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TELEVISION

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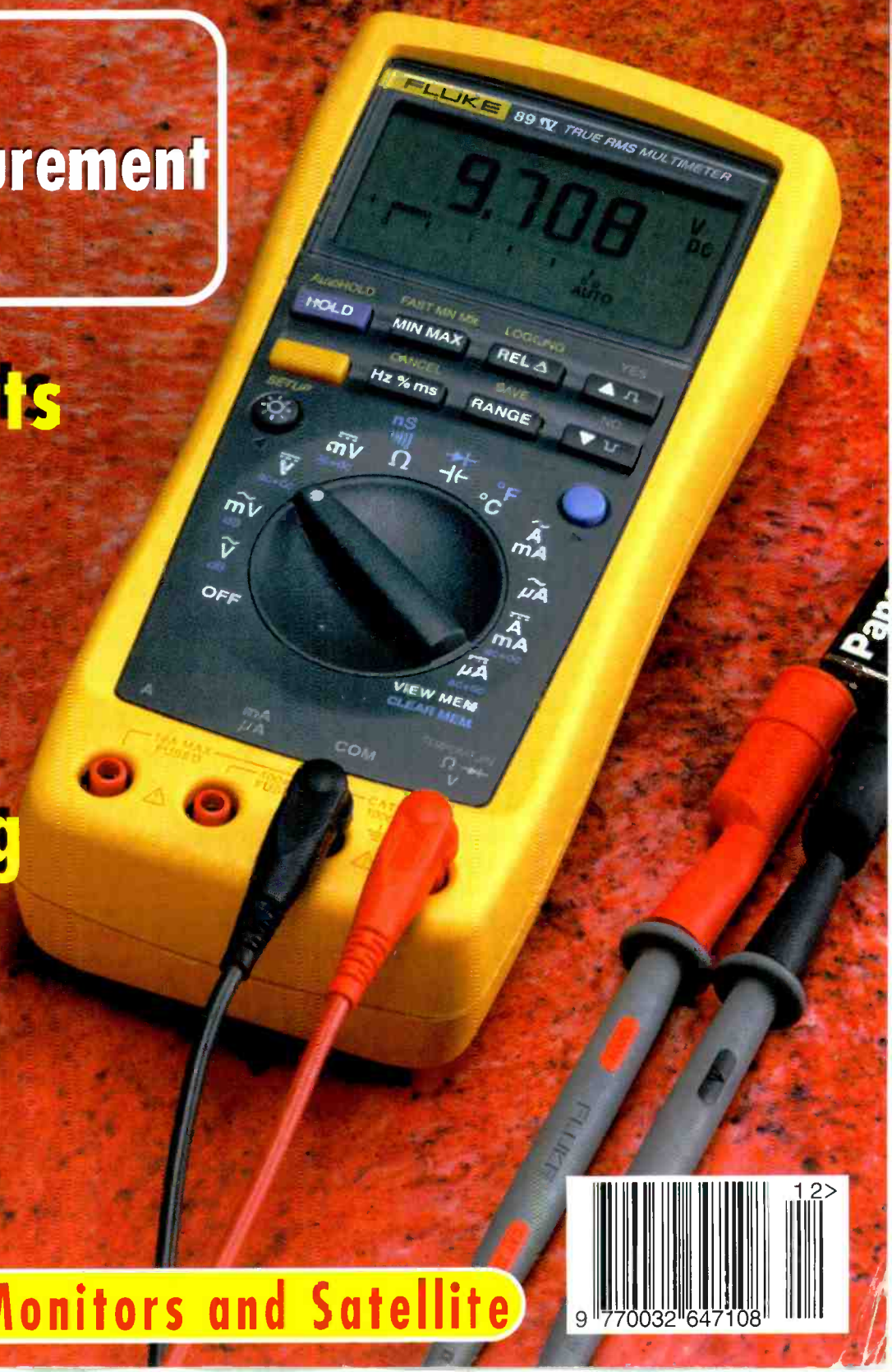

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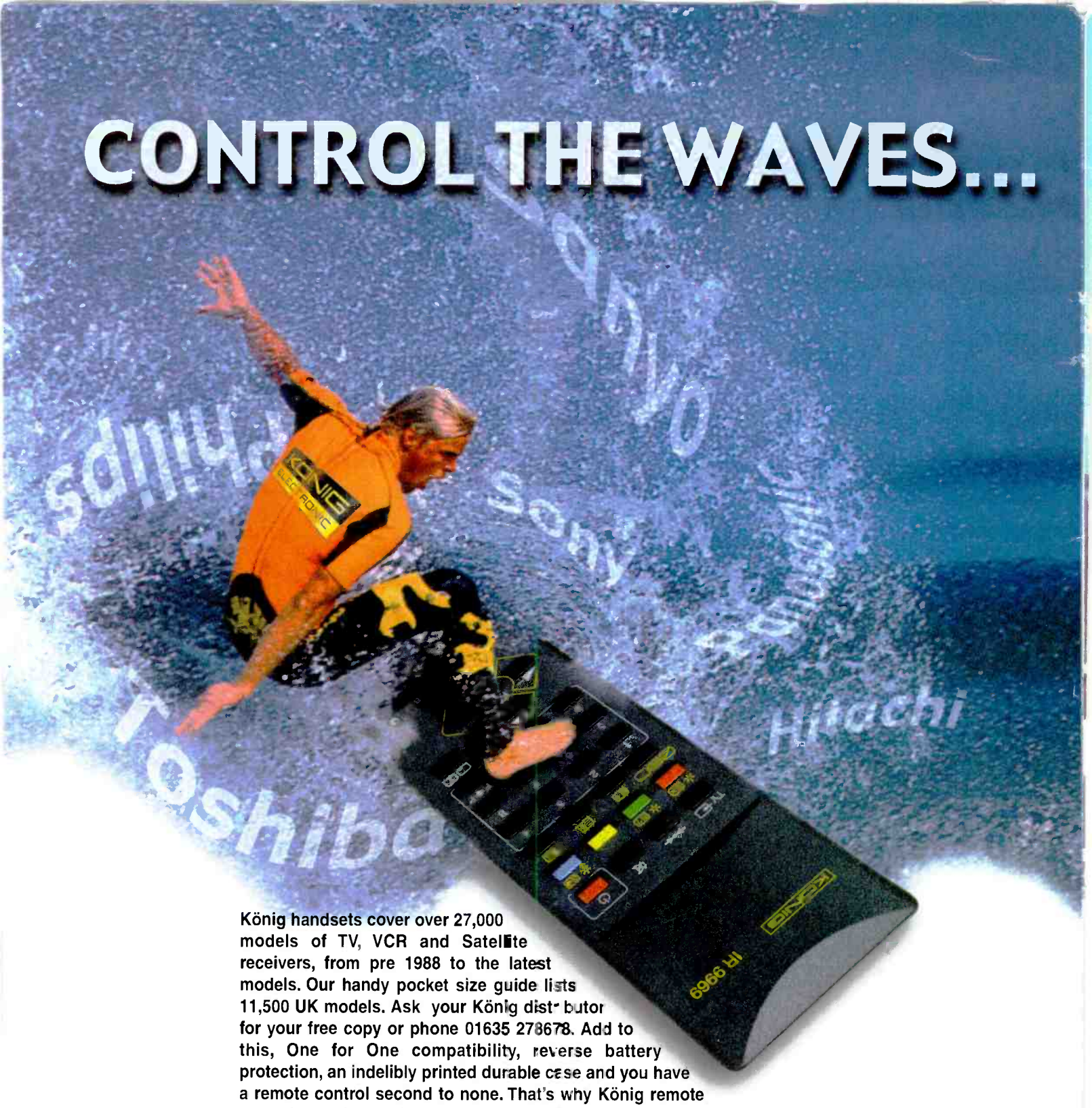

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Digital concerns

The introduction of digital TV broadcasting in the UK has been a success. Apart from the foreseen coverage limitations, and a few complaints about interference problems that are not caused by shortcomings of the system itself, the advent of digital TV transmissions has gone smoothly. As with PAL over thirty years ago, the system selected by the broadcasting authorities provides rugged signals. Satisfaction all round is justified.

There are nevertheless a few points that need to be watched, and the analogue switch-off, when it comes, is likely to cause problems for many viewers. In the main the problems that could arise will not be of a technical nature but rather the result of a highly sophisticated system whose full implications were not fully appreciated.

Questions have been raised about picture quality. This can be exceptionally good, but can be compromised by broadcasters trying to squeeze too many channels into a transmission. Picture quality is determined by transmission bit rate, which is in turn determined by bandwidth. For a PAL-quality picture a bit rate of about 5Mbits/sec is required. But the flexibility of the transmission system enables the bit rate to be adjusted to suit programme material. If a programme needs little data for adequate reproduction, for example a lecture with a simple picture and little movement, the bit rate can be reduced. A bit rate of 2Mbits/sec will provide VHS-quality pictures. The other extreme is a complex scene with a lot of movement, where a much higher bit rate is required to provide good-quality viewing. Those who operate a digital multiplex can adjust the bit rate, reducing it for some channels while increasing it for others. The danger is that lower than desirable bit rates could be adopted by broadcasters to save money, with a reduction of average picture quality.

It has been suggested that the continuation of public-service broadcasting is essential in this respect (and several others of course). The BBC for example would have little need to compromise on the bit rate. So, the argument goes, we need a public-service broadcaster to provide a yardstick for transmission quality-comparison purposes.

A more subtle question relates to broadcaster control over access to the internet via set-top boxes. The point here is that the software used is written and controlled by the broadcasters, who could thus influence viewer access. This might be regarded as a matter of rather remote concern, especially as internet access via PCs would not be affected. It could however affect the development of interactive TV, and is an important point. It would be a difficult matter for legislation to deal with.

More immediate complaints relate to the way in which channels are bundled for sales purposes. This is obviously done to suit the convenience of Pay-TV broadcasters. It may also suit most viewers, but could be inconvenient and expensive for those who are more selective in their use of TV and are used to switching from one source to another.

The problem of how many sets/devices you can operate at a single location will be greater when analogue transmissions come to an end. Traditionally, the TV licence has allowed as many sets as you want to be used at a particular location. People are nowadays used to having several sets to meet a family's varied needs. There is a very real danger that digital TV, with no analogue alternative, could turn out to be quite expensive. In this respect the role of public-service broadcasting will again be vital. But PSB doesn't suit everyone's needs. If the public is to be able to take full advantage of the potential of digital broadcasting, this is something that might require regulation.

As far as DTT is concerned we can be thankful that the COFDM modulation technique was adopted in the UK. The 8VSB system used in the USA continues to cause problems. It was adopted because the transmitter power requirement is less, which is an important consideration in a continent-sized country. But COFDM has far superior performance where reflected signals are a problem – and urban areas in the USA are certainly noisy in this respect. Reflected signals cause data errors with 8VSB, and thus unreliable reception. It will be interesting to see whether a bolt-on solution will be possible or whether a change to COFDM will become necessary. So far DTT has not been the success one might have expected in the USA.

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Indexes for Vols. 38 to 49 are available at £3.50 each from SoftCopy Ltd., who can also supply an eleven-year consolidated index on computer disc. For further details see page 120.
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

Pound hits TV manufacturing

The strong pound and weak Euro have combined to force TV manufacturers in the UK to review their operations, take action and cut jobs. It's just not economic at present, with the extremely competitive TV/VCR market in the UK, and with the pound making UK-sourced products expensive in Continental European markets, to manufacture basic consumer electronic products in the UK. Production of some top-of-the-range items, where margins are higher, and recent-technology products such as digital set-top boxes, is still feasible however. At much the same time last month Matsushita (Panasonic) and Sony announced plans to curtail production in the UK.

Sony announced the loss of 400 jobs at its Pencoed plant, which was purpose-built in 1992. The company is to move production of low-cost, smaller-screen TV sets to plants in Barcelona and Slovakia. Pencoed will continue to assemble higher added-value products, including digital TV sets and STBs and professional video cameras. Production at Sony's Bridgend plant, which makes Trinitron tubes, is not affected – Sony does not have another CRT plant in Europe to move to. The company will continue to employ some 2,700 in its South Wales plants.

Up to 1,300 job cuts have been announced at Panasonic's Pentwyn plant, which until recently had a workforce of 2,400. Production of CRTs and lower-priced sets is being transferred to the company's plants in the Czech Republic. Pentwyn will continue to produce projection and plasma TV sets, digital STBs, laptop computers and microwave ovens. There is also to be an increase in research and development activity.

The month before, Hitachi announced 350 redundancies at its Hirwaun plant. Pioneer has also expressed concern about manufacturing in the UK.

The government is in a bind. If the value of the pound could somehow be forced down, it would probably be necessary to increase interest rates and/or taxes to maintain control over the money supply and inflation. That would hardly be popular. Successive governments have argued that the emphasis in the UK should be on service rather than manufacturing industries. Official figures show that manufacturing now accounts for only about twenty per cent of jobs in the UK. But some recent research suggests that this could be a serious underestimate – by as much as 40 per cent. As manufacturers have sought greater efficiency much work, such as IT and support operations, has been subcontracted out. Hence the jobs concerned don't count as manufacturing ones, though they depend on and are a part of manufacturing operations. It should be remembered that plants such as Pencoed and Pentwyn are efficient, high-technology operations. The only logical policy is to ensure that the UK's economy can support both manufacturing and service sector jobs.

Progress at ONdigital

During its last financial year the number of ONdigital subscribers more than doubled, to over 896,000, putting it well on the way to meeting its target of a million subscribers by the end of the year. But the churn rate – those who fail to renew subscriptions – has been close to twenty per cent. In comparison BSkyB's churn rate is just over ten per cent for both analogue and digital subscribers, and 3·5 per cent for digital subscribers alone. An analysis from Merrill Lynch warns that ONdigital could lose up to a fifth of its subscribers through churn over the next year as twelve-month free set-top box deals come to an end. Merrill Lynch believes that DTT could face the same problems as the cable industry when more than one in three subscribers failed to renew their contracts.

During the first two weeks of the start of the internet TV service ONnet, 20,000 customers signed up. ONdigital has also launched a new, enhanced electronic programme guide service, ONview. This is on channel 20: it enables viewers to see what programmes are on every DTT channel for the day – they can then click straight through to any channel they choose. This complements ONdigital's Now and Next service. The Two Way interactive TV service will be added from January. ONdigital says that at least 25 IDTV models will be available in stores this Christmas – the IDTV conditional-access module to enable free-to-air IDTV sets to be upgraded to ONdigital pay-TV is now available.

ONdigital has upgraded the Crystal Palace group of transmitters in London, extending the coverage to over a million more households. Similar work is being carried out in the North West and South West.

Ondigital is holding talks with cable and telecoms companies, including Orange, Telewest and British Telecommunications, about forming strategic partnerships.

Pioneer has launched an ONdigital STB which is claimed to give internet access at PC speeds when used with an ONnet box. It's being offered in three packages: free box, pre-paid and pre-paid plus with ONnet.

C-Cube has introduced what it believes to be the most advanced chip, the ZiVA-5, for DVD-audio use. It incorporates a full DVD-audio solution with an MP3 audio codec, internet applications and more. The integral 150MHz, 32-bit SPARC CPU has ability to carry out integer and DSP instructions. With a performance of up to 300MIPs, the ZiVA-5 is a suitable platform for software applications such as DVD-Video navigation, DVD-Audio navigation, intuitive user interfaces and the Planetweb internet browser.

DVD update

Toshiba has launched a combined DVD-RAM and hard-disk recorder in Japan. There is no information on a possible UK launch.

Warner Music Group has become the first major music company to launch DVD-Audio titles. The titles cover classical, rock and jazz and are currently available in the USA. There are three recording modes: advanced resolution multi-channel sound; advanced resolution stereo sound; and Dolby Digital encoded sound accompanied by a DVD-Video clip. The latter enables the new discs to be played by existing DVD-Video decks.

Digital round-up

Bush has launched a set-top box, priced at about £79, that enables a standard TV set to receive internet services. The box is simply connected to a TV set and telephone socket: press a button on the remote-control unit and you are linked to the internet. The STB comes with a remote-control handset that has an integrated qwerty keyboard. Accessories include a wireless keyboard and a printer. Bush now has a range of internet TV sets in screen sizes from 14in. to 28in.

Between 19th October and 15th November Panasonic test-marketed a new interactive TV advertising campaign via the Open service. It featured a series of thirty-second adverts and an on-screen icon: clicking on the icon took viewers to a dedicated advertiser location with additional information and the opportunity to buy products.

BBC Worldwide has signed an agreement with the interactive TV company Two Way TV to use the latter's technology to create new interactive games based on BBC programmes such as *Question of Sport* and *Mastermind*.

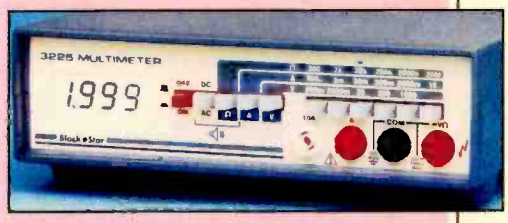
Retailer Iceland is to use the iSeeTV interactive service that enables shoppers to talk to a live personal shopping assistant on their TV screens. The service will be available initially to 100,000 households on the Telewest cable network

Freebox plans to offer a TV-internet service via a free set-top box that can also play DVD discs and MP3 material. The plan is to give away 20,000 boxes before Christmas. The company says that the cost will be covered by advertising, content providers and internet-service providers.

A new interactive TV service, developed by UK company Tventures, is to be launched next year via digital satellite and digital cable TV. It will use a new technology known as TriState to enable viewers to watch a normal programme and make on-screen purchases at the same time.

Pace demonstrated a video-on-demand service delivered via a Telewest digital cable STB at this year's Broadband Communications Expo. Telewest's first VOD service is due to be launched next year.

NTL is forging a common technology platform across its NTL and CWC cable TV networks. As a result of the integration NTL customers will receive internet-ready digital interactive TV and high-speed cable internet services. NTL has chosen Liberate Technologies and the DOCSIS (digital over cable subscriber interface system) cable modem standard.



Black Star has introduced a new battery-powered bench digital multimeter, Model 3225, at £129 plus VAT. Test leads are supplied as standard. There is also a mains-powered version, Model 3225MP. The 0·5in., 3·5-digit LC display has polarity, over-range and low-battery indications. Battery life (six alkaline C cells) is greater than 7,000 hours when used for DC voltage measurements.

The specification includes DC voltage measurement to 1kV and AC to 750V with a maximum resolution of 100µV; DC and AC ranges up to 10A with a maximum resolution of 100nA; and resistance measurement to 20MΩ with a maximum resolution of 100mΩ on the 200Ω range. The 20kΩ range has sufficient full-scale voltage to turn on a silicon diode at a current of approximately 100µA. An audible continuity tester is included: when this is selected, the beeper sounds with a resistance of less than approximately 50Ω between the test probes.

For further details apply to Black Star Instruments, 2 Glebe Road, Huntingdon, Cambs PE18 7DX, phone 01480 412 451, fax 01480 450 409 or e-mail blackstar@ttinst.co.uk

Satellite scene

SES, owner of the Astra series of satellites, forecasts that the number of domestic digital satellite installations in Europe will reach twelve million by the end of the year. At the end of October the number was 10·16 million, a year-on-year increase of 4·67 million. For digital cable and DTT the totals were two million and 890,000 respectively. SES claims a 78·5 per cent share of digital DTH viewing.

Following competition clearance, SES and SSC (Swedish Space Corporation) have completed purchase of the Nordic Satellite Company, operator of the Sirius satellite system. The takeover was announced last July.

DC Sat.Net has completed the first of a series of IP (internet protocol) streaming transmissions using the Astra BBI (broadband interactive) news feed system, which is due for commercial launch in early 2001. The live transmissions were carried out for DC's client Escape TV, the world's first nightclub TV channel, by using a BBI terminal and Ka-band uplink dish on the roof of the Club Eden in Ibiza. Escape TV has a subscriber base of nightclubs in Scotland, Wales and Northern Ireland. Using Astra 1H capacity at 19·2°E, the BBI Ka-band transmissions were streamed to Astra's headquarters at Betzdorf, forwarded to subscribers via the Astra-Net Ku-band IP multicast system and received by PC-based receiver stations at the subscriber venues.

A live interactive TV auction channel, bid-up.tv, has been launched as a free-to-air service via Astra at 28·2°E. Tune to 12·0315GHz H (transponder 17, SkyDigital EPG channel no. 647). The channel is described as a "convergence product for new broadband homes". Bidders can make offers for the same products at the same time during twelve hours of live auctions daily, either via the bid-up.tv website (www.bid-up.tv) or their TV sets. ■

The third generation Wysius flat-screen plasma TV display from Thomson Multimedia features a new silver and translucent design, a silent fan to avoid background noise, a thirty per cent increase in brightness, improved contrast for better colour definition and a digital zoom that enables the viewer to enlarge by up to sixteen times a selected part of the picture. The plasma technology development is in partnership with NEC. The display is in widescreen format (16:9) with a diagonal width of 42in. and a depth of just 89mm. Other items in the Wysius range include a D-VHS recorder, a DVD player, a Dolby amplifier and matching speakers. Thomson Multimedia has added to its Scenium range 28in. and 32in. TVs models that incoroprate a DVD player. The screen image definition achieved by the combination reaches 500 points per line, twice that of VHS, while a 10-bit video ADC guarantees a natural picture. The player is DTS (Digital Theatre Sound) compatible and can reproduce 5.1 sound from Dolby Digital and MPEG-2 audio systems. There's also a new DVD player range from Thomson Multimedia with three models, the DTH4000, DTH4200 and DTH4500. The DTH4200 and DTH4500 can read most types of CD disc and the MP3 format; the DTH4500 incorporates a Dolby Digital 5.1 decoder and has a jog-shuttle control.

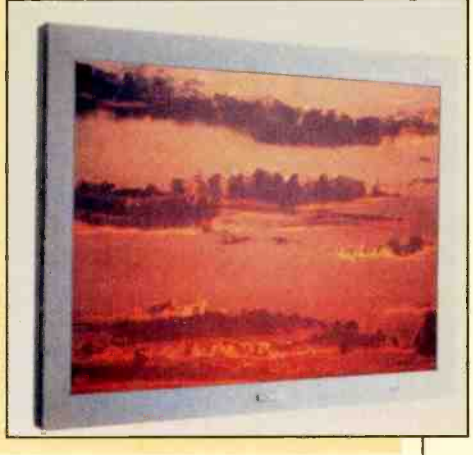


Illustration Dave Bell

WHAT A LIFE

The insurance salesman. How we bought our first electric till. Some TV faults, and a rather lively youngster. Donald Bullock's servicing commentary

My musings on the trade a couple of months back rang a few bells: I've been reminded of the days when I started out.

My first job was with a multiple, and I would park the firm's lettered van outside. This told the neighbours that I was a repairman, so when their sets failed they came and tapped at the door. Before long I was so busy I didn't have time to go to work.

It wasn't long before I started to work from a couple of rooms in a central back street, and had a lettered van of my own.

I can still remember how thrilled I was when my first caller came in. He wore a scruffy suit, needed a haircut, and padded in on splayed-out crepe-soled shoes. After pumping my arm, he looked at me soberly.

"Mr Bullock" he said, in a quiet and husky voice, "I can see you're going to do well, and you'll soon become accustomed to all the best. But there's one thing you ought to think about – think deeply about."

I looked at him. He was a picture of sincerity.

"Have you ever thought what would happen to your family if you . . . er . . . passed away? It happens, I'm afraid. And I have a policy here . . ."

You're right. He was an insurance pest, the first of many, and he plagued me for ages. The last time he called he played his trump card.

"Mr Bullock", he said gravely . . . "If you passed away and I called on your family, I would naturally express my condolences. 'I'm awfully sorry', I would say, 'I wish I could be of help, but I can't.'"

He shook his head slowly and sadly, and I felt sorry for myself, lying there dead. But not for long. He was soon off again.

"Do you know, Mr Bullock, I've just called on Harry Westcott's young widow. He had this very policy, and after the funeral I was able to say to her 'I'm pleased to be able to tell you that your husband left you very well provided for.'" I handed her our cheque for a hundred thousand pounds.

"You couldn't slip me her address, could you?" I quipped, and off he went.

Our first till

He was nearly as bad as the advertising reps, who called in their droves. Those who offered, at a price, a square on their football fixture charts, those representing obscure magazines, the Kelly's directory man, and the chap who offered us a space on a clock he was presenting to the local post office.

At times these pests were so numerous it was difficult to get on with our work. It took some time to learn how to handle them. Even then we fell for one or two of the cleverer ones, like the casual man who called to sell us an electric till. Until then we'd been using a polished box with a drawer and a brass handle for our takings.

"Hello boys" he smiled as he came in, carrying the till. "To be quite frankly, I've come to sell you something. But it'll pay for itself within a few weeks." As he looked about for a space to settle the till, we looked at each other and smiled. "To be quite frankly" we echoed. He was obviously a prat.

"You can call me Eddie, to be quite frankly, boys" he said as he plugged the till in. Then, peppering his spiel with more 'quite franklies', he explained the advantages of the till and told us we could pay for it with four monthly payments.

"Of course, I'd have to have the first one now, if you want the till. But if you forget to send the next, who's to chase you up, eh? There's only me on the boss's payroll, so it would be my job. But, to be quite frankly, I'd never find the time, 'cos I make my money selling tills, not collecting payments."

"But surely, if we have the till we've got to make our four monthly payments" I said.

Eddie squared up. "Look, I get ten per cent every time I sell a till, and nothing when I collect an outstanding cheque. Right?"

I nodded.

"So next month, suppose the boss says to me 'Eh, Eddie, don't forget to call for

that instalment.' What do I do?"

"Tell us" I said.

"'OK' I say to him, 'OK boss.' But do I bother? Do I hell! No, boys, I don't. Because if I call on you for a cheque I get nothing for myself. If, instead, I go out and sell a till I make my ten per cent. Now, what would you do? Be quite frankly with me. What would you do?"

He was disarming all right. A right comic. Couldn't speak his native tongue properly, and here he was telling us we could pay for a new till sometime-never. He was such a prat that I felt benevolent towards him.

"OK" I said, "we'll have the till, to be quite frankly." I thought we were being ever so clever.

He pulled out his forms and got our signatures, then raised his trilby and swept out.

For one reason or another we were a day or two late in making the third of our four payments. Then Eddie showed up.

"Hello Eddie" I smiled, "how are the tills going? You can be quite frankly."

It was a different Eddie this time. He opened his ledger.

"I've come for the third payment, Mr Bullock" he said, "and I'd like it now, please."

"So you found time to call for the cheque after all, Eddie" I commented.

He ignored this and gave me a straight look. He was no longer the prat who had sold us the till.

"Look, you signed a contract you didn't bother to read, and because you failed to make the third payment by the due date this till is legally mine again. I can take it and sell it at twice the profit I made out of you. So pay up, there's a good chap. I've a lot to do and no time to waste."

I paid him the lot to be rid of him. He was just another of the characters who came along to educate us in the ways of business. We gradually learned.

Sam's Hitachi

Sam the Joker called in the other day with his 21in. Hitachi set, Model C2114T (G7PS chassis).

"Rustled when I switched 'im on, he did, then he went off" Sam said, "now he's stuck in standby."

As I reached for a job card he spoke again.

"'Eard the one about the chap who went to 's doctor, Don?" he asked.

I shook my head, painfully. "But I'm going to, aren't I, Sam?"

"Says to his doctor 'Doctor, I feels insignificant.' The doctor looked straight through 'im and shouted 'Next!'"

I waved him out and wrote Sam the Joker on the card.

The basic fault with the set was field collapse, because the TA8427K field output chip IC601 was short-circuit. We've learnt that when this IC in this series of sets fails it is important to fit the Hitachi version, even though it's several times the price of the other makes. Non-Hitachi chips have always failed within a couple of days. So I fitted a Hitachi chip and put the set on soak test.

A few hours later it failed again. Some checks I should have made before revealed the cause: the HT was high at 140V instead of 115V. I then found that R951 (39kΩ, 0·5W 5%) in the HT monitoring network had risen in value to 51kΩ. This had been the cause of the increased HT voltage. A new resistor and another Hitachi chip restored normal operation, and this time the set passed its soak test.

When Sam called for his set he stood there fingering his chin. I waited for another of his pearls, and it wasn't long coming.

"I dunno" he said, "I used to think I was indecisive, now I'm not so sure . . . "

Elvis

I noticed that Mrs Balsam was approaching our door. She was carrying a video recorder. Her son Elvis was with her and was sucking at an outsize lollipop. He also had a stick, which he was stabbing towards passers by, as though he was a fencer. As the pair entered the shop he ran up to Steven and started to prance around him, stabbing the lollipop and stick at him as he did so.

"Careful with that lollipop, Elvis, or you'll get all hairs on it" Mrs Balsam bawled. Then, "look at 'm, Mr Bulger, 'e's just sin *The Mark of Zorro* on the telly an' thinks 'e's that Tire-on Power. Yessy he sin that rodeo film and wuz ridin' his dad round the 'ouse as though 'e was a rodeo hoss."

At this Elvis flung his stick and lollipop at Paul, grabbed the handles of the open door, and swung on it while headbutting it and banging his heels on the glass.

"Cut that out" shouted Mrs Balsam, "you'll hurt yourself else." Mrs Balsam laughed as he went on with renewed vigour. "Thinks 'e's that Butch Cassidy now, ridin' that big bull thing" she said, "'e oughta bin a bloody cowboy. Loves baked beans, don't you . . ."

As the boy stamped harder on the glass she blurted "half time, Elvis. 'Ere, come over and 'ave a look at all the plugs and things on this stand what goes round and round. Come on . . ."

Elvis ran over to the stand and spun it frantically until it crashed over.

"You silly little sod" bawled Mrs Balsam, "that coulda fell on you. Mr Butcher ain't screwed 'im to the floor like he should of."

As Paul took the recorder from her, Elvis hung on the counter by his hands and chin and scuffed along it towards me, pulling faces. When he arrived I locked my pliers on to his ear and gave it a twist.

He threw his head back, bawled and fell on the floor, then contorted himself, stabbing his thumb at his ear. He kicked at his mother's legs until she fell on top of him.

As she got up, I gave her a warm smile. "He's certainly energy-packed today, isn't he? Like a firework, eh? I think he caught his ear on the counter."

"Serves 'im right" she said as she surveyed her damaged stockings. "I'm going to give 'im an 'ammering we gets 'ome."

We all smiled and nodded.

Her recorder was a Panasonic NVL20. When Paul tried it there was no colour, just a black-and-white picture that was zigzagging about and impossible to watch. He checked through the electrolytic capacitors on the tuner subpanel and discovered that C48 (33µF, 16V) showed signs of leakage and was low in value.

A replacement cured the fault, but there was further trouble. In the E-E mode, and only in this mode, the sound was breaking up. The cause was again electrolytic capacitor failure, this time C7678 (10µF, 16V).

Wilfie Wogan

A strange fellow called in with a 21in. Sony set. I didn't like the look of him. As I reached for a job card, he gave the name of Wilfie Wogan.

"Er, no relation to, er . . . ?" I asked.

"I've got no relations at all" he said. I felt relieved.

"And what's the trouble with the set?" I enquired.

"The little light comes on but the set don't" he said.

So I wrote "stuck in standby" on the card. The set was a KVM2151U (BE2A chassis). I gave it to Steven to deal with.

The usual cause of this trouble is failure of the BU508AS2 line output transistor Q802 and the N15 (600mA) circuit protector PS801. This case was no exception, and the set came to life when replacements had been fitted. But that wasn't the end of the matter. The EHT was crackling and spitting, and the height was slightly reduced. We then noticed that the line output transistor's heatsink was very hot indeed.

