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TELEVISION

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Restoring
vintage
radios

Circuit features
of the Panasonic
Euro-4 chassis

Installing audio
in caravans and
motor homes

Electrical
Retailing
Show report

Fault reports

Satellite, PC Monitors, TVs and VCRs



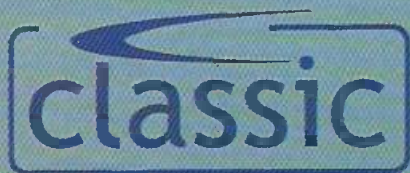


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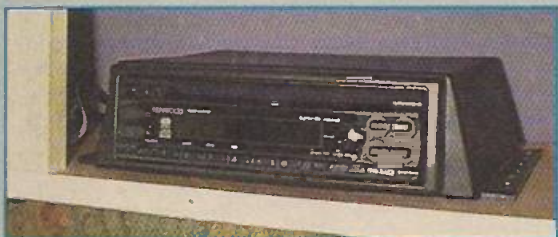
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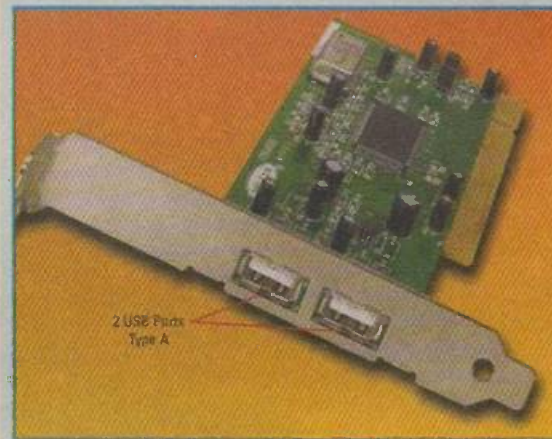
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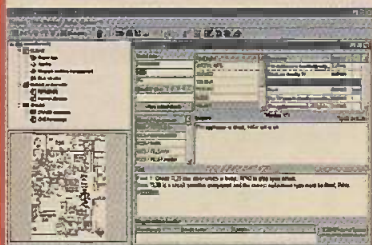
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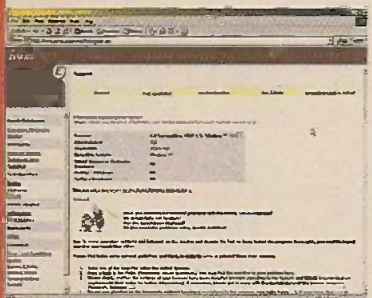
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The Sony way to success

Sales of TV sets in the UK last year reached a record level of over six million. The market was obviously booming. Yet few seem to have profited much from it. Competition is severe, and the cost of cheap sets is such that people buy them without giving the matter much thought. TV has become a commodity item. Pick one up, possibly with the groceries, if you think you might as well have one. Much the same conditions now exist throughout the world, and the situation has become common to most consumer electronic products. Radio sets, hi-fi, portable phones and PCs are all regarded in the same off-hand way. PCs? Yes, these are also now something that most homes have, and people look for something cheap and cheerful. The fact that the office PC market has slumped, following several years of excessive investment in them spurred, in particular, by the year 2000 fear, means that prices are now at rock bottom and are likely to remain there for the foreseeable future.

TV and PC manufacture are both suffering from being, in most ways, very successful industries. The low cost of manufacture has been a highly organised operation. It has had to be, since the Japanese first moved in with their emphasis on market share rather than profitability. They too have been caught out by their success in this respect, and have had to move manufacture to low-cost countries such as China, Malaysia and Indonesia. All this has taken the gloss off such products, which now tend to have a down-market image. In truth it's not easy to make a TV set something special. After all it is, visually, ninety per cent a screen that's dead until programme material appears. As for the set-top box, that's just what it is, with minimal scope for the stylist. And, being given away, it appears to be of little worth, despite the complex electronics within. You'd think there was just a splitter network in there! All this is of no help to the repair trade either. Consumer electronics products now tend to be regarded by many as throwaway items.

Strangely however it isn't all like this. Some companies have always been better at product differentiation and creating a 'lifestyle' image. One thinks of Bang and Olufsen in particular. One major firm that's managed to buck the overall trend is Sony, which has always tended to go its own way. Sony's electronics division had a record year in 2000, with double-digit sales growth. The division's operating profits increased by a staggering 145 per cent, with its contribution to company revenue amounting to 75 per cent of sales. In recent years Sony's PlayStation games operation has been predominant. But 2000 was, according to Teruhisa Tokunaka, chief operating officer, the "year of electronics".

Sales of Wega flat-screen TV sets, digital cameras and the sleek Vaio laptop computers have been the major factors in the success of Sony's electronics division. Good products, yes, but other manufacturers produce flat-screen TVs and so on. What's the difference with Sony? Fujio Nishida, president of Sony Electronics in the USA, attributes his company's success to technology leadership which, he says, has in particular been critical with the TV business. In dollar terms, Sony had two and a half times the consumer electronics market share of its nearest competitor in the States, with Wega flat-screen TV the driving force. He has the following to say about this: "The Wega has a fantastic flat screen that prevents the worst reflections and does not distort the image. It has technology such as 'multi-image driver picture enhancement', which enables you to watch different programmes on the same page. It also has 'digital reality creation', which generates pictures from DVDs and cable television of almost high-definition quality. This technology has had a revolutionary impact. With the Wega, prices are, for the first time in thirty years – since the introduction of colour TV – actually going up."

Design has also contributed to Sony's product differentiation. Ellen Glassman, director of Sony's design centre at Park Ridge, New Jersey, has this to say on the subject: "We spend a lot of time making sure that each product is easy to use, is ergonomic, and has a look and feel that are not generic. Design is hugely important at Sony. It's an organisation that encourages originality. Even the most junior designer has access to Sony's chairman and chief operating officer."

Innovative technology and design flair enable the company to maintain premium pricing for its products. This provides a cash flow that can be invested in further research and development. In fact there's a virtuous circle here. As Mr Nishida put it: "The ability to get cost down depends on market share. First-generation products are always expensive to make. With second-generation products you can integrate the chips better, using fewer. By the middle of the second generation you are making money, as long as you have high volumes." This enables Sony to provide retailers with higher margins than its competitors, increasing the floor space available for their display and hence sales.

So TV can be raised from its present commodity status, though this is unlikely to be possible for all brands. Sony's success must boost the morale of all in the industry. As we enter the digital era, maybe the perception of TV can be permanently raised. It would certainly be justified, when you consider the technology that goes into today's products. ■

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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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TELETOPICS

New digital STBs at Mediacast 2001

Pace and Xcom Communications, a technology company Pace acquired last February, demonstrated a low-cost digital-TV adaptor at this year's Mediacast Show in London. The Digital Television Adaptor, known as the DTVA, enables digital TV to be delivered to analogue TV sets. It has been designed for worldwide use, with satellite, cable and terrestrial systems. The output is fed to a TV set's scart socket. Both free-to-air and encrypted services can be accommodated, and the unit can be used to provide inputs for secondary TV sets.

Pace says the DTVA will facilitate the switch to digital TV in countries where the government has stated its aim to switch off analogue TV transmissions. Xcom is targeting its DTVA technology at digital TV markets across the world. Trials have already taken place in Taiwan and Hong

Kong, and Xcom has plans to run trials in other target markets. The DTVA can incorporate up to three different conditional-access systems and provides an electronic programme guide.

Xcom also showed a new advanced digital set-top box. This unit, the latest in the Xsat range, operates with cable, satellite and terrestrial systems. The new technology incorporated includes: faster processors for virtually seamless channel changing; new on-screen displays and graphics; quicker installation and configuration time; software-download capability for enabling additional new services; and an integrated timer for preset recording of programmes. Up to 4,000 TV and radio channels can be stored. There's also a new digital audio output for connection to a Dolby Digital stereo system with multiple speakers, to provide

a virtual home-cinema experience. Power consumption is 14W in use, 3W in standby. The multi-standard power supply caters for mains voltage inputs from 90-240V, at 50 or 60Hz. It enables the STBs to be used in most countries regardless of the quality of the mains supply available.

Nokia Home Communications and ITV Digital (ONdigital) have agreed to launch Nokia's new Media Terminal unit together later this year. The terminal provides DVB reception (FTA and pay-TV) and internet access, with a hard disk for digital recording, ability to download and play MP3 material, and facilities for gaming and to connect to other peripheral devices. There are also e-mail and chat facilities. Nokia and ITV Digital will be promoting the terminal, ITV Digital's pay-TV services and internet browsing via the ONnet portal.



The Test Equipment Warehouse Company is offering a unique internet service for those who require second-user test equipment and instrumentation. A feature of the service is inspection of the instrument prior to despatch. The company can also calibrate a unit should a more comprehensive service be required. Much effort has been devoted to ensuring that the web site is easy to use, and procedures to ensure client privacy and secure trading have been incorporated.

The Test Equipment Warehouse is an established company that's using the internet as an additional method of marketing. Customers thus get the benefit of the company's technical know-how and the significant cost savings of the internet. The company does not hold stock for its internet trading – equipment remains with the seller until a customer has been found, keeping overheads at a minimum. It charges the seller a commission of

between 5 and 9 per cent: the buyer pays a 5 per cent commission and an administration fee, plus an optional calibration charge. This makes substantial cost savings on purchases possible – between 30 and 70 per cent.

The Test Equipment Warehouse is a division of Inlec UK, which has many years' experience of instrument calibration and servicing.

Customers can simply log on to the web site and purchase on-line, through the secure server. Alternatively they can make contact via e-mail or telephone to confirm orders or discuss their requirements in more detail.

The web site is at www.testequipmentwarehouse.co.uk Send e-mail to enquiries@testequipmentwarehouse.co.uk Phone 01642 875 555, fax 01642 874 511. Inlec UK Ltd. is at Forty Foot Road, Middlesbrough, Cleveland TS2 1HG.

BREMA demands action on TV switch-over

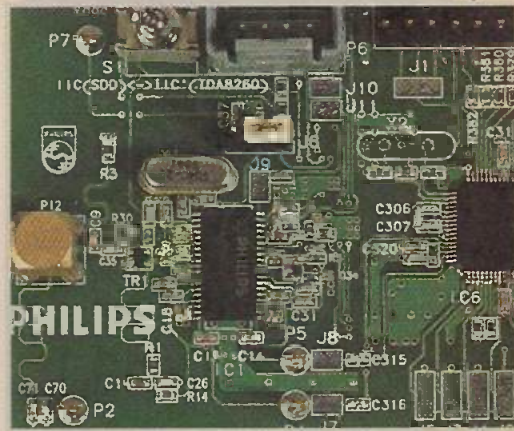
Lord McNally, president of the British Radio and Electronics Manufacturers Association (BREMA), has called for government action to ensure that the target date for the switch to digital TV broadcasting is met. He feels that there is need for co-ordinated action: "I call on the government to appoint a TV tsar or tsarina to co-ordinate political activities and to drive the necessary publicity" he said. Scrapping VAT on digital TV sets is understood to be one option under consideration to promote the take-up of digital TV.

BREMA has also called for a fee to be added to the cost of new products to cover the cost of recycling and recovery. Lord McNally said that the fee should be made "visible", so that consumers are aware of what the extra charge covers. Product recycling and recovery will be required when the European Commission's Waste Electrical and Electronics Equipment (WEEE) directive is adopted. An article that provides more information on the directive will be included in a forthcoming issue of *Television*. Lord McNally has been cautious in commenting on the directive, pointing out that "difficulties lie in devising a fair, effective and commercially viable means of implementation". He added that "the provision to require producers to collect and recycle historical waste is unreasonable, as it imposes retroactive responsibility on producers".

Pace to outsource all manufacturing

Pace Micro Technology has announced its intention to end product manufacture at its Saltaire site in West Yorkshire, with the loss of some 470 jobs. At present 75 per cent of Pace's set-top box production is outsourced, mostly to overseas sub-contractors. The company says that manufacture in the UK is now uneconomic. Instead, Pace will

concentrate on research and development at Saltaire. The company currently employs 670 on this work and expects to add another 80 by the end of the year. Andrew Wallace, Pace's marketing director, commented that "the high-tech side, which is the real heart of Pace, continues to grow quite rapidly".



Philips Semiconductors has announced the TDA8260TW chip for use in satellite digital-TV front-ends. It combines in a single chip the functions of a zero-IF (direct conversion to baseband) QPSK demodulator and a low-noise phase-lock loop frequency synthesiser. The good cost-performance ratio, reduced component count/PCB area, and alignment-free use make it an ideal solution. No critical components or PC striplines are required and the low power dissipation enables a tiny HTSSOP38 package to be used. Full production is scheduled to start in the final quarter of the year. In combination with the new TDA10085 channel demodulator chip a compact front-end can be achieved, as shown by the above prototype board.

DVD recorder launches

Philips has announced that its first consumer DVD recorder, Model DVDR1000, will be launched in the UK this September. It conforms to the DVD+RW standard and includes an index picture screen, one-touch recording, favourite scene selection and a camcorder connector.

There are four video recording modes: HQ, which provides a recording time of 60 minutes with a data rate of 9.72Mbits/sec; SP, which provides a recording time of 120 minutes with a data rate of 5.07Mbits/sec; LP, which provides a recording time of 180 minutes with a data rate of 3.38Mbits/sec; and EP, which provides a recording time of 240 minutes with a data rate of 2.54Mbits/sec. Audio recording is to the MPEG-1 standard, with 48kHz sampling and 16-bit resolution. The audio playback system can also handle MPEG-2, Dolby Digital, DTS and PCM audio, the latter with 48 or 96kHz sampling and 16-, 20- or 24-bit resolution.

The price of the DVDR1000 is expected to be in the region of £1,500.

Panasonic will be showing a DVD recorder that uses the DVD-RAM standard at the IFA show in Berlin this August. Called the Time Slip, it's due to go on sale at around £1,000 in time for Christmas.

Satellite news

The BBC has signed a contract with SES for an additional transponder at 28.2°E. The five-year deal will increase the BBC's digital capacity by fifty per cent.

Eutelsat demonstrated Open-sky, its initiative to build a new open-standard multimedia and high-speed internet service, at the recent Broadband Multimedia Conference in Bologna. Open-sky provides a full range of interactive multimedia services, including multimedia content, fast file delivery, personal broadcasting

services and high-speed internet access, at present via Eutelsat W3 at 7°E. Users need a satellite dish and a PC equipped with an add-on card, and can select between on-line content access or retrieving content stored in the PC in the off-line mode. For details of the transmission standard see Teletopics last month. The number of video-streaming services is expected to increase from twenty to about fifty quite soon. The service was also demonstrated at Mediacast 2001. Eutelsat plans to use three more satellites for Open-sky, including Eurobird at 28.5°E.

Approved CoPs

The Office of Fair Trading has issued a consultation paper on more rigorous approval of Codes of Practice. Its new approach will have two linked stages, corresponding to its present powers and resources and the situation following legislative changes and an increase in its resources. At stage one the OFT will encourage codes that promise to deliver. At stage two the OFT will give a "better trader" logo to codes that prove they can deliver. Tests of this will include compliance audits, evidence of effective dispute resolution, mystery shopping and complaint handling.

Trade associations that currently sponsor Codes of Practice will have to prove that these meet the new criteria. Otherwise they will not, after December, be able to claim OFT support.

DASA, the Domestic Appliance Service Association, has responded positively but believes that some form of legal compulsion will be necessary to combat rogue traders. It says that while the new Core Principles are acceptable as "aims", the current core criteria are commercially unattainable because 70 per cent of consumers choose solely on price and the majority of domestic appliance and other service engineers in the UK work without evidence of competence.

News from BSKyB

In the latest three-month period to be reported, to March 31st, BSKyB recorded an increased pre-tax loss of £105.1m. Turnover increased from £467.2m to £585.1m. There was a strong increase, 252,000, in the number of direct-to-home subscribers, to 5.3m (the total, including those who take the services via cable, was 9.89). Of the total number of DTH subscribers, 5.06m were digital. The number of analogue DTH subscribers has fallen below a quarter of a million: analogue transmissions are expected to end shortly. The subscription churn (cancellation) rate remained static at just under ten per cent.

BSkyB has scaled back its internet and interactive services, forming a single new media division. This includes the TV-shopping service Open, whose London headquarters is being closed. There will be some 300 job losses in these areas, and a one-off charge of £40m has been made in the accounts. BSKyB has now taken full control of Open, buying out BT's stake in a deal valued at some £387m.

As I was back home in Gloucestershire and it was a beautiful summer's day, I decided to take a few hours off. I settled in the hut in the garden to write my monthly article. Then I heard Greeneyes calling. She had a lovely tilt in her voice and was calling me "Donny darling", so I knew that I was in for the bite. But, being a chap of immense courage, I went into the house.

Mrs Waterfield

The first thing I saw was a dog as big as a pony. I saw it because it floored me with a single bound. As I got up, I saw something else. A huge, tweedy woman with a big toothy grin.

"This is Mrs Waterfield" Greeneyes said, "she's staying next door while having an extension built on to her house at Longfield, and has just popped in to say hello. She has three lovely dogs, all like Bonzo here, so I know we are going to get on really well."

"Sure to" I replied, "how do you do, Mrs Waterfall?"

"Oh, and Mrs Waterfield brought her video recorder along" Greeneyes continued, "it needs tuning in to our local transmitter."

"Oh, er, right" I said "what make did you say it was, Mrs Waterhouse?"

She looked at me intently. "I didn't," she replied, "but it's an Hitachi. My hubby could do it of course - he's very clever - but I thought that since we're all going to be friends I might as well let you do it. It won't take you long, will it? I simply must record the *Weakest Link* programme in an hour's time. I do so admire that funny little Robinson woman, don't you?"

"Couldn't do without her, Mrs Millwater" I said, "even better than that whining chap who insists his name is Steve. Oh, and thank you for giving me something to do. I was rather kicking my heels."

Once she'd drunk three cups of tea and polished off the orange cakes I'd hoped to have with mine, she departed - along with her animal. The sooner I tuned her recorder, I figured, the sooner I could get back to what I wanted to do. So I pulled it over to our set and plugged it in.

A tuning problem

It was a Model VTF540. All I could get from it was a blue screen. I set about tuning it, and all seemed to go well. It went through the motions of tuning and storing the channels as it found them, but when I'd finished I still couldn't select a channel or produce a picture. All I got was the same effect - a blue screen.

I called Greeneyes, who came clapping into the room. "Is it all done?" she asked.

"No it isn't" I replied, "but I do just want to thank you for encouraging that Mrs Backwater to pester me with her recorder

WHAT A LIFE

A new neighbour causes problems with her unprofitable work and inability to grasp the situation. Reminiscences from the Broadmead days. Donald Bullock's servicing commentary

She wants it in time to see that daft Robinson programme you watch. It's on in half an hour and the recorder's got a nasty fault on it. And she's scoffed all those orange cakes. I didn't see one of 'em."

"I'm going out in a minute" she said, "so I'll get some more, specially for you. But do get that recorder tuned, won't you? I told her you were ever so clever, and I love her dog."

She clopped off out and I rang Steven at the shop.

"Ah, I know that fault" he said, "I've had it twice recently with the VTF540. Both times it was CQ602. It's a 2.2µF, 50V electrolytic capacitor inside the tuner. I'll be passing in a couple of minutes and will bring one along."

He did, and by the time Greeneyes clopped back home with a new box of orange cakes the machine was fixed and working.

"We'd better charge her a few quid, neighbour or not" I said to Greeneyes. "My Epson printer is out of ink, and the price is an unbelievable twenty five quid for what amounts to a five bob bottle. And I didn't want to do repairs today. I wanted to write my column and prepare my book, *Hovels and Haydust*, for the printers. I need a bit of time to myself. I've been trying to finish the book for twenty years. Now I don't know whether I'm coming or going. I don't feel right at all."

Just then the phone rang. I picked it up. "Don Waterbed speaking" I said, "er... Don."

"Hello Donald" a friendly voice cut in, "this is John. We'd like your column as soon as possible. Can you e-mail it through to T?"

"Almost done" I replied, "won't be

long now. I hope, anyway!"

"Yoo-hoo!" called a loud, gushing voice from the front door.

"Grr whuff whuff" barked a dog.

"Oh my God!" I whined, and rushed back out as our new and bulky neighbour sailed in.

I sat in the hut and started to write my piece for *Television*.

"As I was back home in Gloucestershire and it was a beautiful summer's day, I decided to take a few hours off. I settled in the hut in the garden to write my monthly article..." On and on I wrote, for over an hour, like Mickey Spillane up against a deadline. Then I heard Greeneyes calling me again.

"Donny darling, can you pop up for a minute?"

I jumped up, kicked my chair across the hut and went to the house. As I opened the door the cat walked out. I tried to kick it but it shot off.

Not without our new neighbour noticing. She stiffened, dropped her orange cake, then stared at me intently.

"Oh, hello Mrs Waterpump" I said, "gosh I nearly tripped over our lovely cat."

"Thank you so, ah, much Mr Bullock for tuning the recorder" she replied, "and for absolutely refusing to charge me. I've been talking to your wife. It must be awful for you, twiddling your thumbs and not knowing what to do now that your lads do all the work. But don't worry, I've another little job for you. Our little Alba bedroom set. There's nothing on it. I expect it just wants tuning in, like the recorder."

"Mrs Millstream" I began, "I'm just a bit tied up at the moment. Thing is, I've got this article to do."

"Indeed! Aren't you lucky?!" she gurgled, "it'll all help to ease the boredom, I'm sure. For the church magazine, is it? I should get on with it as soon as you've finished my little set."

I grabbed the set, ran off to my hut, smacked it down and started tapping again at my keyboard. But the Alba set kept nagging at me. It was a CTV842, a model I know well, so I decided to have a go to get it off my mind. Then, I reckoned, I could write in peace.

The Alba problem

I took it to the workshop, plugged it in and found that it was dead. There were outputs from the power supply, but there was no line timebase operation. I touched my little hand scope's probe on the output transistor's base connection. No drive. I suspected a problem with the driver transformer, as its leadout wires sometimes oxidise. This is caused by the action of the glue beneath it on the board. So I whipped it out, cleaned and remade the connections, then resoldered it back in. When I tried the set again a good picture came up. Just as Greeneyes appeared.

"I've managed to do Mrs Millfield's set" I said. "Now, I know that she has a nice cuddly dog, and I know that you like nice cuddly dogs – and nasty dogs, come to that – but we must charge her something towards the ink I need."

"It's difficult" she replied, "she's such a nice neighbour."

I went back to the hut and continued with my writing. After a while, when I'd got most of the article done, I returned to the house. In time to see my neighbour about to leave, with the Alba set in her arms. When she saw me she stopped.

A few more jobs

"Ah, Mr Bullock" she trilled, "thank you ever so much for tuning in this little set. I'm glad it wasn't much. I was just saying, you'll be getting a toaster and an iron to do when I tell my friend Beatrice how clever and quick you are. She's taken them to every shop in town, and some of the dealers have been quite rude to her. Especially that tall, thin chap at Snoddy's. Asked her if she took him for a mug, and even suggested that she had no father. If you ask me, I think we're lucky to have gentlemen like you to bring our work to."

"Mrs Drinkwater, I've not repaired an iron or a toaster for years" I cried. "not for years."

"Well fancy that" she burst out, "and now, because you've been so kind, you'll be getting one of each! Beatrice will be pleased. She hasn't got much money, you see."

As she departed she turned to Greeneyes. "What a nice man your husband is, my dear" she said, "come on Bonzo, let's go."

"Did you charge her?" I asked after she'd left.

Greeneyes looked at me and shook her head. "She's letting me have Bonzo here tomorrow while she's out for the day. How can we charge a woman like that?"

I slumped into an armchair. "Don't let's quarrel over it" I said – I can be magnanimous at times. "Let's have a cup of tea and an orange cake or two, then I'll go finish my article and get my book ready for the printers."

"Oh dear" said Greeneyes, "we don't seem to have any orange cakes left."

"None left?" I echoed.

She shook her head.

"Mrs Waterspout again, I suppose?"

"She seems to like them."

I got up, lurched back to the hut and settled down to finish this article.

At Broadmead's

Many of you have asked for more trade reminiscences. One that occurs to me goes back to the time when I was an outside engineer at a branch in the Broadmead chain. It was common practice for us to deliver a set and leave it on demonstration for a few days. The policy worked. The viewer invariably got used to the set and bought it.

One day a well-dressed chap, Mr

The first thing I saw was a dog as big as a pony. I saw it because it floored me with a single bound. As I got up, I saw something else. A huge, tweedy woman with a big toothy grin.

Denby Vaughan, called at the shop and insisted on being dealt with by the manager. He explained that he had just bought the big house at the corner of Imperial Terrace, and asked for an aerial to be installed. Then he chose a large Philips TV set, and asked for it to be demonstrated once the aerial had been fitted.

This was all done. Mr Vaughan seemed to be impressed with the pictures, and it was arranged that he would call in at the shop the following Saturday morning to settle for the aerial and, almost certainly, agree to have the set as well.

That Saturday the sales staff hadn't shown up by late afternoon, the manager asked me to go round to the house to check that all was well.

