. would cut out. The protect mode was in operation, and after some checks I established that vertical protection was the cause.

Disconnecting Q1504 (vertical protect transistor) enabled me to see what was going on. There was good field scanning at the top half of the screen, but the bottom half was a jumble of lines.

Scope checks indicated that the cause of the trouble was on the field sub-panel. The main item here is the CX02018Q chip IC2561, which is part digital and part analogue in operation. The field sawtooth, parabola etc. are all produced on this sub-panel. After checking the 5V and 12V supplies and the SDA and SCL lines I decided that the chip itself was faulty. A replacement restored perfect geometry control, with all the features (PIP etc.) working correctly. **G.R.**

Bush 2868NTX (11AK19 chassis)

No east-west correction was cured by replacing the BUK444 FET Q683, which was short-circuit source-to-gate. To get into the service mode with this chassis select the install menu then key in 4, 7, 2 and 5 via the remote-control handset. **C.J.G.**

JVC AV25F1EK (JX chassis)

This set was dead with a short-circuit line output transistor (Q502, BU508AFI). Once a replacement had been fitted there was a nasty arcing noise. A new line output transformer was required to complete a reliable repair. **C.J.G.**

Salora 24K77 (K chassis)

Even after replacing the usual electrolytics and diodes this set was reluctant to start on a cold morning. When the fault was present there was the usual whine from the start circuit but the 8V supply was low. Replacing D603 and C604 in the hybrid module failed to improve matters. As a last resort I removed the Ipsalo transformer, intending to try another one. The cause of the trouble was then revealed: dry-joints at pins 17 and 18 within the transformer. **C.J.G.**

Finlandia 66GZ7 (Salora M chassis)

This set appeared to be dead though the standby function worked. DB525 (BYV95C) was short-circuit. It couples the line output transistor to the LOPT. **C.J.G.**

Nokia 7176 Classic

This set was stuck in standby with the LED pulsing. There was HT but no EHT because the line drive was missing. Checks showed that it disappeared after VK22, which is a surface-mounted BC337 transistor. A replacement restored normal operation. **G.S.**

Nokia 7176 Classic

The sound from the left speaker was distorted and got worse until only noise was heard. The cause was a faulty BC858B surface-mounted transistor, VA81. A replacement restored clean sound. **G.S.**

Philips 21GR9752 (G90B chassis)

This set was dead but there had been a prior complaint about "awful teletext". Restoring the sound and picture didn't present much of a problem: I found that C2545 (1·5nF, 3kV) in the line output stage was short-circuit.

The teletext problem was a rather more difficult one to resolve. The characters were over-contrasted, crushed and without colour. On occasions there was red 'flaring' to the right of them. When the chassis was pulled back the fault disappeared!

After a while I found that the fault was both temperature and shock sensitive, the most sensitive area being on the main panel, between the teletext and Nicam panels. There's another daughter board, which is used mainly as a connector link for the scart socket, between them. It has print on both sides inserted into the main panel and is not mentioned in the parts list. I removed it with some difficulty, expecting to see breaks on its print edges. There weren't any, and after resoldering it back in position the fault had been cleared. It would obviously have been sufficient to have resoldered the dry-joints. **D.F.**

GoldStar CF28A50 (PC58A chassis)

The picture produced by this set looked as if someone had taken the top edge and torn it off diagonally. As the voltages in the field output stage seemed to be OK I replaced all the electrolytic capacitors in this area: some read low when checked with an ESR meter and some had a definite leak. This produced no noticeable improvement, but when the TDA8350Q field output chip IC351 was replaced the scanning returned to normal. I assume that the leaky electrolytics had damaged the IC. **P.G.**

Sony KVM19TU (BE1 chassis)

There was lack of width and an obvious EW fault, which is quite rare with this chassis. The µPC4558C pincushion-correction chip IC801 and the 2SD1761F driver transistor Q803 were checked and found to be OK. Voltage checks failed to show anything amiss, so some resistance checks were carried out. This revealed that L804 (2·7mH), which couples the EW drive to the diode modulator, was open-circuit. Removing it and resoldering its terminals, after cleaning the wire, cured the trouble. **P.G.**

Matsui 28M1 Mk III

This set was dead and, fortunately, there didn't seem to be any shorts in the power supply. Because of the low cost of these sets, anything catastrophic within the power supply usually means that the set is a right-off. Some quick checks showed that there was 340V at the mains bridge rectifier's reservoir capacitor and the collector of the chopper transistor but little else. A visual check then revealed what appeared to be a couple of 180kΩ, 1W start-up resistors. R621 was open-circuit. I replaced them both, using a high-voltage type. **P.G.**

Sony KVG2915U (AE2A/B chassis)

There was a strip of picture about two inches wide down the left-hand side of the screen. The situation was the same when text was selected. A look at the sandcastle pulses showed that they were incorrect, so a check was carried out on the line-frequency feedback pulses at pin 8 of the CXA1587S RGB processor chip IC304. They were very distorted. The feed is from pin 2 of connector CN0106, where they were present and correct. They pass next to R597, a 22kΩ surface-mounted resistor, which was found to be dry-jointed with the print slightly charred. I replaced it with a standard 1/8W type which I fitted on the print side of the PCB. This provided a complete cure.

The offending resistor is hidden by the plastic chassis frame. As this model has a built-in satellite receiver/decoder, a fair amount of dismantling is required to remove board A to get to the required section. **M.M.**

Sharp DV5103 (Euro DS1 chassis)

There was very low sound. The mute and volume control circuits worked, but the voltage at pin 4 (mute) of the TDA1905 audio output chip IC301 was very low. The cause was C321 (470µF, 10V), which decouples this pin. It had an 80Ω leak. C321 is not shown on the circuit diagram I had for this model, but a replacement restored normal sound. **M.M.**

Sony KV27XRTU (SX chassis)

There was a display of video at the bottom half of the screen, with just flyback lines in the top half. The channel number was also displayed in the bottom half. This was a red herring: careful observation showed that only the bottom part of the picture was being displayed.

Quickly earthing the CRT's blue cathode produced a full blue screen, so the field output stage was working correctly and the fault was being caused by a blanking fault. A check on the sandcastle pulse, which is produced by the TDA2579 timebase generator chip IC501, revealed a field-frequency squarewave sitting on top of the line-frequency pulses. I replaced the chip with a TDA2579A, which completely cured the fault. After setting up there was a good picture. **M.M.**

JVC C21M3EK

This model is based on an **Onwa** chassis. There had been the usual power supply problems, so an upgrade kit had been fitted. After that there was a picture but no sound. Further checks showed that there was no PWM output from the volume control pin of the microcontroller chip IC601. Normal sound was obtained once a replacement had been fitted. Note that the replacement is an upgrade, and several associated components have to be changed. Fortunately these are supplied with the chip. **M.M.**

Philips 29PT632A (GR2.4 chassis)

This set was dead but produced a ticking noise. It had come from another dealer who had been unable to clear the fault. Some quick checks showed that the BU2508 line output transistor was short-circuit. When a replacement had been fitted the set continued to tick and there was now arcing at the tube base. The line output transformer had obviously been removed, so I decided to extract it for test. During the course of this operation the earth pin for the focus/A1 control section fell out!

A new transformer was fitted but the set still ticked. As a check I disconnected the power supply control module's protection pin. The set then switched on and the screen lit up, revealing an EW correction fault. I next found that fuse protector 1534, which links the EW drive to the line output stage, was open-circuit. There was no further trouble once this item had been replaced. **M.M.**

Mitsubishi CT25AV1B (EE3 chassis)

This set was dead with a leaky line output transistor. When a replacement had been fitted it was clear that the TEA2031A EW correction chip was faulty (short-circuit). Once this had been replaced there appeared to be no further problems, so the set was boxed up and returned to the customer.

About two months later it failed again. This time the line output transistor was OK but there was no line drive. Q501, type JC501-R, was the culprit. It's used to invert the line drive pulses from the MC44031 colour decoder/timebase generator chip IC201. A 2SC1815 proved to be a suitable replacement **M.M.**

Sony KV21XRTU (SX chassis)

The symptoms were failure to tune in the output from the VCR and a bad BBC1 picture. The cure was to resolder the dry-joints at the IF transformers. **M.M.**

Philips 14GR1227 (GR1-AX chassis)

This set appeared to be dead but had tripped out because the HT was high. R3610 (330kΩ) in the series chopper FET's gate circuit had gone high in value. **M.M.**

Sharp 66ES05

This set was stuck in standby. I found that the bleed resistor R713 (680kΩ) was open-circuit. **B.McC.**

Alba CTV840 (Onwa chassis)

This portable's screen was covered with black vertical bars, with a picture visible in the background. I found that C420 (22µF, 160V) was open-circuit. It smooths the supply to the line driver and output stages. **G.L.**

Ferguson T51F (TX91 chassis)

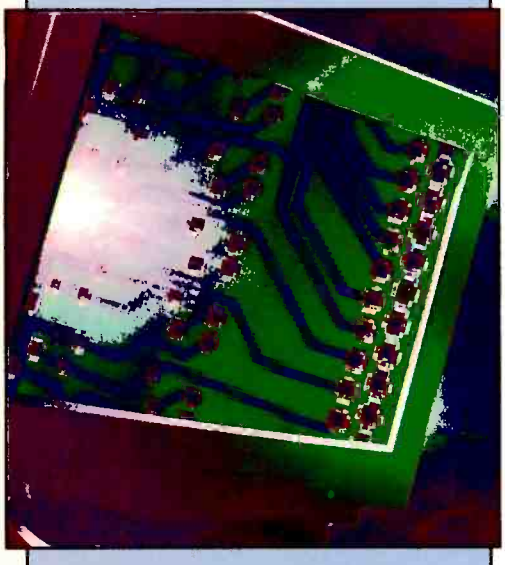
This set produced a snowy raster. Checks revealed that the surface-mounted transistor TH02 (BC858) was short-circuit collector-to-emitter. **G.L.**

Samsung CI3312

This 14in. portable was dead. A quick visual inspection didn't reveal any obvious faults and the mains plug and lead were in good condition. There was 360V at the mains bridge rectifier's reservoir capacitor but nothing at the collector of the line output transistor. The chopper power supply wasn't working, and checks in this area showed that C808 (10µF, 50V) was low at 8·5µF and C817 (100µF, 25V) low at only 10µF. Replacements restored normal operation. **J.H.**

Bush 2571NTX

We see quite a lot of these 25in. sets under various guises. I rather like the layout and build quality (despite the low price of the sets) but component specification leaves something to be desired. This one wouldn't come out of the standby mode. Some resistance checks on the secondary side of the power supply revealed that R826 (470kΩ, 0·25W) was open-circuit. A replacement was all that was needed. **J.H.**



MONITORS

Fault reports from Geoff Butcher E.T. Evans Gerry Mumford and Ian Field

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

Reports can be sent by post to:

Television, Fault Reports, Reed Business Information, Room L514, Quadrant House, The Quadrant, Sutton, Surrey SM2 5AS

faxed to: 020 8652 8111

or e-mailed to: tessa2@btinternet.com

Belinea 102020

This monitor had the usual symptoms of an HT short-circuit somewhere – the power supply was pulsing. A resistance check from the collector of the line output transistor to chassis produced a very low reading. The transistor itself was OK however. Diode D010, which feeds HT to the line output stage, was short-circuit. So was the MOSFET regulator transistor Q801. Once these two items had been replaced the monitor worked normally. **G.B.**

Acer 1555

It was not possible to obtain full picture width: with the width control set at maximum, there was a gap of about 3cm at each side of the screen. Tests revealed that the EHT was too high at about 27kV. This was the key to the cause: the line output stage tuning capacitor C314 (3·6nF) had fallen in value to just over 1nF. After fitting a replacement the width and EHT were normal. **G.B.**

Idek/Iiyama MF8617

There was no CRT display though the front-panel alphanumeric display showed the input signal characteristics correctly and there was normal EHT. I found that the tube's heater supply was missing because of bad joints at the regulator, IC204, which is mounted on the signals panel. The connections to the nearby 5V regulator IC205 didn't look too good either, so these also received attention. **G.B.**

ETC MD935

This little monochrome VGA monitor showed no signs of life though there was HT at the mains rectifier's reservoir capacitor. ESR checks on the other electrolytic capacitors in the power supply showed that C709, C710 and C717 were all in poor condition. Once they had been replaced a display appeared on the screen. After adjustment of the sub-brightness control the job was complete. **G.B.**

Digital PCXCV-GE

When the customer described the symptoms of this fault I thought he must have made a mistake. He said that when the monitor was switched off the power light went out but the CRT display was still present! It seemed impossible, but in this business the impossible regularly occurs.

The monitor uses a common type of two-pole, push-button mains switch, but only one pole is used to connect the mains power. The other pole is used to switch the LED indicator off. You've by now guessed it of course: the contacts used for the power were welded together while the contacts used for the low-power LED still worked. A new power switch was all that was required. **G.B.**

Hyundai HN4848

The customer had been experiencing intermittent loss of the display. It had finally disappeared completely, leaving a blank screen. Checks showed that the tube's first anode voltage was very low. Fortunately the cause was not in the line output transformer. There was a leaky decoupling capacitor, C415 (10nF, 1kV), on the CRT's base panel. When checked with an insulation tester it produced a reading of 2MΩ. **G.B.**

KFC CA6415DL

This monitor's power supply didn't start up. The cause was R509 (560kΩ) which was open-circuit. **G.B.**

Packard Bell A72

If you find that the power supply has failed, replace the following items: Q868, R808, R831, R867, D816 and the UC3842 chip.

As a precaution when checking the power supply, disconnect the feed to the line output transformer and fit a dummy load: I've had some monitors where the voltage control has been faulty, the HT rising to about 160V instead of the correct 75V – when this happens the line output transistor and transformer can both fail. **E.T.E.**

Packard Bell A720

If there is no operation with the chopper transformer hot, it either has shorted turns or there's a fault in the line output stage, i.e. the line output transformer and/or the line output transistor is short-circuit.

If the symptom is four vertical white lines superimposed on the screen, check the double rectifier D434. If this is open-circuit, R507 (24Ω), D498 and D499 will be destroyed. **E.T.E.**

Acer 7256C (AcerView 56C)

This monitor was dead. The power supply had shut down because the BU2508AF line output transistor Q310 was short-circuit along with the IRFS630 pre-regulator FET Q317 and the RGP10J diode D304. As a result the fusible resistor R323 (1Ω, 1W) and the wire-ended fuse FR702 (4A) were both open-circuit. The display was back once these items had been replaced. **G.M.**

Compaq V40, Model 613

This monitor was dead because of failure of the infamous DMV32A double-diode D413. Only someone else had got there first and removed it, presumably in the

hope that this would remove the short and enable the monitor to power up. As a result the 2SC4916 line output transistor Q403 had also gone short-circuit. There was a normal display once these items had been replaced.

The diode pair D413 performs the dual function of EW modulator and efficiency diode. **G.M.**

CTX DBL1596E

This monitor's menu buttons didn't work correctly – they carried out each other's commands. On investigation I found that the small PCB on which the switches are mounted was cracked. Fortunately only a few tracks had split, and repair was quite easy. This completely cured the problem. **G.M.**

ADI Microscan VD-695

If one of these monitors is totally dead, check D915 (HER305) on the secondary side of the power supply. It has a habit of going short-circuit. **G.M.**

Dell 828FI

This model is fitted with a **Samsung** chassis. It suffers from problems with the TDA9109 deflection processor chip IC302, which can be responsible for many thermally-related intermittent faults such as turning off when hot, refusal to turn on when hot, frame collapse when cold, non-linear frame scanning when hot, or intermittent buzzing.

In fact this device causes so many problems in these monitors that it's prudent to replace it as a matter of routine. Unfortunately a total strip-down is required to replace IC302, as it's situated too far towards the front to be accessible after removing the lower panel.

The chassis is also used in the **IBM** 6546-OBN/IBM G54. **G.M.**

Atari SM124

The problem with this **GoldStar** manufactured monitor was randomly intermittent inverse video. After numerous component checks and a mass resolder the fault appeared to have been cured, which seemed to be confirmed by a long soak test. Collection was going to take a couple of days to arrange and, as the Atari test machine wasn't required for anything else, I left the monitor running on soak test. Just a few hours before the customer was due to arrive to collect it, I looked over at the soak test rack and, to my dismay, saw that the fault had reappeared.

I phoned the customer who said he would call anyway because he had several more for me to do. How often does that happen – everything goes wrong and the customer isn't bothered?!

This unit is an old one, with a mains transformer instead of a chopper power supply. It has bundles of cables running everywhere. They are secured by a rather more than necessary number of cable ties. Because of this the cable layout had been 'strangled', with the result that the blue wire had been pulled out of connector P303 from VR302, the user contrast control. Since the blue wire is the earthy end of the potentiometer, the control had continued to make a reasonable pretence of operating. The randomly intermittent inverse video must have been caused by the dislocated connector insert shorting to some point at an arbitrary voltage. **I.F.**

Tatung/Lynwood M14W

This is a mono VGA monitor converted to Atari. The front badge said Tatung and the rear cover Lynwood. My guess is that the company converting these units had set up a production line, so the rear covers didn't necessarily go back on the unit from which they were taken!

The symptom was that the monitor went off after about an hour. The mains bridge rectifier's reservoir capacitor, in the chopper power supply, had begun to climb out of its solder joints. Usually the capacitor stays in place and the solder arcs away around the pins, producing an audible fizzing noise and picture disturbance until the power supply blows up. Fortunately, despite the symptom being less dramatic, the customer had put the unit in for repair before that happened. Most of the rest of the soldering was a little thin, with several areas that could just as easily have been responsible for the reported symptom. So the main PCB was given a full rework. **I.F.**

Iris XDM6050

The LED was on but there was no other sign of life. The cause was traced to the 2SD669A line driver transistor Q404 which was open-circuit base-to-emitter and short-circuit base-to-collector. Surprisingly Q405/6, a complemetary-symmetry emitter-follower pair that's DC coupled to the base of Q404, were undamaged. **I.F.**

Eltec JD156H

There was no job card and when I noticed that this monitor was made by the Jean Company Ltd. I decided to inspect the soldering before powering it up to see what fault was displayed. The line output transformer was not far short of falling out. About four of its pins had completely fractured solder joints with evidence of sparking. Half of the remainder were pulling through the PCB but had not yet severed all round. All the soldering had been applied thinly and had a dull grey, granular appearance.

In a case like this there is no alternative to removal of the main PCB followed by a lengthy session with the iron and fresh solder. Fortunately there was no other sign of damage when the refurbished monitor was reassembled and tested. **I.F.**

Sony CPD100SX

The symptom was a green screen. It was obvious that there was a fault in the cable – it's not uncommon with this range of models. Fortunately the break was near the plug rather than the cable mounting gland. The moulded plug body is soft enough to be carved away with a scalpel. Within the moulding the plug terminations are enclosed in metal screening.

Sometimes you are lucky and find that the plug is a solder-terminal type that can be cleaned up and reused once the cable has been trimmed back to eliminate the faulty section. Unfortunately this monitor's plug had crimp terminals and had to be replaced. Maplin supplies suitable plugs, but pin 9 is present and has to be snapped off to accommodate video cards with the pin 9 hole blocked. Diecast plug shells can be used to finish off the repair – you can either purchase them or salvage them from a scrap monitor.

The connections were as follows. Pins 1, 2 and 3 were, as usual, for the R, G and B signals; pins 4, 6, 7, 8, 10 and 11 all had short lengths of equipment wire that were commoned to the cable braid and other earth leads from the 'bundle'; pin 5 takes the brown wire, pin 12 green, pin 13 white, pin 14 yellow and pin 15 orange. **I.F.**

Apricot XJ44238

The picture was very dim and the frame scan was folded (kinked) in the middle. C517 (330μF, 25V) was the cause of the latter fault – it was bulged. This 15V supply is produced by D503 (FR104) and is scan-derived. It feeds the frame output chip amongst other things, including the CRT heater via a 68Ω, 1W resistor.

Once this fault had been dealt with the display was correct and less difficult to see, but was still dim and poorly focused. The poor focus was cured by replacing R516 (2·2MΩ) which was open-circuit. The brightness perked up nicely when the monitor had been run for a couple of hours with a full peak-white raster.

This mono VGA monitor uses a **Samsung** ML2611/4511/2571/4571 series chassis. **I.F.**

VCR CLINIC

Reports from
Eugene Trundle
Michael Dranfield
Graham Richards
Mike Leach
Keith Brown
C.M. Crook and
Geoff Butcher

We welcome fault reports from readers – payment for each fault is made shortly after publication. See page 298 for details of where and how to send reports.