Steven quickly disconnected the transistor and checked the HT voltage. It was very high – 185V instead of the correct 135V. "Should have checked that before" Steven commented.

This is another known fault, the cause usually being the STR54041 chopper chip IC601. Once a replacement had been fitted the HT was stable at precisely 135V.

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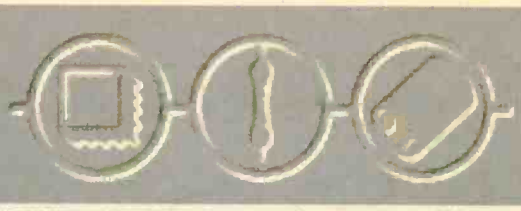

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1458T	PSU	ONWAKIT
1459T	PSU	ONWAKIT
2002	PSU	ONWAKIT
2009B	PSU	ONWAKIT
2052T	PSU	ONWAKIT
2152T	PSU	ONWAKIT
CTV501	PSU	ONWAKIT
CTV701	PSU	ONWAKIT
CTV840	PSU	ONWAKIT
CTV841	PSU	ONWAKIT
CTV485	PSU	ONWAKIT
AKAI		
CT1417	PSU	ONWAKIT
CT2159U	PSU	ONWAKIT
CT2162UNT	PSU	ONWAKIT
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149T	PSU	ONWAKIT
1430RA	PSU	ONWAKIT
1430RS	PSU	ONWAKIT
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1450T	PSU	ONWAKIT
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2019R	PSU	ONWAKIT
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F16	VIDEO	GOODKIT1
GRUNDIG		
CUC 7350		GRUNDIGKIT1

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AV29SX1EN1	FIELD O/P KIT	JVCKIT1
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C14T1EK	PSU	ONWAKIT
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CS21M3EK	PSU	ONWAKIT
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CT21M5BT	PSU	MITSKIT3
CT25M5BT	PSU	MITSKIT3
CT21A2STX	TDA 8178S	MITSKIT1
CT21AX1B	PSU	MITSKIT3
CT21A3STX	TDA 8178S	MITSKIT1
CT21AV1BS	PSU	MITSKIT3
CT25A2STX	TDA 8178S	MITSKIT1
CT25A3STX	TDA 8178S	MITSKIT1
CT25A4STX	TDA 8178S	MITSKIT1
CT25A6STX	TDA 8178S	MITSKIT1
CT25AV1B	PSU	MITSKIT3
CT25AV1BS	PSU	MITSKIT3
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CT29B3	TDA 8178S	MITSKIT2
CT29B6	TDA 8178S	MITSKIT2
CT33B3	TDA 8178S	MITSKIT2
M5 SERIES	PSU	MITSKIT3
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CE25 CHASSIS	PSU	NIKKAIKIT1
C289FTXN	PSU	NIKKAIKIT1
C28F41FXN	PSU	NIKKAIKIT1
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IC561	TDA 8175	PANKIT1
TX25XD60	VERTICAL O/P IC	PANKIT2
TC28XD60	VERTICAL O/P IC	PANKIT2
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310.32253		PHILKIT4
310.32254		PHILKIT9
310.32255		PHILKIT7
310.32262		PHILKIT8
310.62264		PHILKIT1
ANUBIS A	SOPS	PHILKIT2
CP110 CHASSIS	SOPS	PHILKIT8
G90A CHASSIS	SOPS	PHILKIT10
G90B CHASSIS	SOPS	PHILKIT10
G110 CHASSIS	SOPS	PHILKIT3
GR2.1 CHASSIS	SOPS	PHILKIT1

MODEL	KIT TYPE	ORDER CODE
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KSM VIDEO	SOPS	PHILKIT9
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CI6844	FRAME OUTPUT	SAMKIT2
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VIK320	PSU	SAMSUNGKIT
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59CS05H	POWER / LINE	SHARPKIT2
59CSD8H	POWER / LINE	SHARPKIT2
66CS03H	POWER / LINE	SHARPKIT2
66CS05H	POWER / LINE	SHARPKIT2
66CSD8H	POWER / LINE	SHARPKIT2
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35065920		THORNKIT1
FV70	PSU	THORNKIT1
ICC7 CHASSIS	TDA 8178FS	THOMKIT1
ICC7 CHASSIS	FRAME KIT	THOMKIT3
ICC8 CHASSIS	TDA 8178FS	THOMKIT1
ICC8 CHASSIS	FRAME KIT	THOMKIT3
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IBC2000

J P LeJeune reports on the latest from this year's International Broadcasting Convention held at Amsterdam's RAI centre.

Massive hardly is an adequate description of the annual International Broadcasting Convention held at the Amsterdam RAI. It is enormous – eleven halls containing a total of over 800 stands and spreading over 70 000m^2.

The venue's size is matched by the size of the crowd passing the turnstiles for a glimpse of the latest in broadcasting, in excess of 70 000 visitors – another record.

The entire gamut of the broadcasting world is here from cables and connectors to the latest in transmitters, broadband communications and digital effects. Even so, exhibitors are asking for bigger stands next year. A floating pavilion of 6000 square metres is being planned for the 2001 convention to provide extra space.

Dominant themes

Digital technology, internet broadcasting and broadband communications featured strongly this year. Forget analogue. The digital era is here. It has become very well established, and will stay that way.

However, every facet of broadcasting is at IBC2000, including camera cranes, editing suites, digital effects, plasma screens, projectors, satellite uplink equipment, steerable dish platforms, training companies, test and measurement equipment, set-top boxes, cable repeater amplifiers, fibre-optics... The list is endless. Now interactive TV is almost synonymous with digital TV, and there were plenty of stands showing it in Amsterdam.

Special effects

Some amazing effects were demonstrated. For me, the ones that stood out were those from Avid Technology and from Dream Team – an Israeli company. Dream Team's 'Typhoon' animation software provides a powerful real-time solution for production and post-production applications and their constantly running displays grew appreciative crowds.

Effects and gimmicks apart, digital technology has provided the broadcaster with valuable tools for smoothing the output of a studio with slick presentation facilities, and fingertip control of all features from input to archives.

On the domestic front...

At the other end of the chain comes home networking. Here, one's imagination is fired by the endless possibilities.

For example, the set-top box for cable-TV becomes the home gateway. It connects to your TV and VCR, your telephone, computer; and to 'intelligent domestic appliances'.

All this digital technology does not mean that your vacuum-cleaner will be able to operate on its own though, or empty itself. But refrigerators and freezers will have bar-code readers that can determine when you have run out of your favourite Caviar; and re-order it from Fortnum & Mason.

Even the dustbin will log the packaging of spent items and re-order them. Too bad if you have thrown away something you bought but disliked – Dusty has just ordered you some more!

Freedom from wires

Wireless connections to these items in the home means more freedom – particularly with the telephone. It is likely that the home and the mobile telephone will combine at some time, the network switches from the home LAN to the service provider's WAN when taken out of doors.

Home networks also permit remote control of house lights, central heating, the cooker and the VCR via a mobile telephone – possibly as a first step to more sophisticated applications. Video telephony and video mail are on the horizon but await further technological development and the finance to fund it.

The 'killer application' will come in home entertainment with services like video on demand and time shifting via the hard-disk drive in the set-top box.

Advances in home entertainment

Personalised programming allows you to view what you want when you want. It also allows multiple delivery of video to separate locations in the house from a decoder able to handle a number of MPEG data streams simultaneously.

Home entertainment need not necessarily mean that supplied from local or national sources. Internet broadcasting will be global. It will give the user access to programme content from almost anywhere.

Indications at IBC were that this day is not too far away. Internet bandwidth is increasing rapidly to a point where the bit rate will allow reasonable quality communication.

Imagine a phone-in programme with calls coming in from across the world! Philips, Pace, Nokia, Scientific-Atlanta and Motorola were discussing the Home Network at IBC. Many see

Multi-media TV... Nokia's Media Terminal, shown below, combines the internet, digital television, and broadband access. Media Terminal users are able to: fully access the World Wide Web, download and play 3D and networked games, play and store MP3 music files, view video-on-demand services, chat and mail, record digital content on the local hard disk (Digital Video Recorder), place bets and gamble, acquire goods on line, etc. Connection with several external devices such as printers, digital cameras, hard-disk drives, personal computers and gamepads is possible.

Bluetooth, a wireless networking system, as complementary to the home network and not the backbone of it.

What is datacasting?

A new word enters our vocabulary – datacasting. As its name implies, it is the broadcasting of data and is achieved by insertion of internet-protocol (IP) data into the MPEG stream.

Datacasting is made possible by dynamic bandwidth sharing, the data being inserted at variable rates into the unused bandwidth of the channel. This means that when high-detail video content is being forwarded, with the accompanying high bandwidth requirement, very little datacasting will occur.

As the demands of bandwidth drop with more static and less detailed picture content though, the spare bandwidth is not wasted, but is used for datacasting. This allows broadcasters to add another money-spinning service to their current offerings.

Such an application could hasten the changeover to the digital domain for many broadcasters as yet undecided about it.

ATM and datacasting

Although IP technology appears to be *the* medium for datacasting at the moment, another transmission protocol, asynchronous transfer mode, or ATM, could handle datacasts equally well. It has the advantage that it has been around longer and that one MPEG video packet fits into two ATM packets.

Using packet networks allows broadcasters to send video anywhere that the ATM and IP networks go. Many companies were demonstrating video over IP and ATM at the show – fat too many to list here.

Equally, using internet protocol video streams over broadband networks was a common talking point in Amsterdam. NDS Group's StreamShaper allows the reception of a digital TV broadcast, then bit-rate reduction to a suitable level for the broadband network's channel-bandwidth, and descrambling/rescrambling if required.

The outgoing signal can be over ADSL, ATM, Cable TV or any IP network. StreamShaper is also an important component of Synamedia – also from NDS.

Synamedia is a broadband network architecture that allows secure delivery of programme content by placing the store of such content as close as possible to the subscriber. This implies that the core network has fewer bandwidth demands placed on it.

Content of high popularity is distributed by satellite and stored on servers close to the end-user. Specialist content is distributed from central servers via the core network to the distribution network and thence to the end-user. This could impact heavily on the broadband distribution market and was a subject of great interest at the show.

Cable and interactive TV

Cable networks, from what I saw at the show, appear to offer an excellent solution to the requirements of interactive TV.

Most modern networks have a return path from every end-user to the head-end. Signals in the 5 to 60MHz band are used for return path working. They allow high-speed data to be transferred to data highways – usually fibre optic – for passage to the broadcaster or to the Internet.

CATV operators in the main also offer a telephone service that can handle ADSL, so the choice is wide for the cable user.

Downstream frequencies are being extended to 862MHz from the current 750MHz, the extra 112MHz allowing fourteen additional 8MHz channels. Currently, 64-QAM is in use for digital television – in America the talk is of using 256-QAM.

The trade-off for an extra 2 bits per symbol is an increase of 7dB in the carrier-to-noise ratio requirement. If it comes at all, the change will have to await the removal of analogue channels.

Currently, cable operators are running digital channels 10dB lower than their analogue counterparts. The change to 256-QAM will necessitate the digital channels being run only 3 to 4dB lower.

Many of the services on cable will be chargeable and so-called 'subscriber-management systems' occupied a slice of the show. Supervision is done via the return path. It allows two-way conversation with the set-top box for billing, viewing preferences data and access control.

Modern recording techniques

In the future, cable set-top boxes will be equipped with a hard-disk drive, allowing digital TV programmes to be recorded with nice features such as that for interrupted viewing.

Should your viewing of a telephone call or a visitor interrupts a programme, the set top box can take over and record the programme from the point of interruption. On returning to the programme, you can view the recording from the interruption point, but the disk drive goes on recording the remainder of the programme so that nothing is lost!

In this connection, one of the most interesting stands in the whole show

IBC Special Award 2000 went to Toy Story 2 from Buena Vista International for the company's digital cinema screening, top photo. Walking with dinosaurs, below, was part of Le Nombre d'Or widescreen festival at IBC 2000. The BBC received two top awards for Warriors and Mozart in Turkey.

was a small one in the New Technology Campus. It was run by Philips Research and AVIR partners in the ESPRIT project.

The project has developed new technologies that increase the application potential of 'personal TV analysis' of the video and audio content of TV programmes.

In addition, speech recognition can create a content description for the programmes. This allows broadcasters or service providers to develop features that give improved browsing capability through programmes stored in their personal TV systems in the home.

The system supports MPEG-7 and the DVB-MHP standard, which is short for 'digital video broadcasting – multimedia home platform'.

Personal TV is the term applied to the set-top box that can 'record' digital TV programmes for later viewing. AVIR – short for Audio-Visual Information Retrieval – can detect scene changes by comparing the video of subsequent frames, known as I-frames.

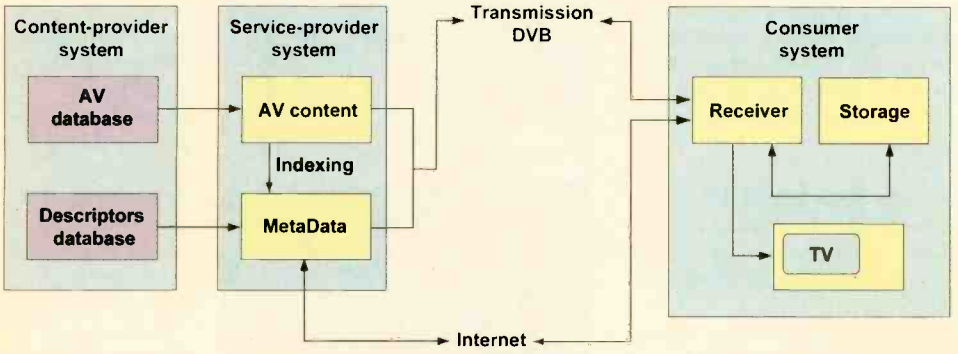
The browsing system shows new frames only to give a quick, yet informative, summary of the programme recorded.

There is also a scroll bar showing the average colour over a period of time. This makes a powerful search aid when attempting to locate scenes of different content such as a break in a football match, a specific scene from a film, or the presenters' segments in a news broadcast.

For the news broadcast, speech recognition techniques are used to generate key-words that can be summoned to assist in the location of items of interest for the viewer. The AVIR project has developed routines that create content description automatically in MPEG-7 format and can be transmitted along with the TV signal.

Service providers can distribute a complete consumer application – like an advanced electronic programme guide, using the DVB-MHP protocol.

Digital technology has completely taken over in the broadcast industry. Among the most outstanding effects were those demonstrated by the Israeli company Dream Team.



Personal TV state-of-the-art. The audio-visual information retrieval project has produced an end-to-end system for generating, distributing and using 'metadata' relating to television programmes.

Multi-programme satellite receiver

Rover Broadcast was showing its DSR700/S8 – a professional multi-programme digital satellite receiver. It is capable of decoding eight services, six of which may have conditional access.

The unit is destined for small CATV head-ends or for SMATV systems. The transport demultiplexer in this receiver is rather busy!

Video output is analogue PAL, NTSC or SECAM selectable with 1V pk-pk output. Audio is stereo or two mono channels at up to +16dBm, mounted in a 19in rack. This unit was an eye-catcher for the itinerant showgoer.

Watch your watch

According to IBM we will all be wearing computers and watching the news on our wristwatches in a year or two. The company showed a 1GB capacity disk drive using a 25mm (one-inch) disk. The entire package with its controller weighs 20 grams.

For widescreen broadcast television, a new 35mm film format is being introduced termed 3-perf. The standard 35mm aspect ratio is 4.3 and occupies four perforations of the film stock.

By reducing the frame height to just three perforations the picture aspect ratio more closely approximates that used for widescreen TV. Digital film was represented and very impressive. Star Wars Episode II is being shot in the digital domain on HD-Cam.

Projecting television

Texas Instruments' DLP projection unit fits onto a standard Christie lamp house with a brightness standard that can already match international standards for film.

The image quality cannot match the best that 35mm can provide. Unfortunately though, film suffers degradation from dust, scratching, fading and sprocket damage – which does not occur with the digital image.

Current tests of side-by-side formats reveals a high level of acceptance by filmgoers for the digital system. With no moving parts, the digital projector will need little maintenance and can be remotely-controlled from a central office

The capital cost is high, a complete projector costs from £7000 to £120 000, whereas a good 35mm film projector is priced at around £20 000. So if you asks "When?", the answer lays with the accountants. Images to the digital cinema would be delivered by satellite or broadband cable with encryption to prevent piracy.

Benefits of DSP for audio

Applied to audio, digital signal processing can help to deal with poor original quality, brighten-up lack-lustre sound and create new sounds that, coupled to the images, create the desired illusion.

Of most interest to me were digital headphones that allow the sound image to remain fixed, no matter which way the head of the wearer is turned. They have to be set up, of course, and this involves a dummy head placed in the 'ideal' room.

The sensors in the dummy take impulse measurements as the head turned this way and that. Readings are processed and used to control the signals fed to the headphones. The upshot of this is that sound crewmembers sitting in a cramped outside-broadcast van can enjoy the acoustic environment of the hall from that the audio emanates from, and the sound image remains fixed as their heads turn.

Samples of sound environments can be made for different applications, for instance, a car. The mixing engineer can then don his or her headphones and immediately be in the driving seat of anything from a Mini to a Stretched Lincoln Limmo. Armed thus, the listener can create the best sort of sound for that environment.

Video on demand via fibre?

Then there was video-on-demand, cited as the current attraction in the world of CATV. Again, the performance was impressive – a choice of some 6000 offerings including films, childrens' entertainment, specialist themes and music productions.

Video-on-demand can be treated like a VCR. It can be paused, forwarded, reversed, run at slow speed, even parked and ignored for a few hours until you are ready to re-commence viewing. All this demands a two-way network – commonplace enough now– plus some dedicated RF channels. The talk in the CATV world is of fibre-optics right up to the house wall or office LAN.

For video-on-demand, a dedicated fibre for this service is becoming a possibility. Distribution from a central server is also on fibre-optic cables using DWDM – a system of stacking light wavelengths analogous to frequency division multiplexing on co-axial systems. This means several beams of IR at differing wavelengths can pass down one fibre, maximising the use of the fibre and helping to keep down running costs.

The advantage of fibre over copper is the tremendous bandwidth it has to offer, allowing high speed data communication over long distances. Fibre trunk routes have been going underground all over the world for about six years and huge 'backbones' exist in many countries.

In the UK many of the utilities and emergency services have their own networks or rent fibre from a service provider. Undersea routes are in place and these international connections have little or no time delay, an unfortunate feature of satellite linking.

With attenuation figures of under 0.35dB per kilometre, long spans of fibre-optic cable are possible before some amplification or regeneration is necessary. Laser-pumped light amplifiers are available using erbium-doped fibre.

Amid the talk of winners and losers in the race to bring multi-programme multimedia information and entertainment to the end-users, I heard a lone sensible voice say that there is room for all three modes of broadcasting – cable, satellite and terrestrial. Each excels in certain conditions, times and places.

Certainly at IBC 2000 they co-existed happily enough. ■

Award for audio – for a change

Ray Dolby received the John Tucker award at IBC during a spectacular put on by the organisers as a precursor to the IBC party that went on into the warm and sticky night.

It is good to see audio getting some recognition among all the masses of video. The spectacular had masses of audio itself. It was much too loud for my old ears and Lionel Ritchie had come along to set the loudspeaker cones a-rattle.

In-circuit electrolytic tester – II

Compared with simple circuits using two quad op-amps to measure capacitor impedance at 100kHz, this circuit is larger. But while 100kHz impedance readings need interpretation, tanδ measurements don't. Cyril Bateman's tester is quick, extremely easy to use, and allows you to check components while in-circuit.

This meter measures the tanδ of electrolytic capacitors mounted on printed circuit boards, to determine whether a capacitor is good, or is worn out and should be replaced. It can also be used to verify stock capacitors.

Designed as an easy to use, portable hand held test meter, it can be housed in a standard OKW plastic case. Four AA batteries provide acceptable life in regular workshop use. **Fig. 1**.

In my version, the measuring circuit is on two single sided sub-boards, approximately 85mm by 70mm. They are interconnected using a seven-way flat Nomex flexstrip jumper cable. Leaded components are used exclusively for easy assembly.

The 'top' board contains the control and logic circuits which permitted this unique meter design, together with a floating 9V supply for the PM128 display module used and a –5v converter.

The 'bottom' board contains the 100Hz test generator and the analogue current and voltage measuring circuits. A degree of charged capacitor protection has been included should a charged capacitor be accidentally measured.

Worst-case protection is not possible in a small portable meter, so avoid connecting charged capacitors.

On the 'top' board are control and logic circuits. These were described in the September issue. This article describes the power supplies and remaining circuits, as in **Fig. 2**.

What is tanδ?

Tanδ is the ratio of a capacitor's resistive component or ESR divided by its reactive component or X_C. It defines the quality of the capacitor.

This tanδ meter works by sampling the voltage developed across the capacitor terminals at two discrete time intervals. The 'R' channel is sampled coincident with the peak of the capacitor's current, the 'X' channel is sampled 90° later. **Fig. 3**.

Fig. 1. Prototype tanδ meter, measuring a 'good' board-mounted electrolytic.

Test voltage

To avoid turning on any semiconductor junctions, a low test voltage is essential. Most semiconductor junctions do not conduct at very low voltages, but any such conduction could degrade measurements. To find out what the maximum voltage should be, I tested various devices at 100Hz.

Some low voltage Schottky barrier diodes conducted at 200mV AC. Further experiments measuring tanδ of capacitors with and without parallel HP5082-2080 diodes determined that acceptable test voltage is 150mV.[1]

Aluminium electrolytic capacitors used on printed circuit boards usually range from 1 to 10 000µF. At 100Hz, impedance ranges from 1600Ω to 160mΩ. Generating a constant test current, while not exceeding 150mV, is not practicable.

100Hz drive

Assuming a small generator source impedance, low resistance test leads and a 2.2Ω current sensing resistor, the 150mV, 100Hz test signal requires some 50mA current maximum from the generator.

Because of the voltage/current phase angles involved in measuring capacitors, I found that a low-cost miniature LT700 audio transformer worked best here, **Fig. 4**. It needs only ±1.5V push-pull drive at a negligible ±5mA current.

A low-cost, stable sinewave needing no adjustments was produced by bandpass filtering a 100Hz square wave. To eliminate the need for adjustment though, the circuit needs 0.5%-tolerance capacitors. I found it possible to select these from 5%-tolerance types.

Current sensing

Using this generator with an LM311 comparator for the logic-channel input stage, I could now finalise the values of the current sensing resistors.

Ideally you would ensure that the test capacitor's impedance was within a

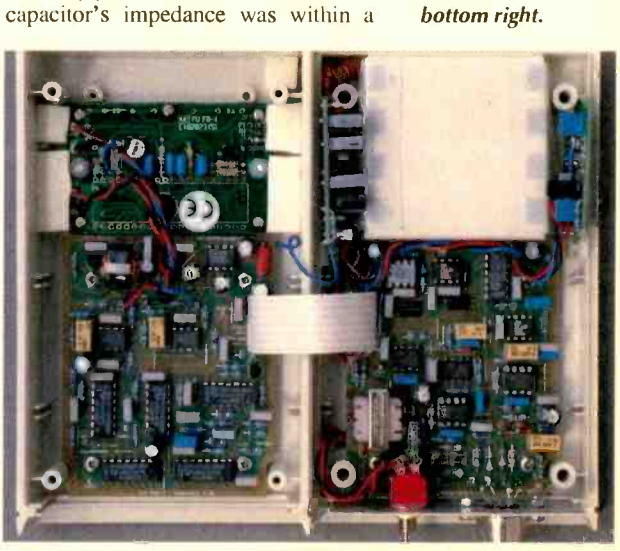


Fig. 2. Inside view of the complete tanδ meter implemented on two small interconnected boards, in a standard OKW plastic case. The left or 'top' board houses the control and logic circuits discussed in my last article. Its –5V and floating 9V supplies are visible adjacent to the PM128 display module. The right or 'bottom' board houses all the circuitry of Fig. 4 and connects to the four-wire test leads by the DIN connector at bottom right.

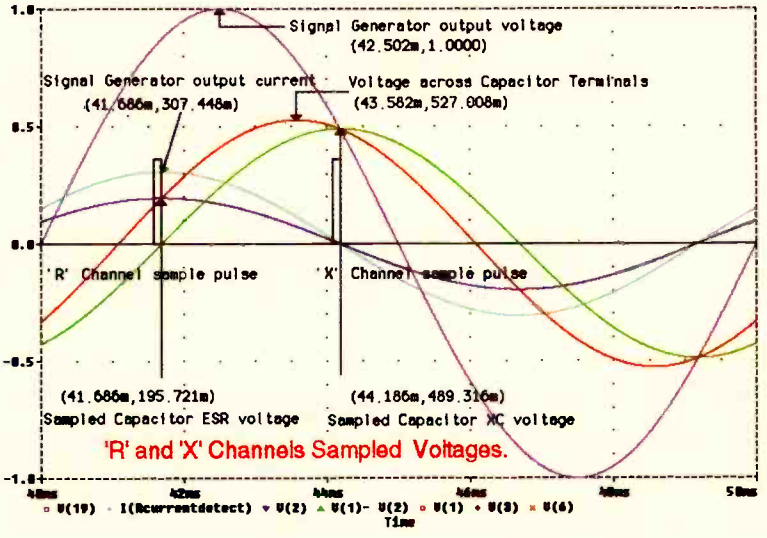


Fig. 3. Sample-and-hold control pulses superimposed on the test capacitor's current and voltage waveforms. The phase angle between the capacitor current and the voltage developed across its reactance remains precisely 90°. The meter design relies on this relationship.

factor of ten of the current sensing resistance used. Experimentation confirmed that a 2.2Ω sense resistor was suitable for test capacitances of 100µF and above.

Lesser values proved more difficult. Three sense-resistor ranges were needed, but only two could be accommodated.

Sense resistors larger than 100Ω caused false triggering in the comparator due to noise picked up on the test leads. A compromise comprising 22Ω+2.2Ω, used with a times 11.6 pre-amp, allowed good measurements down to 2.2µF – even 1µF with reduced accuracy.

Capacitor test probes

Typical commercial test leads have a resistance of around 0.1Ω. It is necessary to measure ESR down to 0.010Ω. As a result, four-terminal measurement is essential to eliminate the effects of the test leads.

Traditional four-terminal measurement methods are not practical with capacitors mounted on printed boards though. As a compromise, I found some standard test prods that could be wired in true four-terminal form, except for the final 30mm long brass probe points.

The brass probes measured 0.45mΩ[2]. As a result I was forced to accept 1mΩ of common contact resistance. For most capacitors this 1mΩ is insignificant, but it does result in a small, acceptable error, when measuring very large value capacitors.

On the schematic, the current-carrying test-lead pair connects between PL1 and PL4 while the voltage sensing pair connects to PL2 and PL3. Resistors connecting PL1 to PL2 also PL3 to PL4 are fitted to maintain continuity should the test leads be removed.

Resistance of the earthy probe lead, together with the range sensing 0.22Ω resistor, means that the test capacitor's voltage is effectively floating. Instrumentation amplifiers are used as the first input stages of both logic and analogue measurement channels.

Setting up

I tried to make this meter as free from calibration as possible. One adjustment using either a known tanδ or a relatively loss-free capacitor calibrates the meter.

With a capacitor connected to the test terminals of the meter, remove the analogue input signal by grounding the junction marked 'Test' on the top board.

Measuring the DC output voltages of both sample-and-holds in turn, trim both to 0V, then unground 'Test'.

Remove the test capacitor and adjust the offset of the current sensing comparator, U_2, for maximum output noise, then back off to just remove all noise while ensuring the comparator output remains 'low'.

Apply a 47µF capacitor to the test leads and adjust the range-switching comparator, U_5 input voltage pre-set, to just turn off the relay, extinguishing the range LED. Replace with a 100µF capacitor and ensure the relay and LED just turn on when connecting the capacitor.

None of the above adjustments is particularly critical, yet they ensure consistent operation of the meter.

This final adjustment sets the meter accuracy. Apply a 10µF metallised-film capacitor of known tanδ to the test leads. Adjust the pre-set resistor R_{19} on the output of the analogue circuit INA118, U_3 until the display reads the correct tanδ while ensuring the output from the 'R' sample and hold remains a small but positive voltage. If you don't know the tanδ of this 10µF capacitor then adjusting the display to read 0.007 should ensure acceptable accuracy.

Voltage sensing

The 150mV generator voltage, fed via the 2.2Ω sense resistor, means large test capacitance values develop very small voltages, so a gain of 11.6 is also needed for the analogue channel.

The current-sense comparator and logic channel circuits, introduce a small delay. This is balanced during calibration, by the adjustable *RC* delay in the analogue channel.

Range switching

When measuring capacitors bigger than 47µF, a comparator, re-triggerable monostable and reed relay are used to short out R_7.

Having completed the circuits needed to measure the voltages representing the test capacitor's ESR and reactance, all that remains is to divide the 'R' channel voltage by the 'X' channel voltage then display the result.

Dividing 'R' by 'X'

The 7106 DVM IC in the PM128 panel meter I used works by ratioing the measured voltage against a pre-set reference voltage. Removing resistors R_2 and R_3 disconnects the reference voltage in a PM128 display module.

An adjustable voltage was applied to the REF-HI input terminals, a second to the normal IN-HI terminal. I found the PM128 could divide and display the result accurately, provided both voltages were within the meter's maximum 2V input range.

The LF398 sample-and-hold circuit, fed with the test capacitor's amplified voltage, outputs some 2.5V maximum, which is then attenuated.

Compared with the very simple circuits using two quad op-amps to measure capacitor impedance at 100kHz, this circuit is larger. While 100kHz impedance values require good/bad judgement, tanδ measurement needs no interpretation, so is quick and extremely easy to use.

Battery supply – 80% efficient

The negative 5V generator uses a Maxim 665CPA high-current version of the popular 660 voltage converter. Because tanδ draws between 20 and 25mA from the –5V supply, low-current versions are not suitable.

A small transformer wound on a two-hole ferrite bead with the turns shown in Fig. 5 produces the floating 9V supply. Circuits for both supplies are implemented on the 'top' board.

To minimise PSU switching noise entering the measurement circuits, a stabilised +5V supply and 'auto off' circuit are housed adjacent to the battery box on two tiny boards. You can see them at the top right of Fig. 2.