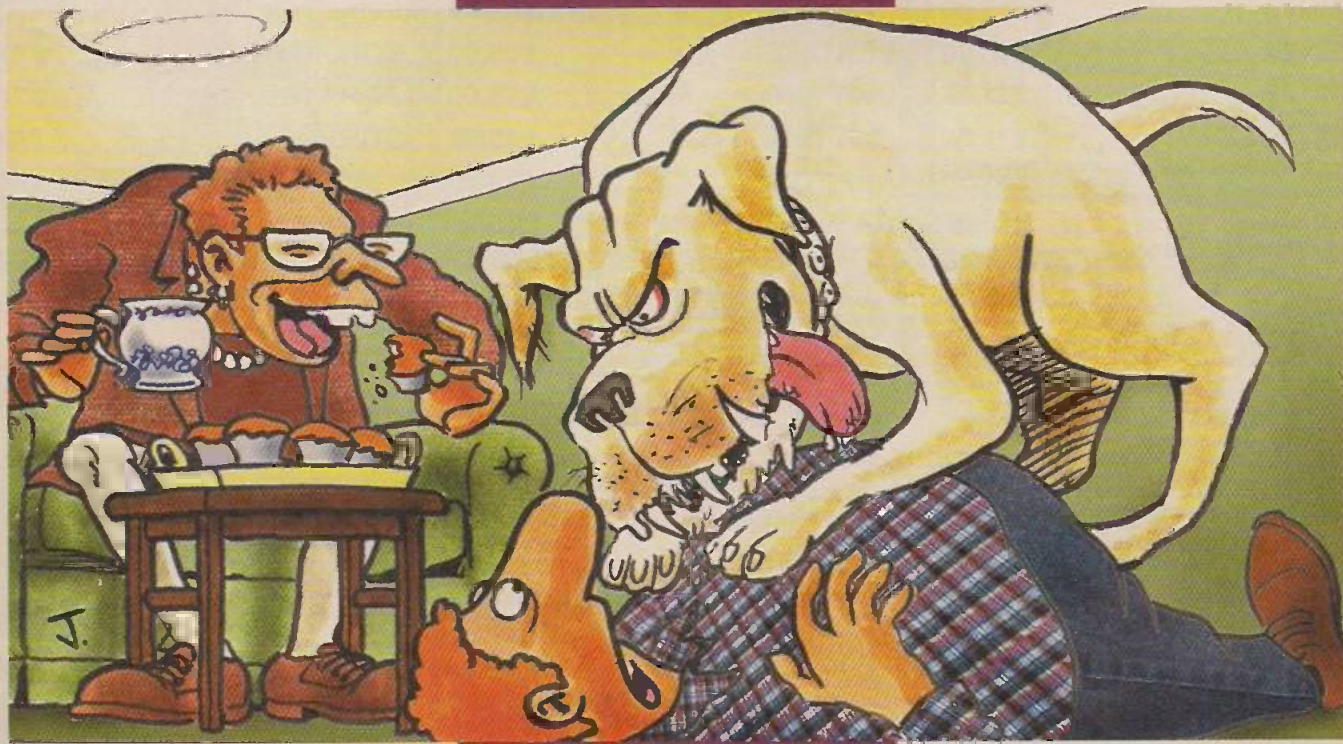
"I'm sure it will be" he said, "because he's clearly a gentleman of good breeding. But we must check."

When I arrived at the house a note pinned to the door referred callers to a nearby address. I popped round there. The door was opened by a lady who looked past me at my customised van.

"I take it you've come for Mr Vaughan?" she said.

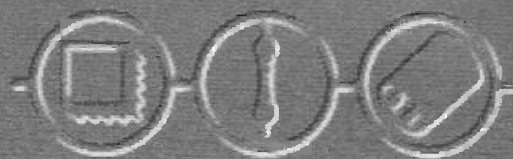
"Yes" I replied, "how did you know?"

"Because most of the TV and appliance shops in town are after him. Anyway, he's gone. Said he was preparing to open a high street shop, and rented the whole house for two weeks. I now know that he had TV sets, tape recorders, washing machines and fridges delivered throughout every day. He took them all away in a big van every night. Then he disappeared, without paying me any rent. He seemed such a well-bred gentleman too." ■



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1456T	PSU	ONWAKIT	AV29SX1EN1	FIELD OUTPUT KIT	JVCKIT1	CT29A6	TDA 8178S	MITSKIT2	KSM VIDEO	SOPS	PHILKIT9
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2009B	PSU	ONWAKIT	C14T1EK	PSU	ONWAKIT	CT33B3	TDA 8178S	MITSKIT2	CI6844	FRAME OUTPUT	SAMKIT2
2052T	PSU	ONWAKIT	C21E1EK	PSU	ONWAKIT	NEI/NIKKAI			VIK310	PSU	SAMUNGKIT
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CTV485	PSU	ONWAKIT	2086	PSU	ONWAKIT	IC561	TDA 8175	PANKIT1	WINNER 1	PSU	SAMUNGKIT
AKAI			2098	PSU	ONWAKIT	TX25XD60	VERTICAL O/P IC	PANKIT2	SHARP		
CT1417	PSU	ONWAKIT	21V1N (BUZ90)	PSU	GRUNDIGKIT1	TC28XD60	VERTICAL O/P IC	PANKIT2	51CS03H	POWER / LINE	SHARPKIT1
CT2159U	PSU	ONWAKIT	21V1T (BUZ90)	PSU	GRUNDIGKIT1	TX28XD70	VERTICAL O/P IC	PANKIT2	51CS05H	POWER / LINE	SHARPKIT1
CT2162UNT	PSU	ONWAKIT	21V1N (MJF18004)	PSU	GRUNDIGKIT3	TX29XD70	VERTICAL O/P IC	PANKIT2	59CS03H	POWER / LINE	SHARPKIT2
CT2863UNT	PSU	ONWAKIT	21V1T (MJF18004)	PSU	GRUNDIGKIT3	TX-W26D3	VERTICAL O/P IC	PANKIT2	59CS05H	POWER / LINE	SHARPKIT2
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F16 CHASSIS	FRAME	GOODKIT1	CT25A4STX	TDA 8178S	MITSKIT1	ANUBIS A	SOPS	PHILKIT2	R3000	PSU	THOMKIT2
F16 CHASSIS	LINE	GOODKIT1	CT25A6STX	TDA 8178S	MITSKIT1	CP110 CHASSIS	SOPS	PHILKIT8	R4000	PSU	THOMKIT2
F16	PSU	GOODKIT1	CT25AV1B	PSU	MITSKIT3	G90A CHASSIS	SOPS	PHILKIT10	ICC9 CHASSIS	EAST/WEST	THOMKIT4
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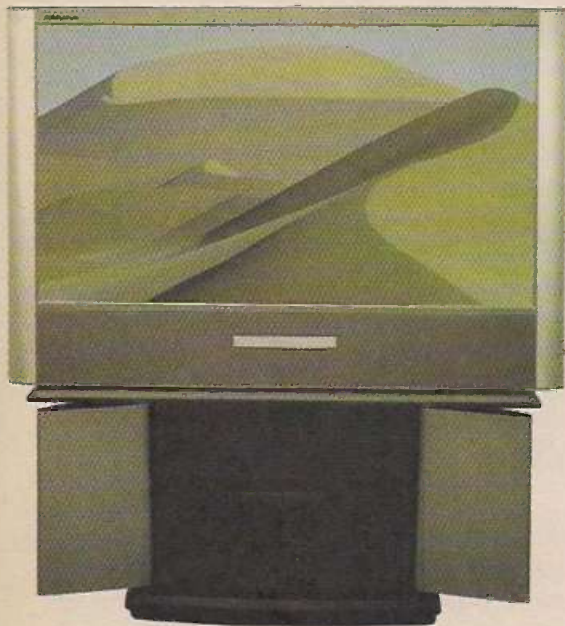
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The Electrical

The emphasis at this year's show was on digital products – TV, recorders, audio equipment and radio. There is also the prospect of the networked home.

George Cole reports



One of Samsung's models with the new ferro-electric liquid-crystal display. This type of LCD provides improved brightness and contrast.

The *Electrical Retailing Show* is held at the Birmingham National Exhibition Centre (NEC) each spring. It gives retailers, the trade and the press a preview of new products scheduled for launch in the UK during the year. Many interesting developments in television, DVD and digital audio were to be seen this time round.

Television

Integrated digital TV receivers (IDTVs) for free-to-air reception were displayed on a number of stands. They all sported the DVB logo, which is designed to make clear to the public that they can receive free digital TV channels via a conventional TV aerial – assuming that local reception conditions and the type of aerial installed are OK.

I spoke to several TV product managers about the logo. The general view was that it's a good thing, but it was felt that most people would not be clear about what the logo means. Some misread it as DV3. A leaflet next to the sets explained the benefits of buying an IDTV instead of an analogue receiver. These include reception of up to eight extra channels free. The leaflet is clearly written, but one could beg to differ over a couple of the points made.

For example it says that buying an IDTV is future-proof. Some observers have pointed out however that many IDTVs may not be able to conform to the new MHP (Multimedia Home Platform) DTV standard. This is based on the Java programming language, and enables suitably-equipped receivers and set-top boxes to receive internet and interactive services from a variety of providers. But MHP requires considerably more memory than that supplied with today's digital receiving equipment.

In addition the leaflet claims that

"analogue TV signals will be switched off a couple of years from now", which is unlikely. But if the logo helps to sell more IDTVs, this will help. Last year just 86,000 IDTV sets were sold out of a total of 1.3 million widescreen sets.

A giant 60in. HDTV rear-projection set and the DI-32Q821D, a 32in. widescreen free-to-air IDTV model that uses LG's Flatron CRT technology, were amongst the wide range of sets on the LG stand. Other features of the DI-32Q821D include a Dolby Pro-Logic decoder, 100Hz processing, digital colour-transient improvement technology, a 56k modem, MHEG-5 digital text reception, three scart sockets and a common interface slot for receiving pay-TV services. Some 800 digital text pages can be downloaded and stored in memory for fast access. LG had a number of flat-screen TV sets on show, including Model LE-15A10, which has a 15.1in. LCD screen, a Nicam decoder and can also display XGA PC images. Model LE-20A20 is a 20in. version with a 150° viewing angle.

There was a time when many thought that one flat-screen technology would come to dominate, but the general view now is that different flat-screen technologies will be used for different types of sets. LG also showed what is claimed to be the world's first 60in. 16:9 plasma display panel. Model MZ-60PZ10, and a 40in. 4:3 panel, Model MZ-40PA10. The latter is just 78mm thick. These plasma displays are designed for use either floor-standing or wall-mounted. Model MZ-60PZ10 has a separate tuner for analogue TV channels and an XGA input socket.

Samsung presented another type of flat-screen technology, the ferro-electric liquid-crystal display (or FLCD), which is claimed to provide better brightness and contrast than a conventional LCD. Samsung's FLCD sets are Models

Retailing Show

SP50L2HDX and SP43I2HDX – the first two figures denote the screen size in inches. The 50in. model is a third the weight of a conventional 32in. set and only as deep as a 14in. CRT model. Samsung also had on show two large plasma-display sets. Models SPD50P2HX and SPD42P2HX, with 50 and 42in. screens respectively. Samsung's Pure Flat CRT models range from the 15in. CZ21ABVN8X to the 32in. WS32W8VHE. That latter includes 100Hz scanning and Virtual Dolby surround sound.

Sony's LS range includes 4:3 models and widescreen sets with 24, 28 and 32in. screens. Sony also showed its PS2 rear-projection sets.

Toshiba had its new Picture Frame Models 36ZP18P and 32ZP18P, with 36 and 32in. screens respectively, on show. A new design gives them slim screen surrounds. Other features include 100Hz DFS (Digital Frame Scan), a Dolby Digital decoder, built-in stereo and sub-woofer speakers, rear surround speakers, 500-page Megatext with Media Window, three scart sockets and both optical and coaxial digital audio outputs. Toshiba's new CRT range includes three sets with Dolby Digital audio, one with Dolby Pro-Logic and three Nicam models. Screen sizes range from 28-36in. Toshiba also had on display two rear-projection sets, Model 40PW13B with a 40in. 16:9 screen and Nicam decoder and Model 43VJ13B which has a 43in. 4:3 screen.

DVD

It was no surprise to find many DVD-Video players on the stands. The low profile of DVD recorders was a surprise however. Samsung had a DVD-RAM recorder on show, but a company representative revealed that Samsung no longer plans to support this format in the UK! The company will be launching a combi-model that



Samsung is hopeful that this combined DVD and VHS recorder will prove popular with the public.

complies with both the DVD-RW and DVD+RW formats in early 2002. The reason given for the policy change is that DVD-RAM is not backwards compatible with existing DVD-Video players. But Toshiba, another DVD-RAM supporter, intends to launch DVD-RAM recorders next year. The company says that its new range of DVD-Video players will be compatible with RAM discs, which use a protective caddy.

Several companies, including Philips, Pioneer and Sharp, have announced plans to launch DVD recorders in the UK this year, but it seems that most companies will not be launching them until next year.

Samsung's DVD-Video offerings included Model SV-DVD1E, a combined DVD player and VHS recorder. The company thinks that many consumers will opt for such a product because it means fewer boxes underneath the living-room TV. The SV-DVD1E consists of a six-head Nicam VCR and a DVD player that's also compatible with CD-R discs and MP3 CDs. The VCR also provides S-VHS quasi-playback and auto-set PDC. It has an RF socket, two scart sockets, S-Video out plus optical and coaxial digital audio outputs. Samsung also

showed two combined DVD players with widescreen TV sets, Models DW28G5VD and DW21G5VD – the first two digits in the number indicate the screen size in inches. Both are available with Nicam or Dolby Pro-Logic decoders.

Toshiba is one of the first



LG's model DVP-2000 has a seven inch screen and is compatible with MP3 and CD-R/RW discs.



Sony's Model DCR-TRV30, with a 1.55 megapixel CCD imager.

companies to launch DVD-Audio players, which also read DVD-Video discs. The company's latest player, Model SD510E, has built-in Dolby Digital and HDCD (high-definition CD) sound decoders. It also provides MP3 and CD-R/RW playback, and has a Super Anti Alias filter which Toshiba says provides a resolution of 540 lines. The SD510E will be available in September. The company also plans

to launch Model SDP1500 later this year. It's a portable DVD model with a built-in 8in., 330,000-pixel 16:9 LCD screen. AV connections include component video and S video, with coaxial digital audio outputs.

Sony's new DVD-Video players include the entry-level DVP-NS400 and Models DAV-S500 and DAV-S800, which consist of a DVD, CD, multi-channel Super Audio CD (SACD) player and amplifier.

LG also had a portable DVD player on show, Model DVP-2000. It has a 7in. LCD screen, two built-in loudspeakers and compatibility with MP3 and CD-R/RW discs. Power is from the mains or an internal lithium-ion battery that provides three hours' continuous playback. Other LG DVD players include Models DVD-4950 and DVD-4750. Both have a built-in MP3 and multi-channel Dolby Digital decoder, also a DTS digital output socket. A set-up memory system enables the players to store a user's preferred specifications for up to fifteen discs, for example on-screen display language and audio configuration. In addition both players have a 4x and 16x zoom function and a bookmark facility. Model DVD-4930 certainly stands out from the crowd: it has a transparent front panel design, and is compatible with MP3-encoded discs.

Recording formats

The hard-disk based recording system TiVo was featured at the show. It was launched last year and consists of a large VCR-like box

that houses a hard disk which can store up to forty hours of video, though at this setting the picture quality is less than VHS. The best quality mode provides up to twelve hours' storage time. BSkyB markets TiVo in the UK, with the hardware manufactured by Thomson. The basic unit costs £399, plus a £10 per month subscription for receiving the programme data that enables TiVo to operate like a smart VCR – owners can opt for a one-off lifetime payment of £199 instead. There are features such as the ability to pause or rewind a live TV broadcast, trick-play functions like slow motion, automatic recording of the viewer's favourite programmes, and an intelligent viewing system that learns the types of programmes the user likes to watch and makes suggestions based on this information. An updated PAL version (2.0) is currently being tested and will be released later this year. It will include a 'wish-list' facility that can find programmes by features such as actor or genre. A season-pass system will record say every episode of a favourite soap, and can be set up to avoid recording repeats.

A TiVo spokeswoman said there were no plans to integrate TiVo into a SkyDigital set-top box, or to combine the technology with a VCR in order to reduce the number of boxes under the family TV set. The latter would make it easier to transfer footage to videotape for archiving purposes.

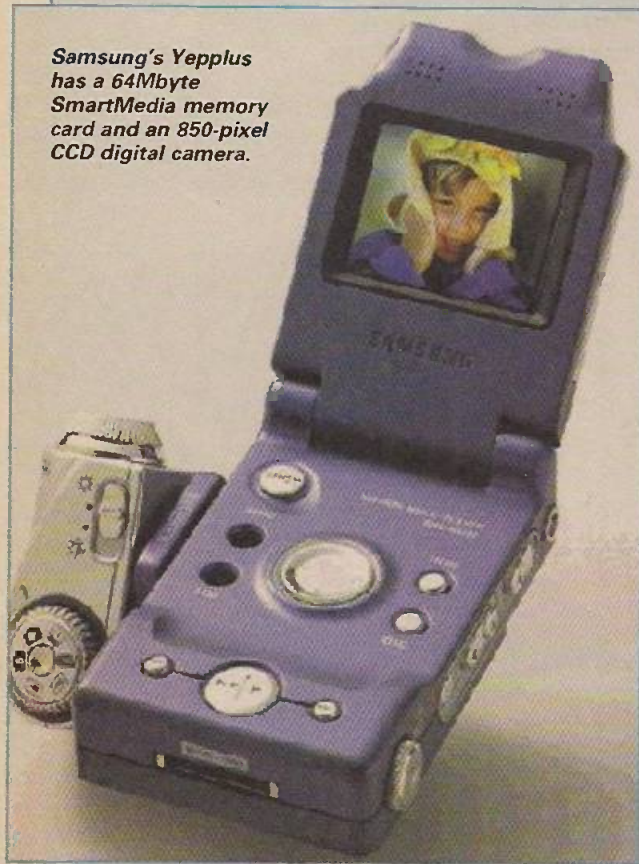
While TiVo has generated a lot of media interest, only some 180,000 units have been sold worldwide to date – hardly a mass-market figure. But the technology may well become more widespread, with companies such as JVC, Toshiba and Panasonic planning to launch hard-disc products in Japan.

VCRs were still a feature of the show. Toshiba had on display a top-of-the-range home cinema editing deck, Model V851UK. Its remote-control handset will also operate a DVD player. The company also showed a combi TV/VCR, Model VTV2133, comprising a Nicam VCR and 21in. TV set.

Camcorders

Sony's Model DCR-TRV30, with a 1.55 megapixel CCD imager, includes digital still image recording and MPEG e-Movie. The company showed a wide range of DV models – there are eight new

Samsung's Yeppius has a 64Mbyte SmartMedia memory card and an 850-pixel CCD digital camera.



models in this year's line up.

Samsung's Model VP-D77 is a MiniDV camcorder that also stores still images on a SmartMedia card. It has IEEE1394 and USB connections for linking with a PC.

Satellite broadcasting

Astra Marketing was busy promoting satellite TV. Plus points are some 87 free TV and radio services available via SkyDigital, free interactive services from Open, BBC and Sky digital text, and Sky sport and news interactive services. There is a prospect of ITV becoming available before long.

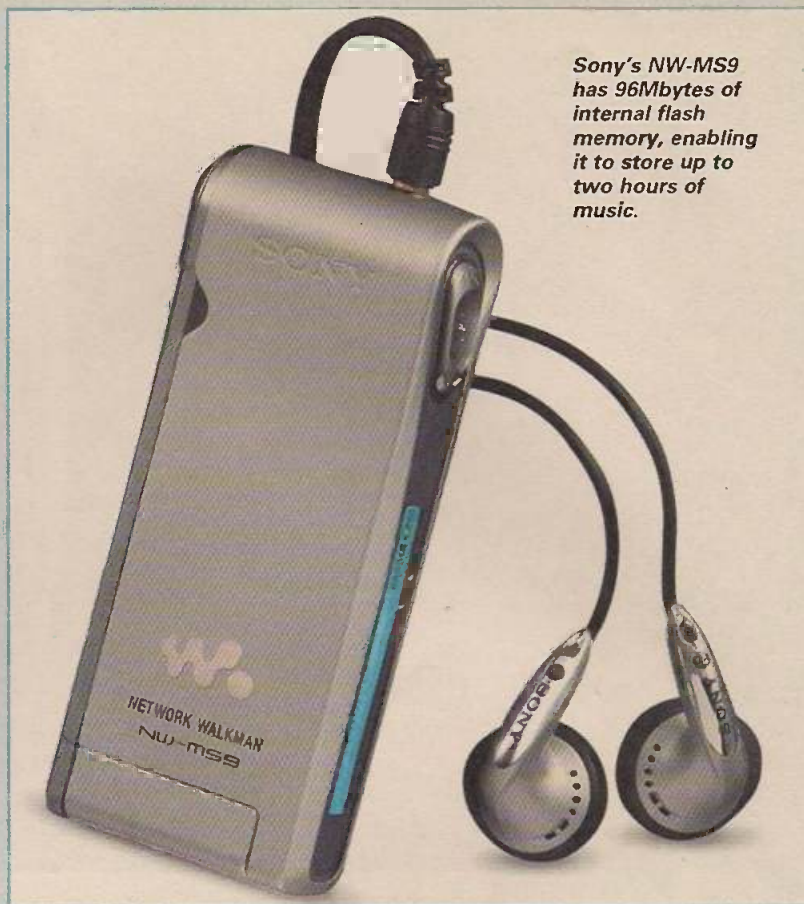
Digital audio

Sony showed its first multi-channel SACD player, Model SCD-XB770, which is compatible with CD Text and CD-R/RW discs. Also on display were Sony Network Audio products, which can download music from a PC hard drive or the internet. There are two additions to the Network Walkman range, Models NW-E5 and NW-MS9. The former has 96Mbytes of internal flash memory, enabling it to store up to two hours of music. The latter stores audio on a Memory Stick card. Ten Sony MiniDisc products have a PC Link facility, enabling tracks to be transferred from a hard drive to a blank MiniDisc.

Samsung showed lots of MP3 portable players, including the Yeplus which has a 1.8in. TFT LCD monitor for video and text playback. It also has a 64Mbyte SmartMedia memory card and an 850-pixel CCD digital camera. Model NA-CP75/15 is a PC audio system that includes an MP3 docking station and a PC parallel connector so that audio files can be downloaded to a SmartMedia card. Samsung also has a portable CD player that can read MP3 files and has a forty-second anti-shock system.

LG's Model MF-PD370 is the first digital audio player that works with the Windows ME operating system, as well as Windows 95, 98 and 2000. It's compatible with the Windows Media Audio (WMA) format, and can store up to two hours of music on 64Mbytes of memory (the player is supplied with a 32Mbyte card). WMA files are half the size of MP3 files, so more music can be stored on a memory card.

Toshiba showed a nice looking digital audio player, Model



Sony's NW-MS9 has 96Mbytes of internal flash memory, enabling it to store up to two hours of music.

ME210, which uses postage-stamp sized SD Memory Cards and the Advanced Audio Coding (AAC) compression format. The memory card stores up to 32Mbytes of data, which is sufficient for half an hour of music.

Digital radio

National commercial digital radio operator Digital One was promoting its system. There are now 106 local, ten national commercial and nine BBC national digital radio channels. By the end of 2002 there will be nearly 310 digital radio stations in the UK, providing 85 per cent coverage of the population.

Although companies such as Arcam, Sony and Technics market domestic digital radios, sales have been low because of their high cost (about £500 each). Videologic has launched a digital radio receiver (Model DRX-601) at less than £300 however, and Digital One has formed an alliance with Imagination Technologies to develop even cheaper digital radio receivers. Both companies suggest that receivers will shortly be available at under £100. But, with the average home having half a

dozen or so radio tuners, it will be some time before digital replaces analogue radio.

The networked home

The dotcom bubble may have burst, but this hasn't affected the development of internet-enabled home appliances. LG showed two interesting internet products, a washing machine and a microwave oven. Samsung introduced a networking fridge that's linked to the internet and can be connected to other items such as a microwave oven, DVD player and the heating system via the domestic power wiring. The user could for example program the microwave oven to start cooking the evening meal before leaving work for home.

One of the biggest benefits of internet-enabled appliances is that manufacturers can provide software upgrades via the net - LG has a special web site for downloading new washing programs to internet washing machines. This could greatly extend the lifetime of consumer electrical/electronics products. It also opens the way for remote diagnosis of operating problems and possibly fixing them on-line. ■



Restoring vintage radio sets

Valve radio sets are becoming rare. Many enthusiasts and collectors are prepared to pay good money for those still around to be restored. So here's another source of profitable work. It requires an understanding of how such sets work and how they were designed. Ian Rees provides a detailed guide to circuit operation and restoration techniques

The number of valve radio receivers that turn up at car boot sales and auctions is gradually dwindling. As a result, prices are rising – even for sets in very poor, non-working condition. Collectors and dealers are usually able to cope with the cosmetic side of restoration, but often have difficulty finding someone with the know-how to get a set to work. Money spent on this greatly adds to the set's value. It's ironic that while we turn away so much modern equipment the repair of these old sets has once again become viable.

Restoration differs from overhaul, repair and rebuilding. Elements of all three contribute to restoration, but I personally take the view that the repairer has a responsibility to maintain the context, spirit and appearance of the item being restored, even though the work may be hidden from view. Modern safety requirements place a large responsibility on the restorer however, achieving a balance between old practices, new regulations and historic

accuracy is, unfortunately, not always possible.

It's sometimes better to disable a vintage radio, leaving the original build and appearance as they were. When a working restoration is required however I try as far as possible to keep to the spirit of the original construction and layout, while making sure that it will be safe to use. Mains cable type, anchorage, cover fixing/protection, insulation and isolation are a few of the things that have to be considered. Once you have restored the set as a working item, these must all conform to modern safety requirements.

Inspection

Initially, a vintage radio receiver can be treated like any other piece of faulty equipment that arrives in the workshop. Obtaining information on its background and symptoms is very important – the customer is unlikely to have resisted the urge to plug it in and try it out.

Genuine collectors know the score about electrical restoration. A customer who has been given a set or

got it cheap and wants it patched up is a menace. In this situation it's vital to make clear what is likely to be involved. I insist on providing an estimate, which must be paid for in advance. If the estimate is accepted, its cost is absorbed in the overall charge. This saves wasted workshop time, and makes clear to a customer the risks involved in having the repairwork carried out.

I recommend that a set is dismantled and inspected visually before any functional checks are attempted.

Once a set has been removed from its cabinet it is vulnerable to damage. Always close the air-spaced tuning gang to protect its vanes. Glass scales, knobs and fittings are usually irreplaceable, so keep them safe.

With valve equipment there are often visual symptoms to aid diagnosis. Sweaty carbon resistors, flaking wirewound ones, leaking electrolytic capacitors and melting wax from chokes and transformers can all indicate the presence of problems. Your nose will often verify what your eyes see. Paxolin has a very distinctive acid smell when it overheats or burns. Tagstrips, switches and valvebases were often made of it. Valves should have mirror silvering (the result of gettering) inside the top of the glass. Any sign of a misty, white deposit inside the top of the glass indicates that the vacuum has been broken – this is not always obvious however. Fabric and rubber sleeving on wires can crumble when moved, causing shorts.

Once the overall condition has been assessed, safety insulation and continuity checks can be carried out. The primary winding of the mains transformer in an AC set should provide a DC resistance reading of about 25Ω when set for 220V operation and 30Ω when set for 250V. A check on the resistance between the HT line and chassis is recommended before a functional test is carried out. Expect a

reading of anything from 50kΩ to infinity once the smoothing capacitors have charged.

Functional test

I carry out all functional tests with the set powered via an isolation transformer and a variac. By using the latter to increase the mains input slowly, any problems not found during the initial inspection will show up before damage is done. This time your nose rather than your eyes will probably be the best means of detecting the presence of problems.