Ferguson FV305HV

Playback was marred by wow on sound and random mistracking because of erratic tape speed. Some quick checks showed that the output voltages from the power supply section were all fluctuating, while a strange noise came from the little chopper transformer. The cause of the trouble was the mains bridge rectifier's reservoir capacitor CP010 (47µF, 385V), which was virtually open-circuit – it was betrayed by bulging and splitting at the top of the can. **E.T.**

Hitachi VTF550E

This machine had a horribly intermittent fault – spasmodic, random loss of functions. Sometimes the on/off key didn't work. Every connection at socket PG2701 on the front shuttle-switch panel was dry-jointed. **E.T.**

Daewoo V435

Two of these machines have come in with the same problem: intermittent or permanent failure to record in colour, with E-E and playback (from a known good recording) OK. In both cases the surface-mounted capacitor C402 (0·022µF) at pin 15 of IC301 was responsible – probably with a hairline crack. **E.T.**

Tatung TVR7121

There was a tape stuck inside this VCR, and reversion to standby took place within a few seconds of switch-on. It didn't take long to discover that the BA6209 loading-motor driver chip IC802 was faulty. But a replacement failed after about three seconds! The loading motor produced a reading of about 2Ω: when it was fed with 6V from a bench power supply smoke poured from it. A new loading motor and another BA6209 chip solved the problem. **E.T.**

Hitachi VTMX810E

There was intermittent loss of the E-E and playback sound via the RF output: a coarse buzz replaced it. The cause was poor soldering in the tuner/modulator unit, where a metal earthing 'finger' was dry-jointed to an earth land near the RF socket end of the unit. Incidentally this machine is made by **Philips**. **E.T.**

Tatung TVR2121

As these machines, of **Sharp** manufacture, age their capstan motors are beginning to fail. The most common symptom is limited operation of the loading motor, with a cassette stuck in the lowered cradle and the capstan, though free to rotate, not moving at all. **E.T.**

Daewoo V235

It's quite common for these machines to develop the 'dead' symptom, usually after a period without mains power. The usual cause of failure is C53 (1µF, 100V) in the power supply module. Recently however we've found that one or other of the two 390kΩ resistors R51 or R52 can be the cause. They go high in value. It's best to replace all three components while the module is dismantled. **E.T.**

Tatung TVR933V

If the problem is that the deck shuts down after running for three seconds in any mode, key 'play' then, quickly, 'pause'. So long as the tape remains laced up with the drum rotating, the likelihood is that R1013 is open-circuit. It feeds the LED section of the take-up reel sensor optocoupler. **E.T.**

Samsung SV615B

There was a horrible fault with this machine. The symptoms were random deck functions, typically cycling between play and rewind, while the front fluorescent panel erratically displayed symbols and parts of characters in a sort of slow-motion flickering sequence. The culprit was IC701, a 52-pin flatpack chip on the vertical front PCB. **E.T.**

Sony SLVE220

This machine is a **Sanyo** clone. The customer complained that when record was selected it would start off then power down to standby. Playback and fast forward/rewind were OK. An easy job, I thought: probably a faulty record tab switch. Not so however. The cause of the problem was eventually traced to circuit protector PR512 in the power supply. In the record mode it had 6V at one end and 5V at the other. A new one measured 0·1Ω when checked with a meter while the faulty one produced a reading of 0·4Ω. The CHS part number is 11929YE.

Note that when this item goes open-circuit the result is a dead machine with no clock display. **M.D.**

Thorn VR194LV

This **Sanyo** clone was dead. As there were no shorts on the secondary side of the power supply, attention was turned to the primary side. Cold checks revealed that D504, which rectifies the feedback winding supply, was leaky. A 1N4148 proved to be a suitable replacement. **M.D.**

Samsung SV213B

The job card said that this machine wouldn't accept a tape. I found that the 'cass in and tape start sensor' SP602, also the end sensor SP601, were badly soldered. Resoldering cured the fault. **G.R.**

Hitachi VTM620

The symptom with this machine was slow capstan speed. I tried inducing a 50Hz hum by touching the connections to the

audio/control head, but this had no effect on the capstan servo. The electrolytic coupling capacitor C610 (10µF, 16V) for the control track pulses from the tape had dried up. **G.R.**

Logik VR950

This robust old-timer suffered from severe power supply hum with playback, recording and E-E operation. The cause was C7 (2,200µF, 63V). When it was removed one of its legs fell off! **G.R.**

Sanyo VHR390E

The complaint was no functions, so I took a look at the power supply and found that a couple of capacitors, C5104 (1,000µF, 10V) and C5101 (1,000µF, 16V), had leaked quite badly. The board needed a good clean up before replacements could be fitted. After that the machine worked normally. **M.L.**

Mitsubishi HS5424E

This time-lapse machine's display was alight, but when a tape was inserted it immediately shut down. No other functions worked. I first wondered about the mechanism – it seemed as if the loading motor had seized or become very tight. But the cause of the trouble was in the power supply, where a 47µF, 50V capacitor was in poor condition. Because of leakage it was impossible to read the circuit reference number – it's mounted fairly near the mains transformer. A replacement restored normal operation. **M.L.**

Hitachi VTM610E

This machine would stop intermittently, spilling tape. I began to suspect microprocessor trouble, but luck helped when I noticed that the take-up spool had stopped turning. A replacement clutch cured the fault.

This machine is fitted with the **Philips** Turbo deck. **K.B.**

Toshiba V705B

This machine was dead with no display. The cause was obviously in the power supply, and turned out to be C808 (100µF, 25V). The correct type must be used, otherwise it will fail again. I found that out by experience! **K.B.**

Sanyo VHR335E

The complaint with this machine was slow and jumpy playback. The always 13V supply was found to be low at 10·5V. C5101 (1,000µF, 16V) had exploded, and the electrolyte had damaged D5114 (1SS244) which was open-circuit. As a result there was no –23V supply. Once these two components had been replaced the machine worked normally. **C.M.C.**

Panasonic NVF55B

It's surprising how many jobs turn out to involve two faults: the one the customer complained about and the one that wasn't mentioned. This job was no exception, the complaint being very poor recording and playback. Thorough video head cleaning cured this, but I then noticed that the tape counter didn't function in fast forward or rewind. The problem was caused by the half-load arm, which didn't operate at all because of a broken gear. Replacement restored normal service. **G.B.**

Goodmans VP2400PDC

"Loss of tracking" was the complaint. The symptoms didn't show up in the workshop for quite a while. Eventually the problem appeared, as described but with loss of sound at the same time. It seemed more likely to occur in the long-play mode.

Examination of the tape path revealed that the tape was riding up the capstan by about a millimetre or so. A replacement pinch wheel and arm cured the fault.

This machine is fitted with the **Philips** turbo deck. **G.B.**

JACK'S WORKSHOP

JACK ARMSTRONG

TV via an Apple Mac

I decided that it would be a good idea to add a TV viewing facility to my Apple Mac PC. So I bought a ProTV Stereo PCI card from MacWarehouse, which promised delivery within five days. It actually arrived the following day: that's the good news!

There were no instructions, but the brief information on the outside of the box said "MacOS 7.6 or higher". This means, in theory, that it will work with an Apple Mac PC which is using the 7.6 or a later operating system (OS). Good. My beige Apple Mac G3/266 was using the MacOS 8.5.1.

I inserted the accompanying CD and looked for some sort of software or read-me file. There were several folders, one of which was labelled "ProTV series". So far so good. The folder contained an installer and a manual in PDF format. I decided to read the manual first. But it doesn't use the 'book-mark' (index) system, so finding the right page isn't easy – the page numbers don't correspond with those in the Contents list.

The first thing I noticed was "MacOS 8.6 or higher". That's not what it says on the box, and immediately gave me a problem as my G3 had an earlier version of the Mac OS. I decided to do it properly however, and spent the next three hours downloading the free updater from Apple's web site.

Having updated my OS and got everything working again, I plugged the ProTV Stereo PCI card into a spare PCI slot alongside my Belkin USB (Universal Series Bus) card and powered up the G3.

The ProTV software installation took only a few seconds, then I was ready to reboot one more time. This was exciting! As soon as the G3 had rebooted, I double-clicked on the ProTV 2.5.3 icon to launch it.

Result? An error message appeared – "The ProTV currently used by another application. You cannot use the display". Darn it. I was missing *Star Trek Voyager*.

There was no obvious reason for this setback. I made sure that Virtual Memory was off, and disabled all extensions that weren't needed. This made no difference. So I removed my Belkin USB PCI card and its driver and extension. There was still the same error message.

I wondered whether the ProTV card would work in my PowerMac 9600/200. So I took it out of the G3 (observing the usual static-electricity handling precautions) and inserted it in the 9600, which is running with OS 9.0. Once the software had been installed it worked straight away.

I went to plug in the TV aerial, but the plug wouldn't fit. It appeared to be an RCA socket. So I borrowed a 'phono' plug, fitted it in place of the TV aerial plug, and inserted it. I now had a picture. Yay!

But it was very poor, with bad interference lines. I traced the cause of this problem to the proximity of the video card in the adjacent PCI slot. When I moved the ProTV card to another slot, leaving a 3in. gap between it and the video card, there was a much better picture. But there was still interference with weak signals. This could be largely eliminated by placing a hand between the two PCI cards. So a metal shield wouldn't be out of place here.

I played with the settings and tuned in all available channels. Every one had to be fine tuned, because the AFC locked the signal with a slight error – the pictures lacked colour.

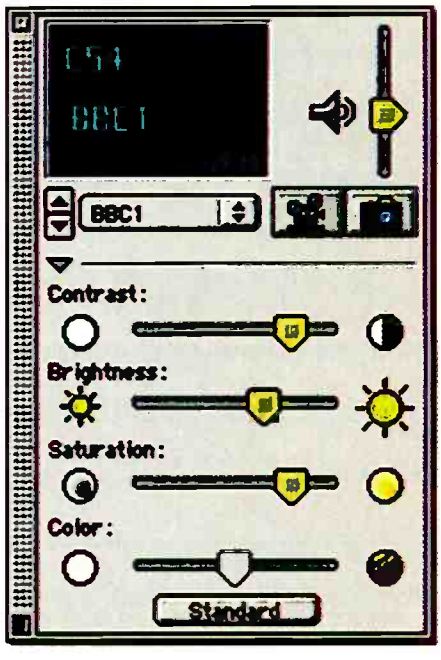
When I increased the picture size from 'normal' to 'largest' however the previous picture frame remained on top of the new picture as a very evident ghost image that nothing would shift. I tried simply dragging the lower right corner of the picture to increase its size. This worked up to a specific size, beyond which the ghost image would remain.

Another strange effect was the streaks, flashes or 'sparklies' that appeared on the image whenever there was rapid movement – rather like a satellite TV picture where the signal level is just at the tuner threshold, or a VCR with worn heads or poor tracking.

A minor annoyance was that every UK channel tuned in at the UHF channel number *below* the one normally associated with that frequency.

Experiments

As an experiment, I selected Virtual Memory 'on' and rebooted the 9600. The ProTV 2.5.3 icon then produced the same



The TV control panel window.

error message as the G3 had ("The ProTV currently used by another application. You cannot use the display"). I turned off Virtual Memory and rebooted. The icon then refused to operate, producing the error number 11 (hardware exception error, whatever that means). When I rebooted the same thing happened. So I wiggled the ProTV card very gently in its socket and rebooted. This time it worked correctly again.

Back to the G3 Mac. If the ProTV card won't work with OS 8.6, how about using OS 9.0 as in the 9600? I spent the next hour installing OS 9.0 and then setting it up. I reinstalled ProTV 2.5.3, and got the same error message as previously – even though Virtual Memory was 'off'.