Generating a +5V stabilised supply

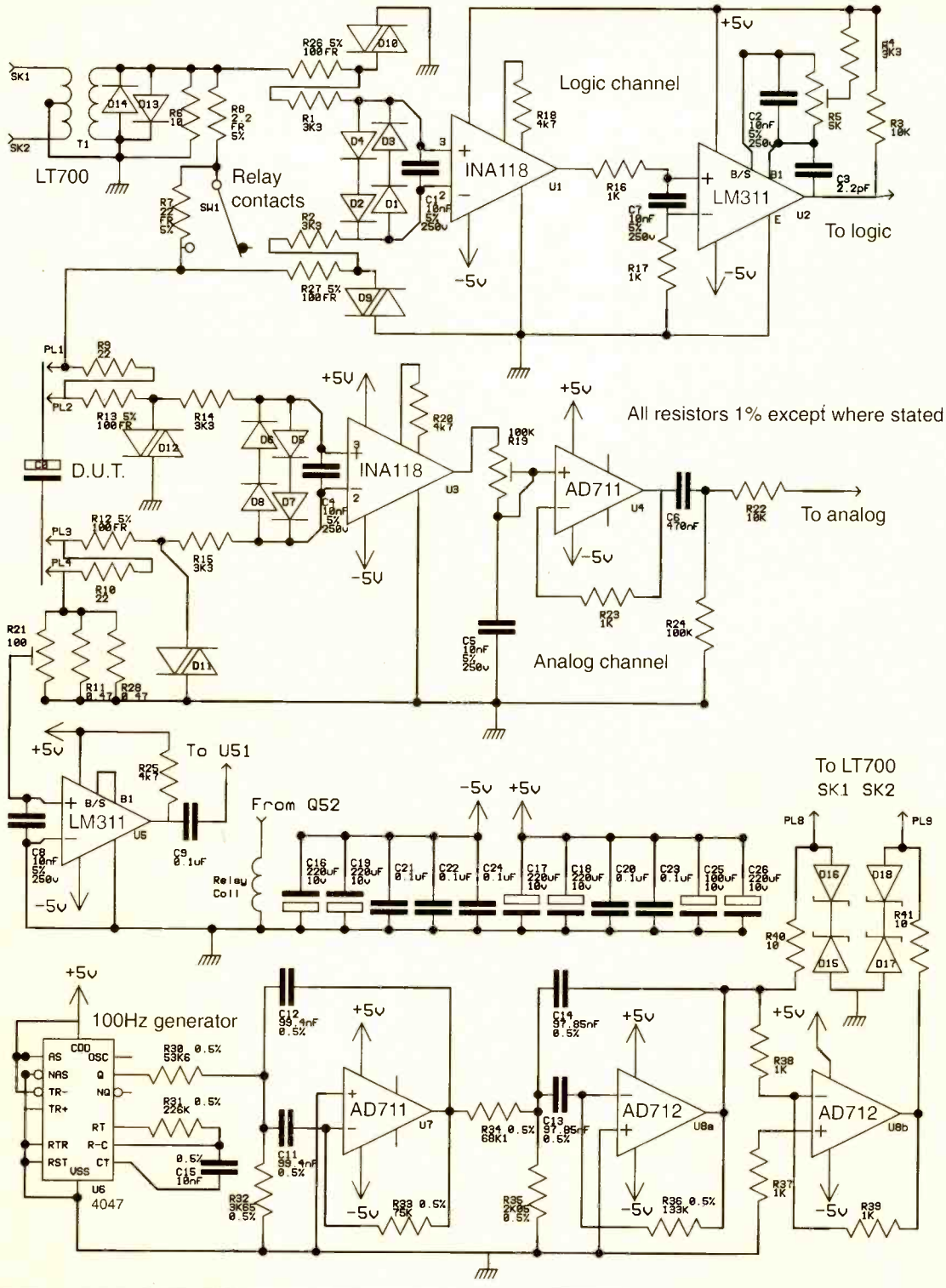


Fig. 4. Mating with the 'top' board shown in the September issue, this 'bottom' board completes the tanδ meter, and includes the 100Hz generator, current sensing and voltage-measuring analogue circuits. The capacitor voltage waveform from this board is sampled by the sample and holds of top board. The four-wire test leads are fitted to PL1, 2, 3, 4, allowing true verification of a board-mounted capacitor regardless of any semiconductor junctions in parallel with it.

Capacitor quality and tanδ

Tanδ is used to describe the quality of almost all general-purpose capacitors.

$$\tan\delta = \frac{ESR}{X_C} \quad \text{where,} \quad X_C = \frac{1}{2\pi fC}$$

All practical capacitors exhibit losses, a small DC leakage current and resistive dielectric losses that dissipate energy as heat. These losses reduce the theoretical 90° phase difference, between the applied current and the capacitor's voltage.

At 1kHz for example, the measured phase angle of a typical new 1000μF 25V capacitor was 67° – substantially less than the theoretical 90°.

This phase angle could be reproduced by either a high value resistor in parallel or a low value resistor in series with an ideal capacitor. The series resistance of this 1000μF 25V capacitor was 71mΩ, X_C was 169mΩ so tanδ was 0.42.

At 100Hz, series resistance measured 104mΩ, X_C was 1.62Ω and tanδ was 0.064. This series resistance is the equivalent series resistance or ESR of the capacitor[9].

Table A. Typical tanδ values of new capacitors measured at 100 Hz – low capacitance values.

Capacitor	1μF	2.2μF	4.7μF	10μF	22μF	47μF	100μF
50V bipolar Al.	0.05	0.05	0.05	0.05	0.05	0.05	0.06
63V polar Al.	0.04	0.04	0.035	0.035	0.035	0.045	0.04
450V polar Al.	0.1	0.1	0.08	0.05	0.05	0.05	

Table B. Typical tanδ values of stock capacitors measured at 100Hz – high capacitance values.

Capacitor	1 000μF	2 200μF	4 700μF	10 000μF
25V polar Al.	0.06	0.075	0.09	0.1
63V polar Al.	0.03	0.05	0.06	0.07

Parts and ready-made meters

I have now put together a good number of tanδ meters. All have performed to specification using only the calibration adjustments. These meters were all built using the circuits shown, which were finalised May 1999.

I supply a 24-page user manual – including schematic drawings, board layouts, calibration instructions and parts list – with each assembled tanδ meter. With printed boards or parts kits, I include a further 22-page assembly manual of instructions, drawings and six assembly-stage photos.

For details, send an SAE to me, Cyril Bateman, at Nimrod, New Road, Acle, Norfolk NR13 3BD.

The **PM128 panel meter** normally sells at £10.95 excluding VAT. If you order from Vann Draper quoting *Television*, you can buy them at £8.95 – fully inclusive of VAT and UK shipping. Overseas readers, contact Vann Draper for details. Phone 01283 704706, fax 01283 704707 or write to Stenson House, Stenson Derby DE73 1HL. E-mail sales@vanndraper.co.uk.

from four AA batteries poses the difficulty that with fresh batteries, the circuit must reduce the battery voltage. As the batteries discharge, the circuit must automatically change to boosting the battery voltage[3].

The LT1303CN8 power supply IC boosts the battery voltage so the ZTX788B transistor can act as a linear regulator, producing a stable +5V. High-frequency noise is decoupled using a VHF inductor and a small twelve turn, bifilar wound, bucking mode inductor, **Fig. 5**.

Should the meter be accidentally left on, the ICM7242 timer shuts down the LT1303 circuit.

In total, four 220µF 10V, low-ESR decoupling capacitors are used for the +5V supply and three for the –5V converter. These ensure very low supply line noise levels. For compactness and reliability, I used Rubycon YXF style electrolytic capacitors[4].

The +5V power supply achieves around 80% efficiency with 4.5 to 5V input, the median voltage using four AA alkaline or Ni-Cad cells.

Performance

This tanδ meter returns a steady measured value within three display-meter counts, or around a second. Its accuracy more than suffices to distinguish between good and bad board-mounted capacitors.

With the exception of capacitors near 1µF and 10000µF, where accuracy reduces, it is hard to tell whether my laboratory bridge is more accurate than the tanδ meter.

At normal room temperature, the meter displays tanδ to around ±0.005 of its true reading for values up to 0.4. Capacitors having a tanδ of 0.4 are worn out[5].

Accuracy can be extended for higher tanδ values simply by changing R_6 in the PM128 meter module from 47kΩ to 470kΩ. This slows down the PM128 meter module, which then takes around two seconds to provide a stable reading.

While intended for use in normal indoor ambient temperatures, the meter's accuracy degrades little between 10°C and 30°C. At very-low ambient temperatures though, cold batteries may not supply sufficient current for a stable ±5V power supply. ■

Part I of this article appeared in the September issue. Apologies for the delay with part 2 – Ed.

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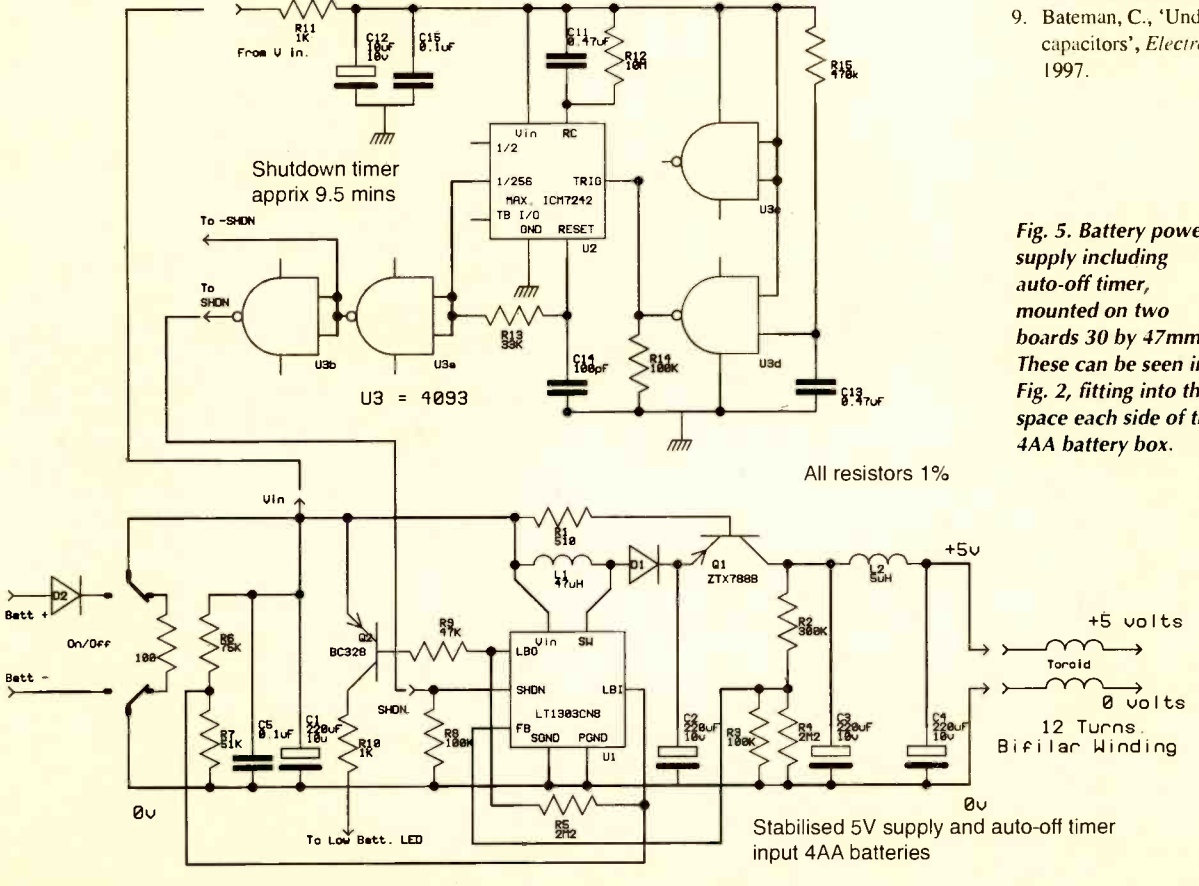


Fig. 5. Battery power supply including auto-off timer, mounted on two boards 30 by 47mm. These can be seen in Fig. 2, fitting into the space each side of the 4AA battery box.

TESTER FOR REMOTE CONTROL HANDSETS

Having used a commercially-available remote-control tester and finding it lacking, Ian Rees set about designing his own. The result is extremely simple, yet it allows you to detect not only whether there's a carrier, but also whether the keypad is working.

I have a commercially-available remote-control tester on which a small LED lights when an infrared beam is detected. I have been embarrassed several times when the tester indicated OK even though a handset was faulty. The test fails because the instrument detects the infrared carrier only. If the modulated pulse stream is missing, the handset will still test OK.

By using an audio IC to amplify the pulses from the IR detector, and putting them through a speaker, both carrier and modulation can be verified.

A lesser shortcoming of the original tester was that it was turned on by mains filament lighting. Although the present design also picks up the 50Hz modulation of mains lamps, it is easily distinguished from the handset's 'tak-tak-tak' sound.

You can see how simple the circuit is from the diagram. The infra-red detector is AC coupled to the amplifier through the closed circuit jack socket and the 4.7µF capacitor.

The jack socket is there to allow the amplifier to be used for signal tracing. When the tracer probe is jacked in the infra-red LED is disconnected.

There's no volume control. The speaker in the prototype is a small 1.5in moving coil unit.

Putting it together

Built on a small piece of Veroboard and enclosed in a small plastic case 4.5in by 2.25in by 0.75in, the prototype is totally self contained.

The op-amp is an eight-pin DIL LM386 audio IC designed for battery operation. I mounted the IC in an eight-pin DIL socket to ease replacement should it become necessary. Only a handful of external components needs to be added to the IC to get the tester up and running.

Outside of the normal precautions when using audio ICs, you should have no problems with the construction. The IC is configured using its lowest gain settings, so offering good stability.

When fitting the infrared diode, make sure that the sensitised area is forward. Recess it back inside the case to reduce the effects of 50Hz lighting hum.

A PP3 battery powers the prototype, and has a long life provided that you turn the tester off after use!

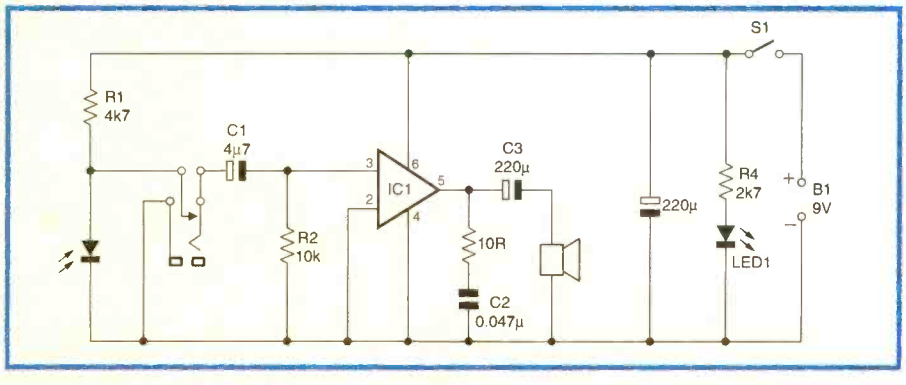
Using the tester

With the tester turned on, face the handset under test about four to six inches away from the tester's sensor. When you press key on the handset, you will hear a distinctive sound from the speaker.

When used on-site, the signal tracer side can be very useful, taking over some of the functions of an oscilloscope once you become familiar with identifying the sounds of different waveforms.

Although the amplifier doesn't have a high gain, it is still very useful in tracing or checking audio and data paths in low voltage equipment.

Connecting a telephone pick-up coil to the tracer allows high-level AC inductive tracing to be carried out. Chopper, frame and even line harmonics can be picked up. Verification that AC solenoids, valves and motors have power applied can also be done. ■



Parts list

Resistors

R_1	4.7kΩ
R_2	10kΩ
R_3	10Ω
R_4	2.7kΩ

All resistors carbon ±5% 0.25W

Capacitors

C_1	4.7µF, 100V electrolytic
C_2	47nF, 100V ceramic
$C_{3,4}$	220µF, 16V electrolytic

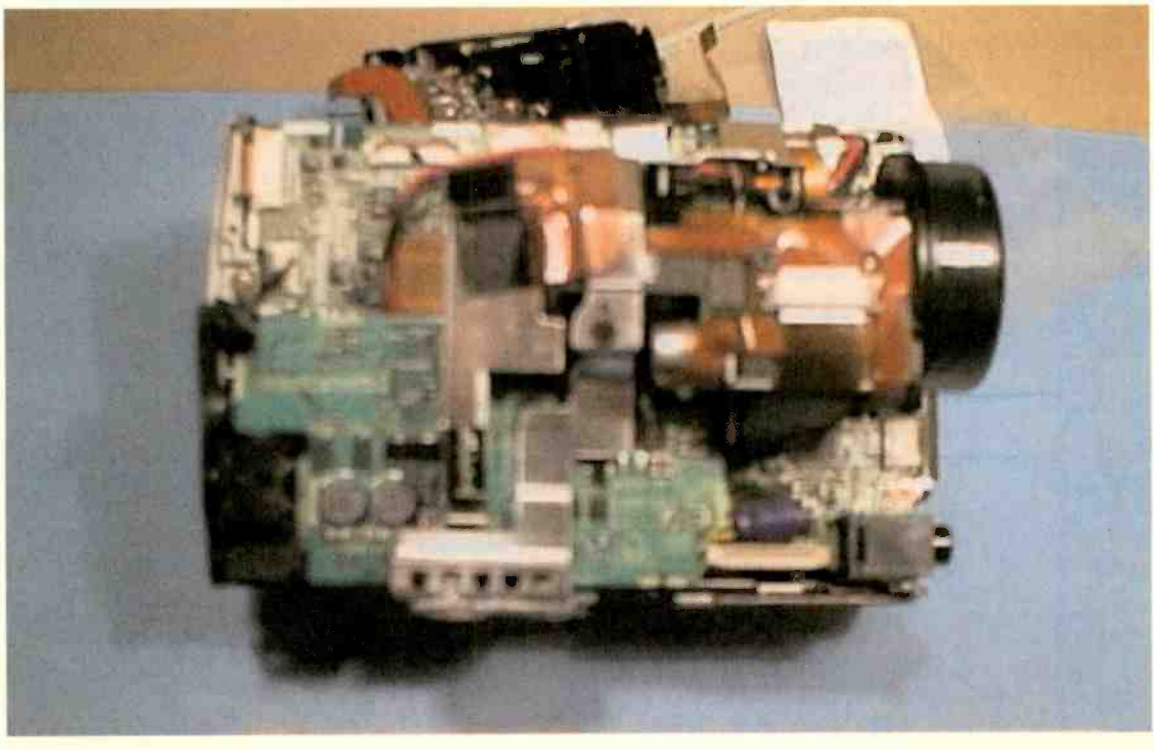
Semiconductors

Infra-red receiving diode – Maplin CH1 1M
LM386N-1 – Maplin UJ37S
5mm red light emitting diode

Miscellaneous

SPST 1A switch
4 or 8Ω speaker
PP3 battery
3.5mm mono jack socket – Maplin FK02C

Recording a digital video signal on tape and its playback are quite complex processes that include Viterbi error correction. In this concluding article on the DVC format Steve Beeching, I.Eng. describes the techniques used



What is DVC?

This concluding instalment deals with the basic data recording and playback arrangements used in the DVC system. Fig. 1 shows the record system in block diagram form. The incoming serial data bit stream is first encoded in Non Return to Zero Inverted (NRZI) form. With simple NRZ, a string of ones or zeros remains at the same signal level. Unfortunately this gives rise to an unwanted DC component in the off-tape data stream. Hence the use of NRZI instead (see below).

Fig. 2 shows the initial playback stages in block diagram form. In addition to NRZI decoding, a Viterbi correction system is used to overcome the effects of noise. Incidentally Viterbi is the name of a NASA engineer who developed the system for dealing with noisy data from distant spacecraft.

The recorded data is played back by the two heads, as with any helical-scan video recording system, then amplified and selected by the video head switching system. AGC and equalisation, to compensate for HF losses, are then applied. This is followed by 1 + D (NRZI) decoding. After that the signal path splits, one path being via an analogue-to-digital converter (A/D) for Viterbi analysis of the signal (see later), the other via a compensation and latching circuit to recover the original squarewave, bi-state data format. Viterbi correction is then applied.

Prior to the 1 + D and Viterbi A/D blocks the playback signal is in tri-state form – see lower part of Fig. 3. This is in effect an AC waveform centred on zero, with an upper level of 1 and a lower level of –1. The subsequent bi-state signal is in the normal form of zeros and ones.

During the record process a magnetic field is produced across the gap of the recording head only when the current in the winding changes. With a steady current (DC) the tape is not affected and nothing is recorded. When a squarewave, such as a digital bit, is applied to a recording head only the transitions from low to high and high to low are recorded on the tape. What happens is that the signal is differentiated, as shown in Fig. 3.

Interleaved NRZI

There may, within the digital

recording stream, be long strings of zeros or ones. This is not good for synchronisation of the playback phase-locked loop. It will also result in the DC level rising and falling. As long strings will not have enough changes to keep the playback PLL circuit in sync with the playback data signal, data will be lost or corrupted.

An NRZI encoder ensures that long strings of zeros and ones don't happen. In effect it 'chops' them, thus maintaining a clock pulse stream for the playback PLL. A scrambled NRZI circuit is used. Basically it consists of an exclusive-OR gate and two delay lines, each with a delay time equivalent to one data bit, see Fig. 4.

The inputs consist of the input data A and the output data (C) delayed by two bit periods, i.e. B. C is the gate's output to the record amplifier. The gate is, in this configuration, used as a serial multiplier, where

$$C = A + (C \times D \times D) \text{ or } A + CD^2.$$

The latter, rearranged, gives us $A = C - CD^2$ which, expanded, produces

$$A = C(1 - D^2) \text{ or } A = C(1 - D^2).$$

The latter gives $C = A/(1 - D)^2$, as shown in Fig. 4.

By expanding this for the recording signal we get

$$C = [A/(1 + D)(1 - D)].$$

In the recording process the heads differentiate the data signal as it's stored on the tape (see above). This is equivalent to multiplying the data by (1 – D), see Figs. 5 and 6.

$$C = [A/(1 + D)(1 - D)] \times (1 - D), \text{ so}$$

$$Cr = A/(1 + D).$$

Cr is the recorded magnetic signal and is equivalent to A/(1 + D). Fig. 7 summarises the record encode process.

Playback

The off-tape signal P is equivalent to Cr, so P = A/(1 + D). It's a tri-state signal at either 1, 0 or –1, and is used by the Viterbi error-correction system to counteract dropouts and noise that affect the tri-state levels.

A 1 + D multiplier, see Fig. 8, within the playback equalisation system converts the signal back to its bi-state format, restoring the original signal A. Negative (–1) pulses at the Q input are converted to positive pulses in the P + Q summing.

The playback waveform diagram, Fig. 9, shows that where there are opposite-polarity pulses at P and Q they are cancelled, and that where there is a pulse at P or Q, of whatever polarity, there is a positive output pulse. The output R = P(1 + D).

The following clocked latching circuit produces a squarewave for the period of the clocking pulses, initiated by the output of the 1 + D decoder. Where two or more output pulses follow each other within the latch period a longer squarewave output is produced, as shown at A in Fig. 9.

Fig. 1: Block diagram of the DVC record drive system.

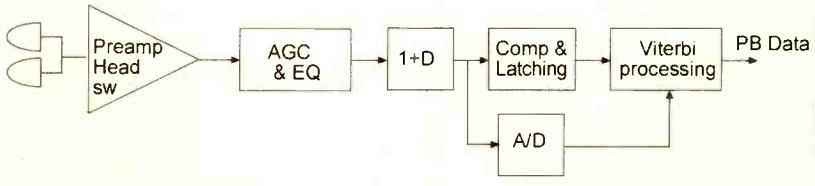


Fig. 2: Block diagram of the initial sections of the DVC playback system.

NRZI operation with a long string

The NRZI processing system comes into its own where a long string of zeros or ones occurs, by 'chopping up' the data stream to ensure that there are as many clock pulses as possible to maintain the playback PLL clock synchronisation.

In the example shown in Fig. 10, signal A contains a lone string of ones – this is a basic NRZ signal. As a result of the action of the exclusive-OR gate, additional pulses are recorded, as shown in line P, during the extended high period. An additional point is that if A was left in the lengthy high state it would tend to be integrated to produce an unwanted DC level, which means that the playback data stream wouldn't centre on zero volts: it would be lifted up, and because of this data would be lost by the following data slicing circuits.

During playback the 1 + D circuit's decoding, shown at R, and the subsequent compensation and latching circuits restore the original signal, A.

As an exercise, check this waveform diagram against the logic diagram chart for the exclusive-or NRZI circuit (see Fig. 4) to get result C from the original signal A. Also confirm the result R = P(1 + D) from the logic diagram and chart for 1 + D multiplication (Fig. 8) during playback, and that the clocked latching circuit then produces a long series of ones from the string of pulses R.

Viterbi error correction

During LP playback the off-tape data

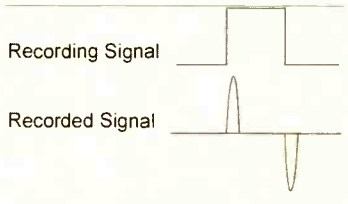
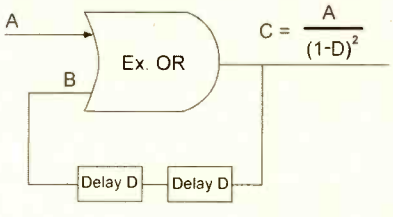


Fig. 3: Conversion of the signal being recorded to tri-state form as a result of the differentiation carried out by the heads.



A	B	C
0	0	0
0	0	0
1	0	1
0	0	0
0	1	1
1	0	1
0	1	1
1	1	0
1	1	0
0	0	0
1	0	1
0	0	0
0	1	1
0	0	0
0	1	1
0	0	0

Fig. 4: The NRZI encoder, which consists of an exclusive-OR gate and two delay lines, and the associated logic table.

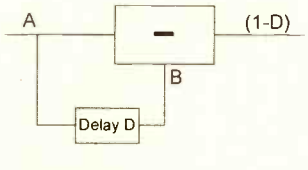


Fig. 5: Equivalent differentiating circuit for the heads.

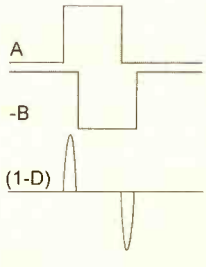


Fig. 6: The effect of head differentiation.

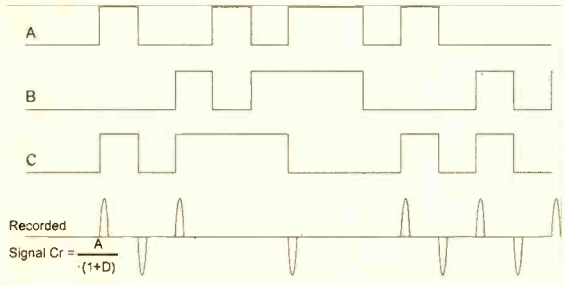
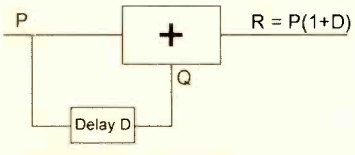


Fig. 7: Record encode waveforms.



P	Q	R
0	0	0
0	0	0
1	0	1
-1	1	0
1	-1	0
0	1	1
0	0	0
-1	0	1
0	-1	1
0	0	0
1	0	1
-1	1	0
1	-1	0
-1	1	0
1	-1	0

Fig. 8: The 1 + D multiplier (NRZI decoder) and its logic table.

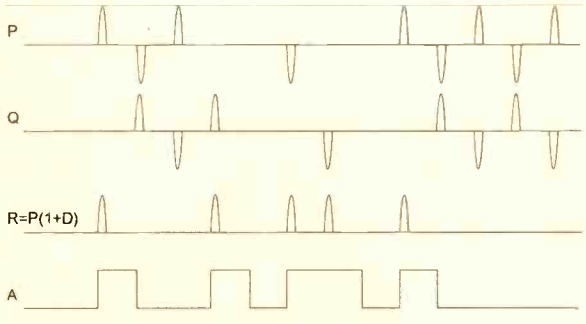


Fig. 9: Playback waveform diagram.

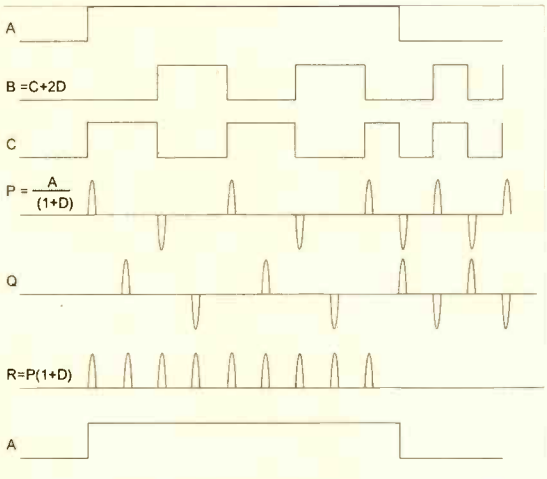


Fig. 10: NRZI processing.

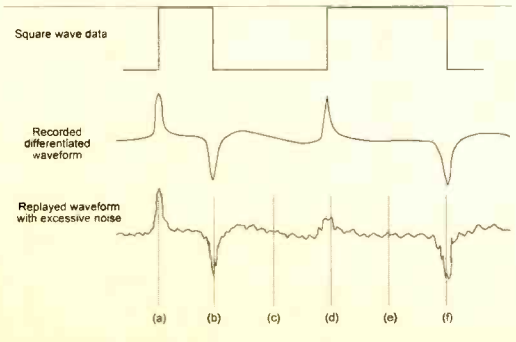


Fig. 11: Viterbi error correction.

error rate is much greater than with SP playback, because of the reduced track width and increased noise. So additional error correction is required.

The binary data record drive applied to a tape head is a squarewave. The playback signal is not, because of the differential action of the video heads' inductive coupling and the rotary transformer. Playback data is tri-state, consisting of 1 and –1 pulses and zero.

As we have seen, restoration of the signal to its bi-state squarewave form is accomplished by the 1 + D multiplier and a latching circuit. This works well as long as the signal-to-noise ratio is high and Reed Solomon parity error correction can accommodate any errors. If the signal has excessive noise, as with an LP recording or poor SP playback, a more comprehensive signal-recovery system is required.

The original problem that led to the Viterbi system was the recovery of digital telemetry data from satellites and space, the data being severely corrupted by noise. As the noise was too great for a variable slicing-level system to be able to provide accurate data recovery, Dr Andrew J. Viterbi proposed a software solution that uses a complex algorithm. The algorithm analyses the data waveform and, by storing sections, compares and examines changes, decides on errors and provides correction. Reduction in error rates by a factor of 100 is possible.

With the DVC system the playback waveform is A/D converted to six-bit data words that represent the voltage level of the pulses present (waveform P, Fig. 10), i.e. the voltage level and the polarity of the pulses is converted to six-bit data words. These values are stored in memory to enable strings of data to be compared.

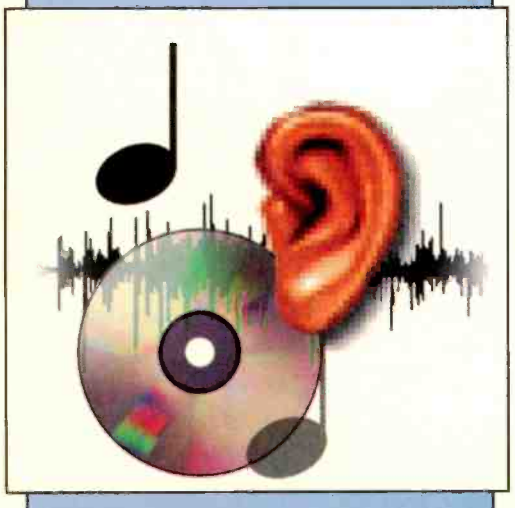
Fig. 11 illustrates the operation of the system. The signal level is checked at times (a)-(f). When the Viterbi software examines these samples, it carries out decisions on the most likely level of the tri-state signal, 1, 0 or –1. With samples (a), (b) and (f) the logic level is fairly certain: 1, –1 and –1. With samples (c), (d) and (e) the level is less certain, except that the signal is not of negative polarity. So these samples are passed to a further decision-making stage which acts on a data train sequence. This works as follows.