Connection of a multimeter to the HT line, switched to its high DC voltage range, will provide a useful indication that everything is holding its own when mains voltage is applied to the set. Excluding battery-operated equipment, an AC or AC/DC radio will normally greet you with a show of pilot lights at switch on. As the set warms up, the HT voltage reading will rise, settling down at between 150V and 450V DC depending on the type of power supply. Many of the valve heaters should glow visibly, followed by a faint hum from the loudspeaker and, maybe, stations on one or more bands with the volume control turned up fully.

Each movement of the wavechange switch should give at least a click, if nothing else. A short throw-out aerial will be required if the set doesn't incorporate a frame aerial.

Apart from a completely dead set, likely symptoms include mains hum, motor-boating (instability), distortion, loss of one or more of the wavebands (in part or whole), lack of sensitivity and interference of various kinds. I hesitate to suggest, at this point, the use of a wet finger (and the other hand in a pocket) to check stage operation, because of modern workshop safety practice.

It's desirable to have a few items of test equipment in addition to a multimeter.

These are an AF/RF signal generator, an oscilloscope and an insulation tester.

Power and audio stages

Most of the problems in an old radio receiver are likely to be in the power or audio sections. Fig. 1 shows a typical AC radio receiver power supply and audio circuit of the early Fifties. The valves have international octal bases. V3, a 5Z4 rectifier used to provide the HT supply, has a directly-heated cathode, requiring a separate 5V AC heater winding on the mains transformer T2. The other valve heaters and the pilot lights are connected to a 6.3V AC winding, one side of which is connected to the earthed chassis.

The electrolytic capacitors C7 and C3 are the HT reservoir and smoothing capacitors respectively. They will either dry out and lose their capacitance or leak, causing mains hum or voltage loading. The rectifier valve is very rugged, but can suffer from interelectrode arcing shorts or low cathode emission. Insulation breakdown or shorted-turns in the mains transformer T2 is not uncommon. Problems with the HT smoothing choke CH1 are unusual (you will often find a low-value power resistor in this position).

The audio output stage consists of a 6V6 beam-tetrode valve that operates under class A bias conditions (standard with a single output valve). It can deliver about 4W RMS via the output transformer T1 to the loudspeaker. A top-cut tone control network (C6 and RV2) is connected between the valve's anode and chassis. The audio input is coupled by an RC network, C2 and R4. Cathode bias is provided by resistor R5, which is decoupled by C5.

A fault from which most valve equipment of this age suffers is leaky waxed-paper or moulded capacitors. All such capacitors should be replaced on sight, without question. If C2 in Fig. 1 is

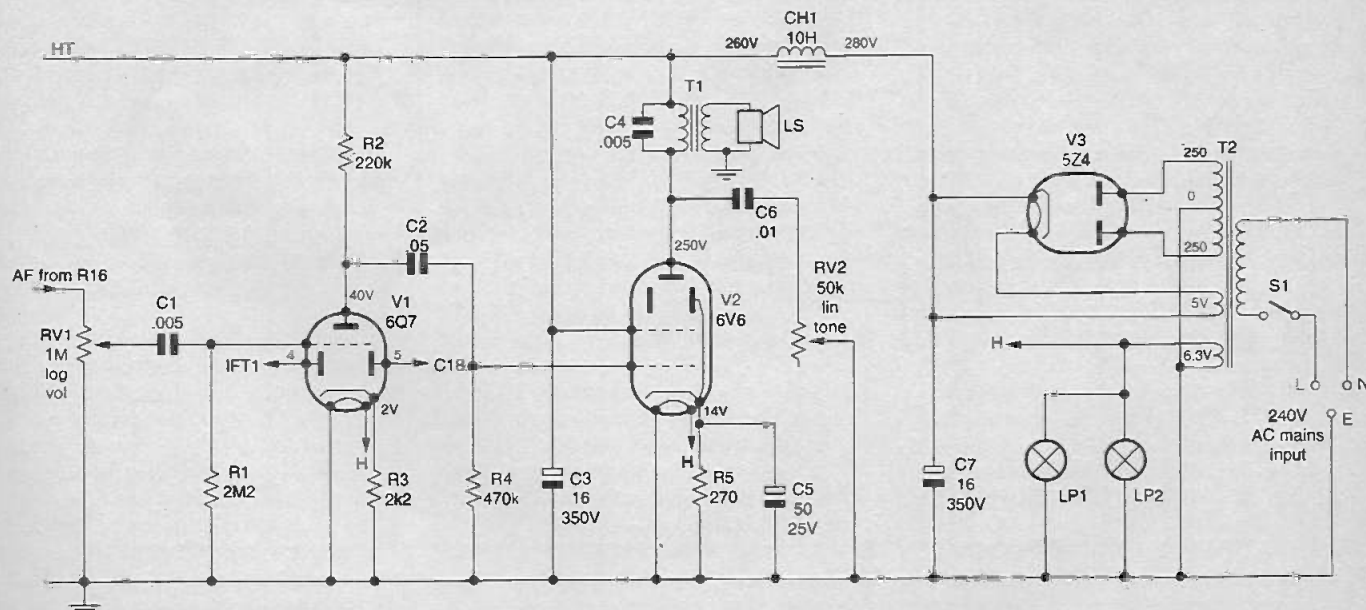


Fig. 1: Typical power supply and audio circuitry in an AC mains valve radio receiver.

leaky for example V2 will pass excessive current, because the positive voltage at the anode of V1 will be present, attenuated by the degree of C2's leakage, at the control grid of V2. Not only may V2's anode glow red, which is not good for it, but T1, R5, C5 and the power supply will all be stressed. If C6 is leaky the track of RV2 will be damaged, making it noisy, and the load on the output transformer T1 will be increased. Paper capacitor C4 can go short-circuit, with the result that there's minimal output via T1 while V2 will be overloaded, or may arc internally at high volume. If C5 dries out V2's gain will be lowered, because of the negative feedback introduced by R5 when it's without decoupling.

The 6Q7 valve V1 is actually three valves in one, two diodes and a triode. The two diodes are used for demodulation of the signal and the generation of an AGC voltage, while the triode provides voltage amplification of the demodulated audio signal. The amplifier stage gives few problems apart from the load resistor R2 going high in value. This reduces the audio output.

Signal injection was the usual method of checking when there's no audio output. Check at each side of C2 then each side of C1. Since a 6Q7 valve has its control grid connected to its top cap, this is an easy place at which carry out a signal-injection check.

A common fault with audio valves, though not particularly the 6Q7, is microphony. This is caused by mechanical vibration within the valve and produces a sound like a string on a musical instrument being plucked. If the effect is loud enough there will be sustained audio feedback. Replacement of the valve is the only cure. As a check, gently tapping the valve's glass envelope will instigate the

condition. Note that some valvebases are mounted on rubber grommets to reduce the effect. Check that the rubber hasn't perished and that the base is free to move.

C1, which couples the audio signal from the volume control RV1 to the grid of V1, is probably another waxed-paper capacitor that's likely to be leaky. The result will be distortion and crackles from the volume control.

The volume and tone controls RV1 and RV2 tend to become noisy, especially when a mains on/off switch is built in (this is common with volume controls). Switch cleaner is very effective, provided you can find a way to get the spray to the track.

Negative feedback is generally applied somewhere in the audio circuitry to improve the sound quality by reducing harmonic distortion. In Fig. 1 R3 is not decoupled. This is a simple way of providing negative feedback in a single amplifier stage. There are various other ways of applying negative feedback in this sort of circuitry. For example a high-value resistor could be connected between the anode of V2 and V1, or a considerably-lower value resistor between the secondary winding on the output transformer and the cathode of V1. If this latter technique is employed it's possible, when working on the output transformer, to get the winding used for the feedback reversed. The result is positive feedback, whose symptoms are distortion or sustained audio oscillation.

Where breakthrough from taxi and other mobile services is a problem, connecting a 5nF ceramic capacitor across the volume control generally provides a cure.

Apart from the power supply, in which differences will be found (see later), the above fault conditions also affect AC/DC mains receivers and battery portables.

RF/IF circuitry

Fault diagnosis in the RF and IF sections of a valve radio receiver can be much more difficult than in the power and audio sections. Fig. 2 shows typical RF and IF circuitry. For simplicity, bandswitching is not included. We'll assume that medium-wave reception only is provided.

The aerial coil L1 and oscillator coil L2 are tuneable across the band by the ganged capacitor VCa/b. The two IF transformers IFT1 and IFT2 are generally tuned to some point in the range 450-470kHz (many US sets use 110kHz). The frequency changer (oscillator/mixer) valve V4 and IF amplifier valve V5 are variable-mu (gain) types, to which automatic gain control (AGC) is applied. The negative-going control voltage is produced by one of the rectifier diodes in V1 (Fig. 1), at anode pin 5, and is applied to the control grid of the mixer section of V4 via R14, R6 and L1, and to the control grid of the IF amplifier V5 via R14 and IFT1.

Smoothing is provided by C8 and C11. C18 couples the IF signal to the AGC detector diode. With a strong signal, the receiver's gain is reduced by an increased negative AGC voltage in order to prevent signal overload. The AGC voltage falls when a weak signal is being received, increasing the overall gain of the set's RF/IF stages. The IF signal produced by V5/IFT2 is also fed to the anode of the other diode in V1, at pin 4. This diode demodulates the signal, producing an AF output across its load, which consists of R16 and the volume control RV1 (Fig. 1). C19 provides RF filtering. The audio tapped from RV1 is fed via C1 to the grid of the triode section of V1.

Many problems will be cured by replacing the waxed-paper capacitors in these stages. C8 and C11 can cause instability when faulty, while C9, C10,

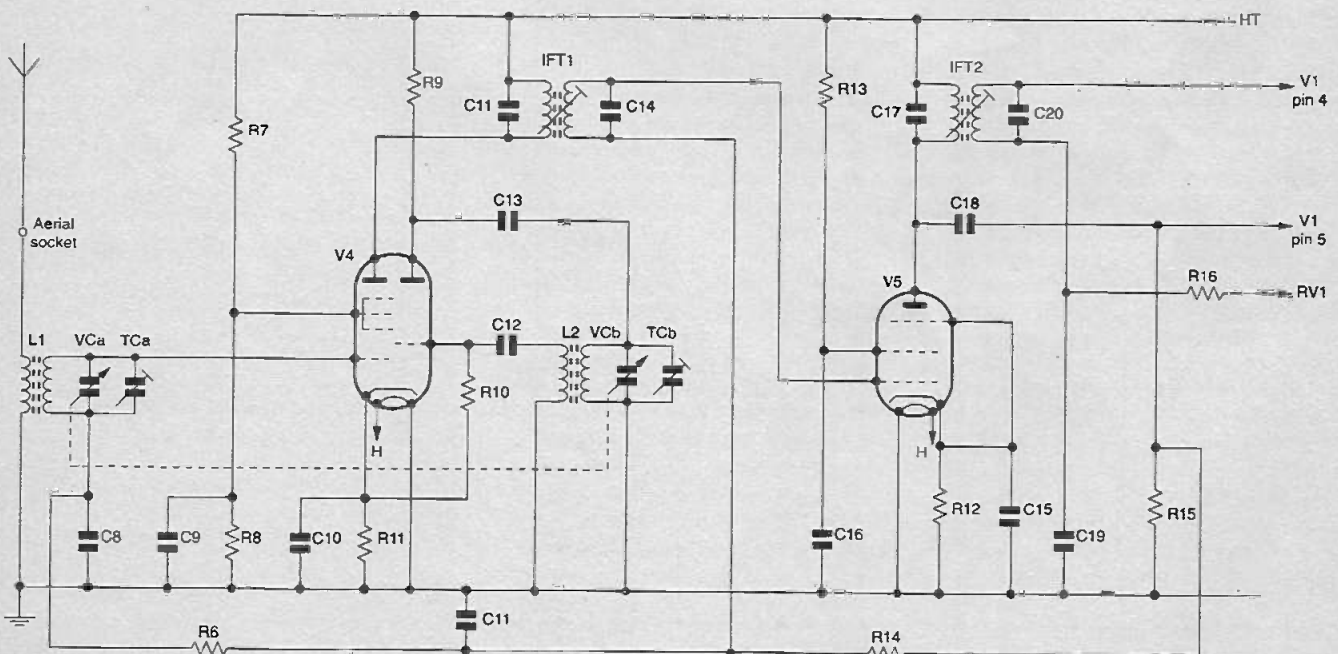


Fig. 2: Typical RF/IF circuitry in a MW superhet valve radio receiver.

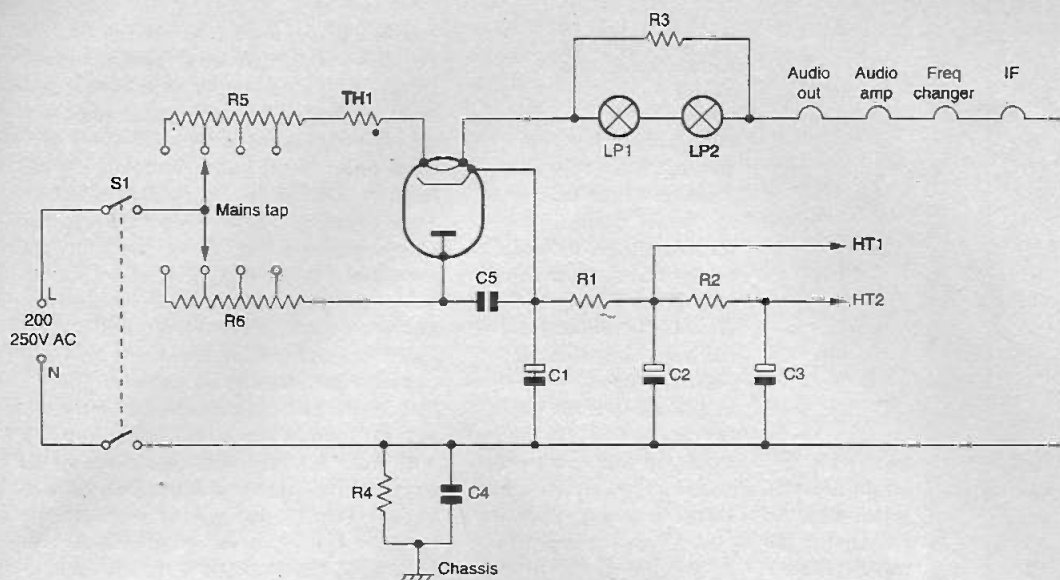


Fig. 3: Typical power supply arrangement in an AC/DC valve radio receiver.

C18 and C19 can be responsible for lack of gain or no oscillation. C13 and C8 will probably be mica or ceramic capacitors, though low-valve paper types can be found in these positions as well. If C13 is faulty V4 will cease to oscillate and there will be no IF signal. Oscillation can be seen by connecting an oscilloscope to V4's triode grid, at the junction of R10 and C12. If an oscilloscope is not available, connect a multimeter to this point, switched to its DC voltage range. It will show a negative voltage when the valve is oscillating.

Tuneable hum with some distortion of the signal occurred with quite a few mains-powered valve radio receivers. Unlike mains hum in the power supply, this is present only when a station is tuned in: off tune, no hum is heard. Check all the resistors associated with V1, especially those in the AGC circuit (R6, R14 and R15). Alternatively heater-cathode leakage in V4, V5 or V1 could be the cause.

Tuneable hum with strong local stations calls for a modification, which would be carried out as a matter of course when a set that exhibited this symptom came in for repair. It's caused by the mains lead acting as an aerial, introducing 50Hz modulation on to the carrier. The cure is to add a 0.02µF, 1kV capacitor - C5 in Fig. 3 - between the anode and cathode of each power supply rectifier. AC-only sets had an 0.1µF capacitor added between the cathode of each power supply rectifier and chassis.

Probably because this was the era of DIY radio, it seemed that everyone who owned a small screwdriver would jump in the back of a receiver and tighten up every preset they could find. RF alignment problems were common. It is important that the aerial and oscillator tuning should keep in step across the whole tuning band, so that a constant IF difference signal is produced. In Fig. 2 the tuning gang capacitors VCa/b have small trimmer capacitors, TCa/b, in parallel for

alignment. IFT1 and IFT2 are shown with fixed tuning capacitors (C11, C14, C17 and C20) and tuneable dust corcs. They could just as likely have fixed cores and adjustable preset capacitors. These alignment adjustments were often the first targets of the twiddler. Refer to the section on alignment before you attempt any adjustments in the RF/IF circuits.

Microphony can also affect the valves in the RF/IF section. Replacement is the only cure. Low emission is something else to expect. When V4 starts to lose emission it may stop oscillating across all or part of the band. Interelectrode shorts or leakage in RF/IF valves is common. Substitute or test to confirm.

AC/DC radios

The AC/DC radio followed the AC-only era, lasting into the Seventies. This was not because such sets had the added virtue of being able to work with a DC mains supply - such supplies had long since disappeared in the UK - but because this approach did away with the expensive mains transformer. Early versions used large wirewound dropper resistors in the power supply to provide the large heater currents: these dropper resistors radiated a lot of heat, which would burn the cabinet.

Fig. 3 shows a typical AC/DC radio receiver power supply. Note that there is no earth connection, only mains neutral and live. Half-wave rectifiers such as the UY41 were introduced, with improved heater-cathode insulation and a higher heater voltage and lower heater current, better suited for use with series-connected valve heaters.

Before this the normal heater voltage for most valves was 6.3V at 300mA. Later AC/DC radio sets have valves with a heater current rating of 100mA and a variety of voltage ratings from around 4V to 100V (the UY41 had a 31V, 100mA heater requirement), connected in series as shown in Fig. 3. As with the lights in a Christmas tree, when one heater failed they all went out. Also used for a time was

a device that looks like a household light bulb and is called a Barretter. This found favour because it not only worked as a dropper resistor that provided a constant-current output but, in addition, its glow could be used to illuminate the tuning scale.

Many dropper resistors (R5, R6 in Fig. 3) have fixed or movable taps to provide adjustment for different mains supply voltages. It is not unusual to come across a set in which the taps have been set for a lower than correct mains voltage in order to boost flagging performance - a stressed valve may not work with the correct tapping. The only answer is to replace the valves and reset the taps.

Just to add further confusion, in some sets the valve heaters are wired in a series/parallel arrangement, with resistors across some of the heaters to balance the current. This can give you the impression that a valve has developed a heater-cathode short when, in fact, one of the balancing resistors has gone open-circuit with the result that the associated valve glows very brightly as it takes the strain.

An alternative to the hot dropper resistor was a type of mains cable called a line cord, which we first encountered in small sets imported from the US. The line-cord mains cable was usually cotton covered and had, in addition to the live and neutral conductors, an asbestos cord that had resistance wire, coiled in a continuous spiral, along its length. One end of the resistance wire was terminated at the live pin of the mains plug, the other end going to the valve at the beginning of the heater chain.

Because of the resistance contributed by its inner core, the length of the line cord is critical. As the UK's mains voltages are double that in the US, the lead could be quite long. Owners irritated by its length would shorten it, with disastrous results.

It's normal for the cable to run quite warm in use. A few working sets with a line-cord cable are still found. Alas the cord is harder to find, and you may have

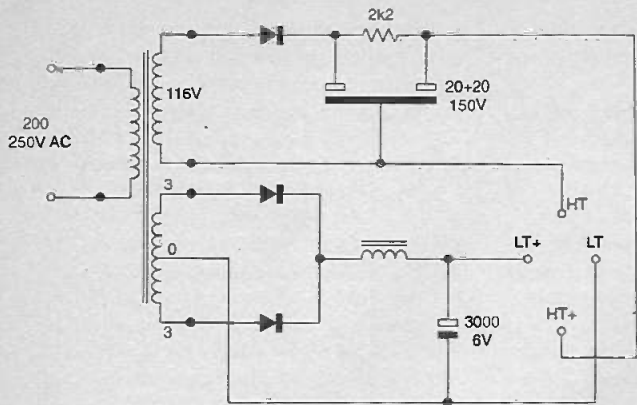


Fig. 4: An original battery eliminator circuit.

continue in operation should they blow. The position of the valves in the heater chain is important. A common arrangement, from the live mains supply end to chassis, would be HT rectifier, audio output valve, audio amplifier/detector valve, frequency changer then

finally the IF amplifier. In some sets you might find that the dial lamps are wired in series with the HT rail. Wherever they are connected, the set must be switched off to replace them.

It's important to ensure that mains live is not connected to chassis. Most of us at the time carried a neon test screwdriver and dabbled it on the metalwork to check. Some manufacturers didn't connect the metalwork directly to the mains supply but chose to use it as a ground plane, with isolation via a small capacitor and a 1-10MΩ discharge resistor (R4 and C4 in Fig. 3). In this event using the metalwork as one connection for a multimeter can produce bewildering readings!

Heat dissipation inside these sets can be very high. Cardboard backs became brittle and were easily damaged, and their screw fixings became worn and insecure. Some US sets had an unearthed metal case that was covered with cloth or a crackle-finish paint. Their 'live' chassis were insulated from the case with thin strips of wood or

Paxolin. These tend to be the most difficult to raise to a modern standard of safety. Although brittle, Bakelite cases keep their good looks. As with other cabinets the back covers and fixings are a weak point. Where an oversize screw has been used, cracking the brittle case, the damage can be repaired with Epoxy resin. Once hardened, the Epoxy can be drilled and tapped to take a new screw.

The grub screws that secure the control knobs are often overlooked with AC/DC radio receivers. They bite down on to the exposed live shaft of the control. The manufacturer would recess the screw well into the hole in its knob, then fill the hole with wax. An oversized screw that sticks out from the knob is a dangerous shock hazard if the mains input is reversed. An insecure knob may leave a live shaft when pulled off. Some shafts were insulated with special insulated coupling extensions. Later, fully insulated shafts were introduced.

A tip for removing a knob that's jammed on its shaft is to wrap a pocket handkerchief round the back of it. Once the circle of wrap has been completed, gather the handkerchief and gently but firmly rock the knob from side to side while pulling. That should get it off.

Battery sets

Battery sets were actually the first to come into general use, because in the early days of radio batteries were the most convenient form of power. Early radio was rather a DIY sort of thing, with lots of hands-on coil winding and experimentation. The battery valves of the period were of the directly-heated type,

to resort to a transformer or dropper resistor in an external box to get such a set to work.

You may find two small rings of tinned copper wire hanging in mid air and no heater voltage at the valves. This will be the home of a missing thermistor, TH1 in Fig. 3, which is incorporated to protect the heaters against the high switch-on surge. You may find that the thermistor's body is lying in the bottom of the cabinet. If it is intact and has not lost its tinning, it can be resoldered to the ring connections. If a replacement isn't available, fit a 50Ω, 5W wirewound resistor.

The use of half-wave instead of full-wave rectification calls for higher-capacitance smoothing and reservoir capacitors (C1, C2 and C3 in Fig. 3) and higher-value smoothing resistors (R1 and R2).

The dial bulbs LP1 and LP2 are connected in series, with a bypass resistor R3 in parallel. This lengthens their life, as they are under-run, and enables the set to

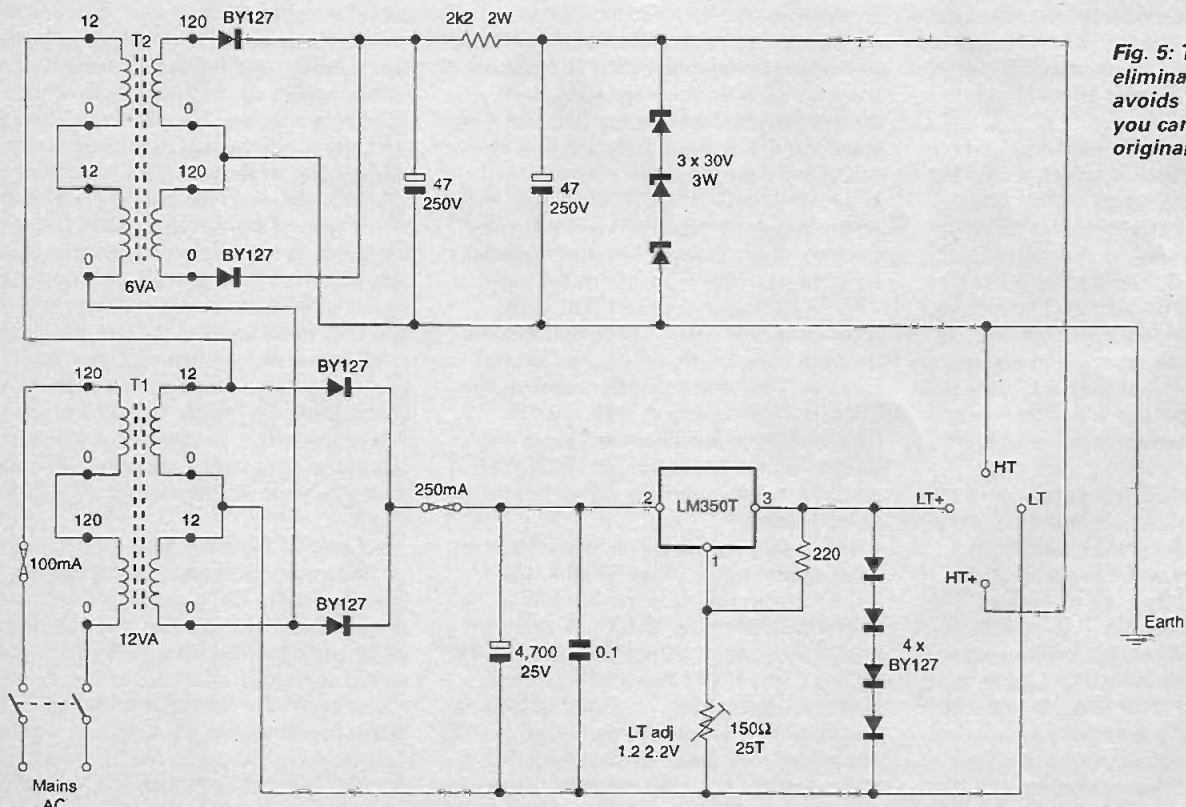


Fig. 5: This battery eliminator circuit avoids the problems you can get with original designs.

where the heater is the cathode. The sets used a varying number of valves, from one to five. Some provided an output for headphones only. These were of the metal-diaphragm type, with an impedance of 500Ω to 1kΩ.

The first sets used three batteries. There was a 2V rechargeable lead-acid accumulator for the heaters, a large HT battery that provided between 45-120V, and finally a 9V battery to provide the valves with grid bias. The HT and GB batteries consisted of banks of dry cells in a cardboard box, with taps to supply intermediate voltages. When, as the technology developed, 'automatic bias' was introduced, the grid-bias battery was dispensed with. Lead-acid accumulators were phased out as more economical valves became available. Only dry cells were then used to provide power. This was really the start of large-scale production and sale of battery-portable sets. Many examples are still around, such as the Pye P114BQ.