Only one more thing to do: a 'clean' installation of OS 9.0, which took another half hour to complete. I'm just glad I wasn't using Windows! When reinstalled, ProTV 2.5.3 produced the same error message. Yes, I did try trashing the ProTV preferences file – to no effect.

Technical support

A few more points. ProTV 2.5.3 contains Formac web site links that are not 'clickable' and don't work anyway. One of them is http://www.formac.com/english/support/updates/html

The main web site still exists, but this file doesn't. Anyone who has read the *Be Found* booklet at http://www.satcure.com will understand that there is *no* excuse for deleting a web site file. It should be left in place, with a forwarding link to the new page. In this case it appears to be http://www.formac.com/2k/support/software_support.html

I also tried http://www.formac.co.uk. But there's no technical support page or information about upgrades or problem solving, so you are left with the option of sending an e-mail or phoning.

I tried an e-mail which, two days later, produced the suggestion that I should remove the 'real audio' codec files from the system extensions folder. I did, but this had no effect.

I had posted a message in a News Group (like a bulletin board) however, and received an e-mail from a helpful chap in Germany. He told me that Formac had admitted that there was a problem with the G3 Apple Mac, and had provided a software update at its US web site. I found this after a search, but it's a 'beta' (test) version. I downloaded and installed it. After that I not only got the previously mentioned error message but was also informed that the software was out of date.

Next day I phoned the Formac UK technical help line. Amazingly, the ProTV software began to work when I did so. It must have needed a good night's rest!

The conclusion from all this is that it will work in a G3 Apple Mac (and apparently in the G4 and iMac too), but the software is still rather 'buggy'. I didn't pay £96 for the privilege of being a beta tester.

It *is* beta software, with occasional system crashes, a disappearing tuner set-up menu, and poor-quality audio with crackling and noticeable lip-sync delay through the computer's own sound board (it sounds better direct from the ProTV board, though with insufficient de-emphasis).

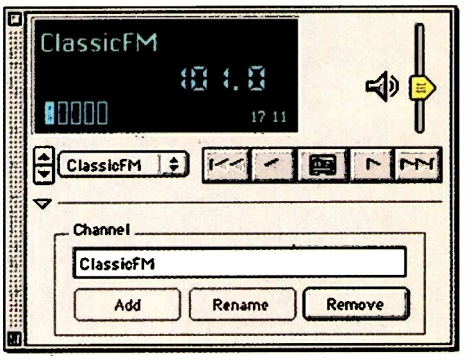
What the card does

Time, then, to look at what the ProTV card can do. It provides an on-screen picture that you can watch while working on other applications. Although the picture will freeze, briefly, with processor-intensive operations, the audio is unaffected. The picture can be any size in any screen position and the quality is excellent. I found that the colour control remains 'greyed out' and unavailable. Since there's also a saturation control, I assume that the colour control is actually a hue control and becomes active when an NTSC signal is detected. This is guesswork however – there is no description of the operation of the controls in the PDF manual.

The video can come from the ProTV tuner module (fed from a TV aerial, satellite or cable TV signal), from a composite video input or an S-VHS input. It can also come from an internal source such as a CD (and probably a DVD, though my G3 doesn't have this capability). The sound can come from the ProTV tuner module or from any external source of suitable impedance. ProTV works with PAL, NTSC and Secam signals, so no problem here. It doesn't however appear to be able to handle Nicam stereo or, despite its name, any stereo.

There's also an FM aerial input, and you can select a software radio tuner instead of the TV tuner. This works well but, disappointingly, the output is mono not stereo. The PDF manual doesn't mention stereo except in the title.

The ProTV software enables you to save screenshots on your hard drive. You simply click on an icon to record a movie of what's happening on screen or simply take a snapshot. Unfortunately each time you do this it overwrites the previous file – unless you alter the preferences, which I found under the 'tuner setting' rather than the 'file' menu. The recording and snapshot recording facilities work well, though the frame rate on the display slows down to



The FM radio control panel window.

about three per second. This makes it tedious to watch and record simultaneously. It's related to the speed of the Mac processor however, not the ProTV card or software. In fact, considering that my G3 has only a 266MHz processor, the performance was exceptionally good.

The record facility can be set to take time-stepped frames from a video input which could, for example, be a security camera. I wasn't able to test this however since every time I clicked on the 'time' menu tab (which, curiously, comes under 'tuner settings') the program crashed and, with the still-poor memory management of any Apple Mac that uses OS 9 or earlier, crashed the Mac as well.

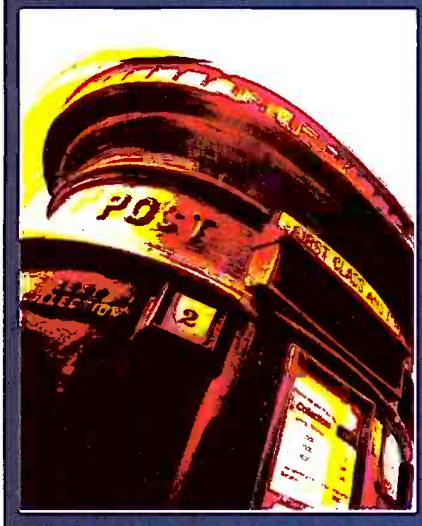
In conclusion

It's not easy to test something that you bought believing it to have finalised software only to find that you have to use beta software to get it to work at all. If all the bugs are resolved, the ProTV PCI card could be recommended to any Apple Mac user. Since Macs tend to be used a lot in publishing and video making, there should be a good market for the product. With the price of Macs decreasing and the processing speed on the increase, I can see a use for the time-lapse facility too: perhaps for security applications, where high-quality pictures could be stored on disc, or for the 'web-cam' systems whose popularity is increasing.

But I wouldn't recommend buying a card until the ProTV Stereo system works properly. The audio problems worry me, because I'm not sure that a mere software change can provide the de-emphasis required or the stereo sound which, seemingly, ought to be there – but isn't on mine.

You can get the latest news on this at http://www.satcure.com

A selection of recorded snapshots is displayed on the opposite page (top left). ■



LETTERS

Send letters to "Television", Room L514, Quadrant House, The Quadrant, Sutton, Surrey, SM2 5AS

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.

Digital CATV

I agree with Edward Dicker (Letters, January): if I could choose the channels I want there would be quite a few I would not select in the packages to which I subscribe. There are many that we never watch but have to have because of certain documentary channels we require.

My gripe with Telewest is that the company's advertisements say the signal is brought into your home by fibre-optic cable. Not here it isn't! And the e-mail service, which is free of charge, is very unreliable: I can honestly say that it has been usable only about 20-30 per cent of the time to date (early January). There have been times when Active Digital was not usable at all, and there's no Digital Text as yet. Another gripe is that the commands are very slow and sluggish, in comparison with Sky anyway.

I wonder whether there are similar problems with cable providers in other parts of the country? I have written to Telewest a number of times. All you get is that its engineers are working on the problem. But the problems were there from the start: I've been with Telewest since October.

David Smith,
Leigh, Lancs.

Thomson ICC17 chassis

Has anyone a solution to the problem of striations with the Thomson ICC17 chassis? They appear from the top to the bottom of the picture as faint dark bars at the left-hand side, and are more noticeable on darker scenes. The cause is presumably ringing in the line output stage. Many of our customers have queried or complained about the lines.

On the early version of the chassis there appears to be space for fitting extra components in this area. In later versions the space has been done away with. Can anyone clarify what the components might have been and their values?

Vincent Power,
London W12.

Rewinds

After being made redundant back in 1993, having been in the trade since 1950, I decided to start repairing old radios. My incoming work rack has never been empty since – there are often thirty or more sets waiting attention.

I charge by the decade, starting at £30 for an early transistor radio, through radiograms such as the Decca SRG700 for £100, to £100-£200 for comprehensive repair of a Thirties radio receiver. Many customers travel long distances to make a personal visit, or send radio sets via carrier. All gladly pay to find someone able to undertake the work, and I have many testimonials.

It's necessary to carry out modifications to many sets to comply with current safety regulations.

For over forty years I sent mains transformers to the Majestic Transformer Co. of Poole, Dorset for rewinding, but the company has discontinued this service because of the retirement of a long-term employee. It will still manufacture transformers to your own specification however – these are much cheaper than rewinds.

Does anyone know of a reliable, economic rewinder anywhere in the country? One that can rewind mains transformers, loudspeaker field coils and audio output transformers. To preserve the original appearance of a chassis, as desired by my collector customers, I prefer to drop in an identical replacement that calls for no modifications.

All letters will be answered.

Bruce Adams,
53 Red Leasowes Road,
Hasbury, Halesowen,
W. Midlands B63 4SE.
0121 550 0019.

Digital effects

Your leader in the December 2000 issue mentioned the way in which digital TV broadcasters can increase compression until the pips squeak. Normal PAL is also compromised by digital feeds. Or, if a programme is produced digitally, especially with BBC trailers, the picture breaks up at the point of change from quiet to loud. This happens regularly. What's going on there?

Keith Scott
(by e-mail).

Poor TV

Like Stephen Cowie (Letters, December) I find current trends in TV a disgrace. During my nineteen years as a Ferguson TLO the accent was always on picture quality – geometry, convergence, colour balance and stability. The vast majority of dealers in my region prided themselves on the pictures produced by the sets they had on display. Six years ago I drew my last Ferguson salary cheque. Only six years, but the situation Stephen Cowie describes has since then become all too prevalent.

I think it's part of a general malaise that has hit our and other industries. Part of the problem is lack of sales personnel training – the extensive use of part-timers and Saturday staff – and the belief that all you have to do to sell is to say how technically advanced and marvellous the product is.

The decline in programme standards, both technical and aesthetic, is possibly part of the same general problem. Many digital TV services are derived from 'playout centres', fully automated broadcasting stations that are unattended except for the need to have someone to change cassettes, discs and operational software from time to time.

TV programmes once had a sense of occasion about them. Smartly-dressed presenters appeared, and voiceovers were generally used only during a vision breakdown. It was impressed on all those engaged in TV, from the broadcasting studio through to sales outlets and repair shops, that what we handled was going into the homes of decent people. Now, especially during the daytime, there is endless trivia, much of it unpleasant. I have always believed that a tremendous opportunity has been missed with TV: the

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opportunity to educate, inform, amuse, stimulate and unite people.
Graeme Young,
Ravenshead, Nottingham.