When the signal is differentiated by the magnetic coupling, the zeros and ones become tri-state (1, 0 or –1). It is certain, from the original squarewave, that –1 must follow 1 if it is not 0. So zeros are ignored and the data string is checked for alternating ones and minus ones. Sample (d) is the highest level. It is positive, and it follows –1 at (b). Therefore it must be one. Intermediate sample (c) must be 0, because it falls between a –1 and a 1. By the same logic it follows that (e) must be 0 because it falls between a 1 and a –1.

If a number of samples cannot be decided upon, the sequence is stored in memory to suspend detection while the next sequence is processed. The Viterbi system looks for common sequences within a set number of bits, and completes correction of suspended data bits from information found while processing subsequent data, which all contributes to the decision making.

The number of bits stored can vary from manufacturer to manufacturer. The more bits stored for comparison, the better the error correction. An average 30-40 bit samples are stored.

The data bits are taken from the 1 + D decoder for checking, after which the Viterbi circuit applies correction to the recovered data output from the latching circuit, in its two-state binary form.



AUDIO FAULTS

Reports from Russell J. Fletcher Chris MacRae and W. Ferguson

We welcome fault reports from readers – payment for each report is made on publication. See page 106 for how and where to send reports.

Teac AX1030 amplifier

This amplifier was dead: there was no power anywhere other than the mains input circuitry and the primary winding of the mains transformer. This suggested a faulty transformer, which was in fact open-circuit.

The amplifier had been installed at a local pub and had been in constant daily use for over four years. Because of restrictions on expenditure and the fact that no money was to be spent on speakers "because the juke-box people had left the old ones in", L-pads had been installed in order to zone the system. Unfortunately in this situation the operators never seem to grasp the idea of reducing the amplifier's volume setting instead of the settings of the zone controls. Eventually the amplifier ends up running at full output with the zone controls down near zero!

If the zone controls don't give up and the amplifier is beefy enough not to lose its output transistors, as in this case, it's usually the mains transformer that suffers. **R.J.F.**

Marantz PM45 amplifier

If the amplifier cuts out intermittently, check for dry-joints around the driver transistors. **R.J.F.**

Revox B77 tape deck

This open-reel tape deck had a headphone monitoring fault: the left channel was missing and the right channel was very distorted. The headphone output is driven by two op-amps on the monitor PCB (bottom right viewed from the rear). One of these op-amps was of the incorrect type while the other was faulty. They should be type LM301. **R.J.F.**

Harman Kardon AVR10/AVI100 AV amps

A buzzing from these AV amplifiers is usually caused by the mains transformer's loose metalwork. For a non-bouncing repair you will have to replace the transformer. It's a very common complaint. **R.J.F.**

Technics SLP777 CD player

This unit was brought in because of a very straightforward problem: the output phono connectors were broken. I immediately saw a quick way of carrying out an effective repair and upgrade. This would avoid the need for a phone call to ask for the exact special replacement, which is probably no longer available anyway.

Strip down and remove the output socket assembly. Break away the original socket parts of this unit, and ream holes to take a nice pair of panel-mount, gold-plated phono sockets. When these are fitted, the grounding even picks up on the original metalwork. The whole assembly can then be refitted to the PCB, with the ground soldered as before and only the signal terminals to connect. When reassembly is complete, the modification really looks the part. **R.J.F.**

Peavey LS systems

If you come across one of these systems with a 15in. Black Widow driver that grumbles, resonates or makes other disturbing sounds, before condemning it check the condition of the bond at the suspension. I've had several of these units in which the glue has let go at the back of the frame around the coil assembly. Check and, if necessary, reglue using a suitable contact adhesive.

If you do get one of these drivers with a damaged cone/coil assembly, Peavey can supply a new "basket assembly". The magnet is simply transferred. This also applies with the smaller Scorpion 12in. units. **R.J.F.**

Revox B77 and PR99 tape decks

If the complaint with one of these open-reel tape decks is intermittent operation when selecting a transport function, strip out the row of operate buttons, dismantle the assembly and clean the switch contacts with an ink rubber or something similar. **R.J.F.**

Sony HCD-H7/H1500

The display was erratic and at power up would freeze in one mode or another, though normal operation was sometimes possible. Scope checks revealed the cause of the problem, which was the 4·19MHz crystal X501 on the front display board. Its output was low. A new crystal restored normal operation. **C.MacR.**

Aiwa LC-X50

This CD player was dead. A check on the door switch SW2 produced a beep from the meter, so I assumed that it was OK. I next found that there was no 8V supply from Q7 on the CD board. This switched voltage comes from pin 4 of IC252, but a replacement chip failed to restore it. When the contacts of SW2 were linked the player came back to life. The cause of the trouble was that its contacts were resistive: once the black film had been cleaned off everything was OK. **C.MacR.**

Philips 70FC450

The trouble with this stereo cassette deck was no motor drive. A check showed that there was 12V at both tags of the motor all the time. I had no circuit diagram, but was able to find a faulty surface-mounted transistor in the motor supply circuit – it was leaky base-to-collector. The transistor is mounted on the panel behind the button unit, nearest the top. **W.F.**

All about Heatsinks

Heatsinks are essential to ensure reliable operation of power semiconductor devices. In the following article Ray Porter, M.Sc., C.Eng., MIEE, explains the heat dissipation process and the basic calculations used to determine the type of heatsink required for a particular application

Semiconductor device failure mechanisms are temperature related. Thus in addition to ensuring that the maximum junction temperature (usually 150°C) is not exceeded, it's advisable to remove as much heat as possible from a power semiconductor device. This is usually done by using a heatsink of appropriate size The following notes cover heatsink principles and design parameters as applied to consumer electronics.

Heat-flow path

Resistance to heat that flows along the path from the junction of a transistor to ambient air is analogous to electrical resistance, while the amount of heat that flows is analogous to electrical current. Fig. 1 shows the basic path and the individual elements that impede the heat flow. Ambient air is taken to mean air that has a fixed temperature. When there is a rise of temperature within an equipment case, this rise has to be added to the initial ambient air temperature, or alternatively the extra thermal resistance between the case and ambient air has to be added to the heat-flow path.

Thermal resistance is quoted as °C/W or K/W. K means degrees Kelvin, which are numerically equal to °C when changes of temperature, rather than absolute values, are concerned. Note that °K does not exist: K means degrees Kelvin, not just Kelvin.

As an example, a heatsink with a thermal resistance of 20K/W would have a temperature difference of 40°C between the semiconductor mounting area and ambient air when 2W was being dissipated in the semiconductor device. This assumes that the ambient air is at the temperature at which the heatsink's thermal resistance is specified, which is usually 25°C. Thus the transistor's mounting area would be at 65°C.

Contact thermal resistance

The resistance to heat flow between a transistor's mounting base and a heatsink depends on the contact area, contact pressure, surface flatness and surface coating. Paint thickness of up to 50 microns has negligible effect on heat flow, but flatness is very important. Contact pressure is often controlled by a spring clip or a screw. Rivets are seldom considered good enough to provide a well-controlled clamping force: in addition, many types slacken off with age because of differential expansion between the rivet and PCB material as the assembly heats up.

Burrs and undulations reduce the contact area. To overcome this, heatsink compound is used to fill the gaps. This material consists of a mixture of silicone grease and alumina, a mineral form of aluminium trioxide. It has good thermal conductivity and good electrical insulation properties.

Maximum permissible heatsink thermal resistance

The heatsink thermal resistance value (θ_{HA}), expressed in °C/W, that will produce the desired transistor junction temperature is calculated as shown below. Abbreviations used are as follows: J junction; C case; H heatsink; A ambient air; P power dissipated; q thermal resistance; T temperature.

From the heat-flow path diagram (Fig. 1) you can see that

$\theta_{JA} = \theta_{JC} + \theta_{CH} + \theta_{HA}$

where $\theta_{JA} = (T_J - T_A)/P$ and $\theta_{JC} = (T_J - T_C)/P$. Thus

$T_C = T_J - P\theta_{JC}$ and

$\theta HA = [(T_J - T_A)/P] - [(T_J - T_C)/P] - \theta_{CH}$

$= [(T_C - T_A)/P] - \theta_H$ equation 1

To use this result, assuming that the power dissipation is known, choose a maximum junction temperature, say 120°C. Calculate the case temperature that will occur, using $T_C = T_J - P\theta_{JC}$. Put the case temperature, ambient temperature and power values into equation 1. This gives the maximum heatsink thermal resistance value that will do the job, assuming that the contact thermal resistance is negligible. In practice a lower value should be chosen to allow for the effect of contact deficiencies.

When the semiconductor device dissipates power intermittently, heatsink parameter calculations are carried out using thermal impedance instead of resistance. This allows for the thermal time-constant of the heatsink, and is applicable with pulses shorter than one second.

The effect of a heatsink's thermal capacity is analogous to the time-constant of an electronic filter with a capacitor: it smooths the temperature fluctuations caused by the heat input pulses. To take advantage of this the duty cycle must be low – so that the heat from the pulse is dissipated during the off period.

Heatsink finish

It's generally understood that a 'black body' radiates heat more readily than one with a shiny finish. But tests using various finishes show that:

(1) A painted surface has greater emissivity than a bright, unpainted one (this is most important with flat plates, where a third of the heat is lost by radiation).

(2) Paint colour has little effect. Matt black is only three per cent better than gloss white. Aluminium paint has low emissivity, but is still ten times better than a bright metal finish.

(3) Painting is less effective with finned heatsinks, as the heat radiated by one fin is gained by the adjacent fin.

(4) Anodising and etching improves emissivity.

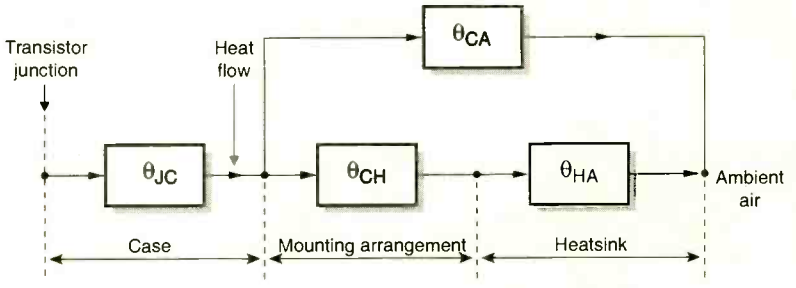


Fig. 1: Thermal resistances in a heat-flow path.

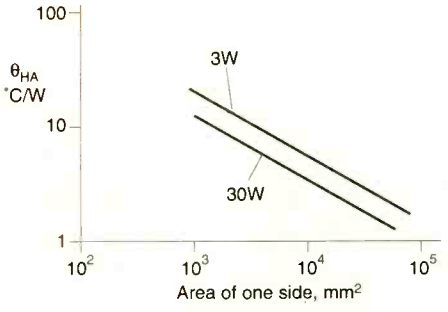


Fig. 2: Flat-plate heatsink characteristics (black, vertical, aluminium, 3mm thick and approximately square).

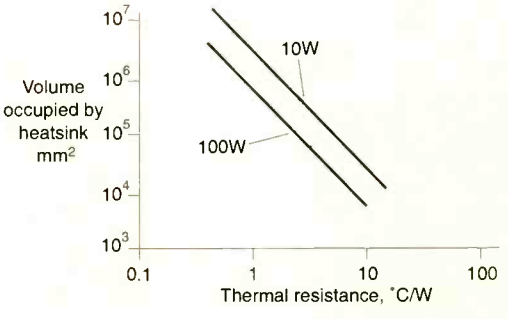


Fig. 3: Characteristics of finned blackened aluminium heatsinks.

Flat-plate heatsinks

The thermal resistance of a flat-plate heatsink depends on its thickness, area, orientation, finish and the power dissipated in the plate. Higher power dissipation increases the heatsink temperature and hence the loss by radiation, which lowers the thermal resistance when compared to the value at a lower temperature. A vertically-mounted heatsink has fifty per cent of the θ_{HA} of a horizontally-mounted one.

Fig. 2 shows the thermal resistance with square, flat plates. The graph applies with plates that are nearly square (sides ratio up to 1:1·25).

The heatsinks used in TV sets are often flat plates bent to a convenient shape. This increases their thermal resistance compared with that of a flat sheet.

Finned heatsinks

Fig. 3 shows the thermal resistance of black, commercial extrusions based on the volume they occupy.

This information and that in Fig. 2 is based on a Philips' application note for power semiconductor devices.

Heatsink compound

Typical values of θ_{JC} for a BU2520AF transistor are 3·7°C/W without compound and 2·8°C/W with compound applied. With a BUT11AF transistor the figures are 6·45°C/W without and 3·95°C/W with, a 63 per cent improvement. These figures show that the use of heatsink compound improves thermal contact when fitting a power transistor. Though it produces a lower thermal resistance, because of process difficulties and associated costs manufacturers don't always use compound.

Report from

Widescreen Integrated Digital Television Model MW82 605 from Grundig.

Consumer electronics technology continues its dizzy progress. George Cole reports on the latest products and systems presented at the Live 2000 show in late September

This year's Live 2000 show was held at Earls Court, London in late September. The event began life as a consumer electronics exhibition, but has now branched out to include telecoms, computer games and mobile communications. There were still many consumer electronics products on display but, sadly, several major brands were not represented this year.

Television

One of the most eye-catching TV sets on display was Sony's Grand Wega KF-50SX100, a 50in. widescreen projection model. The picture is produced by three XGA LCD panels, one each for the R, G and B signals and each panel having over a million pixels. The set also features Sony's Digital Reality Creation (DRC) technology, which uses a proprietary algorithm to increase the resolution of the picture.

Two new Art Coutre sets, Models KV-28FQ75 (28in.) and KV-32FQ75 (32in.), were on display while at the other end of the scale there were two 14in. portables, Models KV-14LT1 and KV-14LM1, that are part of the Mio Wega range. Both have Wega flat-screen CRTs and include a rear scart connector and front AV socket.

Loewe, which is distributed by Linn Products, had on show the Vitros 6381ZW set with Real-Flat tube. Other features include picture-in-picture technology and a 1,750-page teletext memory. The set can be upgraded to provide VGA displays and Dolby Digital sound via add-on modules.

Sharp's interesting display of TV sets included CRT and LCD models. The 76GF64H is a 32in. set with a PureFlat CRT, Dolby Pro-Logic, Fastext and Sharp's TV Guide. The guide looks good and provides viewers with now and next viewing information via a pop-up menu. The NextView connection between the receiver and a suitably-equipped VCR enables the viewer to set the video timer via another pop-up menu, using the teletext pages. NextView is also known as SmartLink, Q-Link and other names. Further PureFlat sets include the 28in. Nicam Model 66GF-63H and a version with Pro-Logic, Model 66GF-64H. All these sets include Sharp's post-code technology, which displays the owner's post code when the receiver is switched on again after being unplugged.

Sharp has long backed LCD technology and has announced that it aims to stop selling CRT TV sets in Japan come 2005. The company has for some years marketed LCD monitors in Europe: this year marks the first time that it has launched LCD TVs here. The new models are the 12in. LC-12A2E and 15in. LC-15A2E, which both feature a newly-developed active-matrix TFT LCD panel with 640 x 480 x RGB resolution and a viewing angle of 160°. The backlight is said to have a life of 60,000 hours, the equivalent of 12-15 years' average use. These models should now be available and will be joined by a 20in. version early next year. Known as the LC-20A2E, it will have detachable speakers. Sharp also showed the LC-28HM2, a 28in. widescreen monitor.

The LCD screens produced impressive pictures, and LCD technology has improved by leaps and bounds in recent years. The main problem now is cost. The 12in. model sells for about £1,500, the 15in. version for some £2,000. The 20in. version is expected to sell for about £4,000 while the 28in. LCD monitor has a price tag of about £10,000. When you consider the relatively low cost of sets with CRT displays, you can appreciate the task Sharp faces. The company plans to open a new LCD factory in Japan however. This should, hopefully, reduce prices. Meanwhile those for whom price is of no concern might be interested in the Sharp

Live 2000

60in. HiVision flat-screen display, which uses CGS (Continuous Grain Silicon) technology. It looked good – then it should have at a price of some £50,000!

Grundig showed an impressive range of sets. The Status Vision Model MFW82 720/9 has a 32in. Super Flat widescreen and an integrated DVD-Video player. Other features include 100Hz scanning, Dolby Pro-Logic sound, a 512-page teletext memory and Clear screen coating, which Grundig says keeps the screen free from dust. The Xenia Flat range consists of two models, the 28in. MFW70 430/8 and 32in. MFW82 490/8. They have Super Flat (Megatron) widescreen tubes, 100Hz scanning, Virtual Dolby Surround sound and a VGA socket.

The Arganto range of free-to-air integrated DTT sets with widescreen CRTs was also on display. It consists of a 32in. model with Dolby Pro-Logic sound (MW82 605), a 28in. model with Dolby Pro-Logic sound (MW70 605 IRDT), a 32in. Nicam sound model (MW82 600) and a 28in. Nicam sound model (MW70 600. They can all be upgraded for ONdigital's pay-TV service by adding a plug-in conditional-access module.

Grundig also showed its new SkyDigital set-top box, Model GDS310, which has a very smart appearance, and Planatron 2 flat-screen set. This has a 42in. plasma display, two tuners, picture-in-picture, Dolby Pro-Logic sound and VGA connection. It comes in two forms, wall-mounted and floor-standing.

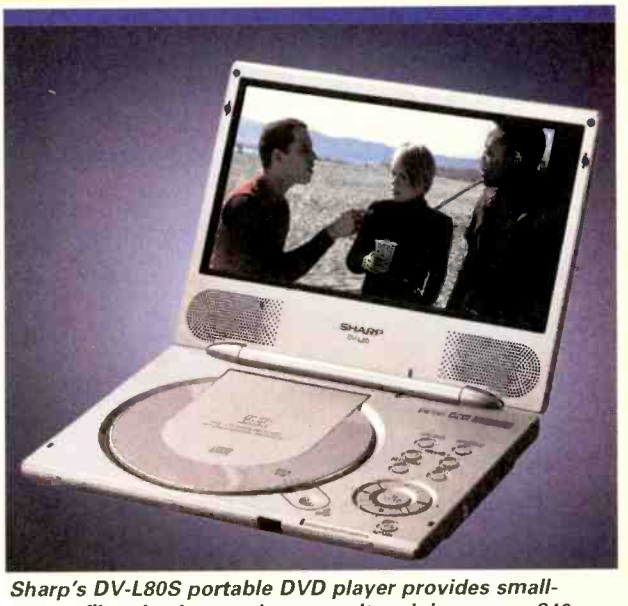
ONdigital was out in force, with a large stand that promoted its DTT services, IDTV sets and the new ONnet TV-internet system.

Video

DVD was a feature of many stands. It was interesting to see the number of audio/hi-fi companies that have adopted the format, with equipment that combines a DVD-Video player and audio CD player.

TAGMcLaren had on display the smart-looking DVD32R, a THX-compliant DVD layer with a top-loading transport system. The company says that this provides a more stable platform for the laser assembly, which in turn eases the demands on the servo control electronics and their power supplies. The fact that the drive motor and servo are mounted on an aluminium sub-chassis that's been mass-loaded with lead illustrates the build care taken with the DVD32R. A servo-control and data-recovery PCB with metal plate screen is attached to the sub-enclosure, close to the laser assembly. But perfection costs: the DVD32R sells for just under £4,000!

Sharp's DVD offerings included the dinky portable DV-L80S player with 8in. LCD screen. It measures 211 x 24·7 x 157mm and weighs 840g. The pictures are crisp and clear, and it certainly feels comfortable in the hand. Features include a built-in Dolby Digital decoder and Virtual Dolby Surround sound. According to Sharp the rechargeable lithium-ion battery should provide operation for about four hours. The miniature DVD player can also read DVD-RW discs – more on this below.



Sharp's DV-L80S portable DVD player provides small-screen film viewing on the move. It weighs a mere 840g and has a low-reflection black-matrix 8in. LCD monitor.

A prototype DVD-RW machine (recordable DVD) was on show. The DVD Forum has three official recordable (or, to be more precise, rewritable) formats, DVD-R, DVD-RW and DVD-RAM. DVD-RAM is a caddy-based system supported by Panasonic, Hitachi and Samsung. DVD-RW, which was developed by Pioneer, is supported by Sharp, JVC, Kenwood and others. It uses a 4·7Gbyte disc with no caddy. Pioneer claims that the discs can be used and reused 1,000 times.

A DVD-RW machine can read DVD-Video and DVD-RW discs, but DVD-Video players cannot read DVD-RW discs. This is because DVD-RW uses the Video Recording Format (VRF) version 1.0 standard, which enables users to edit and shift recordings on-disc, as with a MiniDisc recorder. Edit features include erase, combine, divide, move and playback selection of specific scenes. A DVD-Video player cannot read the complex TOC (table of contents) used by the

The Sharp VC-S2000HM S-VHS VCR offers widescreen recording with twin scarts for connection to a range of audio-visual components.

Sharp's personal MiniDisc player Model MD-MT866H, with circular LCD display, has remote control and weighs only 137g.

The Sharp SM-SX100H SACD player offers 1-bit audio with compact size.

VRF format. Pioneer says that future versions of its DVD-RW machines will be able to record in a mode that's compatible with DVD-Video equipment, and adds that future DVD-Video players will be able to read VRF discs.

A Sharp DVD-RW recorder is due to go on sale in the UK during the first half of 2001. It will enable users to record between one-six hours of video on a disc. Recording time is determined by manual selection of the bit rate. Users will be able to select either of three levels: a data rate of 10·8Mbits/sec, providing an hour of DVD-quality video; a data rate of 5·2Mbits/sec, giving two hours of S-VHS quality video; or a data rate of 1·73Mbits/sec that gives up to six hours of lower-quality video. Sharp demonstrated the latter, with pictures that looked similar to early VHS LP recordings. You wouldn't want to archive material in this mode, but it's adequate for watch-and-wipe recordings. Sharp's DVD-RW recorder should sell for about £2,000, with blank discs costing about £25 each.

Sharp also had on display some conventional DVD-Video players, including the DV-760H.

Sony showed the DVD-S9000ES, a combined DVD-Video and SACD player, and two portable DVD-Video players, Models DVP-FX1 and DVP-F5. The FX1 has a 7in. LCD screen and several virtual surround-sound effects. The F5 is basically the same machine without the LCD screen.

The Grundig Model GDV200 can play an array of disc types including DVD-Video, Video CD (version 2.0), audio CD, CD-R and CD-RW.

There were few VCRs on show this year, a sign of the times. For me the stand-out machine was the Sharp VC-S2000HM, an S-VHS model that includes S-VHS-ET, EP recording, NTSC playback and a timebase corrector. What's more, it is likely to sell for under £300.

There weren't that many camcorders and digital cameras around either, but the products that were present turned quite a few heads. Sony's DCR-TRV20 MiniDV camcorder has a 10x optical zoom, 40x digital zoom, Super Steady Shot, Night Shot, and can store digital still images on a Memory Stick card. It includes DV input and output sockets and has a built-in edit computer. Sharp's VL-PD6H Digital Viewcam includes a SmartMedia memory card slot and, with the company's Super Cats Eye technology, can record down to zero lux.

Sony had two interesting digital cameras on show. The Mavica MVC-CD1000 can store up to 160 2·1-megapixel images on an 8cm CD-R disc with a capacity of 156Mbytes. The discs can be used in most home PCs that have a CD-ROM drive. The DSC-P1 is one of the tiniest digital cameras I've held, weighing just 250g. It has a 3·34 million-pixel CCD, uses Memory Stick technology and has a built-in 1·5in. LCD screen. The DSC-P1 can also record short MPEG-1 video clips.

Audio

There was no sign of DVD-Audio at Live 2000, but SADC was out in force. Sony's offerings included the SCD-555ES. Sharp had on display the DX-SX1 SACD player and SM-SX1 one-bit amplifier: the two products can be linked via a direct digital connection.

Sony showed a number of new MiniDisc features, including Long Play (MDLP) which uses ATRAC3 data compression technology to double or quadruple the recording time. The LP system works by allocating fewer bits to the parts of the signal that are inaudible to the human ear. According to Sony LP2, which doubles the recording time, is suitable for home music use while LP4 is more suitable for casual listening, portable products or in-car use.

Sony plans to offer MiniDisc products that use its new technology soon. High-speed dubbing enables users to copy CDs on to MDs at twice or four times normal speed: a 74-minute CD could thus be copied in less than twenty minutes. According to Sony there is no sound quality degradation. A PC-link feature enables users to transfer PC files such as MP3 music to MiniDiscs. The MP3 files are converted to ATRAC3 files during the copying process. Scale-factor editing is a post-production feature that enables users to change the sound characteristics of a MiniDisc recording, for example raising or lowering the recording level or fading the sound.

A large digital radio stand was present to promote the service, which has yet to gain public acceptance. Part of the problem is the high cost of digital radios, but prices are falling and more products are appearing in the shops. VideoLogic used Live 2000 to launch its Model DRX-601E, a digital radio that costs £299. Psion's Wavefinder, at about £300, is a "digital radio aerial" that enables broadcasts to be received using a home PC. Arcam had two digital radios, the Alpha 10DRT at £800 and FMJ DT26 at £1,000. Sony's offering was the STD-777ES.

Live 2000 also featured next-generation audio products that store audio on hard disks or memory cards rather than optical discs or tape. Imerge's S1000 SoundServer is a hard-disk digital recording system that can store MP3 and uncompressed digital audio. Its 15Gbyte hard disk stores up to 28 hours of uncompressed audio or 280 hours of compressed audio. The S1000 is designed as a home audio server able to supply up to sixteen audio streams around the home. The idea is that the user transfers LPs, CDs and tapes on to the SoundServer or downloads music from the internet. The S1000 uses smart software called Xiva to locate quickly any track by artist, title, album or genre.

Sony had on show its Memory Stick Walkman, Model NW-MS7, which stores up to two hours of audio on a type of Memory Stick known as a MagicGate. This is coloured white and contains copy-protection technology (the blue version does not and cannot be used to make audio recordings). Another Sony product was the NW-E3, a tiny digital audio player that weighs just 45g including the battery. It stores up to two hours of music on a built-in flash memory chip.

BOOK TO BUY

The definitive biography of the century's godfather of invention–from the pre-eminent Edison scholar "Israel's meticulous research and refusal to shy away from the dodgier aspects of Edison's personality offers a fresh glimpse into the life of the inventor."– New Scientist

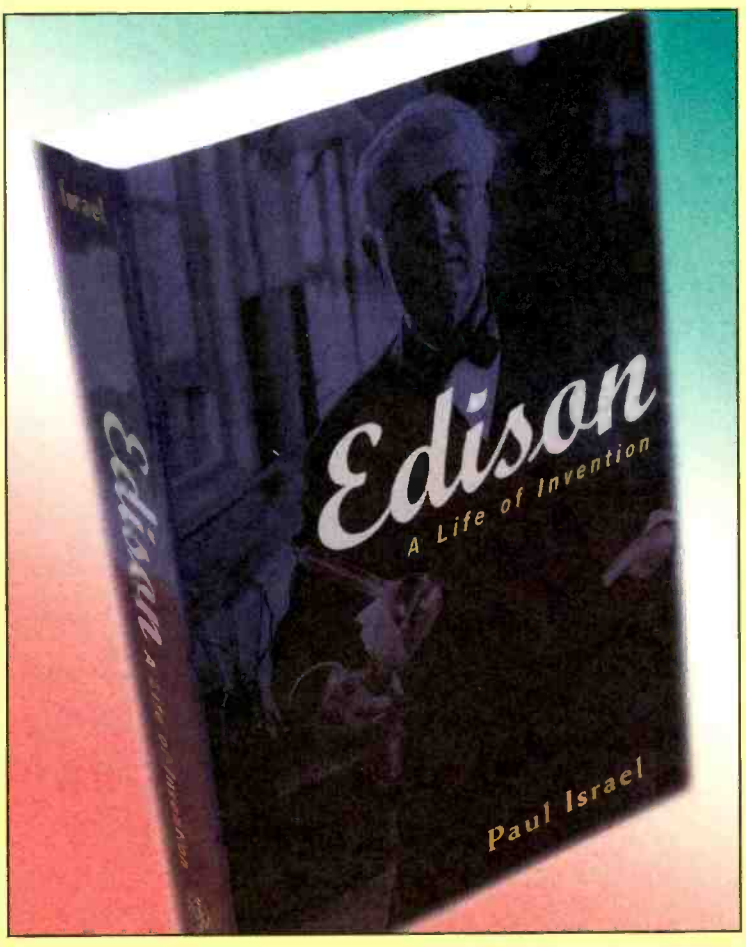
"Remarkable."– Nature

"An authoritative look into Edison's working methods, here leavened by enough personal detail to give the achievements shape."–Publishers Weekly

"Israel's book should go a long way toward taking Edison out of the shadows and placing him in the proper light."–Atlanta Journal-Constitution

"Exhaustively researched, with strong emphasis on Edison's methods and achievements."–Kirkus Reviews

The conventional story of Thomas Edison reads more like myth than history: With only three months of formal education, a hardworking young man overcomes the odds and becomes one of the greatest inventors in history. But the portrait that emerges from Edison: A Life of Invention reveals a man of genius and astonishing foresight whose career was actually a product of his fast-changing era. In this peerless biography, Paul Israel exposes for the first time the man behind the inventions, expertly situating his subject within a thoroughly realized portrait of a burgeoning country on the brink of massive change. Informed by Israel's unprecedented access to workshop diaries, notebooks, letters, and more than five million pages of archives, this definitive biography brings fresh insights to a singularly influential and triumphant career in science.



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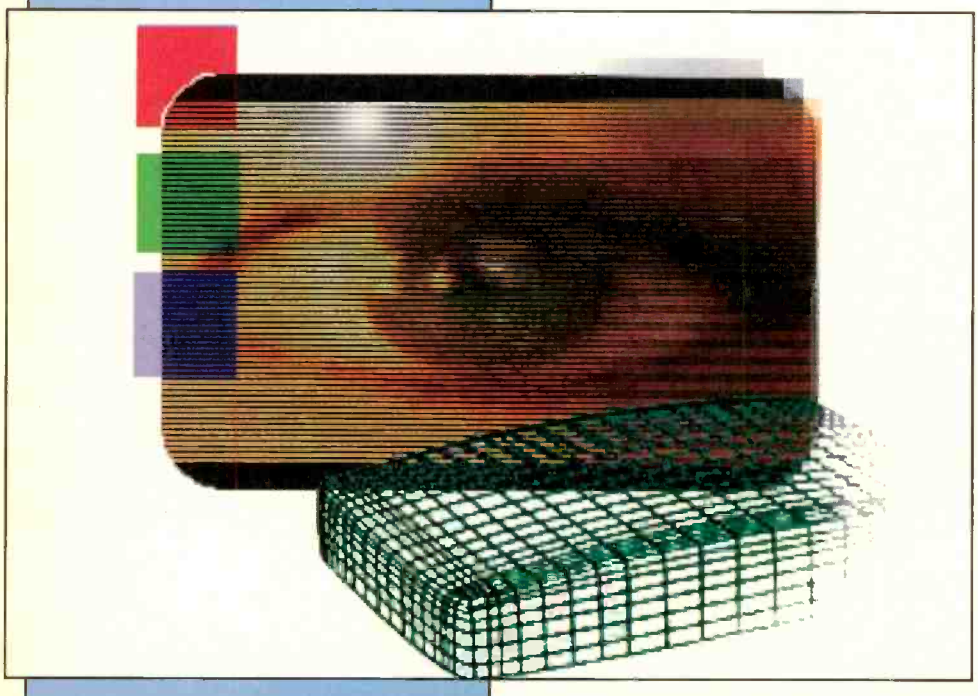


TV FAULT FINDING

Reports from
Michael Dranfield
Mike Leach
Chris Watton
R. Withey
Adrian Spriddell
Glyn Dickinson
T.J. Edwards
Geoff Butcher
Gerald Smith
Denis Foley
Graham Richards
Michael Maurice and
Colin J. Guy

We welcome fault reports from readers – payment for each fault is made on publication. See page 106 for where and how to send reports.