Even the more economical battery-operated valve sets were expensive to run, so battery-eliminator units were introduced. These little steel boxes took an input from the mains supply and supplied the DC voltages required to run the set, via sockets that took the original battery plugs. A cottage industry grew up from the high demand that developed. Kits of parts were sold, but the build standard of these is likely to be very poor verging on dangerous. Fig. 4 shows the circuit of one such unit that I happened to have in the workshop as part of a restoration.

Battery set on/off switches control only the battery side, so unplugging the eliminator or switching off at the mains is the only way of isolating the unit. A problem arises when the radio set is switched off using its own on/off switch. My tests showed that, unloaded, the HT supply from the eliminator rose to 156V, exceeding the 150V DC working voltage rating of its combined HT reservoir/smoothing electrolytic capacitor. The heater voltage also rose, to 3.5V. This is not a good situation. Even if the electrolytics don't break down, the set will have to absorb a high switch-on current when it's switched on again with the eliminator powered.

A strong smell of bad eggs coming from the eliminator means that the original selenium rectifier diodes are either under stress or on their way out. Don't just replace them with silicon diodes. A selenium rectifier has a higher internal forward resistance than a silicon diode, and the result will be far higher output voltages unless compensation resistors are added in series.

The mains lead attached to my sample eliminator is a thin figure-of-eight bell flex, with the ubiquitous knot to prevent it being yanked out of the case through the bare hole in the metalwork. Inside there's a bird's nest of wiring, with few supported

joints other than those on the mounted components. Dating from the time when mechanical joints were the belt and soldering the braces, this little flash-bang abounds with lightest-touch only soldered connections. Sorting it out is a must.

Unless you manufacture your own batteries, you will need to continue to use these eliminators. Even when loaded they tend to provide voltage outputs that are too high. While a slightly increased HT voltage is not a major problem, overrunning the heaters of valves will considerably shorten their lives. Battery valves that have been overrun may not work when correct voltages are applied.

The margin for valves with 2V heaters is ±7 per cent, but ±10 per cent is acceptable. Valves with 1.4V heaters were designed to work with 1.5V cells: if damage is to be avoided, on no account should the voltage exceed 1.6V. Unfortunately, underrunning some valves can also shorten their lives.

Eliminators are vintage in their own right, but date from a later period than the sets themselves. A choice has to be made to either discard an eliminator, use a safe, modern circuit; or strip it and build a modern circuit in the old box.

I designed the battery-eliminator circuit shown in Fig. 5 for workshop use. The LT supply is stabilised by the LM350T IC. Adjustment of the 150Ω preset (25-turn wirewound) connected to pin 1 enables the heater supply to be set up for 2V or 1.5V. I couldn't find a small transformer with a suitable secondary winding for use in this circuit, so I used two transformers connected back-to-back. The mains input transformer T1 is rated at 12VA. It feeds the HT transformer T2 and the LT circuit. T1's primary winding is 0-120V/0-120V, its secondary winding being 0-12V/0-12V. Connected as shown, it provides full-wave (bi-phase) HT and LT rectification.

The LM350T IC has its tab connected to pin 3 (LT+), so it will have to be insulated if bolted to an earthed heatsink. The HT output is limited to 90V by the three 30V, 3W zener diodes. The four BY127 diodes across the LT supply, and the 250mA fuse, were added after I accidentally touched between HT+ and LT+ (the IC went short-circuit and the 1.4V supply shot up to 17V!). The four series-connected diodes clamp the LT output at a maximum of 2.4V: should the IC go short-circuit the fuse will blow.

Don't be tempted to link the HT- and LT- lines. In many sets there are special biasing and other functions that require them to be separate.

I obtained the zener diodes, IC and transformers from CPC (Preston, Lancs).

Next month

So much for basic circuitry, power supply arrangements and fault conditions. Next month we'll consider the tricky subject of component replacement in vintage equipment, and also look at tuning drives and alignment.



Make sure of your copy of *Television*

It can be difficult finding a copy of *Television* at local newsagents. The number of magazines being published keeps increasing, which means that newsagents have less shelf space for the display of particular titles. Specialist magazines in particular get crowded out.

There's a solution to the problem. Most newsagents provide "shop-save" and/or home-delivery services. There's no charge for a shop save. You simply ask your newsagent to order a copy for you: it will be kept on one side each month ready for you to collect. Home-delivered copies are ordered in the same way, but generally incur a delivery charge.

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A serviceman's guide to the

Brian Storm takes a look at the various features that were introduced with the Panasonic Euro-4 chassis, which uses digital chips for signal processing, and provides advice on servicing

The Panasonic Euro-4 was introduced in 1997 as a successor to the highly-successful Euro-2 digital chassis. A lot of the circuitry is similar to that in its predecessor, but there are important differences. These include a combined system control and teletext microcontroller chip, variations in the video processor to cater for basic (as opposed to 100Hz) widescreen sets, a digital interface between the sound processor and Pro-Logic processor. Q-link, the introduction of owner-

ID storage, new 'help' facilities and redesigned on-screen displays.

Owner-ID

The owner-ID facility enables a new set owner to store his/her name, address and postcode in the set's memory. This data is protected by a pin number should the details need to be altered – when the set changes hands or the owner moves house. There's an instruction label on the set's back cover for displaying the owner-ID should the set be recovered after theft. Simply press and hold the F button on the front of the set for more than five seconds.

OSDs

The on-screen displays have been redesigned, especially the picture adjustment menus which now clear to show just the indicator for adjustment that's being carried out. Previously the menus covered two-thirds of the picture, making it quite difficult to achieve optimum adjustments as most of the picture was obscured.

Help

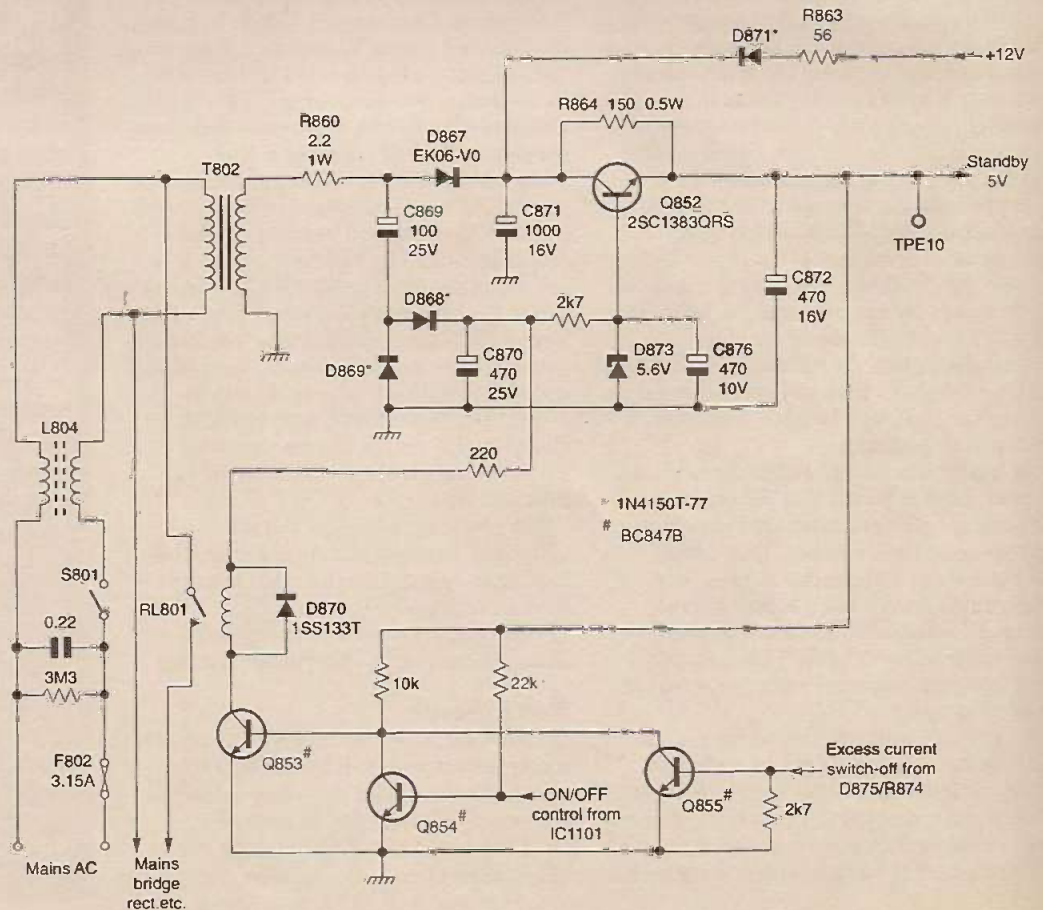
On-screen help facilities are activated by the help button on the remote-control unit. It's marked '?'. All the controls and menus are demonstrated, and indication of which scart connector is available for the Q-link facilities is provided.

Q-link

This is the Panasonic version of a scart-connected smart link. The system is designed to be compatible with all current systems for 'preset download' and 'direct TV record'. The former feature enables you to download a duplicate of the TV set's tuning memory to a compatible VCR or from a VCR to the TV set. The latter feature provides a 'what you see is what you record' facility, assuming that the TV set and VCR have identical channel position layouts. The VCR will switch to the same channel position as the TV set and immediately start to record.

Apart from these global features, Q-link provides other

Fig. 1: The mains input and standby power supply circuitry used in the Panasonic Euro-4 chassis. Minor variations may be found between different versions of the chassis.



Panasonic Euro-4 chassis

complementary features between Panasonic TV sets and VCRs. These include VCR power-off when the TV set is switched off, provided the VCR is not recording at the time. If a TV set is in standby, it will power up when a menu option is called for on the VCR, or if the VCR has a tape inserted from standby: both units then power up as the VCR plays the tape.

These features are all enabled by a data link via pin 10 of the scart lead. The AV2 socket is the dedicated Q-link scart connector. If Q-link fails to work, check that the scart lead has pin 10 connected – some scart leads labelled “fully-wired” don’t have a pin 10 connection.

The remote-control unit

The newly-designed remote-control units have a left-side ‘tool bar’ for the major controls such as picture, sound and set-up access menus. Panasonic VCR or DVD controls, along with the less frequently needed user buttons, are inside a small flap at the bottom.

The power supply

Figs. 1-3 show the basic power supply circuitry used in the Euro-4 chassis (there are minor variations between different versions of the chassis).

For some years Panasonic has followed a ‘green’ policy for standby power supplies, with consumption at less than 2W. This is achieved by using a separate, very low-power standby transformer. Fig. 1 shows the standby circuit, with T802 the transformer and Q852 the standby 5V regulator transistor. The current provided by the transformer (typically 90mA) is in fact so low that it’s unable to cope, without assistance, with the increased current demand when the set is switched out of standby. The assistance in this circuit is provided by a feed from the main regulated 12V line, via D871.

Without this assistance from the main power supply circuit switch-on would be defeated. As the main microcontroller chip IC1101 and its associated circuitry try to power up, the additional current drain,

particularly via the mains relay drive transistors Q853 and Q854, would reduce the voltage to IC1101. The result would be a complete system reset, with continual reversion to standby.

From the fault-finding point of view, the thing to remember is that a switch-on fault may be caused by lack of assistance for the standby power supply rather than a serious data-corruption problem because of an I²C bus-loading problem, as can sometimes happen with sets that employ digital-processing technology.

The main power supply is based on an STRF6654LF51 chip (IC801), which has an integrated MOSFET chopper transistor. It uses quasi-resonant operation for improved efficiency, in a standard flyback-converter arrangement. Fig. 2 shows the circuitry on the primary side of the supply. R805, R814 and C816 provide a start-up voltage for pin 4 of IC801: once the circuit is running, D803 keeps C816 charged. Pin 4 also detects overvoltage conditions. If the voltage at pin 4 is excessive, an internal latch is

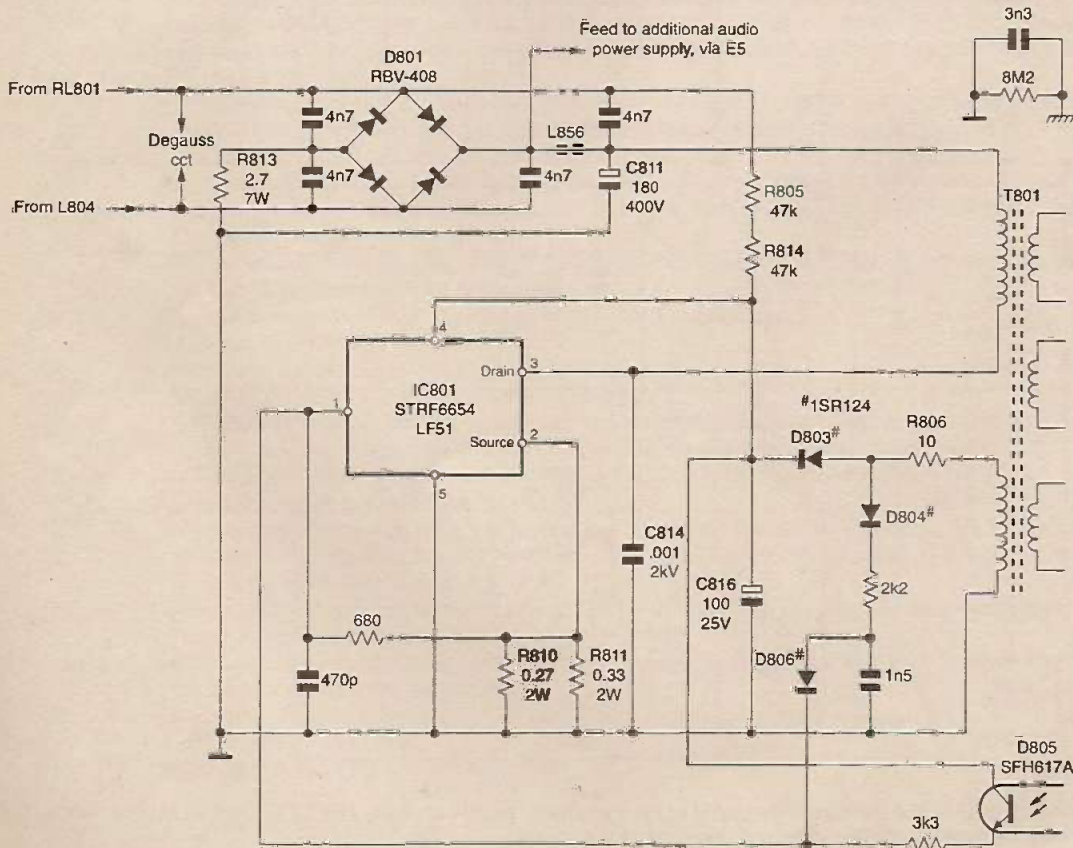


Fig. 2: The circuitry on the primary side of the main chopper power supply in the Panasonic Euro-4 chassis. Minor variations may be found between different versions of the chassis.

The main microcontroller chip

The main microcontroller chip adopted for the Euro-4 chassis also incorporates teletext processing. It's an SDA5450 series device with the following features: an 8-bit C500 CPU; an 18MHz internal clock; eight 16-bit data-point registers; two 16-bit timers: a watch-dog timer; 256 bytes of on-chip RAM; 10kbytes of on-chip display RAM; a 1kbyte acquisition buffer; 1kbyte

of extended RAM; a 6-channel, 8-bit pulse-width modulator; a 2-channel, 14-bit pulse-width modulator; 4 multiplexed A-to-D converter inputs with 8-bit resolution; an 8bit in/out port operational I²C bus emulator; two 8-bit multifunctional in/out ports; one 4-bit port; one 2-bit in/out port; one 3-bit in/out port with optional RAM/ROM address up to 512kbytes.

Pins 1-5 are the crucial main

supply, oscillator and reset pins. Table 1 lists the various pin functions.

As the main microcontroller chip and the EEPROM are generally plugged into sockets, these should be checked for integrity when intermittent faults occur.

The video and deflection processor

The digital video and deflection processor chip used in the Euro-4

Table 1: Main microcontroller chip pin functions.

Pin(s)	Function
1	Chassis connection.
2	Standby 5V supply, which should be stable within $\pm 0.1V$.
3, 4	6MHz crystal (main system clock and teletext reference oscillator).
5	Main system reset input from IC1104, which holds the operating system within IC1101 off until the 5V standby supply is established.
6-36	Connections to the EEPROM IC1102, where the menu structure, operating parameters and address/data look-up tables for all the digital processors employed are held in non-volatile form. The EEPROM is common to all Euro-4 models except integrated digital terrestrial TV sets.
37-39	RGB outputs for the on-screen displays and teletext.
40	RGB blanking input.
46, 47	Line and field sync inputs. When there is no signal from an AV input or the tuner, the on-screen displays are locked to an internal reference. When a signal is available the on-screen displays are locked to its sync pulses to prevent jitter.
48, 49	Serial clock and data lines for loading and controlling the slave digital processors.
50, 51	Serial clock and data connections to the EAROM chip, which contains model-dependent data and stores all user data variables. While EEPROM IC1102 defines the chassis type, EAROM IC1103 defines the individual models within the range.
52	Mains relay on/off control.
53	Main reset control line for the slave digital processors.
54	Power-down indication to IC1101. The slave digital processors require set-up data to function correctly: IC1101 needs to be told when the set is switched to standby (other than by IC1101 itself) so that it can reload the appropriate data in the slave digital processors. IC1105 provides the indication back to IC1101.
55	Service read/write line connected to pin 10 of the AV1 socket, which is used to read from and write to a Panasonic scart memory pack.
58, 59	AV switching inputs from AV1 and AV2. When pin 8 of the scart socket is at 12V the set selects the appropriate input. With pin 8 at 6V the set selects the appropriate socket and switches to 16:9 aspect ratio. The voltage at pin 58 or 59 is 3.21-5V for 4:3 AV selection and 1.25-3.19V for 16:9 AV selection.
60	Front keypad detection input. Whichever key is selected varies the voltage at this pin in a manner determined by the key's position in a potential-divider network. This tells IC1101 which key has been pressed without the need for a complex key-matrix circuit.
61	AFC detection input. During search tuning IC1101 waits for a midpoint between the highest and lowest voltage swings before storing the tuning data.
63-65	Filter connections for various parts of the teletext circuitry.
66	5V supply for the teletext processor.
67	The reference for the internal phase-locked loop.
68	Composite video feed to the teletext processor.
71	Field-scan failure protection pin. When there is field collapse transistors Q1108 and Q451 detect this and pull pin 71 low. After five seconds the set switches to standby, preventing CRT burn.
72, 73	AV link or Q-link connections, buffered by Q1104-Q1107, to pin 10 of the scart lead.
74	Infra-red remote-control data input.
75	General protection pin, which is pulled low to switch the set to standby. The following devices are connected to this pin: D511 for monitoring beam current; Q856 for monitoring the 12V, 8V and 5V lines via Q851 and D863, D865 and D866 respectively.
77	Geomagnetic correction control line for large-screen sets in which correction is provided to compensate for rotation errors caused by local magnetic fields.
78	Mix control line for large-screen sets that have separate luminance and chrominance inputs which may need to be combined to form a composite signal.
79	Chrominance select line, again for large-screen sets that have Y, C inputs.
80	Audio mute control line.
81	Front indication LED control line.

The rest of the pins are for various SECAM options not used in the UK.

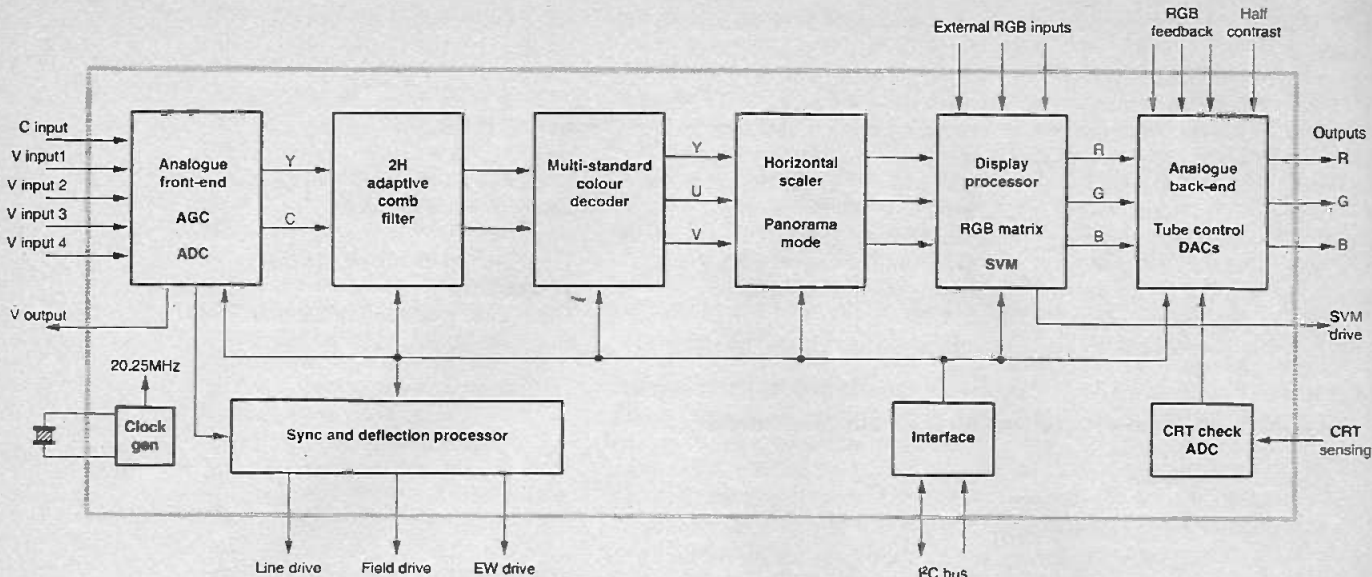


Fig. 4: Simplified block diagram of the VDP3120 digital video and deflection processor chip.

chassis, IC601, is a 64-pin dual-in-line embedded-RISC controller that works at 80Mbits/sec. There are three types: the VDP3120 for highest-quality picture performance; the VDP3112 for high-quality but not widescreen (no pre-scaler) models; and the VDP3108 for basic sets, again not widescreen, which are also without adaptive comb filtering and scan-velocity drive.

We'll take a look at the VDP3120, which provides the entire video display and deflection processing required for 4:3 and 16:9, 50/60Hz sets. Fig. 4 shows a much-simplified block diagram of the device, which incorporates the following functions.

Video decoding: Four composite and one component (Y/C) input; composite video and sync output; high-quality analogue-to-digital converter; adaptive 2H comb filter for Y/C separation; 1H NTSC comb filter; single-crystal (20.25MHz) multistandard colour decoder.

Video processing: Horizontal processing (0.25 to 4); black-level expander; dynamic peaking; soft limiter (gamma correction); colour-transient improvement.

RGB processing: Programmable RGB matrix; digital RGB bus interface; two analogue RGB inputs; half contrast switch; picture frame generator.

Deflection processing: Scan-velocity drive output; line drive output; field drive output; black-level monitoring for CRT ageing; EHT stabilisation.

The VDP3120 has five analogue inputs: pin 60 is the chrominance input from pin 15 of the AV2 scart socket or AV3 S-VHS socket if provided; pin 61 the composite video input from the UHF tuner/IF module; pin 62 the composite video input from pin 20 of the AV1 scart socket; pin 63 the composite video input from the AV2 scart socket or the luminance from the AV2 scart socket in the S-VHS mode; and pin 64 the composite video input from the AV3 scart socket or AV3S luminance input from the front RCA sockets if fitted.

The I²C bus-controlled input multiplexer passes the selected signals to a high-quality, 8-bit analogue-to-digital converter which produces digital Y and C outputs. These are passed to an adaptive comb filter to remove any unwanted signal components that may remain with either signal – this prevents cross-patterning or chroma crawl in detailed areas of the picture.

From the adaptive comb filter the two signals pass to the multistandard colour decoder, where the digital Y, U and V signals are produced. They are then fed to a horizontal scaler stage for processing to fit a 16:9 CRT. Several scaling modes (or aspects) are available: 4:3 produces black 'curtains' at each side for undistorted display of a 4:3 picture on a 16:9 CRT; 14:9 produces a similar effect, with a 14:9 image that has small 'curtains' at each side; 16:9 gives a full-screen display on a 16:9 CRT; zoom generates a cropped 4:3 image on a 16:9 CRT; super zoom magnifies and crops the image in the horizontal as well as the vertical

plane; the 'just' mode applies a non-linear distortion to a 4:3 image to avoid the 'fat-face' effect that a linear stretch gives on a 16:9 CRT; while the auto mode leaves the aspect selection to software control.

Auto-wide processing tries to provide a best-fit solution for every type of signal that's fed to the set. It may not work reliably with some reception conditions in the UK, especially where the signal comes from cascaded terrestrial relay transmitters. The incoming video signal is checked for black sections above and below the picture information. These sections have or should have no video information, enabling the 'auto-wide' detection system to make decisions for best fit of the picture on a 16:9 CRT. If noise is present in the black sections, the detection system will have trouble making decisions and indeed may not make any at all or, conversely, make too many decisions. Either situation will make the 'auto-wide' function useless.

The sense input, pin 28, is used for CRT current checking, which is carried out during the field flyback period. Two sets of measurements for each gun, cut-off and peak drive, are carried out sequentially during this period. The input range at pin 28 is controlled by switching between pins 26 and 27, which introduce resistor networks to buffer the peak RGB samples. The latter are also used for beam-limiting control and AI references.

Field output failure is detected at pin 11: if there is no field scan waveform the RGB outputs will be switched off, preventing CRT burn.