Qualifications and registration

Following various letters in recent issues I would like to offer some thoughts on qualifications and registration. I'm an auto technician with all the usual C&G, NVQ etc. qualifications, and use the knowledge I've gained over 22 years in this industry to repair mostly anything that requires a packet of sparks to function. During the past six years, reading *Television*, I've carried out simple repairs to brown goods items that professionally-qualified engineers seem to have been unable to deal with. The fact that a person is qualified and/or registered doesn't guarantee that he can fix things. Two factors back up this view. First, most of the brown goods items that come my way have a cute little label on them saying Mr Jones, Brown or whoever. This tells me that the item has been to a professional establishment which has been unable to repair it. Secondly, some qualifications are questionable. I was once in the Guild of Master Craftsmen. To gain this registered status you pay your subs and provide them with the names of three satisfied customers of your choice.

On the other hand I know people who have no formal qualifications to do anything but have an inherent ability to diagnose and repair faults.

I think most people take their goods to a local repairer who has built up a good reputation, in particular with good references from other local repairers. It's a confidence thing, as in the motor trade: you know the rogue garages and, regardless of how flash they look, wouldn't take your car there.

I have a fear of so much registration and legislation being introduced that DIY repairs of all sorts would become impossible. Imagine having a puncture and not being able to change the wheel yourself, instead having to call out a qualified road-side repairer to do it; or say for insurance purposes having to call out a CORGI-registered chap to change the bottle in your portable gas heater. Such things are not too likely, but not impossible. ■
Jason Boylin,
Leominster,
Herefordshire.

Help wanted

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.

Wanted: Chassis for a Philips 32PW9631/05 widescreen set. In particular the power supply and large-signal panels, maybe others as well. A complete scrap chassis or set considered as long as the PCBs are intact (slight faults OK, but no liquid or lightning damage or cracks). Phone Julian on 0958 559 970.

Wanted: VIF board (part no. 8-983-149-75) and S board (part no. 8-983-149-35) for the Sony CTV Model KV1320UB. This is a restoration project. Seth Butt, ICTV (Southern) Ltd., Unit 16, Fairway Business Centre, Airport Service Road, Portsmouth PO1 5DY or e-mail racing snake@bushinternet.com

Wanted: Circuit diagram (photocopy OK) for the Sony CPD15F23 colour computer display (Gateway). All expenses paid. R.H. Avery, Flat 54, Hereford Court, Hereford Street, Brighton, E. Sussex BN2 1LF. 01273 623 409.

Wanted: Manual collector requires issues of *Ferguson Feedback* and any Toshiba, Trader and ERT service sheets, also any spare service manuals. Phone Peter Redpath on 0239 225 3595 or e-mail peter @ pcbase.freeserve.co.uk

Wanted: Front cabinet panel for the Ferguson 3V23 VCR or equivalent (JVC 7700E, Baird/DER 8924). Also a remote control unit for this machine. Both items must be in mint condition. A.C. Griffin, 89 The Ridgeway, Sedgley, W. Midlands DY3 3UN. Phone 01902 880 063.

For sale: Ex-engineer wishes to dispose of two four-drawer and one two-drawer filing cabinets full of TV, video, audio and camera service manuals, all over four years old. Offers over £100 to Alan Knight, phone 01707 656 881 (Potters Bar, Herts).

Wanted: Manual for the HP 401B vacuum tube voltmeter, circuit diagram for the Philips PM5519 pattern generator and a front-facing PCB for the Amstrad VCR6000. R. Butson, 52 Ridgeway, Lisvane, Cardiff CF14 0RS. Phone 0292 076 1265.

For disposal: Offers/exchanges please for the following: B&O tuner, Model 1011, flat black and white; B&O music centre Model 3600; Carlton 8-track car stereo-radio, still in box; Sony music centre Model HP239A; Sony music system Model FH10W. Phone 01341 423 447 (Gwynedd).

Wanted/for disposal: Require LOPT (part no. 334B08301) for the Mitsubishi 37in. Model CK3751TX (same LOPT is in Model CT3701TX). Purchase of a complete set with faulty CRT considered. Have for disposal a Mitsubishi 50in. Model VS500 projection CTV and Model VS451 45in. projection CTV, both working. John Howes, 146 London Road, Southborough, Tunbridge Wells, Kent TN4 0PJ. Phone 01892 537 288.

Wanted/for disposal: Require circuit diagram/service manual for the Genexa CTV10/Goodmans Compact 110 10in. mains/battery CTV set and a circuit diagram for the Granada Model C66KZ6/F (Nokia chassis?). Have for disposal approximately 80 BSB receivers, mostly Philips. Has anyone a use for them? No reasonable offer refused! Colin Pearse, 54 Nutfield Road, Merstham, Surrey RH1 3EP. Phone 01737 643 767 or 01737 217 507.

For sale: Complete set of Newnes *Radio and Television Servicing* books from Vol. 1 (pre-1953 models) to 1986-87, complete with index book. There are 37 volumes, mostly in as-new condition with dust jackets. They weigh about 25kg and occupy 1·5m of shelf space! Offers to George Sanders on 01332 571 382 (Derby).

Wanted: Circuit diagrams (photocopies OK) for the JVC AS3 stereo integrated amplifier and Luxman Model 507 amplifier. H.G. Huang, 59 Tylney Road, Forest Gate, London E7 0LY.

Wanted: Manual or circuit diagram (particularly the power supply) for the Hewlett-Packard Vectra PC Model Q5/165, also to carry out repair two 680µF (or thereabouts) 200V radial electrolytic capacitors. D.N. Wellings, Nordheide, Shurton, Stogursey, Bridgewater TA5 1QE. Phone 01278 732 099.

Wanted: PCA84C840P/008 42-pin IC for the 14in. Sony Model KVM1420U, circuit reference IC001. Phone Alek Hobbs on 0121 550 3120 (9-5pm) or 07980 424 996.

Wanted: Remote-control unit and, if possible, user manual for the Mitsubishi HSB11 VCR. Phone Mike Goodall on 01353 860 646.

For sale: 32 volumes of Newnes *Radio and Television Servicing* from the first (circa 1950) to volume 1984-85. Best offer considered. Phone Richard Bogazzi on 020 8658 3838 (office) or 020 8776 0476 (home), Croydon, or e-mail richard@kemo.com

Wanted/for sale: I collect, repair and restore vintage radio and CTV equipment, and would like to hear from any readers who have old sets or memorabilia for sale or disposal. I am also happy to help with repair or spares for vintage equipment. Current workshop reorganisation means that I have to clear out loads of bits to make more space. I have for sale part-exchanged CTVs, VCRs and audio equipment of all types and sizes, some working some not. Also general spares, bits of test gear, benches, trolleys etc., all very cheap. Enquiries for list or information welcome. Phone Steve Farley on 0121 382 1312 (Birmingham).

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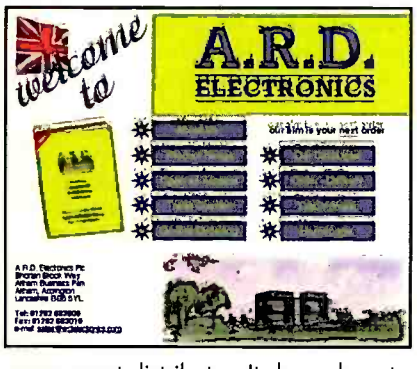

component distributor. It shows how to: open an account (credit or cash), obtain a trade catalogue and place orders (both online and direct)

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/info/reception

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 caravaners and boating enthusiasts.

Doknet Service manuals
http://www.doknet.com

This Dutch site says it has 350,000 service manuals and 1 million service parts.
You interogate the data base by filling out an order form, with the "request" box ticked, and then wait for an email to arrive back on your computer. However,
an on-line index would be useful and maybe on-line downloading of the manuals.

Dönberg Electronics
http://www.donberg.ie

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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MB21
http://www.mb21.co.uk/index.html

Another enjoyable site with a "telenostalgia" section about the technical aspects of television. There's also a section on transmitter sites, teletext "then and now", and a "rough guide" to widescreen television

Matrix Multimedia Ltd
http://www.matrixmultimedia.co.uk

Matrix Multimedia publishes a number of highly interactive CD ROMs for learning electronics including: Complete electronics course, Analogue

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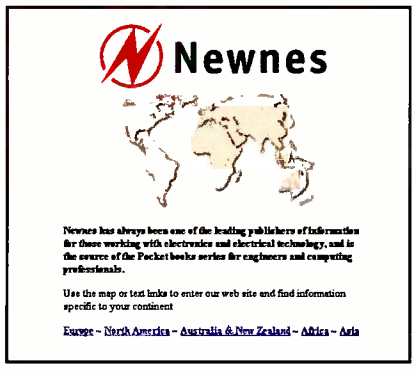
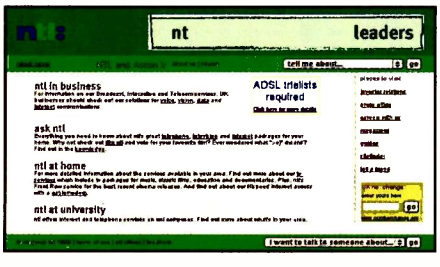


Check out this site for the latest book titles on TV & Video Servicing and Technology and their famous Pocket Book series. You can shop on-line and also register for an Email service to tell you when relevant new titles are published.

NTL

http://www.ntl.co.uk

Go to this site for information on NTL's Broadcast, Interactive and Telecom services, including packages for home



area by area. There's also a useful transmitter site map and database, giving locations and information. The site also contains useful documents, which describe digital TV, interactive TV and digital Radio. There's also a useful contacts list.

Mauritron Technical Services

http://www.mauritron.co.uk

The UK's leading independent supplier of Service Manuals and Operating Guides from valve to video. Also available on CD Rom or download direct from the internet.

PC Universe

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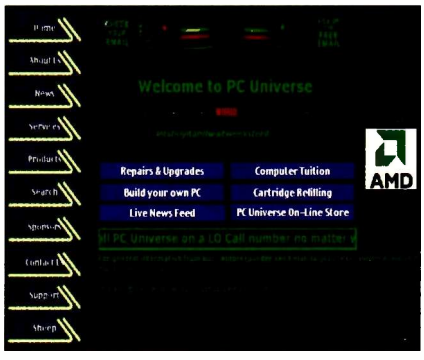

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Sky digital repairs

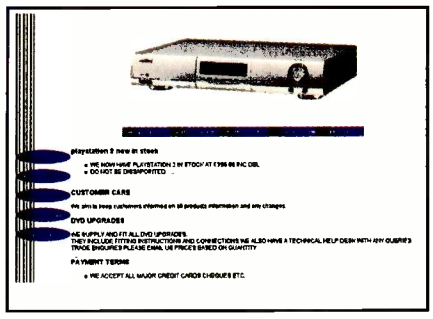
http://www.horizonsatellites.co.uk

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 multiregion dvd players to trade and public, also tv, videos, hifi and playstation 2. We design our own upgrades on dvd and we sell all spare parts. All makes and most models stocked.