Goodmans 2175RA

As this set warmed up the picture started to flash on and off, displaying different colours. After a while a red picture was left on the screen – the green and blue picture content had disappeared. No amount of heating or cooling would produce or remove the fault condition. With the aid of a service manual for a similar model I eventually found that R620 (220kΩ) on the CRT base panel was open-circuit. It's part of the CRT cathode-current measurement circuit that provides feedback to pin 18 of the TDA3566 colour decoder chip for automatic grey-scale/cut-off adjustment. **M.D.**

Tatung T25NE61 (E series chassis)

If you get one of these sets that won't come out of standby, check the voltage at the emitter of the 8V regulator transistor TR806. In this set there was no output from the transistor, a TIP31A, though it tested OK when checked with a meter. A replacement restored normal operation. **M.D.**

Aiwa VX9142K

This new 14in. TV-video combi unit worked for only a couple of days. It was now dead with a cassette stuck inside. The cause was R516 (270kΩ), which is connected to pin 3 of the TDA4605 chopper control chip in the power supply.

Why don't manufacturers use metal-film resistors rated at 350V in this position? Standard carbon resistors are rated at 250V. **M.D.**

JVC AV29SX1EK

This 29in. set wouldn't come out of standby. When the back had been removed it was evident that someone had already tried to repair the set: the TDA8366 IF/colour decoder/timebase generator chip IC101 and the EEPROM had been replaced.

The basic fault was loss of the line drive, which comes from pin 38 of IC101. The 8V supply was present at pins 10 and 35 of this chip, so I checked the clock and data lines at pins 5 and 6 respectively. The voltage at pin 6 was slightly low (the circuit quotes 2·9V at this pin). It's a complex set, and various ICs had to be disconnected from the data bus. The set came out of standby when pin 8 of the teletext microcontroller chip IC806 was disconnected. Everything then worked – except teletext of course.

A replacement P83C654FBP/541 chip restored full operation but left little change out of £30. With a service manual at £16 and labour, it was an expensive repair. **M.D.**

Sharp 37VT-24H

This is a TV-video combi unit. If you find that the set switches back to standby after six seconds, replace R626 (1·2MΩ). It's part of a trip arrangement and tends to go open-circuit. **M.D.**

Alba CTV3458

The set was dead with the BUZ90 chopper MOSFET short-circuit. This time the cause was not R4 or R5: D5 (FR155) in the snubber network was short-circuit. Nevertheless R4 and R5, also the TDA4605 chip, were replaced as a precaution. **M.D.**

Aiwa VXT1400KER

Orange electrolytics are suspect in this TV-video combi unit. With this one the red in the display was weak. It's best to replace C905, C907 and C909 (all 1µF, 50V) even if they test OK. Replacing them covers all three drives, R, G and B, and will avoid a comeback later. **M.D.**

Philips 21PV688/05

This eighteen-months old TV-video combi unit kept going back to standby at switch on. The cause was heavy current consumption by the TDA8356 field output chip. It had failed, which was not surprising as there was no heatsink compound. Safety resistors R3512 (4·7Ω) and R3541 (1Ω) were also replaced – they looked as if they

had been getting hot.

The unit then stayed on, but there was no picture because the supply to the CRT's heaters was missing. R3532 and R3537 (both 4·7Ω), which are in series with the heater supply, were open-circuit. **M.D.**

Hitachi C2558TN (G8Q chassis)

The problem was a ballooning picture whose size varied with the brightness level. A check on the HT voltage showed that it varied between 140-160V as the brightness level changed. The HT preset VR941 (2·2kΩ) had suffered a bit and was replaced but the culprit turned out to be R941 (100kΩ, 0·5W) at the 'hot' end of the HT sensing network. It had risen in value. **M.L.**

Sony KV14V5U

This TV-video combi unit seemed to be OK when first switched on, but after a few minutes it would stick on BBC1 and the channels couldn't be changed. After a while channel change produced only a blank raster for ten seconds, then BBC1 would return – with no on-screen graphics.

The graphics reappeared when I sprayed freezer around the tuner area, but there was still only BBC1. The cause of the fault turned out to be some nasty-looking dry-joints at the tuner pins. Once they had been resoldered the combi worked a treat. **M.L.**

GoldStar CIT2170F (PC12B chassis)

There was severe patterning from cold on all channels – the symptom looked like RF interference from a VCR. The cause was C827 (1,000µF, 25V), which was leaky. It's the reservoir capacitor for the feed to the 12V regulator Q802. A hairdryer and freezer made tracing the cause of this fault easy, as the set worked perfectly when it was warm. **M.L.**

Sharp DV6635

The cause of repeated failure of the line output transistor was traced to the scan coils connector being dry-jointed at the yoke end. Resoldering put an end to the problem.

With another of these sets the cause of intermittent line output transistor failure was dry-joints at L603 in the scan drive circuit. **C.W.**

GoldStar CI14A20

There was failure to tune with this portable set. The on-screen graphics showed that tuning took place, but there was only snow on the screen. The 33V tuning supply was missing because FR403 (5·6Ω) was open-circuit.

The PCB shows many voltages and other information, which is handy if you don't have a circuit diagram – st 12V means switching transformer 12V, ft 25V means flyback transformer 25V, etc. **C.W.**

Ferguson M3610U (TX807 chassis)

The complaint with this set was poor starting. It would sometimes remain in standby for a minute, at other times for as long as an hour, and would make a bit of a noise from time to time while in standby. Once it came on it was OK. The cause of the trouble was the 6·8V zener diode DP57. **C.W.**

Akai CT2870

The complaint was distorted sound. It was OK with a weak signal. The cause was traced to a 47µF electrolytic next to the sound IF chip in the HF block. **C.W.**

Ferguson B51F (ICC7 chassis)

At switch on there was a stronger than usual rustle of EHT and the green power-on LED lit. Then the set cut out completely with no light from the LED.

The cure was to fit a link on the PCB between RP53 and test point BP50, because electrolyte had leaked from CP59 (3,300µF, 35V) and eaten its way through the track.

I've had this with a couple of my rental sets now, so the fault may be becoming a common one. **R.W.**

Panasonic TC2061 (U5 chassis)

For the first few minutes there was line pairing with a louder than normal line whistle. The cause was C808 (47µF, 16V) in the self-oscillating chopper power supply – it's the reservoir capacitor for the regulation feed. **A.S.**

Sony KV2500WX

There was very poor field linearity, with foldover at the top and bottom of the screen. The cause was C558 (560µF). **A.S.**

Grundig G1000 chassis

The line output transistor was short-circuit and a replacement died instantly. When the HT was checked with a dummy load in place the reading was 200V, much to the annoyance of the reservoir capacitor. Checks on the primary side of the power supply revealed that the surface-mounted diode D105 (BAS16), which provides the feedback for the chopper-control chip IC100, was leaky. **G.D.**

Matsui 1496R

This set came in with a blown power supply. I've had a couple of them in recently with faulty chopper transformers: the red ones go short-circuit, the other type intermittent, taking out your nice new components in seconds.

Unfortunately the reasonably-priced transformers used in the Crown portable (type HR9104 from SEME) are different, and the cost of the genuine part makes repair uneconomic. **G.D.**

GoldStar CIT4175 (PC11A chassis)

When this set came out of standby it would just sit there. I found there was no line drive because D812 (1N4003), which provides the start-up supply for the line driver stage, was open-circuit. **G.D.**

Matsui 20V1T

This Grundig-sourced set (CUC7303 chassis) had a faulty line output transformer. Unfortunately the transformer for the CUC7303 chassis will not work in this 20in. set as it's designed for the 14in. version, and the cost of the Matsui replacement is prohibitive. König has a suitable replacement however, type KN30335. **G.D.**

Philips CP90 Chassis

The set was one that has remote control. After a routine LOPT and battery replacement it worked but with no number or standby light display. Fortunately the cause of the problem was not the microcomputer chip but C2875 (330µF, 6·3V) which was short-circuit. **G.D.**

Tatung D25TEE5 (E series chassis)

The customer complained that the set was tripping. A check on the HT voltage revealed that it was in excess of 170V instead of 150V. There was also picture bowing. I lifted L403 to disconnect the feed to the line output stage and fitted a bulb, then checked the HT voltage again. It was the same. The chopper chip IC801 has a habit of developing a fault condition that produces excessive HT, but not this time. The cause of the trouble was R814 (75kΩ, 0·6W, 2%) in the HT monitoring network. It had risen in value to 88kΩ. **T.J.E.**

Matsui 1420B

There was very bad crackling and banging from the loudspeaker, and in addition the sound was coming and going. It sounded just like a ceramic capacitor breakdown, which in fact is a known failure with this model.

The audio power amplifier was exonerated because the output from the LA7520 sound/vision IF chip was also bad. I found that the DC voltages at pins 26, 27 and 28 of this IC were varying with the fault symptom. After replacing various ceramic capac-

itors and the ceramic filter in the audio part of the circuit I came to the conclusion that the chip itself must be faulty, so a replacement was ordered. I was relieved to find that the sound was normal once it had been fitted. **G.B.**

Sanyo CBP2576A (ED0 chassis)

There was excessive height with field foldover at the top of the picture. A new TDA8170 field output chip (IC700) made no difference. The cause of the fault was the flyback boost capacitor C703 (100µF, 50V), which is connected between pins 3 and 6 of the IC. **G.S.**

Nokia 7177 Classic (Stereo Plus chassis)

This set would revert to standby, usually after two-three minutes – the power supply could be heard labouring before it cut off. I disconnected the HT feed to the line output stage and inserted a dummy load, but the set still reverted to standby. This led me to suspect a regulation problem. The cause was a noisy surface-mounted BC858C transistor, VO71. Its collector must be at 0V DC, with 5V peak-to-peak line-frequency pulses present. If the DC level creeps up, the set goes to standby. **G.S.**

Crown CRP25NT

The picture came in at the sides because of an EW correction fault, and the pincushion adjustment made little difference. The cause of the fault was Q579 in the horizontal correction circuit. A replacement restored normal operation. **G.S.**

Nikkai KS159T

This set was dead, with the BUZ77B chopper transistor Q801 blasted and reading open-circuit. In addition I replaced R809 (0·47Ω) and R805 (330kΩ), which were both open-circuit, and the TDA4605 chopper control chip IC801. The set then worked normally. **G.S.**

Sharp 51AT15H (5BSA chassis)

There was no sound or picture with the chopper circuit labouring audibly. I found that the output voltages on the secondary side were all about a third less than they should have been. Checks in the field output stage revealed that Q509 and Q510 were both short-circuit. Replacements restored normal operation. **G.S.**

Toshiba 285T8B

The complaint was no sound or vision. I could hear the EHT rustle up, and when the first anode voltage (control on LOPT) was increased there was a blank raster. So the main power supply was OK. But a check at the microcontroller chip showed that its 5V supply was missing. A second chopper circuit produces 5V and 13V outputs, neither of which was present. After some time spent checking the electrolytic capacitors, semiconductor devices and high-value resistors in this area I was rewarded with a whisp of smoke from the bottom edge of C832 (330pF, 2kV), which was obviously leaky. It's in the snubber network. A replacement cured the fault. **D.F.**

Mitsubishi CT25M1TX (Euro 10 chassis)

There was a weak, milky picture with no contrast control. I found that the voltages around the JC501 contrast control switching transistor Q704 were all wrong, though the transistor produced perfect meter readings when removed for test. A replacement nevertheless cured the fault. **G.R.**

Sanyo CBP3012-10 (A3-A14 chassis)

According to the job card the set took a long time to come on. When you get this problem go straight for R520 and R521 (both 120kΩ). In this set one read 180kΩ and the other 2MΩ! I fitted hi-stab replacements. **G.R.**

Mitsubishi CT15MS1TX (EE2 chassis)

This set appeared to be dead with no sound or picture, though there were no power-supply problems. The tell-tale sign is the LED, which glows orange when the set is taken out of standby then turns green. The cause of the fault was the X24C04 EEPROM IC702. All was well after fitting a replacement, retuning and resetting the picture and volume adjustments. **M.M.**

Hitachi C25-P228 (G8Q chassis)

This set tripped at switch on. With a symptom like this you would expect to find a fault on the secondary side of the power supply, but checks here proved fruitless. When I carried out some checks on the primary side of the circuit I found that the mains bridge rectifier's reservoir capacitor C906 (220µF, 385V) was open-circuit. **M.M.**

Bush 2805NTX

When this set was switched on all you got was a dot in the middle of the screen. There was a dry-joint and slight burning of the PCB at the scan-coils connector. Resoldering this restored the line scanning but not the field scanning – the TDA8170 field output chip IC401 had also failed. **M.M.**

JVC AV21F1EK (JX chassis)

Intermittent sound was the problem with this set. The cause was traced to one pin of IC501, the TDA3810 ambient sound processor chip, being dry-jointed. You will find it on the small daughter board that sits next to the main audio output board on the left-hand side of the chassis when viewed from the rear.

Another of these sets produced an intermittent picture wobble. The fault came and went when I tapped around the VIF/sync processing PCB. Although no obvious dry-joints could be found, resoldering numerous suspect joints and cleaning the board restored a stable picture. **M.M.**

Ferguson D59F (ICC9 chassis)

When they change value RB24, RB44 and RB64 (all 39kΩ) can each be responsible for what looks like a low-emission tube. Not on this occasion however. There was no green because the BC858B driver chip on the main PCB was open-circuit.

Another of these sets produced an excellent black-and-white picture when I'd replaced RB24, RB44 and RB64. After some head-scratching I found that the S video switch at the rear of the set was in the midway position. Resetting it restored the colour. Phew! **M.M.**

Panasonic TC2195 (Z3T chassis)

This set came from another dealer, the fault being intermittent field collapse and intermittent poor linearity. He had resoldered most of the joints in the field output stage and those pins of the TDA4505M IF/timebase generator chip he could get to without removing the metal can! Had he done so he would have been able to resolder the dry-joints on the other pins of the chip. Doing this cleared the fault. **M.M.**

Philips 25PT4501 (MD1.1E chassis)

There was intermittent reversal of colours: when the fault occurred, a red screen from the pattern generator became bluish. Touching the sandcastle input pin (15) of IC7113 instigated the fault. This IC is the Secam decoder chip, and is shown as an add-on in the manual. So I removed it, after which the set behaved perfectly. Why fit the chip in an area where it serves no purpose? **C.J.G.**

Matsui 1436XA

There was field collapse, which was cured by replacing the field output chip. But the customer also said that he was getting a shock from the loop aerial. A PAT tester showed that the resistance between the mains pins and the aerial socket was well under 100kΩ. The cause was traced to a rubber block that was glued to the underside of the PCB, right across the mains isolation area. The rubber, or the nasty glue with which it was stuck on, had become conductive and was presenting a serious safety hazard to the user. I've since found this block glued in exactly the same position in several more of these sets. A safety recall, perhaps? **C.J.G.**

Testing Digital TV Reception Systems

There has now been a fair amount of experience of digital TV reception problems, and guidelines on fault finding have been established. K.F. Ibrahim* summarises the current situation on the servicing front

When there is difficulty with digital TV reception the first thing to do is to establish whether the problem is within the digital set-top box or outside it. The external factors that can affect the video display fall into two categories:

(1) Those that precede the STB, such as aerial or dish alignment, the aerial lead and signal strength.

(2) Those that succeed the STB, such as the scart connector and lead, the UHF output, and the TV set with which the STB is used.

Symptoms caused by the first category can be total video/audio failure or those peculiar to digital TV reception, i.e. picture freeze or break-up of the video and/or sound. Symptoms caused by the second category do not include the total or partial video freeze or audio break-up effects.

We'll consider signal-input problems first.

Signal quality

With conventional reception of an analogue terrestrial TV signal, the results of low signal strength or a low carrier-to-noise (C/N) ratio are poor picture quality and ghosting. Poor-signal conditions with analogue satellite signal reception produce a noisy picture. With digital TV reception however there is no loss of picture quality before the noise level reaches a point at which the picture breaks up, freezes or fails completely. This is known as the digital-cliff effect.

While inadequate signal strength or a low C/N ratio mean poor receiver performance with an analogue signal, the result with a digital signal is increased errors. When these errors are too numerous, the forward error correction (FEC) system is unable to cope. Instead, it 'marks' the data.

A digital-signal decoder processes the received PES (packetised elementary stream) data and, prior to its display, stores the video data in memory. The memory is updated as new PES data packets are decoded. When the FEC system labels a packet as being erroneous however the relevant part of the memory is not updated. The result is a freeze in that part of the picture. If a long sequence of packets is marked erroneous, none of the video memory is updated and a picture freeze or complete picture failure occurs.

This effect can be demonstrated by disconnecting the aerial lead. The freeze then continues for a few moments, after which the picture disappears completely.

Where audio PES packets are marked erroneous, the audio decoder ignores them and the result is sound break up.

A spectrum analyser can be used to measure the digital-signal strength. For correct measurements, the instrument's bandwidth must be wide enough to provide an average reading of the strength of the whole signal. In addition to inadequate bandwidth, a detector meter would produce a wrong C/N ratio, the error margin being as high as ten per cent.

For good digital-signal reception the signal strength must be between 40dBμV and 70dBμV (compared with 60-80dBμV with analogue TV broadcasting). Exceeding the upper limit with digital reception will also cause an unacceptable level of errors, resulting in picture and/or sound break up.

A carrier-to-noise ratio of greater than 26dB is regarded as satisfactory for digital-signal reception, provided the installation is of high standard including the use of double-screened coaxial cable, screened connectors, proper termination and good, well-protected F connectors. The C/N ratio must not fall below 22dB.

Software within an STB enables the signal strength to be measured. It should be the first check to carry out when misalignment or the wrong type of dish or aerial is suspected.

Inadequate signal strength can be caused by aerial misalignment, low aerial gain, kinks in the aerial cable or adverse reception conditions. Misalignment can be corrected by adjusting the terrestrial aerial or satellite dish, with a spectrum analyser used to display the strength of the channels. But a spectrum analyser is a bulky item that doesn't lend itself to use at the top of a ladder. For this reason smaller and simpler detectors are used to provide an indication of signal strength while aligning the aerial or dish.

With terrestrial digital TV reception picture freeze and/or sound break up can also be caused by strong reflected waves with a long delay time. The COFDM

*K.F. Ibrahim is senior lecturer at the College of North West London, in charge of digital television short courses, and is author of the textbook *Television Receivers*.

modulation technique used in Europe and elsewhere is designed to avoid the effects of reflected waves – provided they arrive at the aerial before the end of the guard period. The time delay that can be accommodated depends on the COFDM mode as well as the selected guard period. With the 2k mode used in the UK and a guard period of a quarter of a symbol (the form of the transmitted data), the maximum delay that can be accommodated is 56µsec. Reflected waves with a longer delay are normally too weak to affect the decoding process. Where a high-gain aerial or RF amplification is used however reflected waves with long time delays may be strong enough to introduce uncertainty in the FEC processor, the result being intermittent video and/or sound break up. To avoid this, fit a plug-in attenuator at the STB's aerial input socket.

The aerial lead carries signals with frequencies in the UHF and higher bands. Cable attenuation and physical condition are thus important for signal integrity. Hence the use of low-impedance, double-screened coaxial cable. Bends and kinks can cause disturbance to the standing wave along the cable, the result being intermittent video and/or sound break up. Similar effects can occur when the cable is squeezed, by a very tight clip for example.

With satellite digital reception the size of the dish, the condition of the F connectors and of the LNB will have an effect on signal strength and hence the quality of the reception.

Post-STB problems

At the output end of the STB, picture and /or audio failure can be caused by loose scart connection or a poor scart cable. A defect at one or more pins of the scart connector can cause failure of video and/or sound. To check a suspected scart malfunction, view the DTV programme using the UHF modulator's output. Good video/audio confirms a scart fault, which could be caused by the cable, the connectors at either end of it or the interfaces at either the STB or the TV receiver. A VCR can also be used for a scart-connection test.

Where the connection between the STB and the TV set is at UHF, malfunction can be caused by failure to tune the TV set to the correct channel, a loose aerial input connection or bad lead. Failure within the TV set can be checked by selecting an analogue or a VCR channel.

Video patterning is usually caused by incorrect RF modulator frequency at another device connected to the same RF chain, such as a VCR. To check on this, disconnect the VCR from the RF signal chain and observe the effect on the digital TV channel.

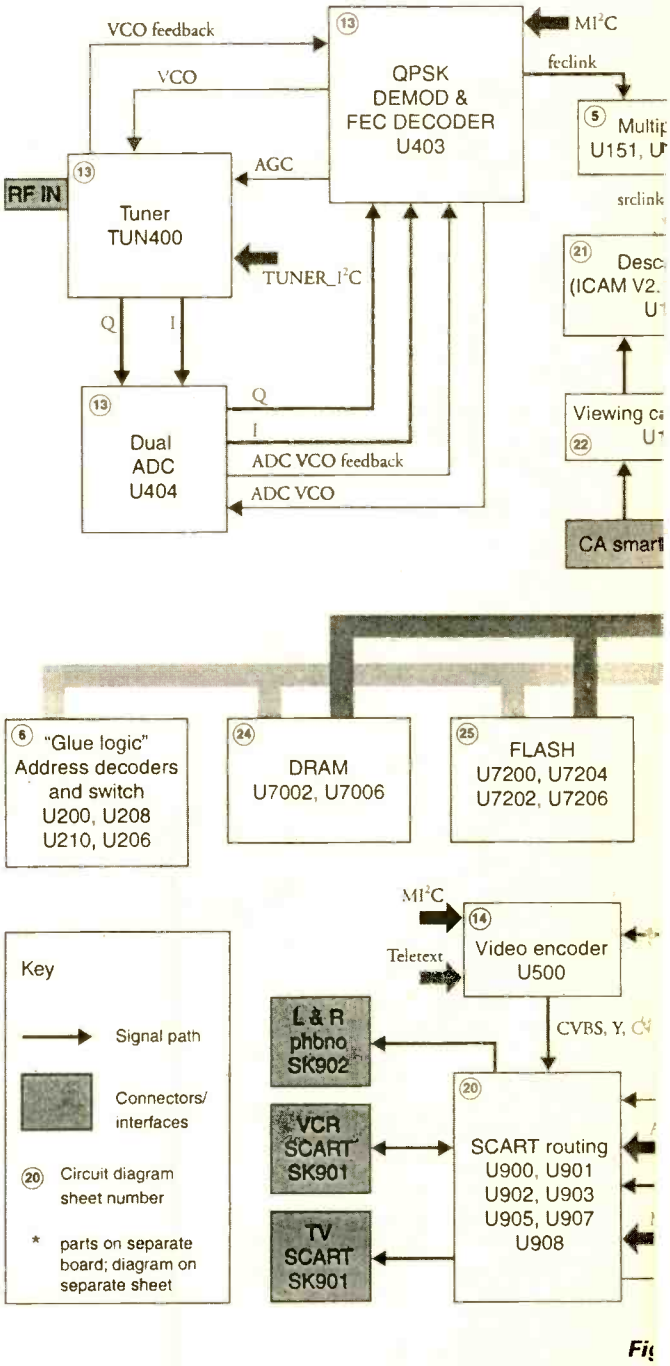
Pace satellite DTV STB

Fig. 1 shows the Pace satellite digital TV STB in block diagram form. RF signals from the LNB are fed to the front-end, which consists of the tuner (TUN400), the dual ADC (analogue-to-digital converter) U404 and the QPSK and FEC processor chip U403. An ADC is required because the transmitted signal is an analogue one that carries the digital data. QPSK (quadrature phase-shift keying) is the form of digital modulation used for satellite transmission. U403 demodulates the QPSK signal then carries out forward error correction.

The output from the front-end, feclink, consists of 188-byte scrambled transport data packets. In the Pace STB this output goes to the descrambler (U1000 etc.), which carries out conditional-access descrambling (if necessary), via a switching (multiplexer) system (U151 etc.) which is used to extract data for feeding to an external source or insert data from an external source.

The descrambled data has to be demultiplexed. This means separating the data packets for the programme being watched by the viewer from the transmitted, multiplexed data stream – remember that each transmitted channel contains data for several programme channels. PID (packet identification) codes are used to identify the packets. The demultiplexing process is carried out by the microprocessor U300 – which also extracts the teletext packets and processes them for display.

The demultiplexed data packets are then fed to the AV decoder/SDRAM (U320 etc.) for MPEG decoding. After this the video signal, ccir601, is fed to an encoder (U500) which produces luminance and chrominance as well as CVBS signals for display by a TV receiver. The TV feed is either via a scart connector or the UHF modulator (U640, U660). The audio output from the AV decoder, in PCM form, is fed to the DAC and filter chip U551 then to the signal routeing section.



Fig

Control of the STB's operations is carried out by the SoC (system-on-chip) microprocessor U300 and microcontroller U600. These two chips communicate with each other via a two-line serial bus – st20_nec and nec_st20. The microprocessor controls the audio and video decoding, including synchronisation, and as we have seen carries out demultiplexing: it also controls the conditional access system, the high-speed data port PL150, the modem and RS232 interfaces, and runs the receiver menu system. It has its own clock, an address (MEMADDR), data (MEMDATA) and control bus system, and its own DRAM and flash memory stores.

The non-volatile flash-type RAM stores software programs that are used in the decoding process. Software upgrading can be carried out off-air. When this is done the new software is first loaded into the DRAM chips then transferred to the flash memory.

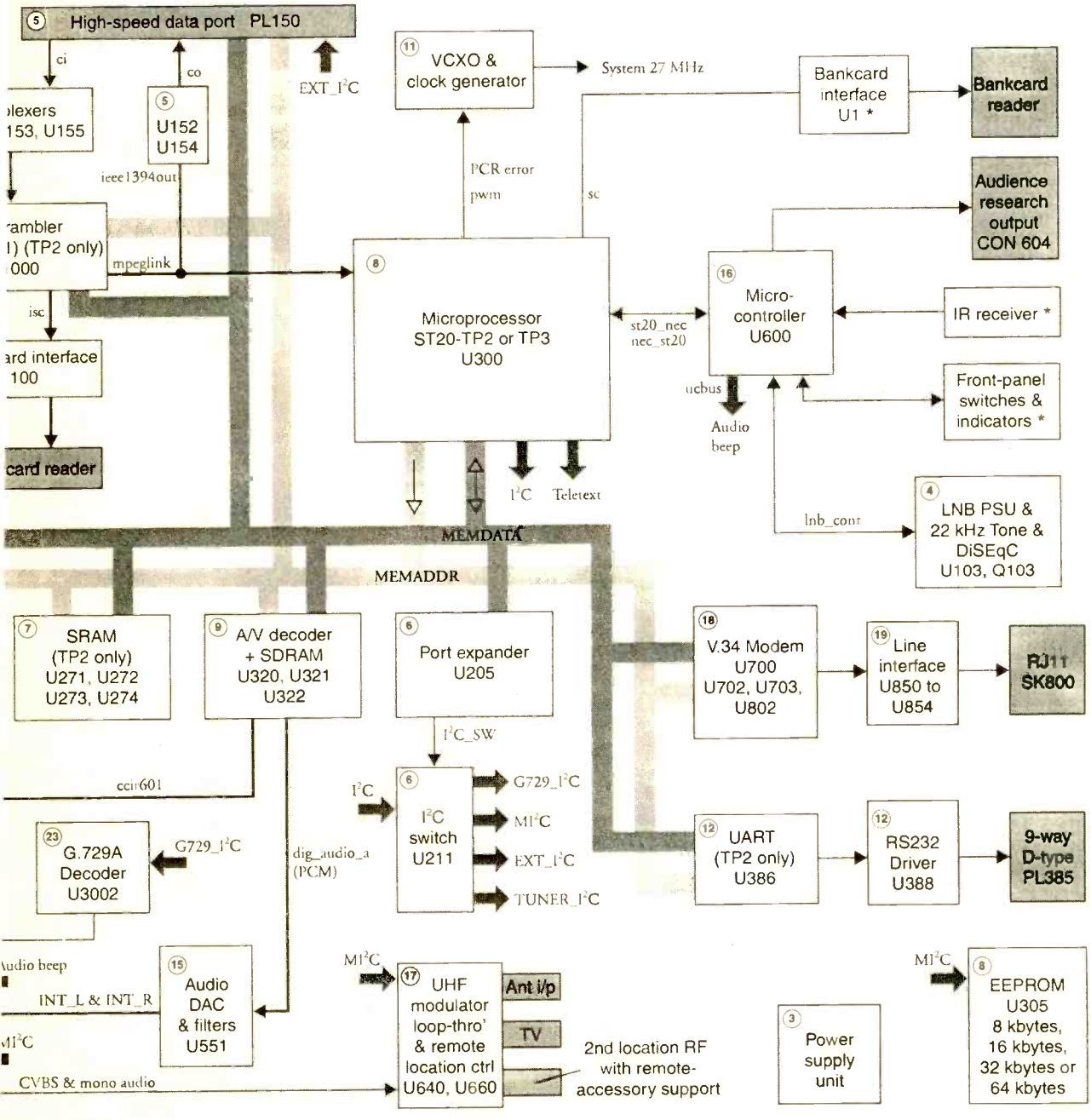
The microprocessor controls the PAL/video encoder U500, the EEPROM, the UHF modulator, the QPSK demodulator/FEC processor U403, the scart routeing, the tuner and decoder U3002 via the I^2C serial bus. A switch (I^2C_SW) isolates the front-end when other items are being addressed.

U300 also extracts the programme clock reference signals from the transmitted data stream and uses them to synchronise the 27MHz system clock (VCXO – voltage-controlled crystal oscillator).

The microcontroller chip monitors the power supply and decodes information from the front panel controls and the remote-control handset.

The system includes telephone connection via a modem (U700), with the necessary line interface, and provides RS232 communication via the UART (universal asynchronous receive/transmit) chip U386 and line driver chip U388.

To be continued next month



g. 1: Block diagram of the Pace digital satellite TV STB.

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: Circuit diagram and/or service manual for the Marantz 2226B stereo tuner-amplifier. Will photocopy and return immediately and pay all expenses. A.J.E. Westmore, 33 Eastmont Road, Hinchley Wood, Esher, Surrey KT10 9AY. 020 8398 8732.

Wanted: Remote-control receiver unit (1190/021A) for the Ferguson Model 51J7, or just the IC (SLR486/PSSR). Would consider purchase of a complete TV (Model 51J7 or 59J7) and can collect. Phone Geoff Davies on 01788 574 774.

Wanted: Circuit diagram for the Goodmans GCE333 car radio/cassette. Will purchase or pay for a photocopy. Roger Burchett, 12 Ormonde Road, Hythe, Kent CT21 6DN. Phone 01303 267 969.

For sale: 486 copies of *Television* from 1964-2000. Offers please. Also RS 500VA isolating transformers at £15 each. Please phone David on 01376 513 072 or e-mail john@trowles17.freeserve.co.uk

Wanted: SEME Conductors ST M9306B1 and VideoCrypt decoder SUA1, working or not. Good price paid for both items. Phone Mr Ward on 01425 475 445 (Ringwood, Hants).