The line drive output is at pin 50. Line flyback pulses for reference

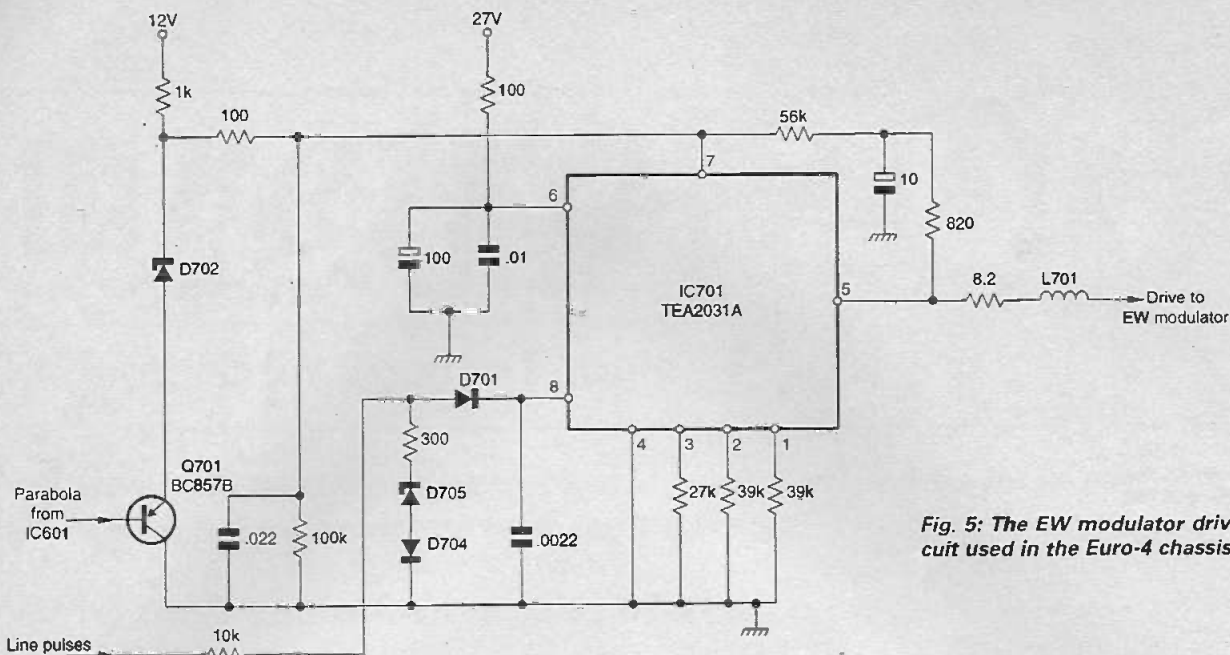


Fig. 5: The EW modulator drive circuit used in the Euro-4 chassis.

purposes are fed back to pin 13. This section of the chip has a separate 5V standby supply. By keeping it running in the standby mode, a stable line-drive output is ensured during power-up from standby.

Field drive is produced at pin 31 and an EW drive at pin 32. A scan-velocity modulation drive is available at pin 34 for sets with larger screen sizes.

Line timebase problems

The line driver and output stages are conventional and straightforward, but do watch out for a batch of bad BU2508AXLB line output transistors that were fitted in certain sets. If you order this transistor from Panasonic you will get two transistors, with advice on fitting an updated transistor in widescreen sets. Most of the sets with this problem should have been dealt with by now.

If there is an unstable line sync effect, check whether clipper diode D556 (1SS133T-77) is leaky. This affects the line flyback pulses fed back to pin 13 of IC601 for reference.

EW drive

The Euro-4 chassis has a redesigned cast-west correction section based on a TEA2031A chip (IC701), see Fig. 5. The EW correction parabola from pin 32 of IC601 is buffered by Q701 and fed to pin 7. Line flyback reference pulses are fed to pin 8, where the circuitry varies between 4:3 and 16:9 operation. The EW drive output at pin 5 is fed to the EW diode modulator via the 8.2mH loading coil L701, which prevents

high-voltage pulses being fed back to IC701.

If you have to replace IC701, always check that L701 reads about 7.5Ω. If it reads low, it has shorted turns and IC701 will soon fail again. Other EW problems can be caused by leaky diodes in the circuitry connected to pin 8.

Audio processing

The Euro-4 chassis uses an MSP3410D multi-sound processor. This version of the widely-used MSP series chip has a digital I²S bus for bi-directional communication with a Dolby Pro-Logic processor. It ensures that there is no noise degradation of the audio signals as they are fed around the inside of the set to the additional stages used for Pro-Logic processing.

The MSP3410D has the following facilities: two selectable analogue IF inputs, with complete on-board decoding of FM sound, AM sound and Nicam sound. Everything is run from a single 18.432MHz system clock with no need for external filtering. The digital sound stages have processing for five-band equalisation, volume, bass and treble control, and pseudo-stereo, all under I²C bus control. Along with three stereo line inputs that are software selectable, there are two simultaneous stereo line outputs and two gain-controlled stereo outputs, again by software.

The Dolby Pro-Logic decoder, type DPL3519A, is a sister chip to the MSP range. It's almost pin-compatible with the MSP3410D but is dedicated to providing a complete active Pro-Logic decoder with optional sub-woofer drive.

Audio power

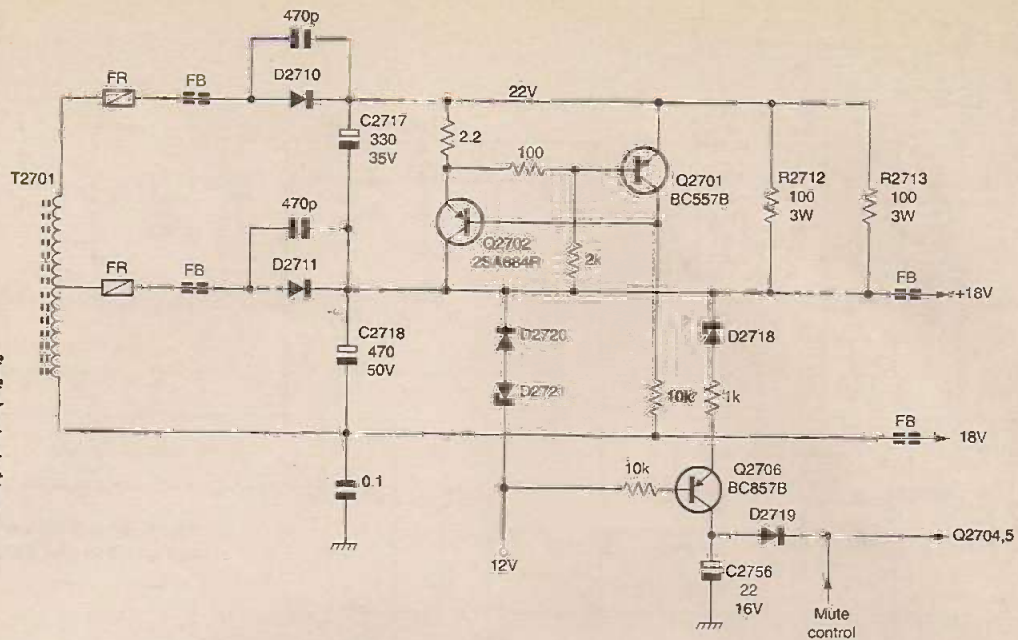
An additional power supply based on an STR10006M chopper chip (IC2701) is used for the centre, surround and sub-woofer output amplifiers. Pin 2 of IC2701 receives a start-up feed via R2702 (150kΩ) and R2703 (180kΩ). Regulation feedback, which is entirely on the primary side of the circuit, is to pin 1 of IC2701 via D2706 and R2705 with C2713 (220μF, 16V – connected to provide a negative supply) as the reservoir capacitor. HT for the chopper transformer (T2701) is derived from the mains bridge rectifier in the main power supply (Fig. 2), with C2707 (100μF, 400V) for smoothing.

Fig. 6 shows the circuitry on the secondary side of T2701, which provides +18V and -18V supplies for the TDA2030AV audio output chips. It includes a Panasonic standard audio-regulator stage that's based on Q2701 and Q2702: this is designed to lengthen the life of overworked audio output ICs.

When you are watching one of your favourite surround-sound films there is inevitably a surprise attack by helicopter gunships, which will probably be shot down by a maniac brandishing high-tech weaponry. If it were not for the action of Q2701 and Q2702, this type of viewing material would cause irreparable damage to the unsuspecting audio output chips. Q2701 and Q2702 act together to reduce the voltage to the output chips, but maintain the output power without clipping by sustaining the current increase as full power is approached.

Before you replace an audio

Fig. 6: Circuitry on the secondary side of the separate chopper power supply used for the centre, surround and subwoofer audio output chips, where fitted.



output chip in an arrangement such as this, check whether the regulator transistors are still all right. In this particular circuit it's not uncommon to find that Q2702 has become leaky through trying to

protect a damaged audio output chip from its eventual demise. If the transistor is leaky, the chances of the replacement chip lasting long are remote. In fact the next failure may well scorch the PCB

quite badly, as the chip may run very hot for some time before it fails.

Q2706 provides power on/off mute control, to prevent a pop noise at switch on or switch off. ■

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: Range board or complete assembly for the AVO electronic test meter Model EA113. Phone Stan Hassell on 01326 312 901.

Wanted: Circuit diagram, service manual or any data (photocopies OK) for the Digital monitor Model VRC16HP (IBM 6317-002). All expenses paid. William Mc Cauley, Manorcunningham, Letterkenny, Co. Donegal, Ireland. E-mail WilliamEi4ek@Yahoo.com

Wanted: RM2001 remote control unit for a Salora M chassis set, original or copy. Also a head and drum assembly and a colour/chroma PCB for the Hitachi VCR598EM multi-system machine. Phone Steve Thomson on 01785 223 219 or 0771 845 0776, or e-mail stevethomson@btinternet.com

Wanted: Service manual, including dismantling information, for the Philips AW7694/05 portable radio-cassette with five speakers (serial no. 00933). B. Norton, Holly Cottage, Fyfield, Abingdon, Oxon OX13 5LN. Phone 01865 390 442.

For sale: 35 Coinmex £1 coin meters Mk 2 and 4000 series, untested but all complete with unbroken locks etc. Some spares included. £3.50 each plus carriage, or £100 the lot plus carriage. Phone R. Tucker on 01403 782 116 (Billingshurst, West Sussex).

Wanted: Either a 19in. GEC or a 22in.

Philips single-standard hybrid colour TV receiver, preferably working or repairable. Also a record player, preferably Dansette or any autochanger type. Phone Carl Toomer on 0786 790 3747, any time.

Wanted: Specification for R773 on the Gateway EV900 PCB. This item has been removed. Also details of the scan-coil section components R669 and IC301 in the AST monitor Model AST 5LA (made by Samsung). Please e-mail Keith Clark at pc@salesman.fsbusincss.co.uk

Wanted: For spares or repair, a Quad 405 power amplifier. Also a Denon DL103 pickup cartridge and a tube base for the Sony Model KVM21U. Phone Mike on 01758 613 790.

For disposal: An old EMI WM58 oscilloscope. It's a valve type and although it works (trace visible) not all the valves do - and it needs calibration big time! Phone John Uttridge on 07801 320 947 or e-mail john@juracid.demon.co.uk

Wanted: A sync panel (U475) for the Philips KT3 chassis and a chopper transformer for the Goodmans TV/VCR Model TVC14VP (the code no. on the transformer is TSM4407). A.G. Chamberlain, 62 St. Lukes Road, Bournemouth BH3 7LU. Phone 01202 521 990.

Wanted: A Pentium processor chip, 200MHz or 233MHz. Paul Williams, 242

Gosforth Lane, Watford WD19 7PA. Phone 020 8428 3647.

Wanted: Left-hand cassette door for the Technics Model RSCH770E. Phone 020 8647 1017.

Wanted/for disposal: Require spares for the Roberts Radio Model R606 or similar. Any parts considered. Have for disposal three output valves (marked TT22-7738Z) for the Sailor Marine transceiver Model T128. Phone Steve Roberts on 01687 462 189.

Wanted: Details of how to remove the child lock on the Goodmans televideo Model TVC141. Phone Doug Carson on 01229 774 749 or e-mail dougcarson@FSBDial.co.uk

Wanted: Service manual (photocopy OK) for the Philips AS405 midi system, in particular details of the output stage. Phone Wilf Milton on 01823 667 575 or e-mail wilfm@eurobell.co.uk

Wanted: Supplement section B, which covers the electronic tuning and remote control board, for the Ferguson TX90 manual (original or photocopy). Also an original remote control unit for the Fidelity CTV Model F14R and the following issues of *Television*: June 1994, October-December 1998, January-March 1999. D. Lee, 16 Devonshire Place, Cloughton, Birkenhead, Wirral, Cheshire CH43 1TU.



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Installing radio/CD systems in caravans and motor homes



How to make money by extending your activities to the car trade: this time Tom Baker tells you how to carry out caravan audio installations

Loose wires don't give a good impression and are more easily trapped, causing problems in the future.

Caravans and motor-homes may not be the most obvious sources of extra income for the TV engineer. But, when you consider the number of them on the road, you might be prepared to

think about them again. Most of us tend to regard caravans as the irritating things that hold us up when we are trying to get somewhere by a certain time. When you finally overtake one however you often find that the vehicle towing it is newer than yours, and maybe ten times better. The caravan itself is probably worth £10,000-£20,000. If nothing else, this should indicate that there are a lot of people out there prepared to pay this amount of cash on their leisure activities. They want the best gadgets as well.

If you've not visited a large caravan and motor-home dealer for a long time, you will probably be shocked to discover the present price of new and second-hand models. With lots of people taking early retirement or redundancy, not to mention busy people who simply want to get away from the phone for the weekend with their families, the market for such leisure items has grown considerably. The market for retrofit items to go with them has likewise grown. I often fit radio/CD systems, alarms, cameras, reversing aids and air-conditioning units, but wouldn't

recommend the latter if you are working on your own – I had a lot to learn before I could tackle air-conditioning systems with confidence.

In this article I'll explain how to fit car radios/CD systems in caravans, with a few photographs to show you how I go about it.

Where to put it

Bear in mind from the start that space is at a premium in a caravan or motor-home. Take up as little of it as you can. The first point to consider is whether to fit the radio/CD unit in a cupboard, out of sight of prying eyes, or cut a hole in the woodwork somewhere and have it on view. If you can, get your customer to make the decision. If not, you will have to use your common sense. I usually fit the radio inside a cupboard near the centre of the caravan, on the opposite side to the door.

There's a reason for this. Most caravanners have an awning that they put up on the side where the door is. All car radios need an aerial. Fit this behind the radio, on the outside of the caravan. It will be impossible to get the aerial up if an awning is there! In addition, you don't want an unnecessary extension lead between the aerial and the back of the radio – it would be something else to hide. So it's best to fit the aerial right behind the radio, hiding the connection.

If you are lucky and the caravan is a new one or one that's only a few years old, you will probably find that the manufacturer has included power wires somewhere inside the cupboards, making it a lot less troublesome to get the 12V power supply you require. In some cases there may be speaker leads as well, but finding out where they leave the roof compartment may be harder than you think.



Speakers

As a rule my first step is to look around the caravan for two places to put the speakers. I normally fit them at the front of the caravan, on each side of the lockers – so that they look symmetrical and ‘factory-fitted’.

I find that a 4in. speaker is the largest you can use. Three and a half inch speakers would be better, but none of the major speaker manufacturers seem to make speakers this small with grilles. You obviously have to use what you can get. If you place the grille over the woodwork and find that it interferes with the opening of the locker, or is larger than the space you have earmarked for it, you will have to rethink what to do.

To save you the effort, what I usually do is to fit them at right angles to the front, by the side lockers. This normally does the trick – but not always as lights are sometimes put there. You will find somewhere to put them but make sure that, wherever you finally decide to put them, they look symmetrical.

Whereas speaker placement in the home is something to be worked at to get the best stereo result, in a caravan, with side seats, tables, bunks, cupboards and even the kitchen sink in the main area, the best you can achieve is good quality sound – even though it’s stereo in theory.

Speaker apertures

Once you’ve made your decision about the speaker positions, the next step is to cut the holes for them. The wood you will be cutting may look like oak or teak, but it’s only veneered chipboard or fibreboard or, in some instances, block-board. Cutting it will make a mess, so get your dust sheet out.

Over the years that I’ve been doing this sort of work I must have tried every possible way of cutting the holes. My first approach was to draw a circle with a pair of compasses, drill numerous holes around the inside of it, then laboriously cut between them with a pad saw to get something like a circular hole.

The main problem with this approach is that you don’t have a lot of room in which to work in a caravan and, as the hole you are cutting will be close to the roof, your arms will be aching by the end. Another disadvantage with

this kind of hole making is that it makes a mess inside the locker compartment. Rough edges on which things can get caught will be left. Remember that while the caravan you are working on is empty, when your customer is using it for a holiday any amount of things are likely to be crammed inside its lockers. You won’t be on their Christmas list if their best napkins have been covered in splinters and ripped by your careless speaker fitting!

I’ve also tried a jigsaw, but there’s not enough clearance between the roof and the locker to do the job properly.

The only thing that does a perfect job is the correct size of hole saw. This is not a cheap item to buy, but it will cut down the amount of time you spend on making the hole. You get a perfectly round hole, with no ragged edges inside the locker compartment. And, when you’ve completed the hole, you are left with a round off-cut with a central hole in it: ideal for wheels for your kids’ toys!

Wiring

The next step is to fit the speakers. I always do so with the connections facing upwards, so that it’s impossible for the wires to fall off. You then have to arrange the wiring to the radio. This can take longer than cutting the holes out, because you can’t have wires hanging loose – they may get tangled up with things. I look for any wiring that the manufacturer has installed: if it’s going in the right direction, I tie-wrap my leads to it or try to squeeze them inside the existing clips.

Once you have the speaker wires where you want them, the next step is to get the power wires there as well.

You sometimes find that there’s a pair of 12V supply wires inside the locker, hanging down from the roof, pre-wired for the job. In this case all you have to do is to check the polarity then join your leads to them – they will not be long enough to pull through.

If you are not so lucky, you will have to find a 12V source to supply the radio. You can take the supply from a lighting circuit – but check that the lights don’t have to be on to get the supply. The next alternative is an accessory position in the fuse box, if this is conveniently placed. Or



Make cables into a tidy loom with PVC tape.

use any other permanently-connected 12V source.

Remember that caravans have 240V as well. So make sure, with your meter, that you’ve made your connections to the right wiring.

The aerial

Once you have a source of power, the next step is to fit an aerial. I decide where to put it, check on the outside that there is nothing in the way, then gently push a sharp, thin spike from inside the caravan through the wall. This gives me my position to drill a hole for the aerial lead to go through. Normally the wall consists of a thin plywood layer on top of a thick insulating layer, then on the outside thin metal.

I usually fit an amplified electric aerial with the caravans I do. These are smaller than a conventional aerial, and I think they look better.

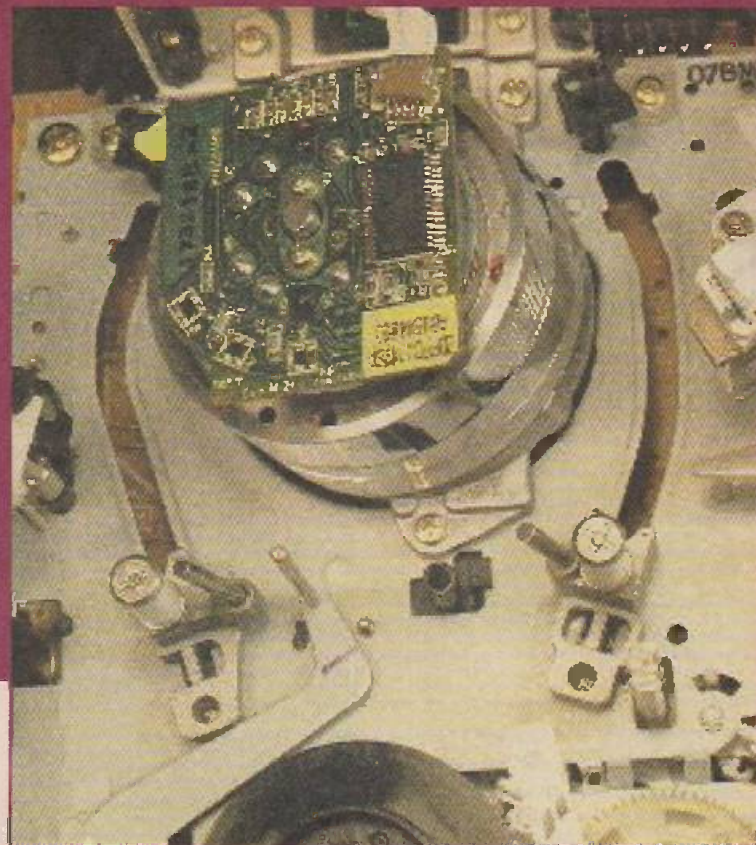
What’s next?

Something a bit different in the next instalment in this series: how to fit car alarms and immobilisers. ■

An amplified electrical aerial mounted on the outside of a caravan.



In this concluding instalment Eugene Trundle deals with problems that arise along the tape path after the tape has passed the drum, tape damage, the mode switch, how to deal with a jammed deck, intermittent faults and auto-diagnosis



Servicing VHS decks

Last month we covered the path of the slow-moving tape to the point where it parts company with the whizzing drum. Its next few centimetres of travel contain many potential trouble spots!

The first item it encounters is sometimes a moving ('half-load') guide pole that swings out from the cassette to route the tape past the ACE (audio/control/erase) head when the deck is in a fast-transport mode: it enables the control track to be read with the tape unthreaded. If the guide-pole arm is stiff on its bearing, the tape will catch in the works at eject. This occurs particularly with some old Sony decks. If the vertical pole or

its arm is bent, this will upset the tape's path across the ACE head, preventing readout and probably crinkling one edge of the tape.

The ACE head assembly

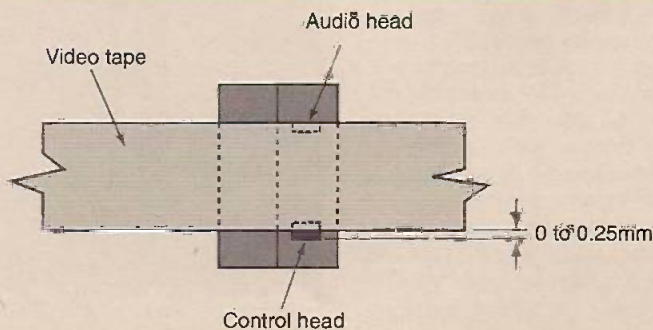
The tape next passes across the face of the ACE head assembly, see Fig. 10. It must at this point be running perfectly parallel with the surface of the deck, and the head assembly must be truly vertical. An error here will have little effect on playback of the deck's own recordings, but those made elsewhere will produce very muffled and 'woolly' audio from the mono/longitudinal sound track because of azimuth error.

The head's azimuth (sideways tilt) is carried out to obtain optimum response from an alignment tape's 6kHz audio edge-track signal while the head is being rocked with the azimuth adjustment screw shown at the top left of Fig. 1 last month. The photo in Fig. 11 shows the adjustment being carried out.

ACE head height is set initially by visual inspection of the tape path (Fig. 10), then by adjustment for maximum audio head output as seen on an oscilloscope screen.

There are two other aspects to alignment of the critical ACE head assembly. The tilt screw, see Fig. 2, adjusts the assembly's 'lean forward': it's generally set so that the top (audio) section is slightly inclined towards the tape, to optimise sound transfer while not noticeably impairing the less critical writing and reading of the control track at the bottom edge of the tape. Too much tilt can lead to unreliable control-track pulse transfer and a tendency for the lower edge of the tape to bubble or scrunch on the lower flange of

Fig. 10: Tape path across the ACE head assembly and its vertical adjustment.



nearby tape guides.

Lateral positioning of the ACE head assembly is critical. Large errors cause bad sound/vision synchronisation ('lip-sync'): small errors upset the tracking. There's no effect when a maladjusted machine is playing back one of its own recordings. The trouble occurs when different machines are used, for record and playback. The tracking error will however be corrected in modern designs that incorporate automatic tracking. But even with an auto-tracking model there will be instructions in the manual for lateral (sometimes called X) adjustment of the ACE assembly. This may involve the use of an oscilloscope to check relative pulse timings, see Fig. 12.

The usual problem with an ACE head is surface wear. This is most easily seen by reflection of a bright light from the face, using a dental mirror to check when the head is in situ. A ridge can be seen where the tape runs past the head. It's often more pronounced at one edge, either the top (audio head) or the bottom (control head).

The effect of a worn audio head is weak and muffled sound, especially with the machine's own recordings, together with hiss when the setting of the TV receiver's volume control is advanced to compensate. Control-track head wear leads to erratic servo control: the symptoms may be cycling noise bars on the screen during playback; wobbly sound with wow; or intermittent muting of the picture. With some models, notably older Panasonic ones, a worn, faulty or misaligned control (CTL) head produces the unexpected effect of speeding up the head drum, which returns to normal speed when the multiway plug at the ACE head is disconnected.

After the ACE head assembly the tape encounters a flanged tape guide – the most common one for a tape edge to crinkle on when there are tape-level problems in this area. As with the other guides, it's vital that this one is perfectly vertical and in the right place. If it's bent or damaged, replace it. If it's misplaced, check the mechanism phasing and the pinion, arm and/or cam that positions it.

The pinch roller

The tape is pulled around the deck by the pinch roller, not the capstan. The roller, forced against the

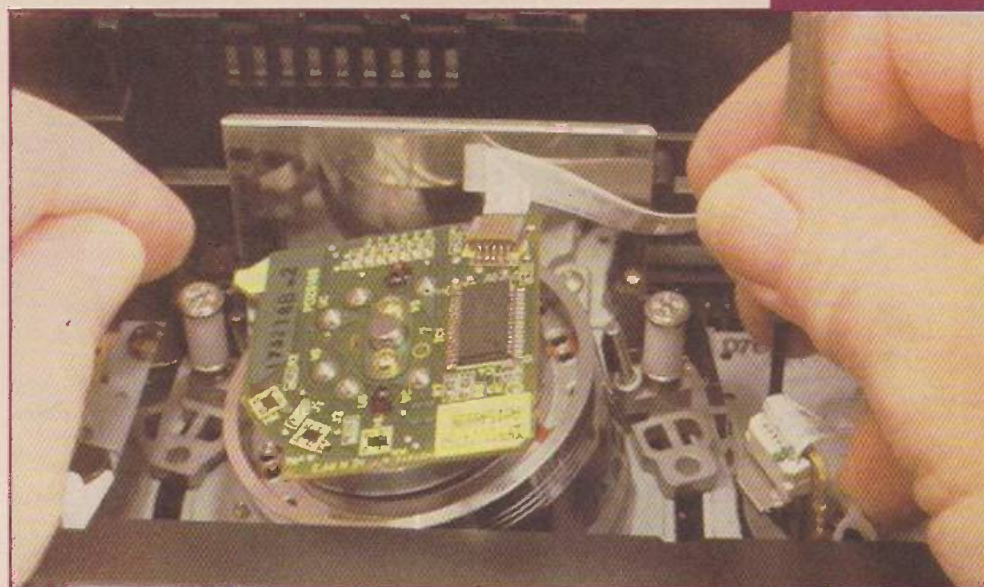


Fig. 11: Adjustment of the audio head azimuth angle. Tune for maximum treble response with an alignment tape.

capstan by spring pressure of about 1.6kg, is driven by friction against the highly-polished capstan shaft, then grips and pulls the tape.