Timecast

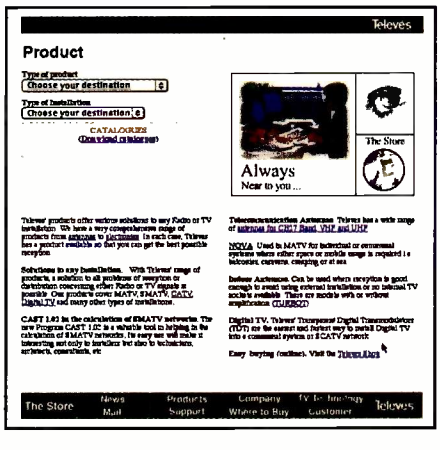
http://realguide.real.com/stations/

This site contains listings of TV and Radio stations available on the Internet. There are also some fixed cameras positioning in locations ranging from game park, high streets and people's houses - not exactly captive viewing! But an interesting thought - are PCs and TVs going to eventually "get married"?

Televes

http://www.televes.com/ingles/ingles.htm

Televes website was launched as an easier way to keep in contact with our World-wide Network of Subsidiaries and Clients. This site is constantly updated with useful information/news plus you can download info on our range: TV Aerials & accessories, Domestic and Distribution amplifiers, Systems Equipment for DTT and Analogue TV, Meters and much more.



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

UK Electrical Direct

http://www.uked.com

For a comprehensive on-line directory, buyers guide and resource locator for the UK Electrical Industry look at this site. Many of the companies listed have links to their own web sites, making this a one-stop shop for a huge amount of information.

UK Mailing List Group

http://www.egroups.com/list/uktvrepair

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 "spamming" - 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 on-line via this site's shopping facility.

Reed Connect

http://www.reedconnect.net/

Another free internet access site, this time from Reed Business Information. However the site possesses a useful UK People and Business Finder, with an e-mail search. There's also business news and local information, and some good links to directory sites.

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".

Put your web address in front of 21 000 electronics enthusiasts and experts.
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This gives other readers the opportunity to look up your company's name, to find your web address and to browse the magazine page to find new sites.

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or fax on 020 8652 3981.
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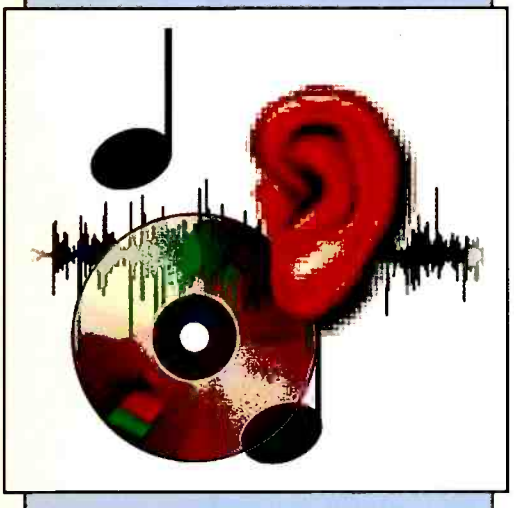
Company name		Web address		



AUDIO FAULTS

Reports from
Russell J. Fletcher
Nick Beer
I. Levy, LCGI and
Michael Maurice

We welcome fault reports from readers – payment for each fault is made shortly after publication. See page 298 for details of where and how to send reports.

Telefunken M12 professional deck

We've had two of these two-track open-reel decks in recently. No record was the problem with one of them. No bias oscillation could be observed, and the power supply module seemed to be running hot. When the bias-oscillator board was removed from its slot the power supply worked normally. There was a short-circuit 4·7µF, 35V tantalum capacitor on the bias-oscillator board.

No spooling was the complaint with the other one. On this occasion a hunch proved to be correct. Normal operation was restored by stripping and cleaning the function switches. The low-/high-speed switch responded to the same treatment. **R.J.F.**

Nakamichi 481 cassette deck

These high-quality decks seldom cause trouble. The problem with this one was that although it went through the motions it wouldn't record. Always check the obvious things first – the heads were dirty! Mind you playback seemed to be OK, and the contamination wasn't obvious. **R.J.F.**

Alesis Quadraverb effects processor

One half of the front-panel dot-matrix display can become 'blacked' out. The fault is in the drive circuitry, which is all embedded in the display. It's therefore necessary to replace the complete module. The cost is about £48 inclusive from the agent. **R.J.F.**

Audio Innovations Series 300 amplifier

The customer complained that there was distorted sound from one channel of this valve power amplifier. We've had the same complaint with other amplifiers from this manufacturer. The cause is the relevant output transformer. **R.J.F.**

Nakamichi 580 cassette deck

These decks are now coming in more often because of an eject-mechanism fault. The eject button is coupled to the actuator via a cable. What happens is that a crack develops in the nylon moulding where the cable is coupled to the actuator mechanism. Unfortunately this moulding is part of the subchassis, which must be replaced as a whole. So it's an expensive repair. **R.J.F.**

Sony MZR50 and other MD recorders

This note applies to portable MD recorders generally. Something that seems to afflict them is damage to the magnetic audio recording head, which is perhaps not surprising in view of the physical conditions. The usual symptom is that while the unit appears to record all right in terms of time etc. there's no playback audio, because the head was not over the heated part of the disc or not sufficiently close to the disc. In my experience the MRZ50 suffers most from this problem. **N.B.**

Panasonic SCPM30MD

This is an all-in-one mini hi-fi system, including MD which was the faulty item. It would intermittently read the TOC but then not play. There was little difference to the symptom with either PM (premastered) or recordable discs. It's incredibly difficult to dismantle the unit to get to the MD section, which is at the bottom and is encased in a metal frame. It's also very difficult to run the equipment when dismantled. Little diagnosis was employed, more instinct. A replacement optical unit cured the problem. **N.B.**

Sony MZR90

This 'fag-packet' personal MD recorder intermittently failed to record audio. Less often it would fail to read the TOC, though it always seemed to work with PM discs. These are classic faulty laser symptoms, and a replacement cured the trouble. Noteworthy perhaps because the unit was relatively new.

Despite its minuscule size, the unit is a joy to work on. I've worked on many Sony personal MD players and have found them all remarkably well designed (by contemporary standards) in terms of dismantling and servicing ease. **N.B.**

Peavey UMA150T amplifier

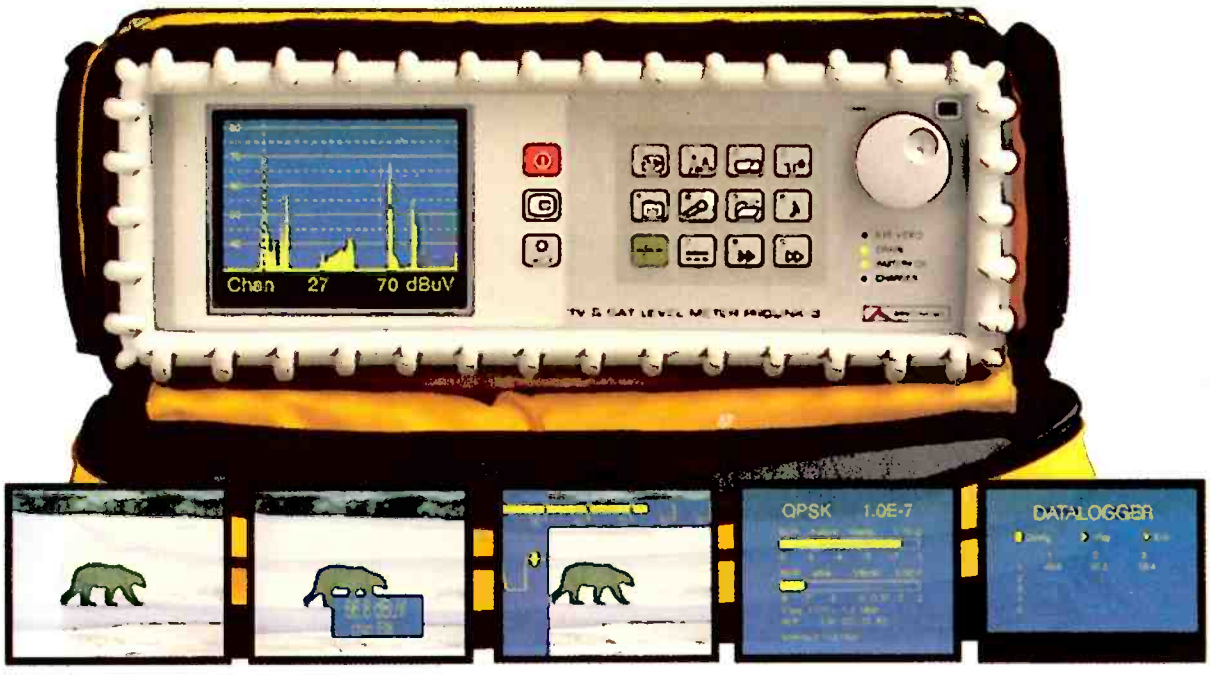
An output with buzzing, or no output, is usually caused by failure of the negative rail's reservoir capacitor (4,700µF, 55V) – it goes open-circuit. I've had ten of these amplifiers with the same fault during the past few months. **I.L.**

JVC C-D5T

I was asked to repair this system which "wouldn't play CDs because of the building work". When I plugged it in both fuses blew. I soon found that Q552 was short-circuit. A replacement, along with D551, D554 and two fuses restored the system to life. Cleaning out the CD section's optical block completed the repair. **M.M.**

Technics SU-X911

The display produced odd characters and there was no response from the selector switches. A new microcontroller chip, IC601, restored normal operation. **M.M.**



Signal analyser test report

Hugh Cocks reviews the Promax Prolink 3 spectrum analyser and signal-strength meter

After many years of hard service our main satellite alignment meter was beginning to show signs of wear. A replacement was therefore required. In this part of the world (the Algarve, Portugal) we are called upon to install systems for reception from a variety of satellites, so a quick and easy way of ensuring that the dish is pointing at the right one is essential. This has become more important with the decreasing number of analogue transmissions that previously provided quick satellite confirmation.

Installing and troubleshooting satellite IF distribution systems is also an important part of our business. For this purpose an easy-to-read on-screen numeric readout of signal strengths for individual frequencies/ channels is required. It's also helpful to be able to display cable losses.

Terrestrial TV mustn't be forgotten. DTT transmissions have yet to arrive here, but something that provides easy aerial alignment is an important requirement.

We decided to buy the Spanish-made Promax Prolink 3 meter. It meets the above requirements and allows for future upgrades. Table 1 shows the basic specification. The unit comes with a carry bag and has rubber shock-proof fixings at each end to minimise possible damage in the field.