Wanted: Tuner and rear cover for a 25in. Ferguson 2000 chassis TV and a Murphy plinth 625-converter for the 600-700 series chassis. Also want complete sets and parts for pre-1975 colour TVs. Phone Keith Parker on 0208 361 8896 (Barnet, Herts).

For disposal: Twenty computer monitors (Mitsubishi, Dell, IBM, Mitac, Siemens, Hewlett-Packard, Tandom, 14/15/16/17in.) all complete. Spares or repairs. £150 the lot. Phone 01341 423 447.

Wanted: Bass speaker for the Ferguson Model 59M5 (ICC5 chassis) and a circuit diagram for the Comark 1905 insulation tester. Alan Jones, Tyddyn Slaters, Pontrug, Caernarfon, Gwynedd LL55 2BP. Phone 01286 678 584 or e-mail alanjones@pgen.net

For disposal: Large-screen Decca colour receiver fitted with the Bradford 30 chassis. Good cabinet and stand. Was working with low-emission CRT until replaced a month ago. Free to collector. Phone R. Sheppard on 01384 378 281 (Stourbridge, West Midlands).

Wanted: Is there a TV/VCR engineer in the Sheffield area with experience of the old Grundig V2000 VCRs? Please phone Steve Hanley on 01142 426 379.

Wanted: Circuit diagram/service manual (copy OK) for the Advance OS250 oscilloscope. Phone Alan Collins on 01494 712 918 (evenings) or e-mail acollins@ic.ac.uk

Wanted: CRT (A68ESF002X43) for the Philips Model 29PT822B/05, new or second-hand. Will pay reasonable price and collect. Phone D. Knight on 01142 490 795 or 0976 946 044.

Wanted: Main microcontroller chip type TMP90CR74DF-73 for the Toshiba V204B VCR. Cash for a good chip. Robert Crooks, 42 Edenderry Village, Shaws Bridge, Belfast, Northern Ireland BT8 8LG.

Wanted: Bang and Olufsen Beomaster 1200 type 2501 to repair damaged unit. White, rosewood or teak acceptable. Phone Edward Pritchard on 01432 272 346 (Hereford).

Wanted: Restorer requires 25in. colour CRT type A63-11X, A63-120X or equivalent, new or used. Good price offered for right tube, or will exchange for other vintage TV items. Would also consider any other type of 25 or 26in. delta-gun CRT. Adrian Fulton, 23 Springdale Close, Blackthorne Lane, Willerby, Hull HU10 6RE. Phone 01482 656 701 after 6pm.

Wanted: Servo control IC, part no. 1-464-175-00, for the Sony Walkman WM-D6 (1981 model). Circuit reference number is CP602. Please phone or fax Paul Wombwell on 01707 265 546.

Wanted/for disposal: Require service manual (photocopy OK) for the Toshiba Model 219R9B, or just the power supply circuit. Have for disposal *Television* from October 1996 to November 1997. David Jordan, Central Electronics, 6 Queen Street, Stirling FK8 1HN. Phone 01786 451 230, fax 01786 449 830 or e-mail david.jordan3@virgin.net

For disposal: Original service manuals in hard binders including Philips 550, G9, G11, 2A, KT3, KT35, KT4, K40, VR6460, VR6467 and Thorn/Ferguson VHS 8925, 8947, 3V00, 3V16, 3V23, 3V31, 3V36, 3V44, 3V45, 3V54, 3V55, 3V59, 3V64 and 3V65. Too numerous to include complete list. Offers considered. Phone Ian Livingston on 01482 887 946 (Beverley, East Yorkshire).

Wanted: Very early 1970s working colour TV set in any condition, preferably Ekco Model CT262 or Pye equivalent, or an early Philips G8 chassis, for restoration. Also looking for **work experience** on computer monitor repairs, on a voluntary no-pay basis, preferably in the Norwich/surrounding areas. Could any local company help? I am an HNC-qualified repair technician with four years of fault-finding experience with a major TV manufacturer. Phone Mike Burton on 01603 767 930 (Norwich) or e-mail mike@madhouse89.fsnet.co.uk

For disposal: Sony Beta portable VCR Model SLF1UB, and tuner-timer TTF1UB, with service manuals for both – tape unit not working. Also a Sony U-matic videorecorder Model CV2100CE, working and in very good condition. For more details phone Allan Westwood on 01292 262 644 (Ayr, Scotland) or e-mail allan.westwood@btinternet.com

Wanted: Servo board for the Ferguson Model FV11R video, also a tube base panel (RR5988) for the Tatung 190 chassis. T.J. Steel, 185 Charter Road, Chippenham, Wilts SN15 2RF. Phone 07930 218 355.

Wanted: Main board for the Philips 41in. projection TV Model GR8841 (G110 chassis). Condition of the LOPT

is not important, and I can repair the power supply if necessary. Please phone 0121 441 2449 if you can help.

Wanted: Any unwanted video tapes for charitable organisation that shows videos to orphaned and Aids-suffering children in children's homes. Well-wishers can send tapes to Mrs Julianah Mamire, 5760 Mharapara Road, Mucheke C, Masvingo, Zimbabwe, Central Africa.

Wanted: Control cover flap – small, white – for the Ferguson 14in. portable Model 14C2 (TX90 chassis), also a handset or good front, not text. Control cover flap and handset for the Salora 04074 VCR. Control cover flap for the Ferguson Videostrar FV37H VCR. R. Ballardie, 6 Crofton Avenue, Timperley, Cheshire WA15 6DA. Phone 0161 962 8826.

Wanted: Any complete machines, parts or panels, Philips VR2324/VR2334 Video 2000 type VCRs. Phone/fax 01489 576 597 evenings or e-mail keith@portset.co.uk

Wanted: Turnover crystal cartridge for the Dansette record player. A.G. Chamberlain, 62 St Lukes Road, Bournemouth BH3 7LU.

Wanted/for sale: Require a main panel PCB, part numbers VEP06B99 and VJB06B99, for the Panasonic VCR Model NV-SD220, preferably complete with tuner unit and scart assembly. Have for sale the following new, boxed LOPTs: five for the Decca 100 chassis, three for the Decca 80 chassis, one for the Toshiba C400 and one for the Pye 205, also a five-stick tripler for Pye TVs. Offers please to D.J. Maule on 0121 733 8629 (Solihull, West Midlands) after 7pm.

For sale: Service engineer giving up repairs has for sale 26 VCR manuals and 18 TV manuals, all original, Hitachi etc. All about ten years old. Price £20 the lot plus carriage. David Forfar, 65 Ormskirk Road, Old Skelmersdale, Lancs WN8 8TR. Phone 01695 735 132.

Sony Chassis Guide – 2

A chassis/model listing update to make it easier to find relevant service manuals. Compiled by Giles Pilbrow

The following list of the models fitted with more recent Sony CTV chassis supplements the listing that was published in the July 1998 issue of *Television* (pages 658-9).

AE5/AE5A Chassis

This 100Hz chassis, designed to drive Wega flat 16:9 and 4:3 aspect ratio CRTs, was introduced in 1999 and is still in production. Extensive digital signal processing provides digital effects and line doubling with some models. Remote control units used are the RM891, RM892 and RM893. Models are as follows:

KV28FC60Z KV28FQ75U KV28FX60U
KV29FS70U KV32FC60Z KV32FQ75U
KV32FX60U KV36FS70U

BC4 Chassis

These are combined TV/VCR units. Production started in 1997 and the units are still current. Remote control unit RMC811. Models are as follows:

KV14V5U KV14V6U KV21V5U
KV21V6U

BE3E Chassis

This 50Hz chassis, designed to drive Wega flat 16:9 CRTs, was introduced in 1999 and is still in production. It's similar to the BE3D chassis but with new power supply and deflection circuitry. DS and DX sets are IDTV models that incorporate a free-to-air digital tuner. Remote control units RM887, RM888. Models are as follows:

KV28DS20U KV28DX20U KV28FX20U
KV32DS20U KV32DX20U KV32FX20U

FE1/FE1A Chassis

A new 50Hz chassis launched in 1998 to replace the 4:3 BE3D and BE5 chassis. Has a reduced component count and lower power consumption than its predecessors. Still in production. Remote control units RM883, RM887. Models are as follows:

KV21X5U KV25K5U KV25X5U
KV29FX20U KV29K5U KV29X5U

FE2 Chassis

A new 50Hz chassis to replace the BE4. Incorporates a new Philips 'jungle' IC that for the first time combines the colour decoder, microcontroller and teletext functions in a single device. Launched this year. Remote control unit RM887. Models are as follows:

KV14LM1U KV14LT1U KV21LM1U
KV21LT1U

GE1A Chassis

Used in Sony's first 100Hz IDTV models, based on the original GE1 chassis. Introduced in 1999 and continues in production. Remote control RM891. Models are as follows:

KV28DS60U KV32DS60U

RE2/RE2D Chassis

A rear-projection chassis operating at 50Hz. Loosely based on the BE3D chassis. Introduced in 1998 and remains in production. Model KP41DS1U is an IDTV set with a free-to-air digital tuner. Remote control units RM862, RM892. Models are as follows:

KP41DS1U KP41S4U

Test Report

This ingenious piece of test equipment identifies the leadout connections of a wide variety of semiconductor devices and carries out a comprehensive range of tests on them. Michael Dranfield finds it an essential servicing aid

The Peak Atlas DCA55 Component Analyser

The Atlas DCA55 is the latest component analyser from Peak Electronics Ltd. I reviewed the last one, Model DCA50, in the March 1998 issue of *Television*. It's good, but this new one is a whole lot better. The DCA50 was designed primarily to analyse transistors of both the bipolar and MOSFET variety. The DCA55 can identify and check triacs, thyristors, diode networks and LEDs as well. It will even check bipolar transistors that incorporate an internal efficiency diode, such as the BU508DF.

Description

The Atlas is slightly smaller than the DCA50 and quite a lot thinner. Use of a different type of battery, the 12V GP23A type commonly used in car alarm keyfobs, has contributed to this reduced size. As a result the new instrument is very neat and compact. With overall dimensions of 10·5 x 7 x 1·5cm it's just right to fit in the top pocket of your shirt.

As before, the readout is a crystal clear LCD that measures 6·5 x 1·5cm. Because of the greater range of tests that can be carried out however the display has to be scrolled page by page by pressing the scroll button. When this button is held down, the unit powers off. This is necessary to reset it for the next component test. Power down also occurs after 30 seconds of inactivity.

Use

Analysis can take up to a couple of seconds depending on the type of component. The display then gives the result of the test. If the component is faulty, the message "faulty or unknown component" is displayed. I found the test probes a bit fiddly at first, but they are a good compromise and are ideal for small transistors such as the TO92 variety.

The transistor test is comprehensive. For example it tells you whether the transistor is a Darlington pair, whether it has a collector-emitter parallel diode, or a base-emitter resistor. When the Atlas detects a base-emitter resistor, the display warns you that this might affect the accuracy of the *Hfe* test (the transistor's current gain). The maximum *Hfe* the Atlas can display is 65,000: in comparison, the DCA50 could display a gain of only up to 995. The Atlas is thus ideal for checking Darlington transistors.

Another very useful test is the b-e voltage drop of the device being checked. This can be used to determine whether the transistor is a silicon or germanium device – the base-emitter voltage drop with a germanium transistor can be as low as 0·2V, compared with a silicon transistor's 0·7V. Although germanium transistors are no longer used in new equipment this is helpful if, like me, you collect and restore transistor radios from the Sixties and have tins full of salvaged transistors with no markings.

The component being checked can be connected to the three probes any way round. The display then tells you its pin connections, say red probe = collector, green probe = base and blue probe = emitter. In addition the Atlas lets you know the collector current at which the transistor is being tested and the base test current.

The most useful aspect of the MOSFET test is the display of gate threshold voltage

– the voltage at which source-drain conduction starts. The MOSFET pin connections are given, whether the device is of the p- or n-channel type, and the current at which the transistor is tested.

Triac and thyristor tests simply display the pin connections. The gate test current for these devices is limited to 4·5mA, which effectively precludes testing high-power devices such as the ones used for motor control in washing machines and vacuum cleaners. High-power devices generally require a gate current of 50mA or more before they switch on. The test current is kept low to avoid damage to sensitive devices. I would have liked to see a user-selectable test current to enable high-power devices to be tested.

Almost any type of diode can be analysed, and the Atlas will show whether the device is a common-cathode diode network, common-anode diode network, series-diode network or inverse-parallel diode network. This is very useful when checking surface-mounted components. Three-terminal devices that look like transistors can turn out to be diode networks.

Diode forward-voltage drop is also displayed. This enabled me to locate a faulty line output stage diode in a set fitted with the Sharp CS chassis – the forward-voltage drop was much more than 0·7V. A reading of 0·25V indicates that the diode is of the Schottky type, which is used in some chopper power supplies.

LEDs are tested in the same way, and the Atlas can even automatically identify two- or three-terminal bi-colour diodes.

As a test I connected a BU508DF (DF stands for Diode, Fully insulated) transistor to the test clips. The first message I got was "the Peak Atlas is analysing" then, after a short delay, "NPN bipolar transistor" came up together with an arrow pointing downwards at the right-hand side. This tells the user to press the scroll button to display further data page by page. When I did so I was given the device's pin connections, in this case red probe = collector, green probe = base, blue probe = emitter. Scrolling down again brought up the message "diode protection between collector-emitter". This is of course the internal efficiency diode. The next page showed the current gain: "*Hfe* = 7" was displayed. Very low current gain is common with high-power devices – a base drive of several amperes is required to drive a line output transistor. The next page gave the collector current at which the device was tested (*Ic* = 2·5A). After that I was told the base-emitter voltage drop, which was 0·61V, then finally the base current at which the device was tested (4·68mA). What more could you want from a semiconductor tester?

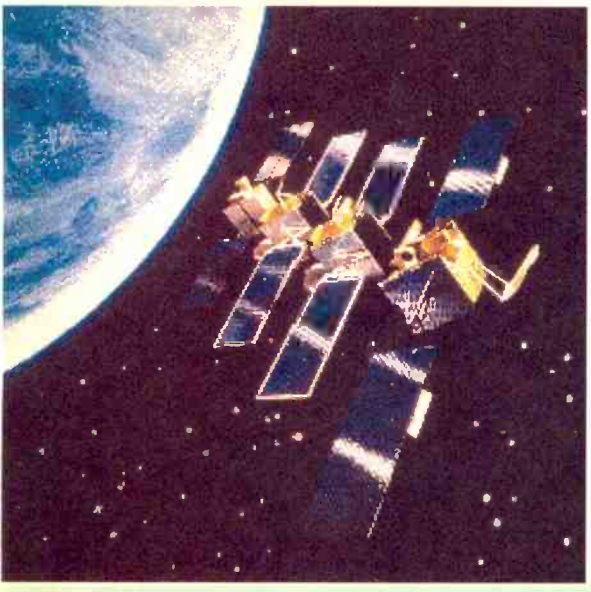
The instrument is ideal for selecting and matching transistor pairs for use in audio amplifiers. When the battery is failing, the warning "low battery" is displayed at switch on. On completion of a test, the information is displayed for thirty seconds after removal of the device. Unfortunately the instrument is not suitable for in-circuit testing.

To guard against leakage, battery replacement every twelve months is reco-mmended. In common with many new VCRs, the Atlas has a built-in self-test. If an internal problem is detected, an error code is displayed after which the unit switches itself off. You then contact the manufacturer.

Conclusion

This is one of those things you don't know how much you need until you've tried one. The Atlas component analyser can be obtained direct from the manufacturer Peak Electronic Design Ltd., West Road House, West Road, Buxton, Derbyshire SK17 6HF at the all-inclusive price of £60 (UK – for overseas orders add £5). Peak's telephone number is 01298 70 012. The web address is **www.peakelec.co.uk**

Free and unlimited technical support for the Atlas is provided. The DCA50 continues to be available for the time being.



Terrestrial DX and satellite TV reception reports. News on terrestrial and satellite band changes. A neat UHF wideband amplifier design and a book recommendation. Roger Bunney reports

DX and Satellite Reception

September won't go down in the record books for its DX reception, though it may well do so for being one of the wettest ever. The summer Sporadic E season came to an end with a flurry of ch. E3 activity at midday on the 2nd and 3rd and a more sustained ch. IB offering (for nearly thirty minutes) from RAI (Italy) on the 8th. Between the periods of wetness there was some really warm weather, with tropospheric propagation improving on the 2nd/3rd and 9th, though reception was limited to Benelux and French stations across Band III and the UHF spectrum.

F2 layer reception should be with us again by the time these lines are read. We are now at the maximum sunspot period in solar cycle 22 and the MUFs (Maximum Usable Frequencies) should be well into the 30MHz region during daytime, hopefully reaching the 40MHz level on good days. Look for ch. E2/R1 signals from the east and south east in the mornings, with reception swinging to the south and then the west as the day progresses, transatlantic signals (ch. A2/E3) being a possibility in the afternoon. High sunspot activity also means solar storms and flares, with magnetic storms in the ionosphere – look out for auroras in the evenings.

Veteran DXer Ryn Muntjewerff with his giant Dahlia.

In a recent e-mail Robert Copeman (NSW, Australia) mentioned a report at the VHF-SKIP Chat Group web site quoting reception of New Zealand TV by a Florida DXer. I have no further information – NZ ch. 1 has the vision carrier at 45·25MHz, so such reception is feasible. There were reports of the old BBC ch. B1 Crystal Palace transmitter being received worldwide, with its vision carrier at 45MHz and the sound even easier at 41·5MHz.

A letter from Brian Renforth (Wallsend) included a couple of test card pictures I'd not seen before. He's very involved with vintage colour TV receivers and recently acquired a circa-1961 RCA Victor colour receiver with 21in. round tube. Odd that the cabinet is metal! Three US-type valves are missing. If anyone has a selection of likely valves, contact me via the magazine and I will pass the information on to Brian.

I was interested to learn that Ryn Muntjewerff, an active TV-DXer for nearly forty years, is also well-known – especially in the Benelux countries – for growing Dahlias. He has cultivated many new types, and a newspaper picture shows him with a prize-winning 35cm-diameter bloom.

Satellite Sightings

It's political party conference time again. This year it was preceded by the fuel crisis, which provided one focus for the Lib-Dem conference at the Bournemouth International Centre, atop Western Cliffs, in mid-September. The vista of a sunset over the sea makes an attractive backdrop for the pundits wheeled out for the 1800 hours news and magazine reports and interviews. Intelsat 801 at 31·5°W provided the single-hop link to the London Millbank facility house, which was using two uplinks on its colour bars, 'Path 1' and 'Path 2', and had commandeered some regular Meridian BT-leased trucks such as BT TES-43.

Observation over a week or so indicated that there's no flexibility with the 31·5°W downlinks used by United Media (Anglia and Meridian), the same frequencies generally being used night after night. Check at 10·974 and 10·988GHz V (Meridian) and 10·983GHz V (Anglia), with the usual 5,632 SR and 3/4 FEC. These frequencies were also used for the live Meridian coverage of the blockade outside the Fawley Esso refinery on September 13th and a live band concert at the Newbury Show on the 15th. Interesting that the band played on with the 1812 overture behind the presenter, unaware that there would be two-gun explosions as the climax. When the first bang occurred the programme had already been cut back to the studio, as the presenter ended with an emotional comment.

The NSS K Reuters lease (11·462GHz V, SR 5,632, FEC 3/4) was fired up during the early morning of the 10th (Sunday), carrying live footage from the NASA Mission Control Centre at Houston of the Atlantis Shuttle flight as it approached the International Space Station. Atlantis linked up with the Station for a final check over and internal air samples – the next trip will take the first occupants to the Station. The pictures were really dramatic and continued through the day

until mid evening.

The BT Global Challenge yacht race around the world set off from the Solent on the same day. Meridian had run a live OB insert for the Southampton-produced *Meridian Tonight* programme from Ocean Village on the 8th. The Meridian studio is about one and a half miles from Ocean Village, but the satellite circuit via 801 made this nearly 52,000 miles!

When Eutelsat W3 arrived at 36°E some months back, the incumbent II F3 was moved to 21·5°E. Its inclined orbit seems to cause problems because of the adjacent Astra 1D at 19·2°E, which is also in an inclined orbit. John Locker reckons that the proximity of these two satellites causes mut-ual interference in the early morning and late afternoon – it's very difficult to find II F3 now unless you have a dish of say 1·5m diameter with the ability for inclined tracking. The news feeds carried by II F3 moved with the satellite, leaving W3 to downlink to Russia. When I checked W3 during late evening on the 2nd I found a very strong signal with a 'real' test card, the Philips PM5544, carrying the identifications 'HUN-002' and 'SNG HUNGARY'. A football match, Budapest v Italy, was later carried. This was all at 11·105GHz H, with SR 6,116 and FEC 3/4.

A new Lebanese digital TV multiplex channel is available via Arabsat 3A at 26°E, with excellent pictures in the southern UK using a 1m dish. The following were available when I checked in early September: LBC-1, Tele-Leban, MTV (a 5534 test card, not the pop music channel), Al-Manar TV, plus five other channels identified as 'Test Channels', suggesting that more will soon be available. This is at 11·785GHz V (SR 27,500, FEC 3/4). The satellite carries numerous Arabic channels, which could offer informed dish riggers with Arabic customers some commercial potential. Al-Manar seems to carry rather 'loud' political commentary and meetings, and is also present in analogue form at 11·938GHz V, with the sound (Arabic) at 6·6MHz. There's an analogue Iraqi satellite channel nearby at 11·983GHz V.

Roy Carmen (Dorking) notes that Europe*Star has been testing from the new 45°E slot, with a caption offering capacity and a number to ring. This is a Ku-band Telecom satellite. The initial test transmissions were received in early September at 12·500GHz V and the unsual digital parameters SR 8,687 and FEC 3/4, PIDs A256 and V308.

The elderly Eutelsat II F1 craft at 48°E is another satellite that's difficult to find. Roy found it recently carrying the Euro Mediterraneo/Sicilia International offering at 11·108GHz H, with SR 2,290 and FEC 3/4.

In late September NileSat 102 arrived at the 7°W slot, next to its elder brother 101. Strong analogue carriers were monitored at around 12·100GHz V.

Unfortunately most of the Sydney Olympics coverage was linked to Europe via Intelsat capacity at 60-64°E, which is invisible to most dishes. It would have undoubtedly been in MPEG 4:2:2 form, making it totally invisible even if you had been one of the few who can actually see 60°E!

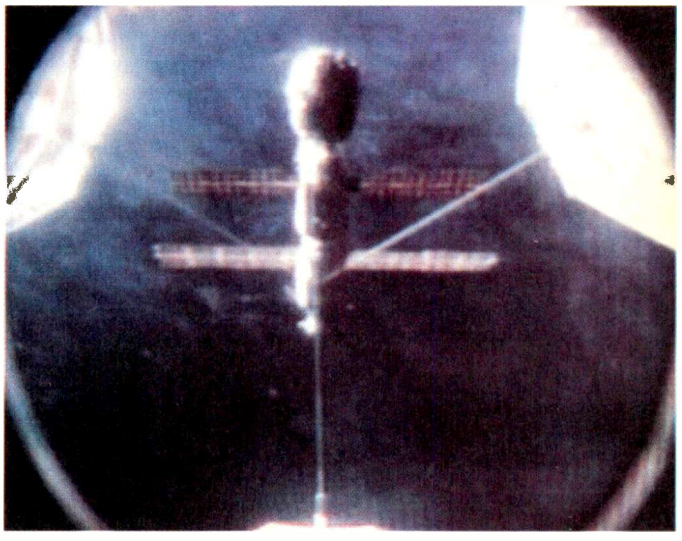
Broadcast news

Singapore: A new digital TV project, TV Mobile, is being introduced by Television Corporation of Singapore (TCS). Two main programme channels will be transmitted along all major traffic routes. The use of single-frequency channels will provide uninterrupted viewing (no retuning) over long distances. It's hoped that the system will be in full operation by March 2001. NTL is planning and engineering the project. Once the Mobile TV system is up and running TCS will probably make a start with conventional digital terrestrial TV.

USA: A Spanish-language channel, Azteca America, is due to open next summer with states-wide coverage. It will be the third Spanish-language TV network to open in the USA and is being started by a partnership between TV Azteca of Mexico and the US Pappas Telecasting Co. The channel should be available to fifty per cent of the country's Spanish-speaking residents initially and 70 per cent within a year. Programmes will be produced mainly by TV Azteca in Mexico City.

UK: NTL's opening of a pan-North UK system that links Manchester, Dublin, Belfast and Glasgow demonstrates that fibre-optic cabling is a viable alternative to satellite or microwave links.

Monte Carlo: The Italian Seat Pagine Gialle-Tin.it group, whose main interests are in computers and web operation, has bought a 75 per cent interest in TV Monte Carlo (TMC). TMC has been losing viewers wholesale. The new group plans to invest heavily in improved programming and expects to be in profit by 2002.



Live picture from the Atlantis shuttle on its approach to the International Space Station. Reception via the Reuters NSS K digital lease.

Wideband UHF amplifier

While sorting through some of my *Television* paperwork recently I came across the wideband UHF amplifier circuit shown in Fig. 1, using 2SC2570 transistors. Unfortunately the notes that originally accompanied it are missing, but it appears to be a useful circuit

that has been neatly laid out on copper-clad board. The component layout is clear (see Fig. 2) and construction should be easy.

Satellite news

Contracts have been signed with Ariane for the launch of the new 9 series Intelsat satellites. 901, 902 and 904 are due up next year, with 905, 906 and 907 scheduled for launch in late autumn 2001 through to 2002.

Intelsat 701 at 180°E is to provide French Polynesia with DTH internet, video and conventional digital programming via a Ku-band spot beam. French connector GlobeCast will uplink from Paris via Los Angeles then a second hop to 180°E. The Tahiti Nui digital multiplex will carry twelve TV and three audio channels. Interesting that the local TV channel will be sent back to Paris for addition to the multiplex. Three internet capacities will provide high-speed access and e-mailing both on- and off-line. More information can be obtained from the Intelsat website at www.intelsat.int

Eutelsat has opened an office in Rio de Janeiro to develop business with the Americas via its Atlantic Gate satellites at 12·5° and 8°W and, in addition, the Telstar 12 satellite at 15°W. Teleglobe Canada has recently leased capacity with the system. Eutelsat can now reach much of Africa and into the Indian Ocean via its W4 satellite at 36°E, which provides signals at up to 45dBW across Equatorial Africa and up to 52dBW in Central Asia. Eutelsat information can be obtained via the web at http://www.eutelsat.com

Eutelsat W1 was successfully launched from Kourou, French Guiana on September 6th to orbit at 10°E, providing European and African footprints. Then, on the 14th, Astra 2B followed to join 2A at 28·2°E.

In the USA, the FCC has revoked the Ka-band licences previously held by Morning Star, PanAmSat and EMS because of lack of progress. The licences had been conditional on construction of Ka-band satellites starting by May 1998. Seven Ka-band slots are now available for other takers.

Europe*Star 1 at 45°E is providing Eutelsat with competition. There are options for two more satellites at 43 and 47·5°E. Europe*Star is providing Ku/Telecom band services to Europe, Africa, Asia, the Far East and the tip of NW Australia at signal levels around 49-52dBW.

Most Secret War

R.V. Jones is a legend in radio and radar circles. As a scientist during World War II he developed a number of new techniques that contributed greatly to the war effort. A tribute to him appeared in this column a couple of years ago, shortly after his death. His book *Most Secret War* has recently become available for about £4.99 in surplus/book disposal shops. It's an updated version of the original 1978 edition, now in the Wordworth Military Library series 1998 (ISBN 1 85326 699 X) with many more pictures added. I feel that it's essential reading for anyone interested in equipment development from the early days of VHF through to UHF, and excellent value at the price.

I'd like to mention one small topic here, from chapter 15 of the book. In early 1941 RAF south coast monitoring became aware of sinewave transmissions at 42·5 and 46·9Mc/s (MHz). Cross-bearing checks revealed that they originated from somewhere near Cassel and from aircraft respectively. Then, during examination of a downed KG26 Luftwaffe aircraft at Eastleigh, a damaged manual which contained tables of figures for several UK cities that were bomb targets, e.g. Southampton and Coventry, was found. At the same time (June 1941) an Enigma-decoded message confirmed that a German Wotan radar installation near Cherbourg had been comple-ted. The Germans named their radar apparatus after goods: Wotan was a senior one-eyed god. This gave Professor Jones the clue that a single beam was being used and that the two frequencies monitored were a means of checking the distance between the base station and aircraft. German aircraft would fly towards a target using a directional beam (Knickebein): Wotan calculated the distance flown, then confirmed the point at which bombs should be dropped.

Electronic counter measures (ECM) were devised to upset this system. The high-power Ch. 1 Alexandra Palace 405-line transmitter was dusted off, and receiving equipment was installed nearby to detect the presence of 46·9Mc/s signals from German aircraft. A high-power 42·5Mc/s signal, the same frequency as the German base station, would then be transmitted. The aircraft thus received two uplink signals from different sources, throwing the German signal loop calculations into chaos as a result RF feedback ('howlround'). This ECM technique was given the name Domino. It made a valuable contribution to minimising the effectiveness of the German bombing campaign.

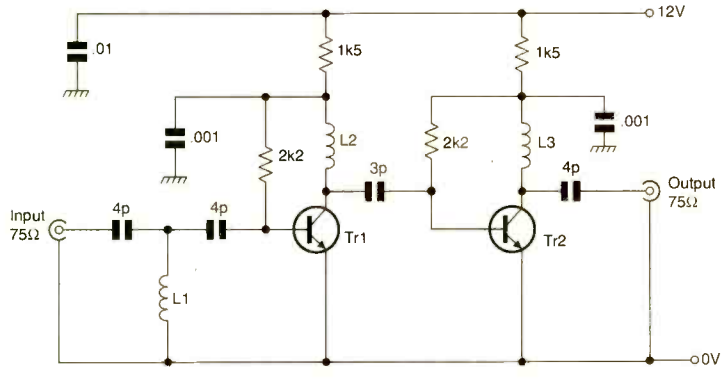


Fig. 1: Wideband UHF amplifier circuit. Tr1 and Tr2 type 2SC2570. L1 3 turns, L2 and L3 4 turns, made from resistor lead wire wound on a meter probe.

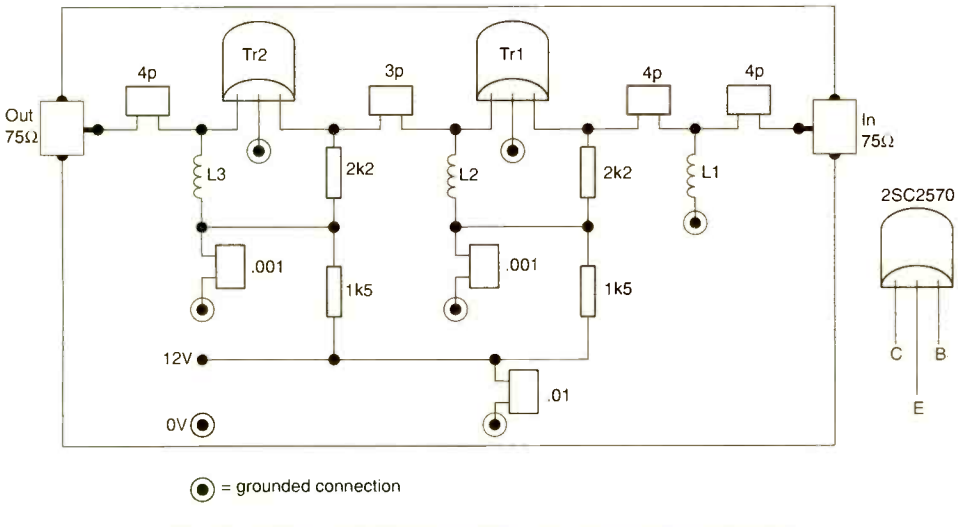


Fig. 2: Layout of the amplifier on copper-clad board.