It's very common for the pinch roller to become worn, acquiring an almost mirror surface in some designs and getting to look like a lump of dry toffee in the old Philips Charlie decks. A worn or faulty pinch roller may lose its grip on the tape, especially when the lower drum is worn and sticky. The result is deck shutdown. More often the effect of pinch-roller wear is to bias the tape up or down as it passes, the result being poor or no transfer of the sound and control-track pulses. From the beginning of play (or after momentarily pulling the roller away by hand during play) you will see the tape slowly ride up or down the ACE head face and hear the sound fade down, while servo control becomes erratic or is lost. At this point the tape will probably begin to crinkle or scallop its edge on the adjacent tape-guide flange, as shown in Fig. 13. Should a worn roller work all right in the play and record modes it may have the effects described above in the cue and/or review modes, when it's driving the tape faster.

Never try to refurbish or treat the surface of a duff pinch roller. Replace it, preferably with one from the manufacturer rather than a 'pattern' type. Take particular care over removal and fitting when the roller is on a pivoted arm stamped out of sheet metal: this is easily bent by vertical force in either direction, leading to a repeat of the tape-path troubles described

above.

The pinch roller can also cause wow and flutter with reproduction of mono sound, and can be responsible for graunching noises that come from its internal bearing. When its surface is polluted or damaged it can impress little repeating patterns on the tape surface: these show, when the tape

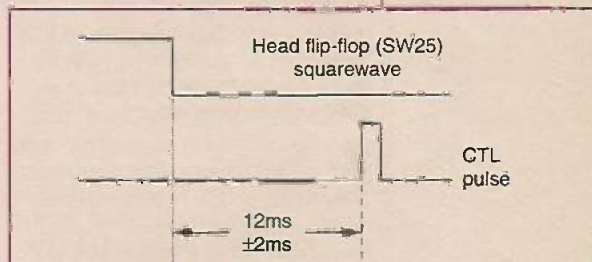


Fig. 12: One method of ACE head lateral adjustment with an auto-tracking VCR. Setting is carried out with an oscilloscope to check the timing difference between the SW25 and CTL pulses during playback of an alignment tape.

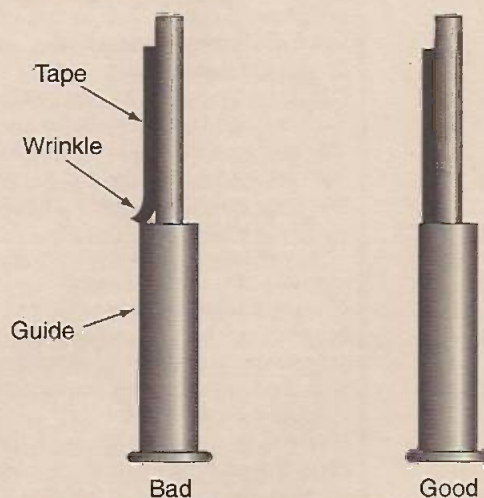


Fig. 13: Tape damage at the flange of a guide: the same can happen at the top edge if the tape rides upwards and a flange is present there.

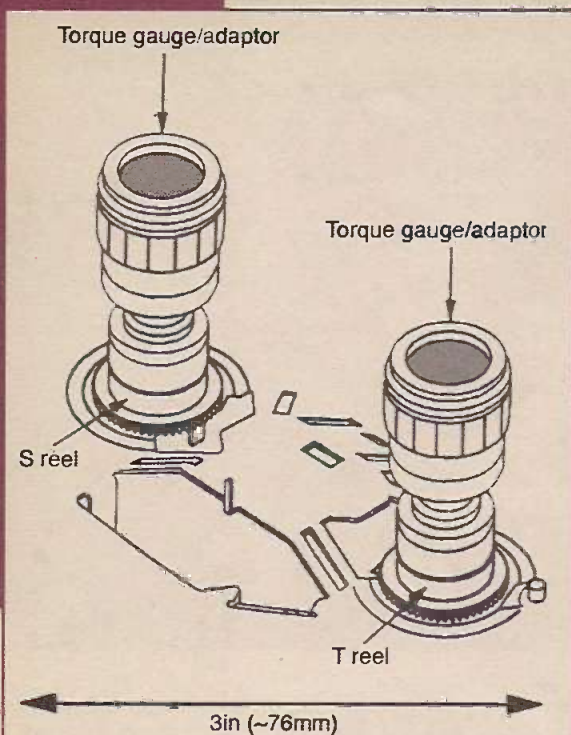


Fig. 14: Hand-held gauge for measurement of reel-drive torque. Shown here in use with an extending adaptor to keep the gauge body clear of obstructions. Its use requires the presence of a dummy cassette – a plastic shell – to keep the control system happy.

is next played, as regularly-cycling horizontal lines on the picture. So much for the pinch roller, a troublesome item indeed.

The capstan

The capstan itself seldom gets into deeper trouble than the need for a good shaft clean. Stubborn dirt can be removed with a fibre pen, which will cause no damage to the hard, polished-steel finish. The capstan motor, which is almost always a direct-drive type, can and does give problems however. The symptoms can be failure to turn or insufficient torque; wow and flutter; irregular rotation, with effects on the sound and the picture tracking; and tape chewing because the supply spool fails to take up the tape during the unthreading process, leaving a loop of tape out of the cassette at eject.

Some types of capstan motor, for example older Hitachi ones, develop a fault that causes the on-board drive chip to become progressively hotter while running, with the torque steadily decreasing. A good indication of this is obtained by placing a finger on the chip. If your finger gets too hot for comfort, the motor is in trouble.

Capstan motors can seldom be

repaired, because their individual components are not available separately. The bearings can become tight or sticky – it's a common problem with old Hitachi and Sanyo decks. To cure this, dismantle the motor by releasing the clip or ring at the bottom of the shaft, remove the flywheel, then thoroughly clean the shaft and bearings. Add a tiny drop of light lubricating oil before reassembly.

Many deck designs have a flanged tape guide, sometimes called the review pole, see Figs. 2 and 3, downstream from the capstan. It again tends to damage the tape edge when the pinch roller is faulty or worn. But ensure that this guide is vertical, undamaged and correctly placed before looking elsewhere for the cause of this trouble.

Take-up

The tape is next spooled on to the right-hand (TU, take-up) cassette reel. The spool turntable is driven by a clutch designed for a torque of about 60 or 80g/cm. This can be measured using a hand-held torque gauge, see Fig. 14.

Insufficient torque can be caused by a faulty clutch, a slipping drive belt, a tight clutch on the swinging reel-drive idler, or excessive reel braking. Don't mess with a faulty clutch assembly: replace it! With insufficient torque there's erratic take-up, the result being intermittent deck shutdown and/or tape looping at eject, the latter because the supply spool is turned backwards by the same clutch to retract tape during the unthreading process.

With excessive take-up torque, which is invariably caused by a faulty clutch, there can be wow and flutter with reproduction of mono sound and tape damage – the latter was very common with yesteryear's Amstrad decks. Some reel-drive clutches, notably those used on certain Daewoo decks, develop a 'snatching' action. As a result the tape is relaxed then tightened in very short cycles. This causes wow or flutter with sound from the mono track and, in severe cases, the back-tension pole at the other side of the deck oscillates.

Fast transport

This means fast-forward and rewind. With these functions the reel-drive clutch is mechanically short-circuited, as it were. This should be checked when rewind/fast-forward is slow, or doesn't work with the machine

shutting down within a few seconds of the mode being selected. Clutch-switching is generally carried out by a mechanical slider or lever that's operated by the deck's main cam, driven by the loading motor, or by a 'grab' solenoid.

Other causes of slow or laboured fast-forward/rewind are slipping belts, reel brakes dragging, low capstan-motor torque or, when rewind takes place with the tape fully threaded, a 'sticky' lower drum (see previous notes and compare the tautness of the tape at each side of the drum).

Tape damage

Mention has already been made of several causes of tape chewing. When a loop is caught in the works or left hanging from the cassette at eject this will be because the supply reel failed to take it up during the unthreading process. Check the points mentioned above, also that the reel idler pivots freely between the spool turntables; that the brakes on the latter or (if fitted) on the capstan-motor flywheel are operating correctly; and that the mode switch (see next section) is in good condition.

If the tape has been snapped at its end or pulled off the spool, the first thing to check is that the optical end-sensor is working correctly. If it is, it may be that the reel brakes are worn or not being applied fully, or that the reels are still rotating at full speed until the end of the tape – in this case the reel-rotation sensor(s) is the usual cause. These can also be responsible for deck shutdown within a few seconds of entering a mode. To distinguish between this and other causes of the same symptom, key play followed quickly by pause. If the tape now stays put, a reel sensor will be to blame – or its link to the control chip.

The mode switch

The mode switch, which is also known as the cam switch, rotary encoder and slide encoder, is the most unreliable part of a video deck and a prolific source of fault symptoms – and repair jobs! Its internal contacts become dirty or oxidised, with the result that it sends unreliable data – or downright porky pies – to the control chip. The resulting fault symptoms range from tape scrunching and damage to mechanical deck components to deck shutdown, mechanical oscillation, loss of some functions

Table 1: 'Emergency' data readout for a modern JVC deck.

Emergency	Symptom	Detecting mode	Subsequent mode
E:01	Loading motor rotates for more than 8 secs without shift to next mode	Loading	Power off
E:02	Loading motor rotates for more than 8 secs without shift to next mode	Unloading	Power off
E:03	TU reel FG absent for more than 4 secs	Rec/play/FF/rew/ search FF/search rew	Stop then power off
E:04	Drum FF input absent for more than 3 secs	Rec/play/FF/rew/ search FF/search rew	Stop then power off
E:06	Capstan FG input absent for more than 4 secs	Rec/play/FF/rew searchFF/search rew	Stop then power off
E:07	No SWD5V/12V	Power on	Power off

The last two events are held in memory and can be called up as required.

and intermittent operation generally. If in doubt, replace it. You can get away with servicing it: dismantle it, thoroughly clean the contacts and rotary brush, retention the latter, then reassemble it with a squirt of switch cleaner/lubricant. But replacement is best where possible – it's cheap enough!

A good idea of the condition of a mode switch can be obtained by connecting a DC-coupled oscilloscope to each of its active pins in turn and watching on screen the effects of selecting the various deck functions. A bad switch will be betrayed by noise and hash on the control lines – sufficient to confuse the control chip totally.

It's vital that the mode switch is correctly phased to the deck mechanics. Diagrams are provided in service manuals. The correct position is indicated by a notch, hole or mark on the switch rotor and a corresponding one on the bar, slider pinion or whatever drives it. Ensure that the deck mechanism is in the 'reference' position at the time: this may be stop (tape in and unthreaded) or eject.

A few deck designs have dispensed with a mechanical mode switch, most notably some Philips types in which a rotating 'butterfly' is used instead, in conjunction with an optocoupler. They are more reliable for it!

Jammed deck

A tape sometimes gets stuck in a jammed or non-operational machine and prevents dismantling for investigation and repair because it masks one or more of the deck fixing screws. Instructions

for dealing with this difficult situation are sometimes given in the service manual or, as in recent JVC designs, there's a means of release by removing the cassette cradle's top plate and then the cassette.

In other cases, particularly where access is possible to the underside of the deck, you can often drive the mechanics by hand or by applying an externally-derived 6-10V supply to the loading motor. If you do the latter, be sure to disconnect the motor from the VCR's electronics, otherwise you will wreck the motor-drive chip. While the tape is being unthreaded in this way, it may be possible to prevent tape damage by turning the capstan flywheel by hand to take up the slack.

Another approach, usable only where its fixing screws are accessible, is to remove the front-load cradle assembly and lift it out, complete with the cassette.

Intermittent faults

The most common causes of intermittent or spasmodic deck faults are: the mode switch; slipping drive belts; wear and slippage at other friction surfaces, for example at reel idlers and brake pads; and the unpredictable effects of hard, dried grease on moving parts, for example in older Mitsubishi decks where, amongst other things, it can cause breakage of part of the capstan assembly.

In later Orion decks, used by Tatung and others, the centre LED (used for cassette-in and tape-end detection) can be responsible for intermittent operation.

Auto-diagnosis

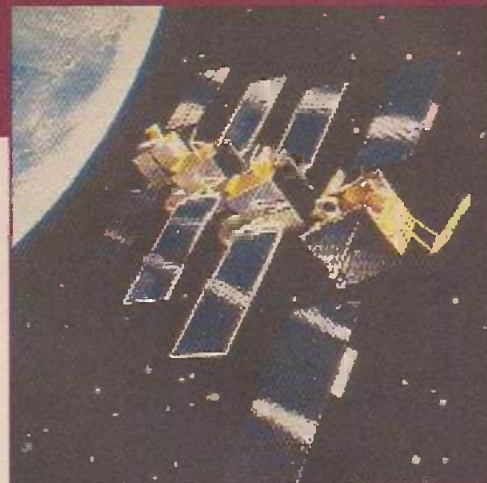
Many modern VCRs have an auto fault-diagnostic system built into their control processor. It produces an alphanumerically-coded indication of why the system instigated deck shutdown during an 'emergency routine'. This is useful when investigating a deck fault, particularly an intermittent one, if fault data is stored even when deck operation subsequently returns to normal. The feature is not always obvious. Look in the service manual for instructions on calling it up and interpreting the codes.

An example of data readout, for a JVC HRJ-series machine, is shown in Table 1. This particular model requires the use of a special presetting unit (technician's remote-control unit): to bring up the diagnostic display, hold down the N key for more than two seconds.

In conclusion

It has not been possible in this article to cover all the problems that may crop up in all deck designs. For specific faults by model and deck type there are various sources of information – the technical advice lines of the manufacturers concerned, the disc index to the wide-ranging coverage of *Television magazine's* VCR Clinic feature, and the CD-ROM Euras guide to faults. Before you turn to any of these however take a good, analytical look at the deck concerned in operation. It might well save you having to use the phone or boot up the computer. ■

DX and Satellite Reception



Terrestrial DX and satellite TV reception reports. Broadcasting and satellite belt news. Heat problems with satellite receiver SMPSs. The evolution of DX-TV reception technology. Roger Bunney reports

The aurora on March 31st occurred just after my last column was prepared. There have been no reports of DX-TV AR reception in the UK but it seems that, as usual, more northerly parts (Scandinavia) fared better. *Skywaves*, the bulletin of the British FM and TV Circle, reports that FM-DXers had success with AR reception. An unusually timed peak occurred at 0800 hours: the usual afternoon lift took place at teatime, while the late phase was split between a short first period at 2030 and a longer period from 2130 to 0030 on the following morning.

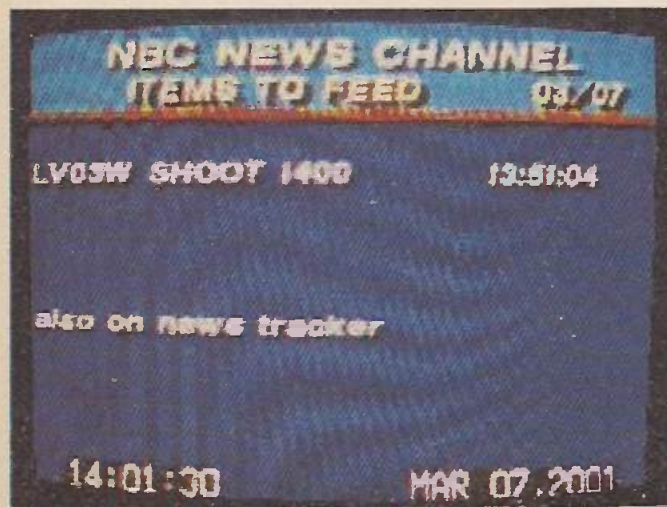
A visible aurora with red streamers was to be seen – by those without rain! – to the NE during the 2030 phase. The AR sheets produced the usual north-south reflective propagation: Dutch, German and even Serb/Croatian signals were identified at 87.6 and 87.8MHz. There was activity throughout most of the FM band and as high as Band III. Lack of Band I reception is odd. Perhaps no one persisted. But a scanner check here in Romsey during a visible aurora – the NE sky alight with fading white illumination – in 2000 produced no video buzz, just noises. Frank Lumen (Bradford) reported slight AR activity on April 7th.

The first signs of year 2001 sporadic E reception were noted in mid April. The Italian shopping channel TVA (ch. -E3) was received on the 23rd, along with RAI ch. IB. Low-level Band I SpE activity was present on the 20th, 21st and 25th, but with no identified signals. Ch. -E3 is between ch. IA (53.75MHz) and ch. E3 (55.25MHz) at 54.09MHz nominal (video carrier frequencies): TVA is a dominant signal when Italian reception is possible here.

Solar Cycle 23 is now well past its sell-by date. It's declining to a minimum, which will probably occur during the next four years. When the next Solar Cycle (24) peaks at about 2010-12, producing maximum usable frequencies at low VHF/Band I, there could be no analogue TV channels left.

Satellite sightings

There was not much excitement for sat-zappers during April. The,



A news feed to Europe from the US via NSS K.

story of the US spy plane that collided with a Chinese jet fighter was well covered via the North Atlantic circuits. During April 10-11th the Clarke Belt was full of news feeds and reports. At one stage during the evening of the 10th there were simultaneous statements via NSS K (21.5°W) from President Bush in the White House, the Department of State, Washington and the Pentagon. The WH Pool colour bars (White House news pool) via the Globecast package at 11.590GHz V (SR 20,145, FEC 3/4) was a sure indication that important news was breaking.

PGA golf via the Globecast NSS K package is now encrypted. During the late afternoon/evening of the 21st the "encrypted" caption was present on all three channels. But a check at the BT Washington frequency (11.566GHz H, SR 5,632, FEC 3/4) produced the PGA Twelve Bridges Gold Club tournament in the clear. NBA basketball was present in the clear on the same day, at 11.489GHz H, with the "NBA on NBC" logo. So the moral is: check elsewhere in the band!

NSS K is a favourite of mine. There's always something happening. On April 4th at 11.558GHz there was a dual test card with two colour-bar inlays, each with the identification Sony Music, as part of an extensive international hook-up rehearsal for the *Woman.Future* programme: from about 2000 hours GMT three circuits, London, New York and Detroit, were checking audio and video levels. The tests came to an end prior to 2100, when a computer corporate presentation appeared. Two well-dressed gentlemen expounded on the good life about to arrive with the merging of their computer companies: the presentation "Yahoo!SAP" was a soft-sell for better times ahead. Next day *Woman.Future* returned, with inputs to New York from locations across the States, the UK and France.

Reader Nick in Sutton watched, as I did, the space shuttle action on the 22nd – bolting a crane arm on to the International Space Station ready for more construction. This was via the Reuters 11.462GHz V circuit. Rather more dramatic was a report on a death-sentence injection in a prison death room, via Globecast Channel 1 (11.590GHz V, SR 20,145, FEC 3/4).

The Conoco oil refinery at Immingham blew up on the 16th: there was fire, smoke and drama. News feeds were carried via Eutelsat II F3 (21.5°E) from SIS Link trucks, at 11.042GHz H and 11.073GHz H (both SR 5,632, FEC 3/4), the former encrypted. The Russian PTP news also carried footage of the Immingham fire – this was seen when Reuters' Moscow Bureau relayed the Russian evening news via its NSS K North Atlantic circuit, at 1800 hours.

The foot and mouth outbreak was extensively featured via Eutelsat II F3 and Intelsat 801 (31.5°W).

While checking my new dish azimuth settings with the 18in. actuator arm I strayed into the wilderness past Anatolia at 50°E. On the basis of counts per degree I found, at possibly 57-8°E or more, distant signals that remain unidentified. Flashing horizontal lines (data downlinking) were present at 11.124GHz V, while out of band at 12.952GHz circular a strong carrier was found with no sign of either analogue or digital TV. This suggests a Russian Gorizont craft, but there's nothing listed – only NSS 703 at 57°. A possibility came to light when I checked the internet SatcoDX chart: MOST-1 at 56°E. It transmits extensively in the BSS band

(12.26-12.47GHz) using circular polarisation, though the beam is directed at Moscow with the UK well beyond its coverage contour.

Dean Rogers (Abbeywood, London SE2) has installed at his flat an 80cm tracking dish with 0.6dB LNB which feeds an EchoStar 2001 receiver. The dish's balcony location provides tracking from 42°E to 45°W. Being sports orientated, he laments the loss of PGA golf via Globecast. But he did manage to catch the San Marino Formula 1 race which was being linked to RTL via Eutelsat W2 (16°E) at 12.558GHz H and, later, on April 14th the Paris-Roubaix cycling event via Telecom (5°W) at 11.586GHz V (SR 6,283, FEC 3/4). Our sympathy to Dean whose father died recently at a relatively young age.

The Stefan Hagedorn newsletter reports that Italian has been added to the languages used by the Euronews channel via Eutelsat W3 (7°E), at 11.387GHz H. Also that if you can track to the horizon at 58°W you will find APTN London via PanAmSat-9. It's at 11.475GHz H (SR 26,463, FEC 3/4) and uses the unusual service identification ADHOC CHANNEL 3. Pas-9 puts a strong signal into the southern UK, as I have discovered - provided the horizon isn't obstructed.

Broadcast news

Digital TV: At present the digital terrestrial TV (DTT) coverage extends to only fifty per cent of households in the UK. The government is seeking to increase transmitter powers so that 71 per cent of households are guaranteed stable DTT reception. This is likely to increase interference levels with analogue TV reception however. The aim is still to switch off the analogue transmitters by 2010. The Italian government has confirmed that the analogue switch-off will be in 2007.

US: The FCC expects about 1,000 main TV stations to be transmitting dual analogue and digital signals by May 2002. Though most stations expect to make this date, there is still concern over the use of 8VSB modulation.

PLT: Dave Lauder's April EMC column in the RSGB journal *Radcom* comments on attempts being made to change existing radiation level standards so that power lines can be used for data communication - it's known as Power Line Telecommunications (PLT). The idea is to alter the current European EMC standard to allow PLT radiation levels to rise. Though the band talked about is 1.6-30MHz, it's likely that PLT frequencies will reach into the low VHF segment where they could affect receiver IFs, DXing and 49MHz devices. Interference can occur as RF radiation or simply via the mains supply. Dave comments that Siemens is involved, so PLT should be taken very seriously.

SMPSs and heat

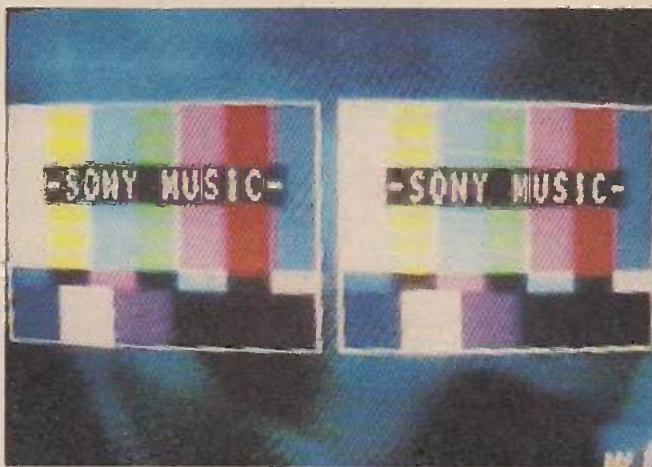
The New Zealand trade magazine *SatFACTS* commented recently on the reliability of switch-mode power supplies in satellite receivers. Many satellite receiver switch-mode power supplies can operate satisfactory over an AC input range of 90-250V. This helps manufacturers, since use of such a SWPS enables a receiver to be sold anywhere in the world, reducing component costs. But tests have shown that when a SWPS in a receiver powered at 240V AC nominal runs hot, feeding it from a step-down auto-transformer that provides an input at say 120V AC considerably reduces the heat generated. There's also reduced component stress. The result is improved reliability. Heat and humidity are other factors that affect receivers in the Australasian/SE Asian region.

Any trade reader care to comment on experiences with SMPSs?

Satellite news

The US group GE is to launch two new satellites with European coverage in coming months. Satellite GE-1i will be positioned at 47°W in spring 2003. It will operate mainly in Band C to provide links between Europe, the Americas and Africa, offering TV, data and internet services. GE-2E should arrive at 24°W in autumn 2002, providing Ku-band capacity. This is rather close to the 24.5° slot at present occupied by Intelsat 603!

Eutelsat has ordered a new satellite, W3A, which is due for launch in early summer 2003 to sit alongside W3 at 7°E. It will have fifty transponders operating in the Ku and Ka bands and pro-



Two for the price of one! Part of a corporate rehearsal between New York, Detroit and London via NSS K.

vide coverage from Europe across to Iran, Saudi Arabia and Ethiopia.

When the new Intelsat craft 902 reaches its allocated slot at 62°E in August NHK will be one of its first customers, taking HDTV pictures from uplink sites in Paris and London over a dedicated news-contribution link that opens in October.

Tandberg Television, which has a research and production centre adjacent to the M27 at junction 7 (west side), has developed a 16QAM modulator that enables at least 20 channels to be compressed into the bandwidth previously used for 6-8 channels with a 36MHz transponder. The new DVB-compliant SM5600 modulator is to start being marketed this summer and should reduce satellite leasing costs.

Aerial Techniques

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The German KB Impuls Service GmbH is to lease a 36MHz C-band transponder aboard the Russian Express-3A satellite at 11°W for voice, data and internet use across Germany/Europe. Intersputnic is also offering a twelve-month lease on a 30MHz transponder aboard Express-2 at 14°W, with a footprint that covers North Africa and the near/middle east, providing 36dBW at the centre boresight.

SkyDigital is now downloading the Arabic Al Jazeera news channel. It's intended for the Arabic community in the UK.

Programming theft, i.e. the use of pirate cards etc., is clearly a worldwide phenomenon. Bob Cooper's *SatFACTS* magazine reports that the March 24th issue of the Brisbane *Courier Mail* carried the following message: "Important Notice - Circumvention Devices. The recently enacted Copyright Amendment Act (Digital Agenda) 2000 introduced new enforcement provisions enabling courts to fine offenders. In line with this Queensland Newspapers Pty Ltd. will not accept advertisements for circumvention devices, e.g. mod chips." Interesting to compare with the pages of a UK satellite publication which has advertisers offering wafer cards, several multi-programmers and various micro chips. Check out <http://www.vxtools.com> which is printed on several programmer PCBs.

Evolution of DX technology

It's some thirty years since I took over the former DXTV page in what was then *Practical Television*. Charles Rafeal, who started the column, had sadly just passed away. He was a true enthusiast: all who came into contact with him were affected by his keen interest and drive.