Operation

There's just one knob plus a

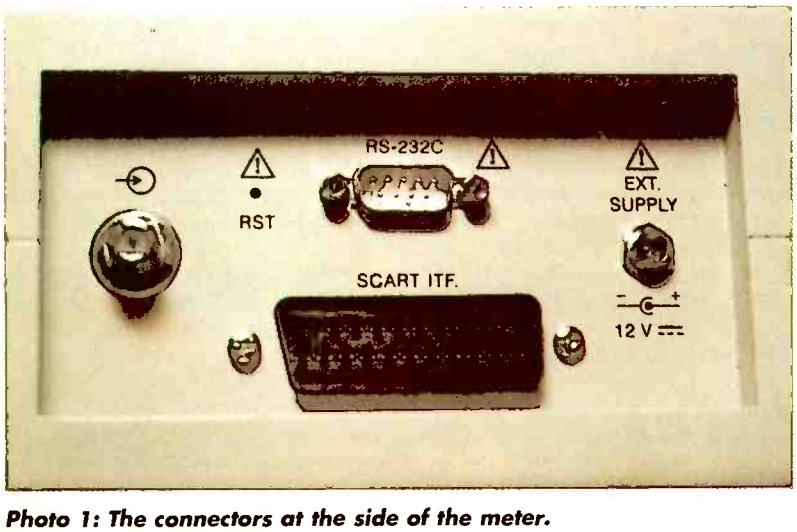


Photo 1: The connectors at the side of the meter.

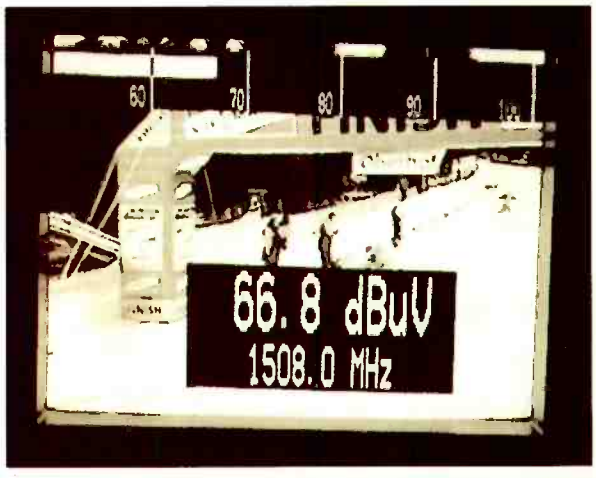


Photo 2: Analogue reception (Eurosport) from Astra at 19·2°E.

number of buttons. These provide easy access to all functions once you have learnt how to drive the meter. The buttons are all 'soft' types, beneath a durable plastic covering. This helps to minimise the button problems that can occur with a unit of this type. Storing and recalling the most commonly used channels is easy.

The unit has an audible tone for dish alignment: the pitch varies with signal strength. But we use it in conjunction with a simple satellite peaker/squawker in line with the coaxial cable to the LNB, as this gives a more subtle pitch variation. LNB skew setting is an easy process in the spectrum-analyser mode since this minimises opposite-polarisation carriers.

My main gripe is with the position of the aerial input socket at the side of the unit, adjacent to the scart socket (see Photo 1). This makes it hard to reach when the unit is in the carrying bag. The socket is used for all bands and is a recessed F plug into which you screw either an F back-to-back socket or a Belling Lee-to-F socket depending on the aerial lead connector. With this sensible arrangement there is minimum damage to the unit's socket: if the adaptor wears it can be unscrewed and replaced.

Alternative adaptors are provided, a coaxial-to-F socket or a BNC-to-F socket. These screw into the recessed plug directly. But I found it difficult to unscrew the

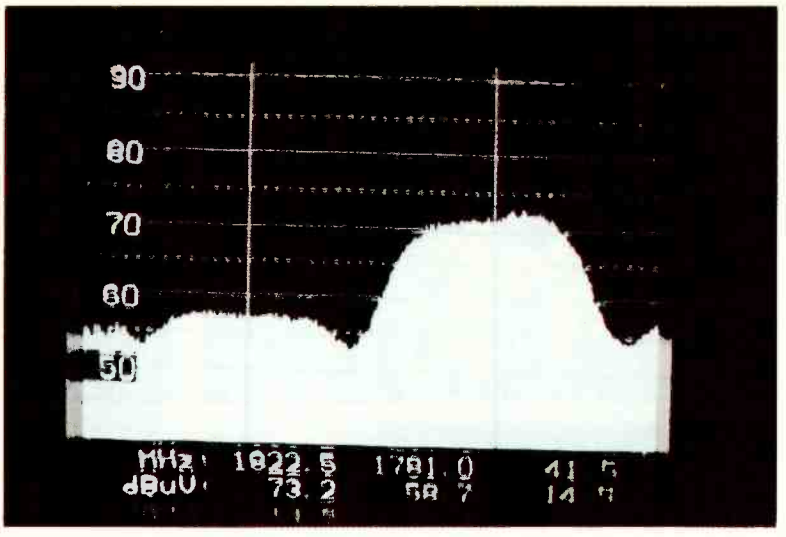


Photo 3: Two digital carriers at approximately 1,781 and 1,822MHz. Marker A is on 1,781MHz, marker B on 1,822MHz. Signal levels are displayed on the bottom line. TThe last column shows the frequency and level differences between the two signals..

Table 1: Promax Prolink 3 meter, basic specification

Tuning range: 5-862MHz terrestrial, 920-2,150MHz satellite IF. 99 memory positions. Satellite tuning can be displayed as transponder number or frequency.

Measurement range: 20-130dB/µV (10µV-3·16V) terrestrial bands; 30-120dB/µV satellite bands.

LEVEL MEASUREMENT
Readout: In digital mode absolute value, calibrated in dB/µV, dB/mV or dB/m. In analogue mode, bar at top of screen plus superimposed readout (see Photo 2).

Measurement bandwidth: Terrestrial bands 230kHz, satellite bands 4MHz.

Accuracy: ±2·5dB from 5-45MHz, ±1·5dB from 48-862MHz and 920-2,150MHz.

MEASUREMENTS IN TV MODE
Terrestrial: Analogue channels level, video/audio ratio and carrier-to-noise ratio (auto and referenced). Digital channels power and carrier-to-noise ratio.

Satellite: Analogue channels level and carrier-to-noise ratio, digital channels power and carrier-to-noise ratio.

Data-logger function: Automatic acquisition of up to 9,801 measurements. Can be printed out via optional printer or downloaded to a PC via optional RM103 software.

SPECTRUM-ANALYSER MODE
Measurement range: See above.

Measurement bandwidth: Terrestrial 230kHz or 1MHz selectable, satellite 230kHz or 4MHz selectable. Use of the 230kHz bandwidth in the satellite bands enables narrow-band beacon signals to be resolved – these usually transmit to the satellite operator telemetry on the satellite's status.

Span: Terrestrial and satellite, full band on each or 500, 200, 100, 50, 32MHz plus 16 and 8MHz on terrestrial bands only.

Markers: Two available with level, frequency plus level- and frequency-difference indications (see Photo 3).

Measurerments (all bands): Analogue channels level and carrier-to-noise ratio (referenced). Digital channels power (integration method) and carrier-to-noise ratio (referenced).

BASIC DETAILS
4·5in. black-and-white monitor display (colour available at extra cost). TV standards B, G, I, D, K, L, M and N. Synchronisation and burst, graphic representation over the picture. External video and audio input/output via scart socket. Internal teletext decoder available as an option. Audio demodulation 4-9MHz in 10kHz steps plus Nicam.

Power consumption: 42W from separate 12V mains supply or external 12V supply. Car cigarette-lighter adaptor included.

Power to LNB or aerial amplifier: +13/15/18V selectable, can be switched off. 22kHz tone signal for universal LNB high-band selection can be on or off. DiSEqC generator included (1.2 standard).

Physical details: Dimensions 280 (W) x 95 (H) x 250 (D) mm, weight 5·2kg with batteries.

Optional accessory: Portable printer with connection via RS232 port.

Digital options: OPT-103-81 BER measurement for QPSK-modulated satellite DVB signals plus digital channel identifier. OPT-103-82 as 81 but for cable signals, using QAM modulation. OPT-103-83 as 81 but for DTT signals using COFDM modulation. OPT-103-85 combines -81 and -83 in one, enabling satellite and terrestrial BERs to be checked.

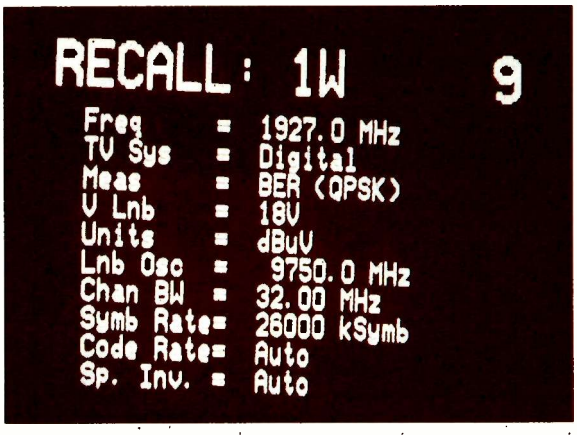


Photo 4: Digital parameters held in memory for Norwegian TV.

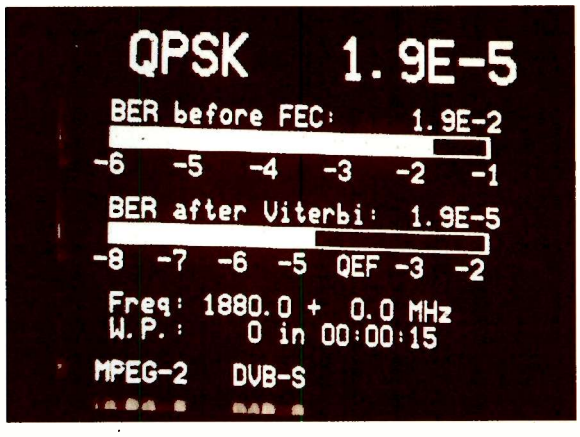


Photo 5: Digital signal conditions at threshold.

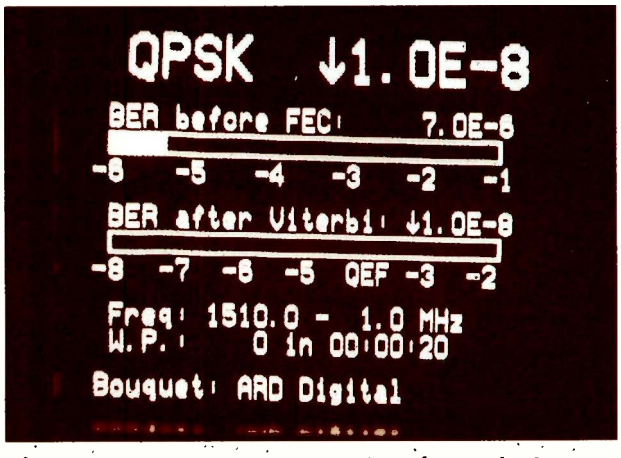


Photo 6: A strong ARD (German) package via Astra at 19·2°E.

adaptors to change from a terrestrial coaxial to a satellite F connector: the carrying bag's side flap, which provides access to the side panel, makes it difficult to tighten the adaptors up in the field.