MONITORS

Fault reports from Geoff Butcher Adrian Spriddell and Ian Field

We welcome fault reports from readers – payment for each report is made on 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

Philips 4CM8270

If you find that the line output transistor is short-circuit, it's important to check for bad joints in the line drive circuit, also C2614. If there is still no display, L5601 may have shorted turns. It should measure 10mH. It's also worth checking C2608 (33µF) which decouples the supply to the line output transformer. This note also applies to **Models 4CM4270** and **4CM4279** among others.

An odd symptom I've had with one of these monitors is a sharply-defined, narrow black band down the right-hand side of the screen. The cause was C2631 and C2636 which were both open-circuit. **G.B.**

Elonex PC235XB

This monitor was stuck in standby. The cause was traced to R23 (220kΩ) in the power supply – it was open-circuit. **A.S.**

Dell VC5EN

The BUH715 line output transistor occasionally blows, the result being a dead/tripping monitor. I've sometimes found that a BUV48A is fitted in this position, but the last time I tried fitting one it didn't last very long. The 2SC3688 can be used: its specification exceeds that of the BUH715, but only just. The main attraction is that it's cheaper! **I.F.**

Viglen CA1726LE

The complaint was "blurry and shakes". As always, the first port of call was the power supply panel. A check on the electrolytics revealed that C34 (22µF, 350V), which smooths the feed to the B+ master PWM controller, had an ESR that was off the scale (FSD = 7Ω). The other electrolytics were all OK.

I replaced C34, then started to check the voltage-sensing resistors. R46/50, which are connected to the 16V rail, were OK. But R65 (249kΩ, 1%), which is connected to the B+ rail, read 253·6kΩ. 249kΩ + 1% = 251·49kΩ, so R65 was out of specification and its value was probably rising. Clearly a replacement was required, but 249kΩ is one of the E48 values I hadn't got around to ordering. So I selected 240kΩ and 9·1kΩ from the E24 series and connected them in series. The reading obtained was 251·49kΩ, which is just within specification and a great improvement on the original resistor.

A routine inspection of the timebase panel followed, which was just as well. Q206 (2SC3886A) was bolted to the aluminium heatsink/cover instead of its own PCB-mounted sub-heatsink. This monitor had the small sub-panel, flylead and plug, as in earlier models. The sub-panel is soldered on to the 2SC3886A transistor's leads. I found that the base lead had been bent over and soldered to the track, where the solder pad had been damaged. The collector lead had pushed its pad well clear of the PCB, with the track peeled up to meet it. The emitter pad looked ready to fail as well. All this was repaired with stout wire links, then the panel was reassembled. After that everything was OK.

With care and a logical approach, these monitors can be repaired to give excellent results – despite the fact that many of them are getting on a bit. **I.F.**

Packard-Bell PB70E

This is a PC power supply box. With generic PC power supply units available at £10 or less, very few people ask for them to be repaired. But this power supply wasn't generic, and a replacement would have cost more than the PC was worth.

I spent a considerable time checking components on the primary side of the circuit, mainly to find out why there are two optocouplers. The small four-pin Liteon LTV817 is driven by a TL431. The six-pin Sharp S12MD1V optocoupler is driven by the safety shut-down circuit, which is also on the secondary side. Each optocoupler drives a 2SC2655 transistor (Q3 and Q4) which both shunt the base of the chopper transistor.

Q3's base drive was only about 0·8mV, so this one wasn't removing the chopper drive. Q4 had a little over 0·6V base-emitter bias, which was the cause of the shut down. I was trying to decide whether to trace out the circuit on the secondary side or start by carrying out some random component checks when I noticed a poor-looking solder joint near the centre of the secondary side area. The lead belonged to C19 (2,200µF, 16V). Fresh solder failed to attach it, and the heat applied by the wire produced a vile smell! The power supply worked normally once the gunge had been cleaned off and a new capacitor had been fitted. **I.F.**

Hyanu MF8515F (Visionmaster 15)

The broken 'function <' button was taped to the front of this monitor, which I thus had to strip down. This is made difficult by the fact that the manufacturer uses hot-melt glue between the CRT and its base.

As the plastic button 'web' is hot-melted to the front casing, any attempt to remove it for repair is likely to cause more damage. Each button has two flimsy struts, which act as 'springs', to the nearest main strip. As these lie flush with the inside of the casing, glue is out of the question without removing the button assembly. The only option was to use the tip of a soldering iron to attempt to weld the plastic together.

It's important to use 'filler', which can

be cut from a scrap plastic cabinet, and to press the button between each application of filler to free it from sticking to the front moulding – until sufficient filler has been added. This is very fiddly, and if the strut is melted away or fused to the front there are no second chances!

When I felt that adding further plastic would do more harm than good, I added a strip of Sellotape with holes cut for the button spigots. This limits the movement of the buttons slightly and gives all five buttons approximately the same 'feel' as the repaired one. Also, hopefully, should any of the buttons break in the future they will be held in position and remain operable. **I.F.**

Philips 4CM2799/05T

The customer's complaint was "a fizzing noise then dead". He had asked on the phone whether I could repair an Apple monitor. I have a machine for testing Apple monitors, but was quite pleased to discover that this monitor was a 'regular' type with a PC-MAC adaptor.

The monitor is much easier to work on than expected. Its power-supply module slides out rearwards, while the timebase panel is mounted in a cutout on the side chassis panel. The entire track area is accessible once the cover plate has been removed.

More out of curiosity than anything else, I decided to examine the power-supply module first. Some of the soldering required attention, but there was nothing that would account for the reported symptoms. Bridge rectifier diode D6103 (BYW95C, rating 3A, 600V) was not well seated on the PCB, so I decided to reseat it. As the diode was being bent to a better position it snapped in two. When the other three diodes were checked D6101 did the same. The other two survived this test, so they were checked for Vf and leakage. As they passed these tests, only the two broken ones were replaced. A badly arced pin was then found on the PSU 'cable' connector (the +180V rail). One or two of the other pins had very faint fatigue rings, which where attended to when the connector was removed for pin scraping and PCB cleaning.

After a general resolder and a check for any semiconductor devices that might have suffered from the arcing (none found) the monitor worked well. It needed only slight grey-scale adjustment. **I.F.**

SM584V

This monitor had the FCC ID KTASM584 but no clue to its origin. The CRT was LG branded however, and the chassis construction was typical of this manufacturer. The complaints were a red background to the display and a V-size twitch when warmed up.

Manipulation of the larger components indicated that solder-joint deterioration was responsible for the V-size twitching. But as the vertical output stage is right next to the secondary side of the chopper power supply it was difficult to narrow the cause to one or the other. The fault was most sensitive to movement of the chopper transformer however – more so than flexing the V-output heatsink. Inspection was made difficult by a coating of flux residue. Experience has shown that the residue is highly resistant to solvents, while the green lacquer will withstand a metal-working wire brush. The lacquer is robust, which is as well because so is the flux residue. It's worth cleaning the whole PCB and reworking any joints that appear to be crystallised.

Once the twitch fault was out of the way I attended to the grey scale. As usual, the heater supply smoothing electrolytic (C164 – 1,000µF, 16V) should be replaced. Some care is needed with the CRT cut-off presets, as there is very little difference between adequate highlight drive and background flooding. If this adjustment seems to be too critical, try reducing the settings of the three cut-off controls and increasing that of the A1/G2 preset to compensate – but not too far, as this seems to degrade the contrast.

The adjustment procedure that provided the best result involved balancing the cut-off presets first, using a test pattern with separate 256-step colour scales for R, G and B. The best background balance was obtained with the green cut-off control set so that all 256 steps of the green scale were visible, the red preset adjusted to cut off the last two or three bars and the blue preset to blank about five or six bars. Adjustment of the red and blue drive presets affected only the brightest end of the respective scales. Comparison is not easy using this test pattern. So switch to an eight-bar grey-scale, reduce the A1/G2 setting until only three-four bars remain visible, then balance the red and blue with the fixed green gain. The gain settings don't seem to affect the cut-off adjustment, which didn't need any further trimming once the gains had been balanced. Conversely the cut-off presets have a large effect on gain balance. So balance the cut-offs first. **I.F.**

Elonex MN024

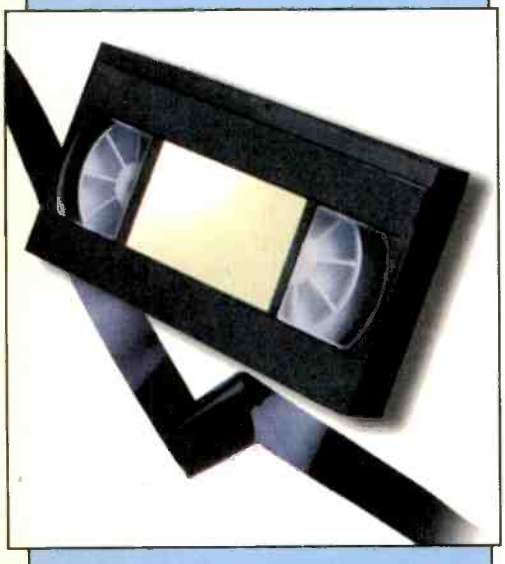
This monitor was dead with the 3·15AT mains fuse blown. There was no obvious cause: neither the chopper MOSFET nor the bridge rectifier was short-circuit, and the degaussing posistor gave every indication of being in good order. The mains filter capacitor is of the self-healing type, so unless any damage becomes severe the dielectric material doesn't produce any leakage at the point where 'punch-through' occurs. Mains-borne transients are a fact of life where my workshop is located, so it would soon become obvious if this component was degraded.

Since a replacement fuse restored the monitor to working order, there wasn't much else I could do other than give the soldering a quick freshen up and put the monitor on soak test. Most of the soldering was perfectly OK, but some of the joints around the chopper transformer were beginning to look tired. **I.F.**

Data General CM1414T

"Line on the picture" was what was written on the top of this monitor. When it was powered no fault was apparent other than the grey scale being more like a brown scale. So I decided to replace some electrolytics known to cause obscure problems. First C828 (47µF, 25V) at pin 7 of the 3842 power supply control chip – I added an 0·1µF decoupling capacitor here to reduce self-heating through ESR-loss. Then C823 (470µF, 25V) and C824 (47µF, 16V). I usually replace them both with 470µF, 25V HF SMPSU types and add parallel 0·47µF, 63V Mylar decouplers. Some of the soldering looked a bit tired, so a blanket resoldering was carried out. Particular attention to the power supply snubber components is needed: they all run hot, and sometimes need to be removed so that the leads can be scraped clean. As the heater voltage was low at 5·9V with the 84V rail correct, the 6·3V rectifier D818 was replaced using a Schottky-barrier type to obtain the correct heater voltage without overrunning the other rails.

During subsequent bench testing I found that the monitor sometimes failed to synchronise in Windows when 800 x 600 or 1,024 x 768 was selected (large or small fonts). Presets R452 (H-F/V), R405 (horizontal hold 1) and R414 (horizontal hold 2) all had a very rough feel when they were rotated. The two horizontal hold presets are slightly interactive and must be set approximately right before setting up H-F/V. Then switch to 800 x 600 and rotate the H-F/V preset until the threshold point is found, when the picture will brighten slightly. Edge the preset back until the picture just returns to normal. Once this has been done the two horizontal hold presets can be balanced to minimise the need to move the front-panel horizontal shift control when switching modes. Horizontal hold 2 is dead critical, so some compromise will probably have to be accepted! **I.F.**



VCR CLINIC

Reports from Eugene Trundle Steve Leatherbarrow Denis Foley Graham Richards Paul Smith and Ronnie Boag

We welcome fault reports from readers – payment for each report is made on publication. See page 106 for where and how to send reports.

Tatung TVR7121

These machines are fitted with a deck produced by **Sharp**. It can give capstan-speed problems, including 'pulsing' once per motor revolution. Before you condemn the motor (and hence probably the machine itself!), ensure that the little FG generator block, a four-pin device, is very close to the rim of the flywheel. **E.T.**

Mitsubishi HSM54B/59B

The cause of refusal to fast-forward or rewind a tape can be dry-soldered joints on tarnished connection pins at the brake latching solenoid L570, which is beneath the deck at the front. The fault can be intermittent. **E.T.**

Sony SLV757UB

This machine's playback picture gave the impression that its video heads were dirty or blocked, but I found that a picture of sorts was obtained when the drum was slowed by hand. The symptom was intermittent, generally appearing when the VCR was first switched on. The cause of the trouble turned out to be dry-joints at the drum motor stator's plug/socket. **E.T.**

Toshiba V703B

If there's a dim display, with possibly sluggish operation or tape chewing etc., replace the electrolytic capacitors on the primary side of the power supply unit. The usual cause of trouble is C813 (47µF, 63V) **S.L.**

Sharp VCM26

If the machine is stuck in the child-lock mode and you don't know the pin number, proceed as follows:

(1) Press and hold the remote-control unit's lock key. The lock symbol appears in the display.

(2) Press and hold for more than three seconds the remote-control unit's standby key and the standby key at the front of the VCR.

The VCR should shut down and clear the child-lock entry. **S.L.**

Philips VR4557/05 (JVC clone)

The cassette loading mechanism was 'floppy' – it would move in and out with very little effort. The customer's son insisted that it went like this suddenly when he was loading a tape. This part of the mechanism gets its drive from the capstan motor via an intermediate gear (item 74) that JVC calls the change-arm assembly. The arm is held in place by a spring that hides beneath the sliding plate (item 56). The problem was that the small nylon pin on the arm had broken off.

I cheated by fixing the end of the spring into the nylon arm by application of heat from a hot soldering iron – and an extra dollop of hot nylon. This seems to me to be more secure than the original miserable pin.

Cheats never prosper however. When everything had been reassembled I had no front display and no E-E signals. The switched 5V supply had been removed by the leaf spring beneath the power supply. It's there for connection to the bottom screening plate – and to catch out unsuspecting technicians! I had pushed it into the power supply, but fortunately only CP801, a CN20 circuit protector, had been damaged. A new CP and more careful reassembly left me with a fully working machine.

I'm not sure which is the equivalent JVC model, possibly the HRJ220. **D.F.**

Panasonic NVHD600B

A continual tripping could be heard when this VCR was powered. Cold checks in the power supply led me to the MA185 rectifier diode D1124, which produces the –28V output. Once a replacement had been fitted there was normal operation. The BYD33D or BYD33J is suitable in this position. **G.R.**

JVC HRJ610EK

This VCR was dead. Checks with our Wizard capacitor tester revealed that C12 (2·2µF, 50V) on the primary side of the power supply was open-circuit. The following capacitors on the secondary side were replaced because they produced poor readings: C31 (22µF, 50V), C34 (22µF, 63V), C36 (470µF, 10V) and C38 (0·47µF, 50V). **G.R.**

Sanyo VHR766E

The tape would load but there were no functions. Checks showed that the 12V and 5V (switched) supplies were missing. The culprit was Q513 (2SC4483). A 2SD1207 is a more substantial replacement.

Q1501 can cause the same symptoms. When it fails only the switched 5V supply is removed. It's also a 2SC4483. **G.R.**

Orion D1096/D2096

This machine would intermittently stop, eject the cassette and revert to standby. I thought that the cause of the problem was poor soldered connections to the supply-reel sensor Q1001. The fault was in fact cured by replacing both reel sensors, Q1001 and Q1006. **G.R.**

Matsui VP9405

There was very slow rewind with a clunking sound. It was caused by a defective supply-side clutch assembly. The square-

sided centre shaft starts to slip, then wears down until it becomes almost cylindrical. You can get the same problem with forward wind, when the take-up clutch assembly is defective.

Replacement is the only cure. As this was an economy repair, I used a replacement from a scrap mechanism.

The RF modulator frequency also had to be retuned. The procedure is as follows:
(1) Switch on the VCR.
(2) Keep the standby button pressed until the display alters and a test signal appears.
(3) Use the + or – buttons to set the RF output frequency, as displayed on the clock.
(4) Press standby again until the display reverts back to the clock. **G.R.**

Ferguson FV41R/Toshiba V110B

There was severe pulling (similar to overloaded video) with E-E pictures and no playback video. Checks around the BA7258AS video processor chip showed that there was perfect video at pin 27 in the play mode but nothing at pin 24. A low-pass filter, circuit reference FN54, is connected between these pins. As a check I bypassed it with a 1µF, 63V electrolytic capacitor, which restored the video signal. A replacement filter unit, type SEL4230, cured both symptoms. **G.R.**

Sharp VCA50

There was intermittent buzz on playback sound. On investigation I saw that C603 was pressing against the mechanism. Slight repositioning cured the fault. **G.R.**

Akai VSF33EK

The display showed four bars but the machine couldn't be turned on or persuaded to take a cassette. Visual inspection of the bottom PCB revealed dry-joints at TR408, which is near the back-up capacitor. As a result the safety resistor R425 (0·47Ω) had gone open-circuit. A replacement resistor and some resoldering brought the VCR back to life.

Another of these machines had a picture with noise bars on it. The cause was C7 (1,000µF, 16V) in the power supply. Its value was low. **P.S.**

Matsui VP9405

This machine would shut down after about five seconds in any mode. Scope checks revealed that there was no output from the reel sensor beneath the take-up spool. A replacement cured the fault. **P.S.**

Toshiba V726

This machine came in with the complaint that it was dead. Operation was restored by replacing CP007 (10µF, 50V) and CP008 (100µF, 25V), but the display was dull. This was corrected by replacing CP041 (220µF, 10V). **R.B.**

Akai VSG271

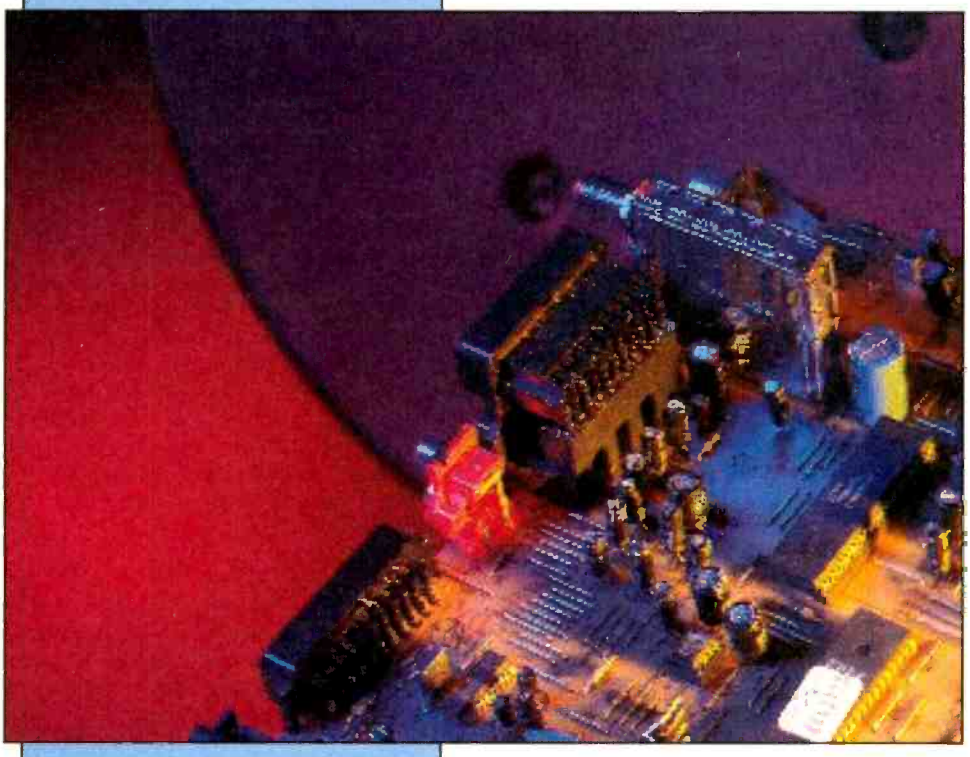
This machine refused to accept tapes. The cause was found to be dry-joints at D402 (LED tower). **R.B.**

Samsung SV222

This machine was dead. When voltage checks were carried out in the power supply I found that capacitor C1SS33 and diode D1SS33 were both faulty. Replacements restored normal operation. **R.B.**

Nokia VR3786

There was no rewind and tape wasn't taken up on eject. The cure was to replace the back-tension band. The old one had come off and the band had stuck to the supply reel. **R.B.**



SATELLITE WORKSHOP

JACK ARMSTRONG

Grundig GDS200

These digital receivers have proved to be reasonably reliable. The few faulty ones I've had so far have been sent straight to Genserve of Swindon for repair. I had a feeling that this particular one had an 'easy' fault however, so I decided to investigate.

The problem was no reception of the horizontal channels because the LNB supply remained at 12V. There was no obvious cause, but I suspected the power supply. A known good one fitted as a substitute proved the point. Voltage comparisons between the two power supplies were easy to carry out, and I discovered that the white wire feeds the LNB supply to the main board while the green wire links the control voltage from the main board to the power supply. With the good power supply, the control voltage was 0·85V when horizontal polarisation was selected and 0·14V when vertical polarisation was selected. With the faulty power supply the voltage supplied by the green wire was either 3·32V or 0·01V, which puzzled me since the source was the same. The cause of this discrepancy turned out to be a difference in the power supply designs: the good one was newer and had a greater loading effect on the control voltage.

I concentrated on tracing the connections in the faulty supply and found that at switch on D8 supplied 13V while D7 supplied 17V. As soon as the receiver had completed its boot-up sequence however these voltages fell to 12V and 13V respectively. The only capacitor connected to D7 is C18, which I checked with my ESR meter. The reading was very high. As glue had been liberally applied to C18 it was impossible to read its value, but its size suggested 220µF, 25V. When I fitted a replacement rated at 35V everything worked perfectly.

This repair was completed in less than half an hour without the help of a circuit diagram. It proves that at least some repairs to digital receivers are going to be feasible.

Amstrad DRX100

Don't you just hate computers? I remember the days when PC referred to the local bobby and windows were what you cleaned on Monday. A ram was a male sheep, "scsi" was what an Italian said when he wanted to interrupt you, a mouse made women shriek and a hard drive was that long run up the A68 to Scotland in an 803cc side-valve engined Austin, which the passengers had to push up every incline. Technology has now advanced to the point where everything is just a computer in disguise. Even the Amstrad DRX100 satellite receiver.

The one that arrived recently had the now common 'no signal' problem. Fitting a replacement tuner is not a job for the faint hearted: it's all too easy to leave a little solder on one of the pins, which results in track damage when the tuner is lifted out. Once I had completed the job and checked it, I reassembled the receiver. Normally it takes about thirty seconds for the receiver to come out of standby. This time it refused. What had I done?

I had visions of a solder short between tuner pins, but then noticed that the front-panel connector had not been fully pushed into its socket on the main board. Once this fault had been corrected the receiver came out of standby and produced music with the menu screen. When I changed the programme however all I saw was a blue screen with the no-signal message again. In fact there were signals, as a few programmes worked, but most of them didn't. I suspected an LNB supply voltage problem. A check revealed that it switched correctly between 13V and 18V however.

When 'services' was pressed, followed by 4 0 1 then 'select', the secret installation menu appeared. I chose 'LNB setup', which revealed the cause of the problem – the 22kHz tone had been set to 'off'. I changed the setting to 'on', stored this selection, and went back to 'all channels'. The problem was still present, and a return to the 'LNB setup' menu showed that the 22kHz tone had reverted to 'off'. This was very puzzling. When I pressed the red button to reset all settings to standard the tone was on again. But the 'no signal' fault symptom was back when I exited the menu.

In desperation I switched off the mains power then switched back on while holding the 'backup' button on the front panel. After a few seconds all the panel LEDs lit. I then left the receiver for fifteen minutes while it downloaded the software. When this operation had been completed the tone was still at 'off' in the menu. This time however changing it to 'on' and storing thes setting cured the fault. Phew! Don't you just hate computers?

The final blow to my pride came when I replaced the screws that hold the PCB. I did this without disconnecting the mains supply. Yes, I know this is wrong, but we all make mistakes and I was having a really bad day. As I replaced the screw nearest the power supply my screwdriver touched the large heatsink on Q1. The fuse went bang and I jumped.

The unit was now dead. Just to prove how stupid I was, I replaced the fuse. The new one exploded with a bang, scattering glass. Oh dear! I had visions of having to order a new Q1. It has four pins and is marked IL0380R, but my eyesight is becoming worse and I might be wrong about that. Fortunately I then found that

one of the bridge rectifier diodes was short-circuit. Everything else seemed to be OK.

I replaced the diode and fuse and stood well back with my safety goggles on. Wossname from Church Street came through the door behind me and clapped loudly. The DRX100 was now working perfectly however, but I wasn't sure about my heart.

Pace 2500 digibox

Wossname had a Pace BSkyB 2500 digibox under his arm.

"Thought you were dead" I remarked drily.

"Wishful thinking. Thought you were going to die when I clapped. Should have seen you jump! Have a look at this will you? Cat peed in it."

"No thanks. I've had dealings with that stuff. Send it to Pace."

"Already did. They sent it back."

He had such a hang-dog expression that I felt sorry for him and agreed to take a look. The corrosion was limited to just one IC, the modem chip U700, so I squirted WD-40 around it, scrubbed it with a toothbrush then dried it with a hairdryer. Amazingly, the digibox then worked perfectly.

I didn't like to charge for the work, as the unit might prove to be unreliable. He bought me a pint that evening, so I was satisfied.

Nokia SAT1700

You know how a job can defeat you and you put it aside meaning to have another go later. The problem with this receiver was intermittent. It had a silly habit of switching itself off (in a pulsing on/off fashion) then resetting to Channel 1. This would happen about once every three days. I'd already had a couple of goes at repairing it, and had replaced every single component on the primary side of the power supply – I had even swapped over the chopper transformer with one from another receiver. That was some considerable time ago. The receiver came to my attention again when I tripped over it while looking for something else! I'd lent the customer a replacement, which had obviously proved to be satisfactory. But I felt that I really ought to get it repaired.

I decided to forget about the primary side of the power supply. What could cause this fault on the secondary side? Back when the Nokia Technical department was still in operation I had been advised to resolder all the wire links that are connected to chassis. I had done that, but it had made no difference. I felt each of the rectifier diodes on the secondary side of the circuit and found that D12 (UF5403) was distinctly warmer than the rest. It supplies the 12V rail, and carries much more current than the others. Maybe it was leaky. Anyway I replaced it with a BYW98 I happened to have handy. That was three weeks ago, and the fault has not occurred since.

Would Jim be happy to have it back and be prepared to pay for the repair? Trouble is, we haven't spoken for almost two years!

Jack Armstrong is willing to try to sort out readers' satellite TV receiver problems by e-mail. You can reach him via the internet web site at:

http://www.ukstay.com/jack

If you have no internet access you can write to him c/o Television, Room L514, Quadrant House, The Quadrant, Sutton, Surrey SM2 5AS. Please enclose two first-class stamps.

Test Case 456

Whatever happened to summer? Only last month we were in Colonel Kingsley's sunny garden with Techno-Supersleuth blowing backwards through a petrol filter, now here we are in the murk of winter. Television Ted is already complaining about the cold in the workshop, despite all the radiators clicking and throbbing on this chilly morning!

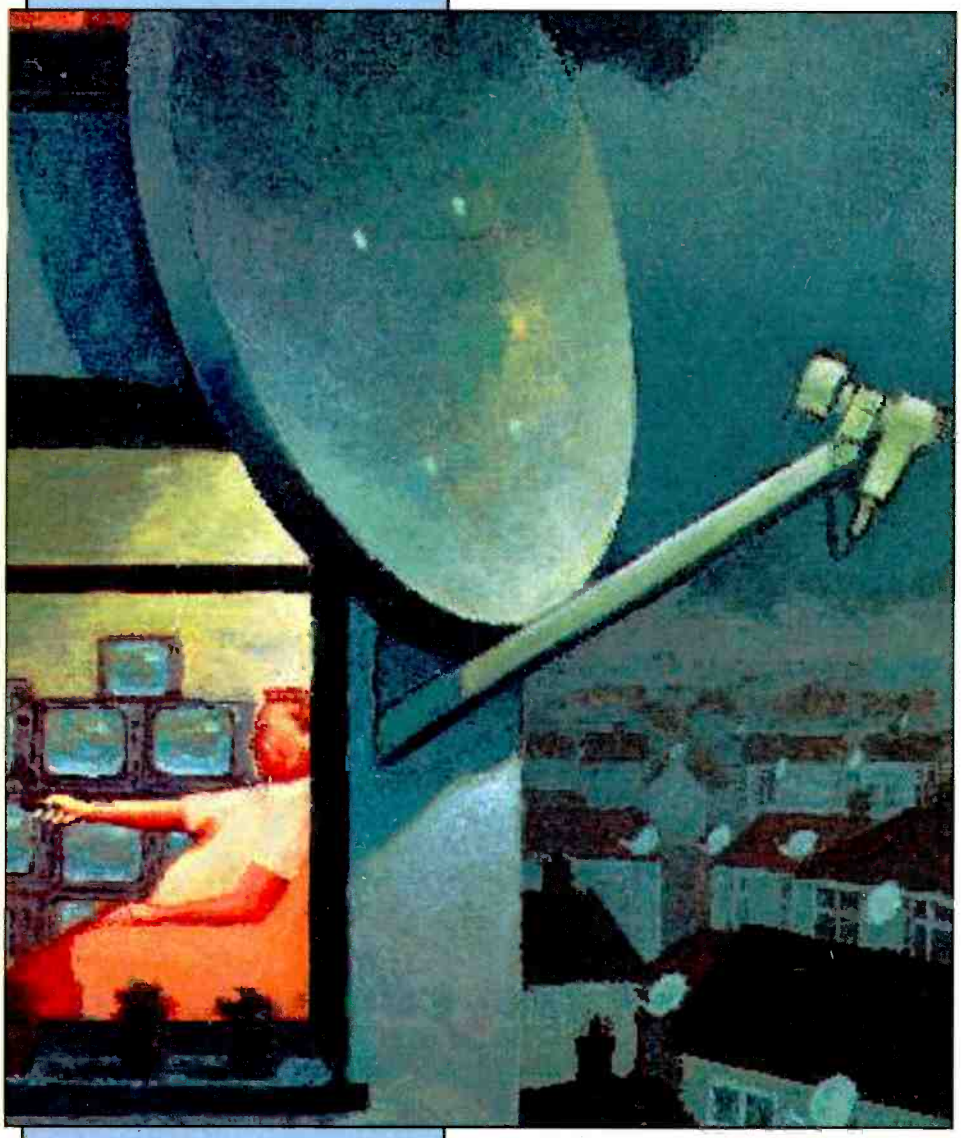
Nor was the cold Ted's only problem. Sage had gone off sick with some flu bug, and the VCR repairs were therefore landing on his TV service bench. It's a fact that Ted doesn't like VCRs. The first one to come along was a rather ancient Toshiba V213B, with the complaint that the tape ran too fast. The offending tape was inside the machine: there was a movie on it, recorded off-air by the customer's daughter, using her JVC machine. It certainly ran too fast on test in the Toshiba machine, with the actors shrieking in high-pitched voices and rushing about like souls demented, and the playback half-obliterated by mistracking interference. The machine played the workshop test tape correctly however. Ted soon had this one sorted out and on its way, with a 'nominal' £15 bill. What was the cause of the problem?