Back in the mid Sixties we tended to use Bush sets for DXing - the TV53, TV62 and TV63 series. They were very reliable and of course designed for system A operation (405 lines). For Continental reception you had to introduce switching between positive- and negative-going video and change the line frequency. Experiments with 30L15 and EF184 valves gave us increased RF and IF gain, then the first home-built preamplifier designs based on OC171/AF114 transistors came along. Occasionally Laskys or another London dealer would advertise a limited quantity of 'export chassis'. These were system B/G receivers: ideal for DXing, though the wide IF bandwidth led to ch. E2 and ch. R1 reception overlapping.

In those days most stations transmitted test cards during the day, with programming in the evenings. This made it easy to identify the source of a transmission. Each network or station tended to have its own test card design, a slide scanner being used to generate the test signal. Then the famed Philips PM5544 electronic test pattern appeared, often being transmitted with only a network identification. Life became more difficult for DXers!

The mid Sixties also saw the start of UHF TV. Before long Laskys was selling 'surplus' UHF tuners at 29s/6d (about £1.48). The early ones used the gold-pinned PC86/PC88 valve combination. They were soon replaced with transistor versions using devices such as the AF139, AF186, BF180 etc.

It was possible to modify a dual-standard UK TV set so that you could use the 405-line IF strip at the same time as the 625-line timebases - the Thorn 850 chassis was easy to modify in this way. The advantage of a narrowed IF bandwidth was reduced noise, making it easier to see a DX picture.

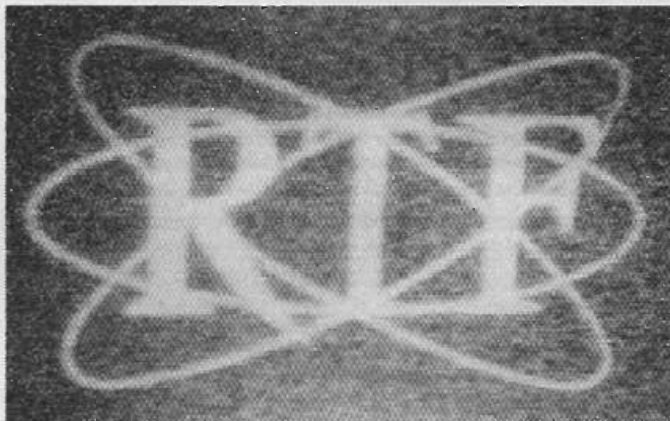
By the mid Seventies we were using Bush/Murphy TV125 receivers. Then an important innovation came along, the varicap tuner. What luxury - a tuner that covered 40-110MHz as one band! At last all Continental channels were easily tuneable. The varicap VHF, or combined VHF/UHF, tuner could be used as an outboard unit feeding IF bandwidth selectivity modules (those in the Philips G8 chassis were ideal for the purpose). Feed out at IF to a VHF TV set tuned below ch. B1, remove the supply to the local oscillator, and you ended up (using a TV125) with an up-market tuning system and five IF stages!

Notch filters and various wideband Band I, Band III and UHF aerial designs became available, along with improved preamplifiers. DXing technology had perhaps reached its peak.

Christmas Eve 1975 was significant. A greetings card from Steve Birkhill included photographs of UK reception (at



Latvian ch. R1 TV. SpE reception by Ryn Muntjewerff in Holland.



DX-TV in the early days. This off-screen shot shows mid-Sixties reception of French TV - Caen ch. F2, an 819-line signal.

860MHz) from the NASA ATS-6 UHF satellite, whose aerial was aimed at India. There was a flurry of excitement amongst enthusiasts who devised various 'dish' acrials, often made from close-mesh chicken wire. By June 1976 a number of enthusiasts were receiving pictures of sorts: satellite reception had arrived. As the Eighties started, Russian TV could be received from Gorizont (14°W) with a small dish, at 3.675GHz. Then RF interference, from early computers, 49MHz walkie-talkies and baby alarms, cordless phones and even the stripline PCB in certain BT telephones, became an increasing problem.

By the Nineties TV transmissions in Europe were predominantly at UHF. The 405-line service had closed down in the mid Eighties, while across the Channel an increasing number of stations were moving to UHF.

TV-DXers were now tending to turn to satellite reception. Receivers, dishes and LNBS had become readily available, thanks largely to the arrival of Sky TV in the late Eighties. For a time analogue transmission using FM was the norm. Apart from those that used devious encryption techniques, the signals were easy to find. Then digital transmission started to appear. By the mid Nineties it was being adopted for SNG links. Within the next five years it was everywhere: terrestrial, satellite and via fibre optic down the nearest manhole. DAB in Band III had also arrived for a few wealthy folk - one of modern technology's best-kept secrets!

DXers have always adopted the latest technology for their activity. But progress has now taken us beyond the possibilities of home construction. Mostly we have to buy what we need. We are now far from the humble EF80 valve. In the early Sixties we struggled to receive RTF on ch. F8A from Lille. Now we receive New York via an 80cm dish sitting on the lawn, or enjoy perhaps 500 channels via a 35cm Sky digidish. And the technology is still accelerating ahead!



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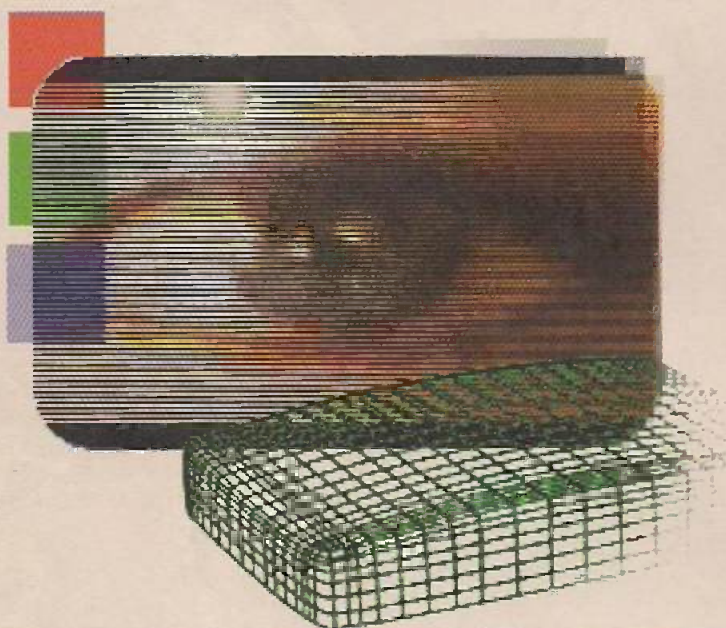
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equipment is brought in for repair. It did on this occasion. A whole row of pins, 41-64, of the LA71529 80-pin surface-mounted flatpack IC had never been soldered. Resoldering cured the problem.

A while back I tried sitting a new flatpack IC on the PCB of a digital satellite receiver and pressing it down by hand before soldering it in, to see if it cured a problem, but it was impossible to get all the pins to touch at the same time. M.D.

Bush 2059NTX

These Onwa chassis sets are prone to power supply blow up. Should you find that there are further faults after the repair, such as the picture size varying with the brightness, check any 0-68Ω safety resistors you can find. The excessive currents they pass when the supply voltages rise seems to affect their value, which increases to about 4Ω. As a result, the currents that can be drawn from the supplies they protect are limited. M.D.

Ferguson D78N (ICC9 chassis)

The fault with this huge set was EW bowing. Adjustment of the software controls made little difference, so I left them where they were. Circuit checks revealed that the voltage at the collector of the BD675 EW driver transistor TL40 was low. The culprit was the associated 4.7μF, 160V capacitor CL42. Why does everyone leave the workshop when I need a hand to move a set like this? G.D.

Matsui 1482

This portable was dead though there was plenty of voltage at the input to the chopper power supply. Bypassing any thought processes, I replaced various items in the power supply before noticing a standby mains transformer which was open-circuit. G.D.

Matsui 21V1N (Grundig CUC7350 chassis)

After the usual power supply rebuild there was no sound. RF or scart AF reached the Nicam panel, but nothing came out to the working audio amplifier. All the processing is carried out by one chip, IC3960. How we laughed at its price: who says the Germans have no sense of humour?! Fortunately the cause of the trouble was not the chip. Its 8V supply was missing, because the LS4148 surface-mounted diode CD3963 was open-circuit. G.D.

Ferguson A51F (IKC2 chassis)

"By the way" the customer had said, "the sound was a bit low before the set went off." You know how these parting comments often indicate something that's really

TV FAULT FINDING

Reports from
Michael Dranfield
Glyn Dickinson
Chris Dakin
P. Salkeld
Dave Gough
Geoff Butcher
Denis Foley
Chris Watton and
Graham Boor

We welcome fault reports from readers - payment for each fault is made shortly after publication. See page 554 for details of where and how to send reports.

Samsung CI5322XT

At switch on this set's power supply made a noise as if it was about to blow up. A check on the secondary side of the circuit showed that the HT was at over 250V instead of 125V. Switch off quick! The cause of the problem was C852 (470μF, 16V) on the primary side of the circuit - it had dried out. When a replacement had been fitted the HT was correct at 125V but the set was still dead. R826 (1Ω safety) in the feed to the line output stage was open-circuit while the 2SD1650 line output transistor was short-circuit. M.D.

Thomson Nature 2 (TX807 chassis)

The picture that this under-guarantee set produced was predominantly blue, and the grey-scale couldn't be set up. I traced the cause of the problem to the 1N4148 diode DT71, on the tube base PCB. It was slightly leaky - approximately 5kΩ with reverse bias. M.D.

Thomson 441A (Combi mono EU)

This 14in. TV-video combi unit had been bought at an auction of catalogue/store returns, so it was presumably brand new. The problem was with video playback: there was no picture, just a blank, noise-free screen. I usually find that a good look around pays dividends when new or newish

hard to fix! A new on/off switch restored the picture and very low sound. Some time was then spent carrying out tests in the audio output circuit, before a scope check showed that the audio leaving the expensive IF can, at pin 10, was low. Prior to this the audio leaves the can at pin 7, for the scart circuit, returning at pin 14. A 1 μ F, 63V axial capacitor, CS14, connects pin 14 to the LA7550 chip within the can. It had fallen in value. G.D.

Alba CTV701 (Onwa chassis)

These chassis don't get any easier to repair! This is a 20in. version with text. There was no sound or picture, just a pretty pattern on the screen. Vidco reached the text processor chip but didn't leave it, because the 5V supply was missing. This supply is switched by the same signal that drives the relay-control transistor. The control signal was varying enough to operate the relay, but not enough to get the text and audio circuits working. It should fall to 0V but was at 3V. Earthing this line made the set work, but there was still patterning – and picture-size variations, which provided a clue. The HT was unstable. So I replaced the 100 μ F, 160V electrolytics in the HT supply and the set was finally cured.

Since then I've had two more of these sets that have required the same treatment. G.D.

Sharp 51AT15H (5BSA chassis)

This set had a folded-up raster, with flyback lines towards the centre of the screen. I replaced C713 in the -10V supply because I didn't like the look of it, also C712 in the +10V supply (they are both 1,000 μ F, 16V), but there was no change. At this point I noticed that the front controls didn't work, there was no on-screen display, and the remote control didn't work either! This suggested an EEPROM fault. It was nothing of the kind of course. All functions were restored when Q509 (BC635) and Q510 (BC338) in the field timebase were replaced. They were both leaky, and were affecting the data lines. G.D.

Sony KV20WS1B (BE5 chassis)

This set was reluctant to switch on from standby when cold. Once persuaded, it ran reliably. Heating the power supply area cleared the fault, but all the electrolytic capacitors proved to be OK. When I spoke to Sony I was advised to increase the value of C623 from 56 μ F to 220 μ F. This cured the problem. C.D.

Philips 14PV182/05

This TV-VCR combi unit worked well apart from the fact that it didn't produce

on-screen displays. Checks on the OSD generator chip IC801 showed that there was no activity here. As this IC is on the TV PCB, fault-finding was not easy. Cold checks were the only answer. I eventually found that the 7.4MHz oscillator coil, circuit reference L802, was open-circuit. Its part no. is 4822 157 71289. P.S.

Panasonic TX21GVI (Z421V chassis)

A known problem with these combi units is intermittent switching off and coming back on again. The answer is to replace the TOP210 chopper power supply chip IC1807. P.S.

Philips 29PT6773/05 (MD1.2EAA chassis)

This set worked perfectly except that it wouldn't go into standby. While carrying out a general check on the large signals panel, which incorporates the power supply, I discovered that R3588 (3.3 Ω , 0.5W) in the standby/protection system was open-circuit. A phone call to Philips Technical for any additional information revealed that C2561 should be changed to 3,300 μ F, 16V (part no. 4822 124 40784). P.S.

Panasonic TX21GVI (Z421V chassis)

There were flyback lines in the top half of this combi unit's picture – teletext was OK. I always go into the 'self-check' mode with these sets before diving in. To do this, press volume down on the set and the status button on the remote-control unit. Once this had been done no further action was required. P.S.

Bush 2857NTX

This set came in because it was dead. The usual capacitors on the power panel, C908 and C910, were faulty. When the set was up and running I tried selecting standby: the sound muted and the picture went dark. A check on the standby transistor Q201, on the main board, showed that it was short-circuit emitter-to-base. I found that a BUT56A worked in this position. P.S.

Samsung CI5079T

Failure of the 2SD5072 line output transistor Q401 is a fairly common fault with these sets. How often have you replaced it along with ZD801, IC801 and HC801 in the power supply, restoring normal operation, then had the set back a week later with the same fault? To overcome this problem, Samsung has introduced a recommended service procedure. I'm pleased to be able to say that it works. Replace the following items: ZD801, part no. 0403-000691;

IC801, part no. AA13-20004P; HC801, part no. AA13-20004M; F801, part no. 3601-000261; L803, part no. AA27-90001G; C803, part no. 2303-000163; C851, part no. 2401-002280; C852, part no. 2301-000111; Q401, part no. 0502-000295.

It may look like a rather daunting task, but doesn't take long once you get started. P.S.

Akai CT2125 (Samsung P58C chassis)

This set came on with the power supply chirping away and the red standby light on. After thirty seconds it would trip off. Checks in the power supply revealed that C817 (100 μ F, 25V) was faulty. It's the reservoir capacitor for the supply to the TDA4601 chopper control chip (pin 9). A replacement restored normal operation. D.G.

Bush 2169NTX

This set was dead with the 2.5A fuse blown. Further checks in the power supply revealed that R1 (5.6 Ω), R4 (270k Ω) and the P3NA90F1 MOSFET Q1 were all faulty. Replacement of these items brought the set back to life. The original type of MOSFET is quite pricey. I found that a BUZ77B did the job. D.G.

Alba CT840

Another dead set. This time R302 (6.8k Ω) in the power supply had gone high in value. A replacement restored full operation. D.G.

Philips 25PT4103 (L6.2 chassis)

I had been doing battle with this set for a while: sometimes it was dead apart from a buzzing from the speaker, like an angry bee; sometimes there was a picture with severe line sync disturbance; and sometimes it worked normally. In the May 2001 issue Glyn Dickinson described a fault with almost identical symptoms, the cause being the current-sensing resistors in the power supply. I had already replaced these as part of the Philips power-supply repair kit however. The cause turned out to be the nearby BF487 transistor 7501, which was going open-circuit intermittently. It's used to switch off the self-oscillating series MOSFET chopper transistor, its conduction point being determined by the sawtooth developed across the current-sensing resistors and the regulation bias at its base. G.B.

Toshiba 2512DBT

The symptoms were severe lack of height with slight bottom compression. The cause turned out to be C372 (2.2 μ F) which is not easy to replace, especially if you don't

know where it is! You'll find it tucked away under a screening can on the DPC sub-board. **G.B.**

Osaki 32145

This 14in. portable was completely dead. There was HT at the mains bridge rectifier's reservoir capacitor, but the power supply wasn't running. Checks on the start-up bias resistors and several other components revealed that they were all OK. I decided to replace the STR50103 chopper chip, though on every other occasion when I've had to replace it the problem has been excessive voltage outputs from the power supply. The replacement made no difference, and I then spotted some very poor joints at D124, C170 and R121, which appear to be associated with the standby circuit. Resoldering these joints brought the set back to life, but this was not the end of the story.

I refitted the original STR50103 chip – no point in throwing away a good component, is there? Wrong! When I switched on again the EHT came up momentarily then the set died with a buzzing from the power supply. You've guessed it: the STR50103 was producing excessive output and had blown the R2M avalanche protection diode D508. All was well once the new STR50103 had been refitted, along with a new R2M. Ever the optimist, I decided to be glad the fault had developed on the bench rather than back at the customer's home. **G.B.**

GoldStar CIT2168

The customer's complaint was that this set "just went off". I found that the line output transformer had shorted turns, which prevented the set from powering up. A replacement transformer put matters right. **G.B.**

Ferguson 59J7 (TX100 chassis)

I was caught out by this one! The set came in with field collapse. Failure of the TDA3652 field output chip is often the cause, so I merrily replaced it (with the usual TDA3654 plus modification kit) and resoldered any dodgy-looking joints I could see. This put matters right, I thought.

Two days later the set was back again with the same fault. I found that the output chip was OK, but there was a bad joint at the field-scan output connector. It's hidden under a plastic chassis member, which is why I hadn't noticed it on the first occasion. **G.B.**

Hitachi C2556TN

This set sorely tried my patience. Although the job card said "dead", when I switched it on I heard the EHT rustle up. But the screen was blank except for a display of the channel number and some graphics on the right-hand side. After a while I discovered that the set worked normally when an aerial was connected. Had the designers decided to mute the sound and picture in the event of no signal?

The fault was actually an extremely intermittent tripping of the power supply. It was made more difficult to diagnose because of the extraordinary long soft-start operation. Every time I moved the chassis the picture and sound would click off then slowly return some seconds later. I couldn't persuade the set to stay off – that would have made-life too easy!

I resoldered the pins of the chopper and line output transformers, and every regulator IC that I could find, but the fault persisted. I then discovered that the fault disappeared when the cradle that holds the chassis was removed. After high-flown suspicions, which proved to be unfounded, of static discharge from the plastic cradle to the PCB, I saw that one end of potentiometer R950 was tight up to the cradle and that the connection had broken (dry-joint). I suspect that R950 is part of the overvoltage protection circuit. **D.F.**

Genexxa CTV10/Goodmans Compact 110

The cause of reduced height in one of these 10in. portables was traced to RP05 (8.2k Ω , 3W metal film) which was open-circuit. I used a resistor sourced from Philips, part no. 4822 053 12822.

Another of these sets had no line scan (a vertical white line down the screen) because the scan-correction/coupling capacitor CH01 (4.7 μ F, 50V bipolar type) was open-circuit. I was again able to source from Philips, part no. 4822 124 23057. **D.F.**

Ferguson TX92 chassis

This set came on, worked all right for about a minute, then went off. It was noticeable that the 12V regulator IP50 was getting very hot, but a replacement made no difference. IP50 provides a start-up feed to the 9V regulator IP70, via DP54. Once the set has got going the feed to IP70 is derived from the line output stage, via DP55. This latter diode was faulty, and as a result IP50 was trying to maintain the supply. Replacement of DP55 solved the problem.

DP55 is type 1N4001 in mono sound sets, type BYV10-20 in sets with stereo sound. **C.W.**

Aiwa VX-T1000 Mk 2

This TV-VCR combi unit had lost its line drive. The VCR and sound sections worked. After much tracing around, as I didn't have a circuit diagram, I eventually found that D7, a 9.1V zener diode, and C105 (330 μ F, 16V) were both short-circuit. Shame the CRT was worn out! **C.W.**

Philips 10CX1120

This mains/battery portable worked all right when connected to the mains but not when used with the 12V battery power supply. Checks in this module showed that there was no drive to the BUZ71 chopper MOS-

FET T29. A replacement drive coupling capacitor, C23 (1 μ F), put that right.

I discovered that if the DC supply drops below 10.6V the power supply stops and won't restart until the set is disconnected from the power source then reconnected.

I also found that the 9.1V zener diode D37 was open-circuit. As a result the 8V output was a little high. This didn't seem to affect the set. **C.W.**

Goodmans Compact 110

The switch-mode power supply in this 10in. set didn't start up. An easy one for a change: R5 (180k Ω) was open-circuit. **C.W.**

Finlux 5000 series chassis

There was no luminance though the sound and text were OK. The cause proved to be transistor Te9 (BC857) which is hard to find as it's not marked on the PCB. Its base is connected to pin 9 of the text PCB while its 1k Ω emitter resistor Ra88 is connected to the junction of Re31 and Re35.

If the channel number is permanently displayed you can remove it by pressing it then pressing and holding the clock button on the handset. When the clock disappears, so will the channel number. Do the same thing to get it back. **C.W.**

Nokia 6332 (Euromono 2 chassis)

There were three coloured lines that danced in the top three inches of the picture. The cause was in the field output stage, where diode 6D04 (1N4002) was leaky. It's connected between pins 2 and 6 of the TDA8170 field output chip to produce the flyback boost voltage. **C.W.**

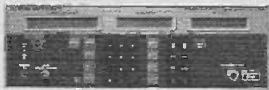
Tatung T21TF70

This 21in. set was dead with the standby LED giving four flashes at a time, which was obviously an error code. A check with the service manual narrowed the cause of the trouble to the beam-current monitoring system, where R909 was found to be open-circuit. As a precaution R913 and R922 were also replaced. These resistors are on the CRT PCB. **G.B.**

Panasonic TX25AD1DP (Euro-2 chassis)

This set was dead with the power supply tripping. A quick check around for any obvious shorts failed to reveal anything amiss, but I subsequently found that when plug W7002 on audio board K was disconnected the set powered up. This plug provides the bus link to the board. The cause of the problem was failure of the separate power supply on this board, because the start-up resistors R7000 (180k Ω) and R7005 (150k Ω) were open-circuit. Presumably the main microcontroller chip was failing to get the response it expected from board K. **G.B.** ■

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Dell D1028LR

There was no display, with some serious flashing and banging that came from the CRT base connector. I at first thought that the tube was breaking down, but the fireworks continued even with the tube connector unplugged. It turned out that the focus voltages were way too high because of a fault in the EHT transformer.

The chassis was made by Philips and is marked CM6800, but there seems to be some variation in transformer types: the one fitted in this particular monitor was part no. 3138-128-75530. I was able to obtain a replacement from SEME, but it's not a cheap item. I've since had exactly the same problem with two other monitors of this type, so it looks like a common failure. G.B.

Viglen MC1726PE

The customer said that for some time the display had been disappearing intermittently, with a vertical white line being visible momentarily. An additional fault had now appeared: excessive width with severe pincushion distortion.

The cause of both faults was found on the small scan-output PCB, which is located on the right-hand side PCB (viewed from the rear). Diode D306 was short-circuit, and there was a burnt solder joint at connector P307. The diode was marked FMG G26S. I had a job finding any data for this device, but eventually discovered it at the Sanken website. A suitable replacement appears to be the RHRP860, provided an insulating washer is used. It's available from RS Components, part no. 157-5858. G.B.

Dell D825TM

This monitor appeared to be dead but there was in fact a very low, pulsating output from the power supply. The cause of the problem was C621 (1,000µF, 25V) which smooths the 15V supply: it was open-circuit. G.B.

Chuntex/Project 1451GM

Intermittent sync was the complaint with this monitor and, while checking, I found that the fault was sensitive to movement and/or tapping on the CRT base assembly. The signal cable is connected via a piggy-back DPMS sub-panel which is fixed to the tube base PCB by nylon stand-off pillars and an edge connector/pin header, on which the manufacturer had used 'chocolate-teapot alloy' solder.

This stuff produces solder joints with a perfect appearance and "superior wetting qualities" – for about six months. As usual, when heat was applied to a joint the solder rolled away from the component lead and

formed into tiny beads. A good scrub with a wire brush, some aggressive flux, proper solder and plenty of elbow grease were required to make good the "superior wetting qualities" and clear the fault! I.F.

Packard Bell 7480

The customer said "the display looks as if the CRT is worn out, but it isn't because the set-up menu shows up perfectly". It seemed to be an early version of the model. Externally, the only noticeable difference was that the built-in speakers at either side of the screen were flat: the grilles in the later version I recently encountered are angled to give a more 'trendy' appearance. Internally the construction of the earlier version is more cumbersome. The whole bottom tray has to be separated from the CRT surround and dismantled to release the main PCB. In the later version the PCB is retained by slotted latches: once the rear bracket has been removed, a single screw has to be taken out to enable the PCB to be slid back to clear the slotted latches, after which it can be lifted out.

As it seemed unlikely that the chassis could be operated in a position which would give access to the track side of the PCB for measurements to be carried out, I started by identifying the automatic beam limiting (ABL) control circuitry and performing cold checks on all the relevant components. The line output transformer's ABL pin is identified on the PCB. The path from this is via a clamp diode circuit and a low-pass filter, then a long length of track to the circuitry around Q771-4. This group of components is right next to the connector for the front-panel brightness and contrast controls. Its supply is tapped from a track that feeds the front-panel microcontroller chip. Apart from some dodgy-looking solder joints, nothing amiss was found here.

Because of the large amount of work required to reassemble the chassis for testing, I had lifted and checked every single component in the ABL control path, and scoured the whole PCB for suspect soldering. Then I identified the ABL output, so that the chassis could be reassembled for powered testing on the more accessible CRT base PCB. The ABL-regulated contrast control voltage is applied to the CRT base PCB at pin 11 of connector P302. The voltage here was less than 1V. When a current-limited voltage was applied to this point there was a slightly overbright display with normal contrast, but the front-panel contrast control had no effect. 12V applied via a 5.6kΩ resistor to the ABL low-pass filter capacitor C776 had the same effect, though the user contrast control now worked.

This proved that the cause of the trouble

was within the LOPT. Fortunately a replacement cured the worn-out tube effect. **I.F.**

Viewsonic 17GS (Model 1769GS-2)

There was no sign of life from this monitor. It was the old start-up resistor problem. R831 (330k Ω) was completely open-circuit, while R828 (270k Ω) had a decidedly peaky appearance. They both looked as if they had been of unsuitable type to start with, so I fitted more appropriate replacements and copied a trick used by a great many monitor manufacturers: the higher-value resistor is the one that's connected directly to the 320V source, so a high-voltage type is used in this position; the lower-value resistor is at a lower voltage, so only a good-quality component needs to be used here – there's no need for the resistor to have a high-voltage rating. **I.F.**

EMC EM1428

The job card said "intermittent fault that goes away when the monitor is tapped". The customer also wanted the width "stretched". After wire-brushing the baked-on flux on both the main and the CRT PCB I found that the solder was thin in places and heat-crystallised at some of the hotter-running components. Once thorough resoldering had been carried out there was no sign of any intermittent fault despite vigorous flexing of both PCBs.