A good compromise is to screw a coaxial socket-to-F adaptor in very tightly. It enables a normal coaxial aerial lead plug to be connected and helps because, being almost flush with the carrying bag's cover, the connection is easier. Keep an F socket-to-coaxial plug adaptor to hand in the carrying bag's top cover: this can be plugged into the coaxial socket to enable a satellite F plug to be screwed in easily.

Digital BER measurement

BER (Bit Error Rate) measurement is fairly straightforward. A channel's parameters can be stored in memory, as shown in Photo 4 (the Norwegian international TV signal via Intelsat 707 at 1°W, frequency 11·627GHz with horizontal polarisation). So, as shown in the photo, the 1,927MHz IF from the LNB has been entered.

Photo 5 shows the MPEG-2 signal at threshold. The top bar displays the BER before forward error correction (FEC), the lower bar the BER after the Viterbi decoder. The white bar must be to the left of the QEF (Quasi Error Free) mark. Incorrectly received data packets (displayed as W.P., i.e. wrong packets) are shown towards the bottom of the screen (in this case none found in fifteen seconds). The IF is this time 1,880MHz. Any AFC the analyser had to apply to centre the digital signal is displayed to the right of the IF. In this case it's + 0·0MHz, i.e. the tuning is spot on.

The digital channel identifier at the bottom of the screen just shows, in this case, that the signal is an MPEG-2 one to the DVB-S standard. If the network/ channel identification is transmitted by the broadcaster, this will be shown instead, see Photo 6. In this case the signal was a stronger one from ARD (Germany) via Astra at 19·2°E. The BER is much lower and 1MHz of AFC has been applied to the incoming signal.

Analogue signal measurement

Photo 2 shows a Eurosport analogue signal received via Astra at 19·2°E. The top bar indicates the signal level. There is also a superimposed on-screen readout. This can be removed, or altered to show the satellite transponder number.

Verdict

The meter is now in everyday use and has proved to be of help with all manner of signal alignment and reception problems. When we want to, upgrading to the DTT channel identifier option is possible.

The unit we have, with the digital add-on option, cost well over £1,000. Because of the uses to which we put it, this is money well spent.

More information is available at the Promax website, www.promax.es

Full specifications on this and the company's other products can be downloaded. The e-mail address is sales@promax.es

The UK agents are Alban Electronics Limited, 6 Caxton Centre, Porters Wood, St. Albans, Hertfordshire AL3 6XT. Phone 01727 832 266, fax 01727 810 546. ■

Answer to Test Case 459

– see page 286 –

Mr Allen's set did get repaired, but to stay within the budget limit he had specified for the job we had to charge for the time involved at a reduced rate. And of course there was no charge for the IC we had fitted in place of the perfectly good one already in the set.

In fact the colour-killer *had* come into operation, for the very good reason that the colour burst was not being gated out of the chroma signal for feeding to the reference oscillator's control circuitry. A check at the chip's gating pulse input pin, 38, showed that the pulses were of very low amplitude, way below the normal peak level, and were rather misshapen.

The pulses are obtained from the line output transformer and are shaped/adjusted by a network that consists of various discrete components. A check in this area revealed that R512 (100kΩ) had gone high in value. A replacement restored the colour, and a new 0·47µF coupling capacitor (C319) produced better-shaped pulses. The same sort of symptom occurs when there are no sync pulses at pin 36. Incidentally a number of smaller-screen Toshiba models that date from about 1985-7 use the TA7699AP chip with similar external circuitry.

So Mr Allen senior is still enjoying his TV programmes, and there remains a second-hand TA7699AP chip in our stores. It was interesting to revisit older PAL decoder technology, and we ended up with £44-82 in the till!

NEXT MONTH IN TELEVISION

Spares guide 2001
This year's fully updated TV/VCR spares guide.

At the Las Vegas CES
This year's Consumer Electronics Show featured many interesting technologies, including a new flat-screen TV display system, recordable DVDs, digital storage media, Super Audio CD, hard-disk recorders and HDTV sets. George Cole reports on the latest developments.

Servicing the Sony BE3D chassis
The BE3D is Sony's core 50Hz chassis designed to drive both 4:3 and 16:9 CRTs in sizes up to 32in. Giles Pilbrow describes the chassis and fault conditions.

Repair chiropody drills
Here's something else that will help provide extra work and income in these hard times. Chiropodists' drills receive extremely heavy use on a daily basis, so wear is to be expected. B.A. Berry describes the basic repair work you can carry out.

Held-overs
Part 2 of digital terrestrial TV reception and the concluding instalment in our series on the Sharp CS chassis.

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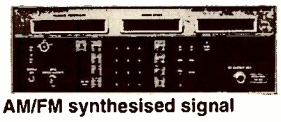

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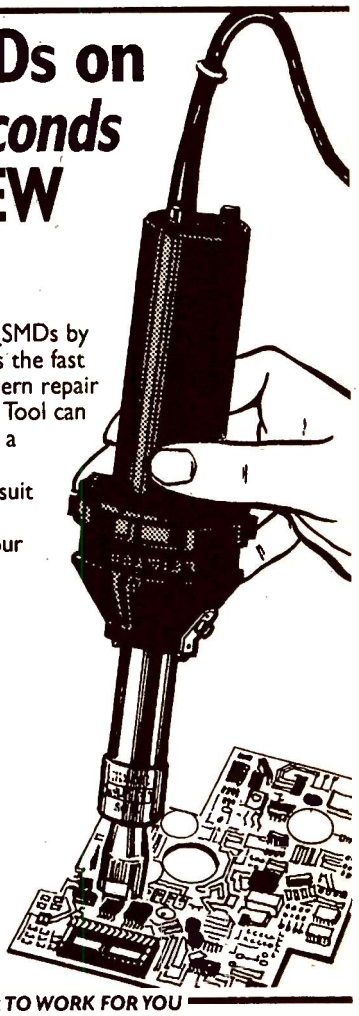

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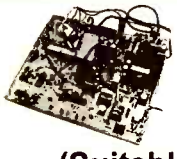

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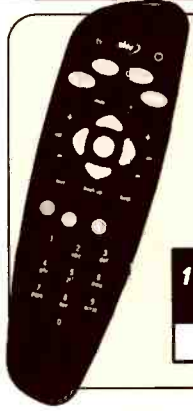

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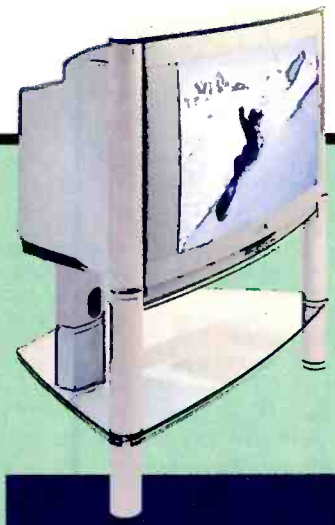

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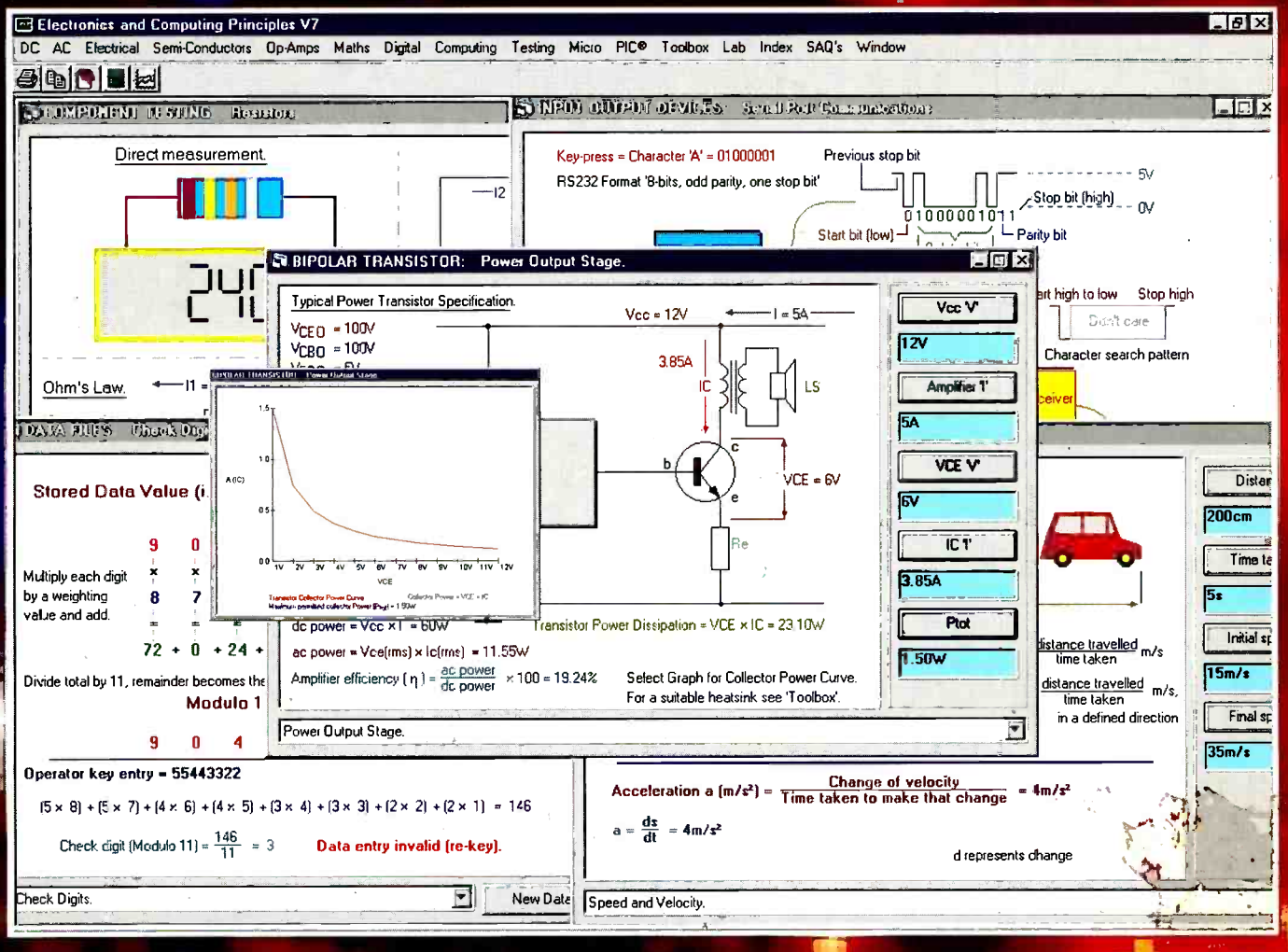

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