The next patient was a Daewoo DV-F502P VCR with the FM deck, though the problem with it could apply to other models. The tape inside was very badly crinkled and chewed, but not as a result of tape looping when the cassette was ejected: it had been mangled during its passage through the deck. Ted inserted a scrap tape and carefully watched its motion in the region of the capstan shaft and pinch roller. The tape rode upwards, graunching on the shoulder of the tape guide, then rode downwards, likewise crumpling. The picture was badly marred by mistracking bars, and the sound and servo lock came and went as the tape writhed up and down over the surface of the audio/control head.

Surely this must be a pinch-roller fault? The roller appeared to be OK, but what can you tell by looking at it? There were two roller assemblies in the stores, so plainly a failure of this sort was not unknown. It was the work of minutes to fit one to restore normal operation – but the tape still didn't run properly! In fact the tape behaved (and crumpled) pretty much as before, while the picture, servo lock and sound were as bad as ever. Although he couldn't see why it should cause this problem, Ted decided to check the left-hand spool's take-up torque. It was correct at about 80g/cm.

By way of experiment, Ted tried the other deck modes. Fast-forward and rewind seemed to be OK. The on-screen results were normal in the review (search backwards) mode, though with the usual noise bars, but in the cue mode the tape behaved erratically. Ted pressed the play key once more, and wished he was repairing TV sets as he watched and heard the tape crinkle and crunch on its way towards the take-up reel.

Then his eye wandered over to the other side of the deck, where something was definitely wrong! After fifteen minutes and another foray into the VCR component stores, the machine was ready to go – with its original pinch roller back in place. Which part had Ted replaced? All is revealed – along with the solution to the Toshiba problem – on page 120.



SATELLITE NOTEBOOK

Reports from
Christopher Holland
Steven Leatherbarrow
and
Hugh Cocks

Digibox switch-on device

Problems can arise when a digibox is used to feed a communal or SMATV system because the box reverts to standby after even a brief power cut and, unlike other (non-Sky) digital and analogue receivers in which the facility is commonplace, won't return to the channel being received before the cut.

One way round this is to use an Uninterruptible Power Supply (UPS) to provide the digibox with a constant 'mains' supply. UPSs were originally intended for computer use. But if the power cut lasts for several hours a large backup battery capacity will be required to feed the UPS's AC inverter, especially if several digiboxes are in use.

An inexpensive solution is now available from Kesh Electronics, which produced the Pacelink channel programming system for Pace analogue satellite receivers. The new unit consists of a small box which is connected to the digibox's second RF outlet socket via a coaxial socket on a flying lead. Power for the unit comes from the digibox itself, as the second RF socket can be used to provide power for a remote infra-red 'mouse' unit for channel changing in another room – power is easily switched on using the digibox's installation menu.

The box feeds remote-control commands to the socket – the digibox is designed to receive commands in this way from a 'mouse' channel-change system. Enter in the digibox's favourite-channel menu the channel you require it to produce when starting up. This is done in the usual way, with a tick, but with this application only one channel can be entered in the menu selection.

When mains power is applied, the box sends remote-control commands to the digibox. These bring it out of standby and, after the normal boot-up sequence in which the digibox always goes to channel 998, tells it to go to the channel entered in the favourite-channel menu.

The unit has been thoroughly tested with the five types of digibox available – they all have the same menus and remote commands of course, though there are differences in the boot-up times. Reception is normally restored within thirty seconds or so of power being applied after an interruption.

For more information on this unit call Kesh Electronics on 028 68 631 449 or e-mail gmccrea@pacelink.co.uk

C.H.

Pace PSR800 LNB problem

The Pace PSR800 is the receiver-only version (no decoder) of the PRD800. It's not widely seen in the UK but is similar to the PRD800, apart from minor alterations to the power supply and signal circuitry.

I was recently called to an installation where German analogue signals were being received from the Astra slot at 19·2°E. The problem was intermittent reception of the horizontally-polarised signals. On initial inspection I was suspicious of the very long cable run from the dish. There was a join with some very tarnished-looking F connectors and a back-to-back socket in the basement. This might have been sufficient to introduce a voltage drop in the supply to the LNB, so that it switched to the vertically-polarised (lower-voltage) channels. However a check on the voltage at the 1Ω resistor R544 (I'm quoting PRD800 component reference numbers – the PSR800 numbers differ) in the LNB supply feed, adjacent to the tuner, showed that the voltage from the receiver's power supply was low.

Once the board had been removed the cause was found to be a poor joint at the negative side of C23, the 1,000µF, 25V capacitor that smooths the 18V LNB supply. The PSR receiver produces far less heat than the PRD version, and the power supply electrolytics were all the original ones. In view of their age however I decided to replace the lot. I also replaced the connectors in the basement and the LNB's F connector – this item was easy to get at as the dish was out in a field! **H.C.**

SkyDigital update

Table 1 shows the channels added during the past month. The transponder number is

shown in brackets after the frequency, the EPG number being shown in brackets after the channel name. Transponders 59 and 60 are aboard Astra 1D, the others being aboard 2A. The 1D transponders use a different symbol rate and error correction (SR 22,000 and FEC 5/6, instead of the normal 27,500 and 2/3 with the SkyDigital package).

Transponder 37 (12·422GHz H) has been activated for the first time. It's currently transmitting Prime TV (685 in the EPG) in parallel with transponder 14 (11·973GHz V). **C.H.**

Amstrad SRD545

This receiver produced the "invalid card" message despite the fact that the customer had obtained a new card. As a check I fitted the decoder and card reader boards from a workshop SRD510. The results were the same, which was a little worrying. I subsequently discovered an open-circuit resistor, R205, which is mounted just rearward of the four-pin socket at the front left-hand edge of the main PCB. You could also get this fault with the **SRD540**. Strangely, our SRD510 doesn't have this resistor fitted. **S.L.**

Watery cable

An analogue Nokia receiver shared a dish and twin-output LNB with the house next door. The initial complaint was "intermittent Channel 5, sometimes it's on a German station". There was no problem with the other receiver connected to the dish.

The cause of the trouble was found to be in a cable connection, using a back-to-back F socket and two F plugs, on the roof. Water had got in and caused inner-conductor corrosion, to the extent that there was a significant voltage drop at the junction. As a result the LNB switched from horizontal polarisation (higher supply voltage) to vertical polarisation, where German stations are on adjacent frequencies to Channel 5. Once the offending connectors had been replaced and the Nokia receiver had been powered again, all channels were good – except Sky News which was barely visible!

My conclusion was that the cable from the roof was attenuating the LNB's IF output for Sky News. This proved to be the case, confirmed by running a temporary cable from the roof to the receiver via a window. Water had entered the cable at the junction, and as the cable was of the old air-spaced type the water had travelled some distance along the air spacing – fortunately not as far as the tuner's F socket, where it could have caused considerable damage. **H.C.**

Table 1: SkyDigital channel update.

Frequency (GHz)	*Pol*	*Channel*
10·862 (59)	H	Disney +1 (614), Toon Disney (615), Playhouse Disney (616)
10·936 (60)	V	Sky Sports Extra (404)
11·954 (13)	H	Extreme Sports (422)
12·032 (17)	H	Bid Up TV (647)
12·188 (25)	H	Biography Channel (563), Community Channel (655), Q Interactive Music (455)
12·207 (26)	V	History Channel +1 (562)
12·324 (32)	V	Storm Live (946), Sunrise Radio tests
12·480 (40)	V	Sky News Eire

WEB SERVICE

AcquiVision

http://www.acquivision.com

Acquivision solutions, including XY-Plotting, Oscilloscope (with FFT), Data Logging and Custom Software, have been getting the most from computers since 1994, Download software. Telephone (01903) 830502

All Tech Tips

http://www.skyeinteractive.net/techtips/

Another US technical tips site which deals with subjects related to repair of the whole range of consumer electronic items. The site is being updated and plans to include current repair articles, books on repair, schematics and links to manufacturers technical repair sites. There's also a chat room.

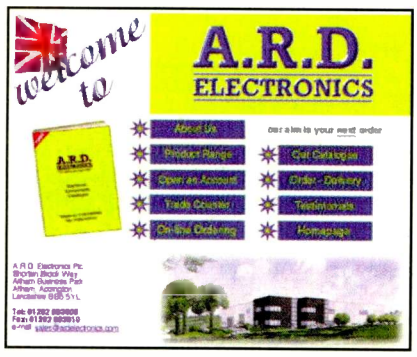
Anatekcorp

http://www.anatekcorp.com/

A US site selling computer databases of fault reports and schematics, but it has some interesting articles for free download - you can even submit your own. There's a technicians forum but you have pay $60/year to be a member.

A.R.D. Electronics Plc

http:/www.ardelectronics.com



A.R.D.'s Website details all the information you need to know about this new and exciting electronic 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.

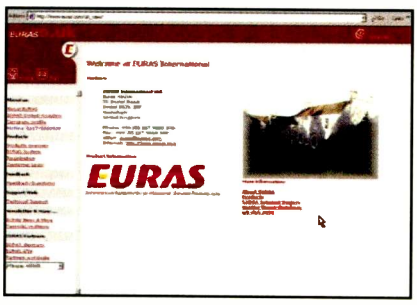
Doknet Service manuals

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.

EURAS International Ltd

http://www.euras@euras.co.uk



"The definitive fault index... based on feedback from manufacturers, technicians and workshops throughout Europe" IER Magazine. Available on CD-ROM including ECA vrt-disk 2000. Subscription includes free Internet access for update downloading, access to pin board, discussion forums and classified ad section. Monitor database also available.

Goot Products

http://www.kieagoot.co.uk

Kiea Trading Company is the sole agent of Goot products, We specialise in supplying the soldering and desoldering product range manfactured by Goot Japan for the UK market. Goot

uses advanced production technology to manufacture high quality soldering iron products for industrial, prfessional and general purpose use.

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

Newsgroups

uk.tech.broadcast

uk.tech.digital-tv

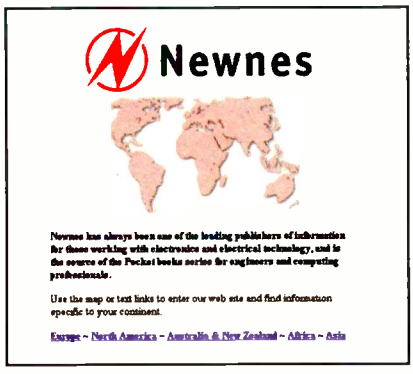
uk.tech.tv.sky

If you have never got into newsgroups then these are worth a look. You"subscribe" (free of charge) to a newsgroup through your e-mail software (eg. Outlook Express). If it's not obvious how to do it then check out the help section on your Internet Service Provider's front page. Newsgroups are like notice boards where subscribers can send an Email to be viewed by everyone else.They are generally a source of help and advice, with plenty of humour too! Maybe there should be a TV engineer specific newsgroup called "uk.tv.engineers". Any thoughts? (thanks to Iain Dobie for this information)

Newnes

http://www.newnespress.com

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

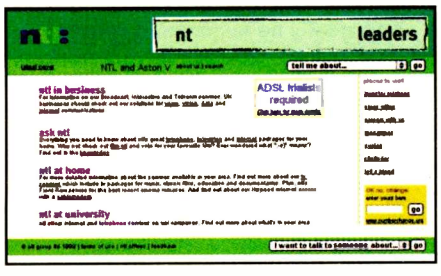


you when relevant new titles are published.

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.

M.C.E.S.

http://www.mces.co,uk

The MCES site gives details of our range of service including Tuners, Video Heads, RF & IF Modules plus latest prices and special offers.

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.

Pace

http://www.pace.co.uk/trade/index.htm

The Pace site has a product finder. On servicing, there is a restricted access area for Pace retailers and service partners. If you are a member of the trade and you deal with Pace products you can apply for access by following the instructions. The free access area contains some useful Frequently Asked Questions and links to other useful sites such as the Lyngemark Satellite Chart at http://www.lyngsat.com.

Philips

http://www.philips.com

http://www.semiconductors.com/products/

Take a look at the impressive Philips home page which leads to a product listing and detailed information. Perhaps more useful to the technician is the semiconductor data "tree" where data sheets can be downloaded on all Philips integrated circuits.

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)

Donberg

http://www.donberg.ie

As the leading distributor for the TV, Video and Audio 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

Texas Instruments

http://www.ti.com

Quality Electrical Direct http://www.qed-uk.com Here's a new retail site with a very interesting feature - not only can you purchase from a huge range of consumer goods but you can also request price information on your mobile phone. For example, you could be looking around your local branch of Dixons and see something you want. You can then send a message to QED via the Short Message Service (SMS) on your mobile phone to request a price and delivery from QED. The information is send back to your phone.

Timecast

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

Television of the future? 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/

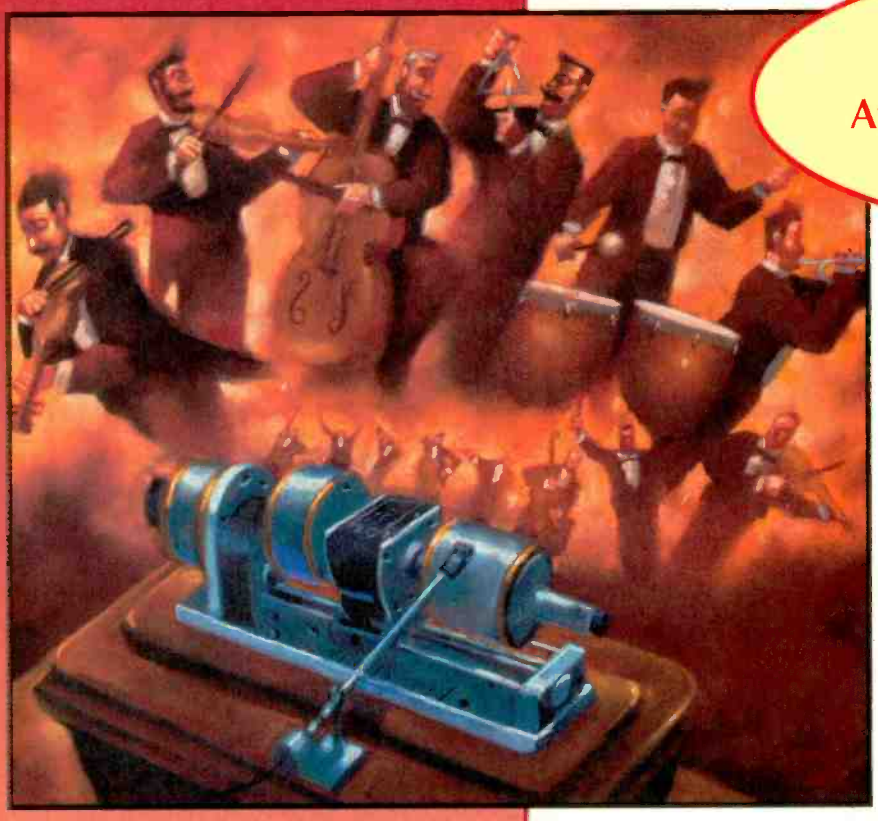
Another free internet access site, this time from Reed Business Information. However the site possesses a useful UK People and Business Finder, with an e-mail search. There's also business news

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".



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Track

1 Washington Post March, Band, 1909
2 Good Old Summertime, The American Quartet 1904
3 Marriage Bells, Bells & xylophone duet, Burckhardt & Daab with orchestra, 1913
4. The Volunteer Organist, Peter Dawson, 1913
5. Dialogue For Three, Flute, Oboe and Clarinet, 1913
6. The Toymaker's Dream, Foxtrot, vocal, B.A. Rolfe and his orchestra, 1929
7 As I Sat Upon My Dear Old Mother's Knee, Will Oakland, 1913
8 Light As A Feather, Bells solo, Charles Daab with orchestra, 1912
9 On Her Pic-Pic-Piccolo, Billy Williams, 1913
10 Polka Des English's, Artist unknown, 1900
11 Somebody's Coming To My House, Walter Van Brunt, 1913
12 Bonny Scotland Medley, Xylophone solo, Charles Daab with orchestra, 1914
13 Doin' the Raccoon, Billy Murray, 1929
14 Luce Mia! Francesco Daddi, 1913
15 The Olio Minstrel, 2nd part, 1913
16 Peg 0' My Heart, Walter Van Brunt, 1913
17 Auf Dem Mississippi, Johann Strauss orchestra, 1913
18 I'm Looking For A Sweetheart And I Think You'll Do, Ada Jones & Billy Murray, 1913
19 Intermezzo, Violin solo, Stroud Haxton, 1910
20 A Juanita, Abrego and Picazo, 1913
21 All Alone, Ada Jones, 1911

Total playing time 72.09

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

LETTERS

Send letters to "Television", Room L514, Quadrant House, The Quadrant, Sutton, Surrey, SM2 5AS or e-mail jackie.lowe@rbi.co.uk using subject heading 'Television Letters'

After-sales service

It has been depressing to read the letters pages recently, but the decline of the brown goods repair trade has had a certain inevitability for several years. In the late Seventies in Australia for example service engineers were doing quite well, then Japanese sets started to be imported and their high reliability meant that TV repair people were looking for something else to do. As a rule however TV engineers are a versatile bunch, and their fault-finding skills, usually to component level, will be of use in other branches of electronics.

Even though today's products are as a rule very dependable, they are not invariably so and service personnel will always be required at some stage. It seems to me that setmakers should be starting to worry about the impending situation. But it appears that they aren't, as there has been no comment from them in these pages. They must, surely, realise that efficient after-sales service is vital to a manufacturer's on-going reputation?

It seems that manufacturers have a problem when it comes to analysing what's required in running a service-only company. A typical example was Sony's "true cost of service" policy, which was rapidly dropped when the company was accused of being out of touch with the realities of running a workshop profitably. It is true that these are hard times in this industry, with everyone's profits being squeezed, but setmakers and workshops must work in partnership to make the job worthwhile. The warranty claimback scheme should be dropped, and manufacturers must accept the charges levied by repairers instead of paying only what they consider acceptable. So come on Sony, JVC, Philips etc., let's hear your comments. They will be read with interest.

Edgar Beddow,
Milton Keynes.

Monitor EEPROM

In the November issue of *Television* Ian Field wondered why, in some computer monitors, an EEPROM is connected to pin 12 (monitor ID) of the 15-pin connector. The EEPROM forms part of the VESA Display Data Channel (DDC). It stores information about the monitor for use by a "plug and play" operating system such as Windows 95 to determine the correct display parameters. Some monitors come with an adaptor that you can connect between the monitor and the graphics card to ground pin 12 to ensure a colour display with an older or non "plug and play" compliant operating system.

Philip Offord,
Newbury, Berks.

Sky let-downs

The following is a situation that we in the TV trade must come across virtually every day of the week. It's costing us money that we are unable to reclaim from those causing the problem.

(1) Customer rents a TV set and VCR from a dealer, and gets a digibox from Sky.

(2) Digibox goes wrong. Customer calls Sky who call out and take away the digibox. No loan left

(3) Six weeks later customer phones Sky to find our where her digibox is. She is told "it's in the warehouse, we will phone when it's on its way back to you".

(4) An hour later a courier arrives at the doorstep with a parcel containing the digibox. No Sky technician to connect it and set it up.

(5) Being elderly, the customer is unable to connect the box herself, so calls her son to do it for her.

(6) Son connects box but cannot understand why, whenever the Sky button on the handset is pressed, the TV goes to ch. 3 (ITV).

(7) Customer calls Sky and is told "we can call out in three days time and it will cost £50".

(8) Customer calls dealer for help. We call and program the handset correctly, at our own expense with no charge to the customer.

(9) All this time Sky continues to take direct debits from customer's account, even though a refund had been promised.

This may be shrewd business, but who pays the cost? The dealer does! How long are we going to let Sky get away with it?

The situation described above is just one of many with which we have to deal. Others include wrong and poor installation by Sky, no demonstration of equipment operation, etc.

To keep our customers, dealers in the retail and rental trade have to follow up and correct these mistakes free of charge. This is not reasonable. Sky should be made responsible for seeing that we are reimbursed for the work. After all, Sky has taken away some of our business by doing its own installation and service work.

What do others think about this?

Peter F. Exeter,
Dereham, Norfolk.

Sales hype

As an ex-engineer, I wonder how many sets are now being sold with "digital" as a hype? Most of the sets I see in high street stores are maladjusted. They display NTSC-derived MTV pictures stretched to 16:9 at worst, or widescreen-broadcast BBC News 24, with the colour and contrast set excessively high. The sales assistants say "good, isn't it?" – and believe this!

Manufacturers still set the picture to overscan, in some cases badly, and with some models the focus is such that I believe the vertical definition is probably about 300 lines at best with digitally-sourced material. The chrominance and luminance still don't coincide properly in most pictures. Is it a wonder that in Europe HDTV has been put on the back burner?

Quality and the quantity of programmes are inextricably linked. With more channels, things will get much worse. There now seems to be a fad for wobbly close-up camera work that passes for 'technique' but leaves the viewer giddy. Then there's a general dumbing down – take the BBC's *Tomorrow's World* as an example. *Horizon* has yet to be transformed into the banal docuformat, with a trance-based musical score and half the dialogue scrapped, especially words with more than two syllables. It makes me wonder whether I really want to spend money on a new receiver come the analogue switch off.

On the bright side, some of the DVD players I've seen produce really impressive results.

I would be interested to know which types of sets sell on which features. I suspect that keeping up with the Joneses and 'status' value are higher up the list than actual picture quality and enhancements such as 100Hz scanning.

Stephen J. Cowie,
Llandudno, Gwynedd.

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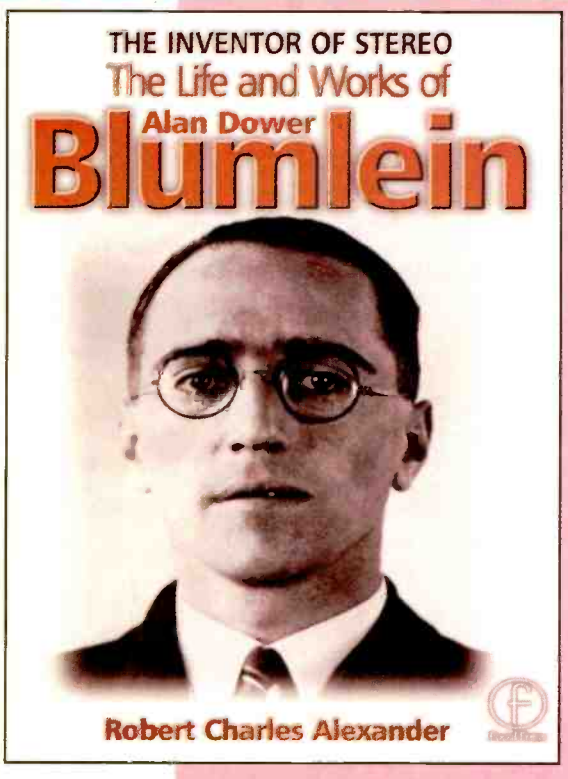

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This book is the definitive study of the life and works of one of Britain's most important inventors who, due to a cruel set of circumstances, has all but been overlooked by history.

Alan Dower Blumlein led an extraordinary life in which his inventive output rate easily surpassed that of Edison, but whose early death during the darkest days of World War Two led to a shroud of secrecy which has covered his life and achievements ever since.

His 1931 Patent for a Binaural Recording System was so revolutionary that most of his contemporaries regarded it as more than 20 years ahead of its time. Even years after his death, the full magnitude of its detail had not been fully utilized. Among his 128 patents are the principal electronic circuits critical to the development of the world's first electronic television system. During his short working life, Blumlein produced patent after patent breaking entirely new ground in electronic and audio engineering.

During the Second World War, Alan Blumlein was deeply engaged in the very secret work of radar development and contributed enormously to the system eventually to become 'H2S' – blind-bombing radar. Tragically, during an experimental H2S flight in June 1942, the Halifax bomber in which Blumlein and several colleagues were flying crashed and all aboard were killed. He was just days short of his thirty-ninth birthday.

For many years there have been rumours about a biography of Alan Blumlein, yet none has been forthcoming. This is the world's first study of a man whose achievements should rank among those of the greatest Britain has produced. This book provides detailed knowledge of every one of his patents and the process behind them, while giving an in-depth study of the life and times of this quite extraordinary man.

Contents

Answer to Test Case 456

– see page 111–

Ted is now back in TV service, having thankfully handed VCR repairs back to Sage – all those nasty motors and mechanics! As most readers will probably have twigged, there was no fault with the old Toshiba V213B. It's equipped for SP operation only, and had no problem with its own recordings and those on bought and rented cassettes. The tape inside it on this occasion had been recorded by a more modern machine, in the LP mode. Played back at normal speed, it rushed through a two-hour movie in sixty minutes, with the action greatly enlivened!

The Daewoo machine with the FM deck had an unusual fault to match the strange symptom. Ted eventually saw that the back-tension control post did nothing, and that the tape was quite slack as it passed the full-erase head and started on the head wrap. The felt-lined band that should brake the supply spool had no effect because its anchor, which incorporates the tension-adjustment screw, had come adrift. There was also one of these in the stores, so maybe Sage knew something that Ted didn't!

Not all deck designs give rise to such repercussions so far downstream as this particular one: presumably much depends on the friction at the surface of the lower drum and elsewhere.

NEXT MONTH IN TELEVISION

CLOSED-CIRCUIT TV

CCTV installations vary in complexity from a single monochrome camera and monitor to systems that have dozens of cameras, outdoors and in, with a sophisticated central control station. The middle level is best suited to those who intend to get started in the business – there is currently a demand for engineers who can specify and install systems that deliver good-quality pictures. In a new series, Joe Cieszynski will survey current equipment and provide guidance on installation and operation.

SERVICING THE SHARP CS SERIES CHASSIS

At first glance most engineers see this chassis as being difficult to service, because of the densely packed surface-mounted components on both sides of the PCB. But with a logical approach plus care and attention these sets can be repaired at little cost to either your pocket or sanity. Next month's article has been designed to help engineers with fault diagnosis and avoid incorrect component replacements and time wasting.

A VISIT TO DOLBY LABORATORIES

George Cole reports on a visit to Dolby's headquarters in San Francisco, where he was briefed on the latest developments such as Dolby Digital EX, Dolby Pro-Logic II, DVD-audio and advanced audio coding techniques.

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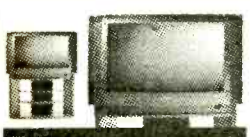

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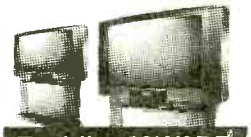

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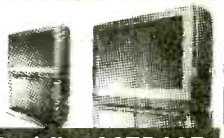

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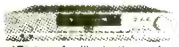

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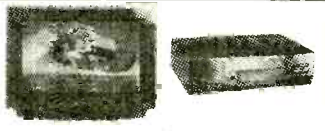

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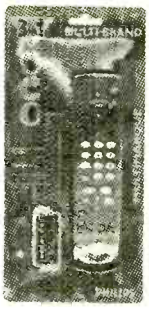

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Gain UHF	10 (+24)	10 (+24)
Noise Figure	2.5dB	
Line Power	12Vdc	
Output	89dBµV	

Features
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- Low noise figure
- F connectors
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Technical Specification			
Reference	8130	8131	8132
Gain (dB) out 1	23	17	7.5
Gain (dB) out 2	-	15	7.5
Gain (dB) out 3	-	-	12
Gain (dB) out 4	-	-	16
Outputs	1	2	4
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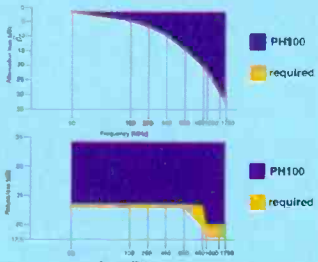

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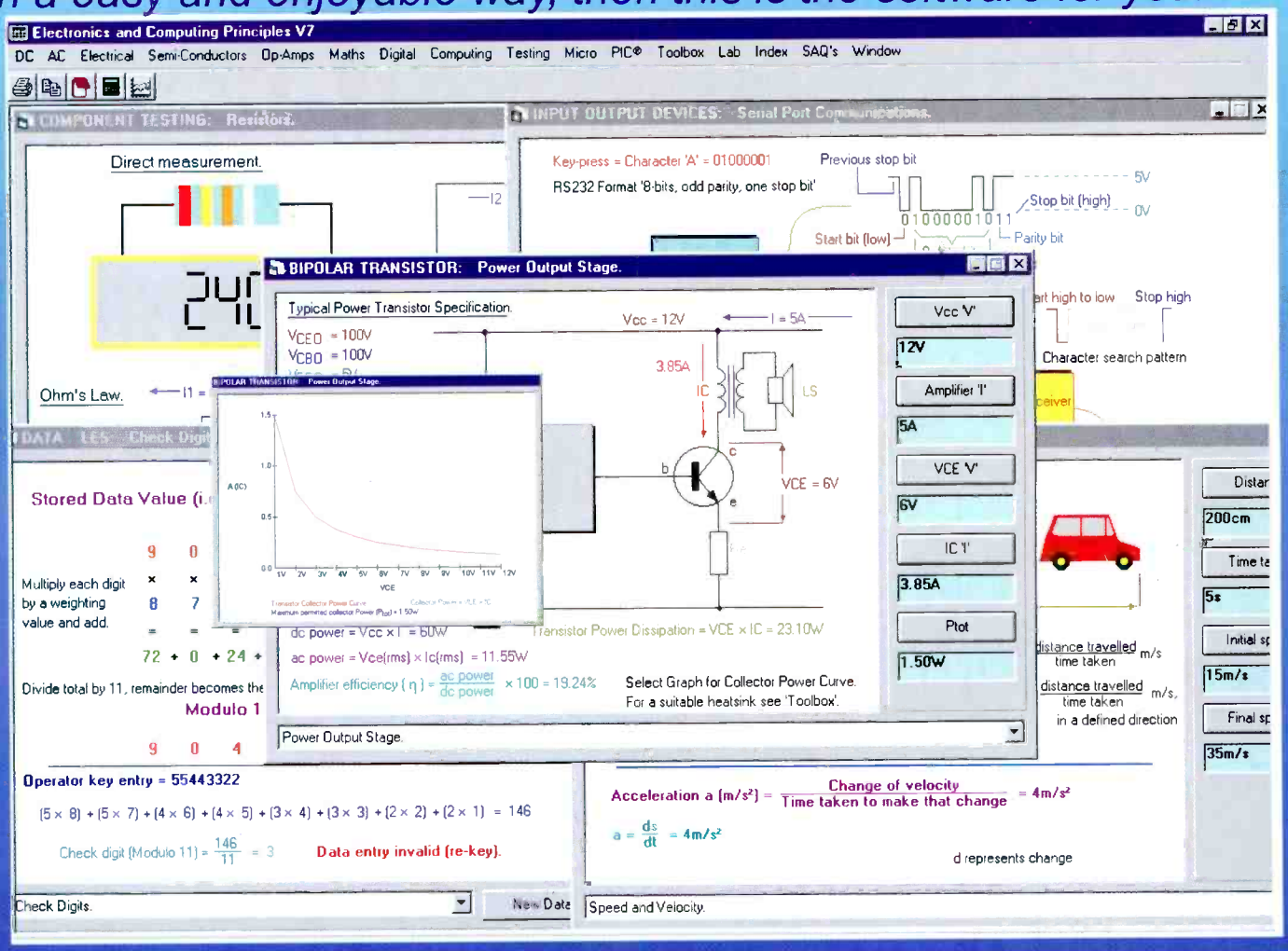

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