The width was quite poor but not noticeably worse than with other monitors of the period. I tried removing the ferrite slug from the width coil, but this didn't increase the width sufficiently. With the slug still out, an added 2.2nF, 1.6kV capacitor in parallel with the flyback tuning capacitor C619 produced too much width. Fortunately replacing the slug provided a normal width adjustment range. **I.F.**

Tatung TM3401 (Y2P chassis)

This monitor was dead with no LED illumination. One of the most common causes is failure of the 4.7nF, 1.6kV (bright orange!) line flyback tuning capacitor. The excessive voltage then generated activates a small thyristor which is disguised as a signal transistor. This in turn increases the current through the LED section of the regulation feedback optocoupler sufficiently to stop the power supply. In this case however a replacement test proved that the flyback tuning capacitor was not the cause.

As this was the version of the chassis with the energy-saving sub-panel screwed to the side of the line output stage heatsink, R705 (680k Ω) was a possibility. This resistor feeds a standing bias to the gates of

the two power MOSFETs used to disconnect loads from the secondary side of the power supply. R705 can go high in value or open-circuit, and can cause symptoms that range from suspicion of excessive ripple to complete shutdown. In this case R705 was OK!

I next checked the start-up resistors. In this monitor R804 was replaced by link LK815, leaving R805 as the sole start-up resistor. Lack of voltage at pin 7 of the UC3842 chopper control chip does not necessarily mean that a start-up resistor is open-circuit. There are two small thyristors and a transistor connected to this line. They can, in response to a variety of fault conditions, short the line to 'live' chassis. But in this case R805 was open-circuit. It was somewhat discoloured: the colour bands appeared to be blue/black/brown. I believed the blue and, possibly, the black, but definitely not the brown! It almost certainly started off as orange. The black band could have been red before overheating, giving a value of 62k Ω , though 60k Ω is not unheard of. As I didn't have either value in a suitable wattage (3W), I decided to cheat!

There was a scrap Acer F6Y to hand with a pair of 2W 33k Ω start-up resistors. This combination would not only increase the total wattage rating to 4W, it would also distribute the dissipation by employing the R804 position. One resistor had a pink body, the other a grey body: pink is high voltage, grey regular. So the pink one went in the R804 position and the grey one in the R805 position. This restored normal operation.

Some manufacturers use the high-voltage resistor in the position connected to the mains bridge rectifier's reservoir capacitor, with a regular resistor (0.25W or less) at the UC3842 end of the start-up resistor chain. Liteon is an example. Experience has shown that the ordinary resistor is only slightly more likely to fail than the high-voltage one! **I.F.**

Samtron SC428PSL

The display was barely visible, so I switched to a full peak-white raster. After a few seconds the emission had improved to the point where the raster was easily visible but was still far too dim. Very often the cause is low heater voltage, but it wasn't too bad in this case. When I replaced the heater rectifier with a Schottky-barrier type, upgraded the reservoir capacitor and buffered it with a 1 μ F, 50V non-electrolytic capacitor, there was a significant improvement.

A trick that often works in a case like this is to replace all three 1 μ F, 160V video coupling capacitors with non-electrolytic

types of the same value and voltage rating. When high-voltage/low-value electrolytics are used in an area that gets warm, their ESRs increase. It may rise to a higher value than that of the surge-limiting resistor in series with the relevant tube cathode. Even if the ESRs haven't risen to this extent, non-electrolytic capacitors will still improve the tube drive.

This improvement to the video amplifier's transient response contributes to dislodging the contaminants that accumulate on the cathode coating. To obtain the best improvement to the tube's emission while running it in, I use a chequerboard test pattern which pulse-drives the cathodes. Another advantage is that the average beam current is reduced and with it the risk of a warped shadowmask.

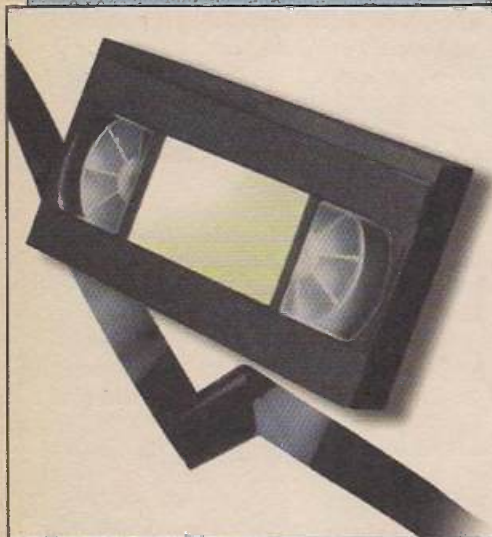
After several hours of running in I gave the grey scale a final balance. Because of the age of the tube, the resolution improvement was not as great as I had hoped for. But the emission was as good as new! **I.F.**

Elonex MN024/Acer Peripheral JVP7156E/F3T

The display's background was flooded with green. I found that the three RGB amplifiers were working correctly, the cause of the trouble being incorrect voltages from IC103 (Acer AP3105G). Pin 11 was being pulled to +5V by the in-line resistor network RP1910 (8 x 4.7k Ω). The results with a replacement AP3105G chip from a scrap chassis were exactly the same, so either both chips had the same fault or the front-panel microcontroller was sending a faulty serial-data sequence to the chip at switch on. I then found that with IC103 removed the monitor produced a display that had a normal grey scale. But all three screen cut-off and gain adjustments were at maximum, and the user contrast and brightness controls no longer worked.

As a socket was fitted, I decided to try bending pins 10, 11 and 13 of IC103 out. This produced normal gain and user control operation with the three colour cut-offs at maximum. An e-mail was sent to Acer Peripheral (webmaster@acercm-eu.com) but the customer was in a hurry for his monitor. So I added a 47k Ω preset from the IC103 pin 11 position to chassis to enable the green background to be adjusted. This worked and the customer was satisfied with the results.

Pin 10 of IC103 is for blue background adjustment and pin 13 for red. Presumably the other outputs along this side of IC103 are for the video gains and user controls, but I wasn't able to check on which of the other pins does what. **I.F.**



VCR CLINIC

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We welcome fault reports from readers – payment for each fault is made shortly after publication. See page 554 for details of where and how to send reports.

Sony SLV373UB

These decks may be ten years old, but many are still in use and working well. A common problem is tape looping at eject, because of a stiff pivot-bearing on the RVS arm. We've now found that another cause of this symptom is a worn brake on the take-up reel turntable. E.T.

Aiwa HVF125

There was no RF output from this machine. Not having a circuit diagram, all I could do was to check that there was a supply to the modulator. Pin 5 was at 5V, but all the other pins were at 0V. I assumed that this was OK, but as I was about to start unsoldering the modulator I spotted that IC307, which is an N10 circuit protector, was open-circuit. A replacement restored the RF output – at much less cost than a modulator repair. C.W.

LG BC969i

This new VCR had apparently died while recording. I carried out some checks on the outputs from the power supply and soon discovered that the 1N5822 Schottky diode D106 was short-circuit. C.W.

Sanyo VHR251E

The customer said that the picture and sound disappeared after a few minutes, leaving just a blue screen, when the machine's own recordings were played back. Playback of prerecorded tapes was OK. Voltage and current checks in the record/playback paths failed to reveal anything amiss. The cause of the trouble turned out to be mechanical: the tension-band lever was out of position. The cure was to adjust the tension band as laid down in the manual. J.C.S.

Sony CCD-F335

The E-E and playback sound had gradually faded away until it was non-existent. On investigation I found that the surface-mounted electrolytic C420 (1µF, 50V) had leaked. Because the fault had been left so long, the copper had been eroded at one point. Fortunately it was repairable. After that the camcorder worked normally but, to avoid bounces, I obtained the owner's permission to replace all suspect electrolytics. R.B.

Sony CCD-F330

This well-used camcorder suffered from surface-mounted electrolytic capacitor problems. The playback pictures were, as usual, affected by the five 22µF, 6V capacitors C317, C320, C330, C348 and C353 on board SS86. The E-E and thus the recorded pictures were severely broken up.

To be on the safe side I replaced C790 and C791 (both 33µF, 4V) on board VC50 and C808 (4.7µF, 35V), C812 (22µF, 6.3V), C810 and C816 (both 10µF, 16V) on board VC51.

As usual, it was the 22µF capacitors that were causing the problems and, as usual, the boards were undamaged.

Another CCD-F330 was brought in because there were striations on the E-E and playback pictures. The culprits were C494 (10µF, 16V) and C497 (22µF, 6.3V). To be safe, I did a blanket electrolytic capacitor replacement job. R.B.

Granada/Finlandia VHS-LH7G (Hitachi VTF250E)

This machine would accept a cassette. But when eject was pressed it would unlatch, the capstan motor would 'grumble', then it would latch up again. A clue was provided by the fact that the LED display dimmed slightly during the 'grumble' period. So attention was turned to the power supply.

I found that an LT smoothing capacitor, C12 (470µF, 16V, 105°C), was faulty. A replacement restored normal operation. This model seems to be similar to the Hitachi VTF350E. D.F.

Aiwa HVGX770K

The complaint was dead with no display. I found that the 5V rectifier D517 was short-circuit. It's a Schottky-GL diode, type SB340L. Type 1N5822 seems to be a cheaper equivalent. D.F.

Sharp VLE66

This Viewcam unit was dead. On investigation I found that CP901 was open-circuit because the display DC-DC converter can was faulty. N.B.

Toshiba V711B

This machine had a general reluctance to return the tape to its owner. All other functions were all right, including acceptance of tapes. I stripped the carriage right-hand side, then cleaned and refitted the switch. After that all was well. S.L.

JVC HRD610

The cause of a recent case of the machine being dead when the family returned from a short break was traced to C12 in the power supply unit. S.L.

Panasonic NVDH600B

There was a tricky problem with this machine. The tuning wasn't 'positive', with occasional tuner drift – usually only slight. The cause was eventually traced to C7605. It's an 0.1µF, 50V capacitor, part no. ECUM1H1042FN. Come to think of it

we've had failure of this type of capacitor in many Panasonic colour TV sets and VCRs over the years. **S.L.**

Sharp VCM20HM

Intermittent failure to accept a tape or intermittent stopping can be caused by faulty start or end sensors. They can be obtained from WVE under part no. 0233GEZZ. **S.L.**

Sony SLVAV100

Echo on the playback sound is a complaint we still get with these machines. Don't waste your time looking for the cause of a fault however – it doesn't exist! Go to the audio menu and deslect the audio mix mode. **S.L.**

Mitsubishi HSM50

The symptom looked like that produced by dirty heads. We've been fooled by this before however. A sharp tap on the deck removed the symptom. The cure is to remove the head amplifier and resolder the connector connections. Redo all the panel earths at the same time. The fault can be very intermittent. **S.L.**

Toshiba V213B

This machine was dead with a slight whistling sound from the power supply unit. Z821 turned out to be the cause. It's in the always 14V supply. The part no. is 23144480. **S.L.**

Samsung SV231BV

There was no record sound, though pre-recorded tapes played back OK. The cause was traced to resistor R3A19, which feeds the record signal to the audio/control head assembly. It had not been soldered in place correctly during assembly, and made only intermittent contact with the PCB print. Resoldering cured the fault.

We've had another of these machines in the workshop recently, this time with no record or playback audio. The audio/control head assembly had to be replaced. **S.H.**

Matsui VP9601N Mk 2

The cause of weak sound and cyclical mistracking turned out to be a faulty pinch roller. Although the original pinch roller didn't appear to be at all misshapen and was unusually clean, it made the tape ride fractionally high over the audio/control

head assembly. Turning the roller upside down proved the point, and a replacement cured the problem.

The sound problem was obviously not present when a tape with hi-fi sound was being played but, oddly, the mistracking was also much less pronounced.

I gather than this machine uses a Tatung deck. **N.A.**

Panasonic NVHD600

There was no record picture. Playback and the recorded sound were OK. The cause was Q3002 (BC856B) which was short-circuit. As a result there was no 5V record supply at pin 2 of the head amplifier. **D.M.T.**

JVC HRJ265

This machine was dead with no display and no functions. The cause was zener diode D5301, type MTZJ15A, which was short-circuit. **D.M.T.**

Goodmans/Daewoo VP2500

There was no playback – it looked as if one head was faulty. The cause was C408, which is connected to pin 89 or IC301. **D.M.T. ■**

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The USB card simply pushes into one of the three PCI slots at the rear left of the motherboard – once the blanking plate has been removed. First open the hinged plastic inner cover, which has sliding clips to hold it in place. Take care when pushing the card into its slot, because it's easy to bow the motherboard downwards and dislodge the adjacent audio card from its slot. This can cause problems at start-up, or simply loss of audio.

One problem for me was that I found it almost impossible to remove the USB card from its slot. I didn't like this, so I removed solder from an unused hole at the corner of the card and inserted a key ring, insulated with tape. See Photo 2.

No software is supplied. Mac OS 8.6 and later operating systems already include USB drivers. If the card is not recognised, all you have to do is to download the relevant USB driver installer from Apple's web site. At the time of writing this installer is called USB Card Support 1.4.1.smi. If you are using the card in a PC, simply follow the instructions enclosed with the card and install the Windows driver. If the card is to be used with a printer for example, the relevant printer driver software will also have to be installed.

The advantage of having USB connections is that external accessories such as printers, scanners, Zip drives and cameras can be hot-plugged and used immediately without the need to reboot the computer, as you would have to do with SCSI devices.

Analogue satellite receivers

A lot of people still use analogue receivers. Although BSkyB's analogue transmissions are about to end, other services are available. In addition receivers such as the Amstrad SRD2000 and Pace MSS1000 have a built-in Dolby Pro-Logic surround sound amplifier that can be used independently of the receiver section, and the ability to route scart inputs from other equipment. Even if they are not used for satellite TV reception, these boxes still make a useful addition to a living-room home-cinema system. A further point is that the MSS508ip and MSS1008ip have built-in dish-position controllers that can be used in conjunction with a digital receiver. So customers still ask me to repair these receivers.

Faulty MSS1000s

The last MSS1000 I had in exhibited a typical VideoCrypt decoder fault, with the on-screen graphics drifting from left to right and Channel 5 TV scrambled. Since this channel has been available via SkyDigital for some time it was no great loss, but the customer wanted to be able to see the on-screen menus.

The easiest way to bypass the decoder is to remove the 100Ω surface-mounted resistor R72 and solder a wire between

JACK'S WORKSHOP

Jack Armstrong

Mac upgrades

Apple Mac users are frequently happy to upgrade their computers rather than spend hundreds of pounds on a new one. A major limitation with earlier Macs is the lack of USB ports. This is a permanent drawback with the Mac Quadra, Centris and earlier models, because no one makes a USB adaptor card to fit in the NuBus slots with which these Macs are equipped. Later PowerMacs and the beige G3 however have standard PCI slots that will accept a PC USB card such as the one in Photo 1. A major advantage of the Belkin type is that it comes with both Mac and PC software, so you can stock one card which will do for

Macs or PCs, eliminating the need to stock something special that might sit on the shelf for months.

When I fitted a Belkin USB card to a beige Mac G3 recently I was slightly confused about the way in which the top cover of this desktop computer is held. But the manual revealed the method. There are two semicircular clips beneath the front panel 'overhang'. Push these clips up and you can pull the entire front, top and side cover assembly forwards then upwards. Incidentally I make the distinction between the beige and the later Bondi Blue G3 because the latter comes with USB as standard.

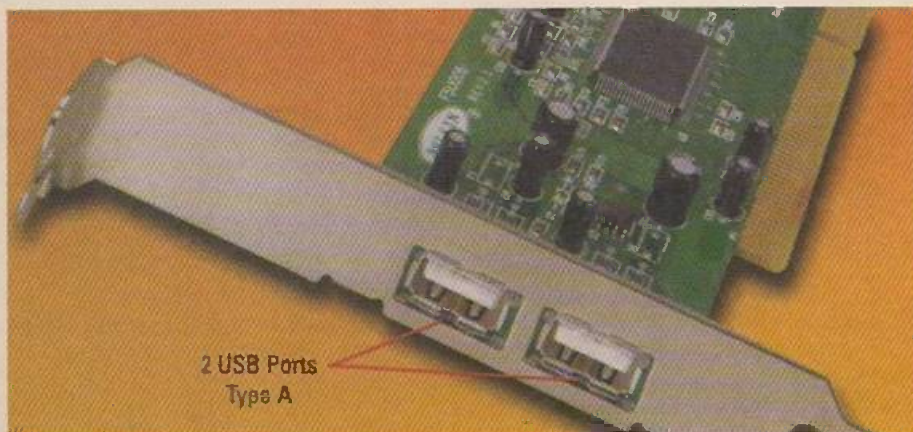


Photo 1. A typical PCI card with two USB ports.

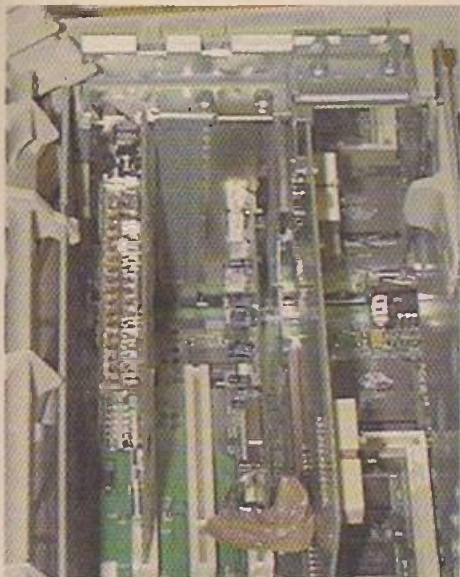


Photo 2: USB card fitted inside a beige Mac.

links LK154 and LK151. When this has been done you won't get Channel 5 TV but you will get MTV Germany. U29 (PTV111) is required because it provides sync for the graphics and the "no signal" message. If it fails, it can be replaced with a TEA2130. The nearby capacitor C208 is prone to failure. It should be replaced with a 1µF bipolar electrolytic or multilayer ceramic capacitor.

In common with most other receivers, you occasionally get power supply failure with the Pace MSS1000. I've had a few

however where the power supply appeared to be dead but produced a faint ticking noise. Disconnection of the Dolby Pro-Logic sound board brought the receiver back to life, the cause of the problem being one of the 4280 power amplifier chips on the sound board. Failure of these ICs is usually caused by human intervention: it's important that loudspeaker wires are not connected or disconnected while the receiver has mains power connected.

Very occasionally replacement of the 4280 ICs has not produced a complete cure and I've also had to replace the surface-mounted components D1 (4.7V zener diode), Q3, Q4 (both type BC846B) and Q6 (BC856B). See Photo 3.

It's worth checking the high-current FES8FT diode D54, which is just in front of the main power supply transformer, since this can go short-circuit with the same symptoms. I also usually replace all the special UHR electrolytics supplied in Relkit 10 (phone 01270 753 311 for details).

If the power supply remains dead after disconnection of the sound board you will need Satkit 10. But don't assume that the

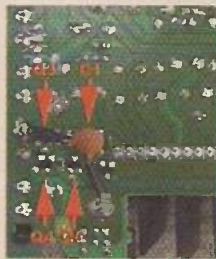


Photo 3: Part of the Dolby Pro-Logic board in the Pace Model MSS1000, showing items that can fail.

power supply is dead simply because the front panel fails to light up. There could be many different causes. Always check the outputs on the secondary side of the power supply.

Other sound faults can be caused by failure of the MSP3400 audio processor chip, and by the high-reliability electrolytics that are available in Relkit 10.

Very early receivers can suffer from intermittent loss of sound. This might require a wire to be added to the Dolby board or the latest-type microcontroller chip (U22) to be fitted.

If you have any questions about Apple Macs you can e-mail Jack from the internet web site at: <http://www.ukstay.com/jack>

You can also contact Mac Users and ask questions at the Yorkshire Mac User Group web site (YMUG): <http://www.ymug.york.co.uk>

Information about Sky Digital Satellite receivers can be found at: <http://www.satcure.co.uk>

You can order Apple Mac cables, connectors, batteries and other accessories from the SatCure web site at: <http://www.satcure.com>

Test Case 463

Sage is very fond of his holidays, and had once more abandoned the workshop to go swanning off. At the Gatwick check-in desk, suitcases in hand, he hadn't a care in the world – least of all for the woes of his colleagues back at the workshop!

Since his last encounter with video machines, which was reported in detail in last December's issue, Television Ted had decided to avoid them if at all possible. In fact he would hide behind a large TV set whenever a VCR came into the workshop for repair. So it was that TechnoCrat and Cathode Ray were put in charge of the video repair department. After a long struggle with a Philips video deck, Ray took to hiding behind an audio stacker unit, leaving TechnoCrat to deal with the video 'nasties'. By day three of Sage's absence there were ~~ten~~ ^{fifteen} machines in the queue. Something had to be done!

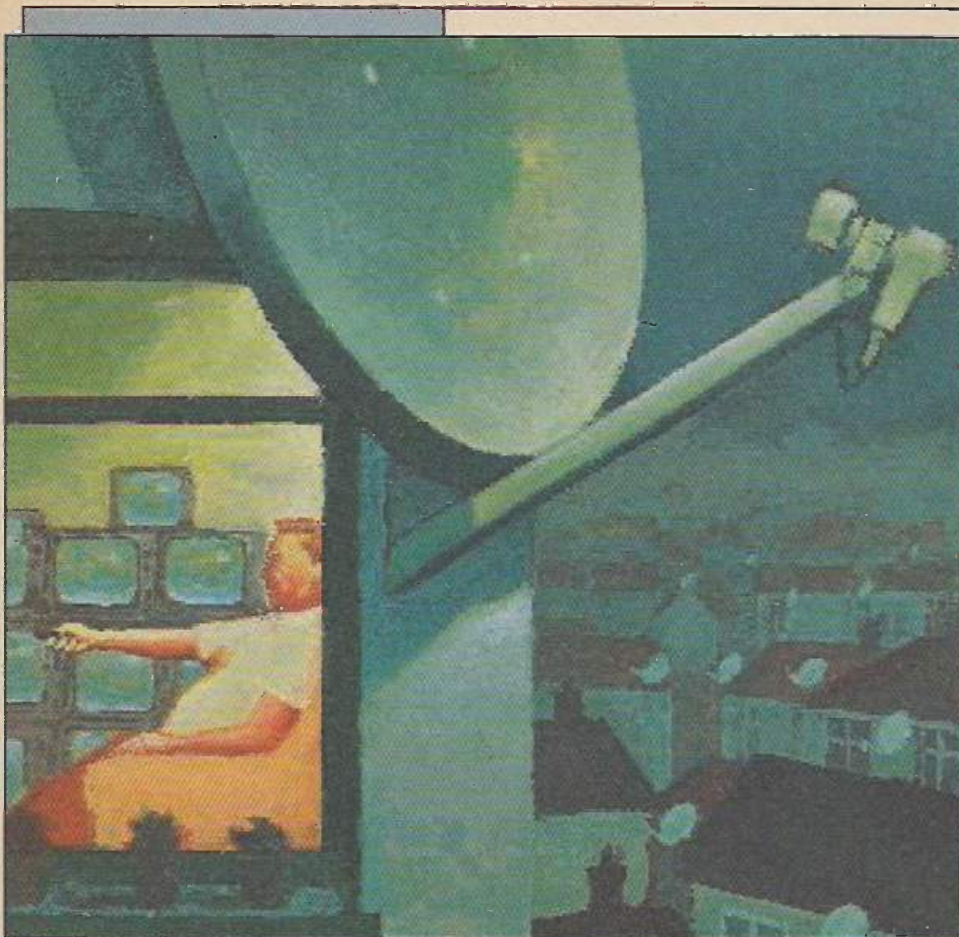
TechnoCrat waded into the first of them, an Hitachi VTM212E. It was accused of intermittently failing to eject a cassette, and of sometimes shutting down in the middle of record, play or fast transport. On test it worked all right for a while. But the third time it was asked to eject the tape it unlaced, whirred, then laced up again. When TC took the bottom cover off, he discovered that the cassette-loading cradle and its drive mechanism were free to move. In this design the cassette cradle is driven by the capstan motor. TechnoCrat stood the machine on its side to watch the mechanism in opera-

tion. On the fourth request to eject, the fault cropped up again. He saw that the capstan motor was rotating when eject should have taken place, and that the reel-drive pulley turned. When TC laid the machine flat again he noticed that during tape unlacing the slack was being taken up by the *right-hand* spool. What strange mechanical fault could cause this?

Well, mode switches can cause all sorts of peculiar faults, can't they? TechnoCrat fitted a replacement, but it didn't cure the problem. Indeed when tests were carried out the other fault symptom put in an unwelcome appearance – the deck sometimes refused to work at all, shutting down shortly after a function was requested. TC managed to confirm that all the power supplies were present and correct when the fault occurred and that, as far as could be seen, the loading and head-drum motors were playing their parts – so far as they were allowed to by the syscon with the fault present.

Attention was then turned to the capstan motor, which is a known source of trouble with this deck. A replacement was fitted, but it soon became apparent that the original one was OK – the faults were still there. Further checks showed that when backwards functions, like fast rewind and picture-review, were selected with the fault present there was correct operation of the loading motor and deck mechanics but *forward* motion of the tape.

Could the control processor have been at fault? Did Technocrat fancy sourcing an M38184MB-129FP and popping it in, just to try? No! It wasn't necessary. For the solution, see page 568.



SATELLITE NOTEBOOK

Reports from
Christopher Holland
 and
Michael Dranfield

Card reauthorisation

Mr Martin had been away from home for several months. During this time he had left his digibox disconnected from the mains supply and the telephone line, to avoid possible damage from lightning and power surges. When he reconnected his digibox he was surprised to find that most channels produced an on-screen message like the ones shown in Photos 1 and 2, for Channels 4 and 5 respectively, telling him to "upgrade his subscription to receive this channel". Those channels that didn't require an authorised viewing card, such as Sky News, TCM and CNN, provided a picture however.

There was no problem with his subscription but, as his digibox had been

unplugged for a while, his viewing card had not received the latest authorisation codes – they are updated at least once a month. Without the new codes a card will produce the above rather confusing message, as though the channel concerned doesn't form part of the viewing package. You see exactly the same message when, in normal circumstances, you go to a channel that's not part of the subscription, say Sky Sports.

When a receiver has been switched off for a few weeks the simplest solution is to switch it on and leave it. All the channels that form part of the original viewing package will reappear within a few hours, once the updated authorisation codes have reached the viewing card.

Strangely, the channels don't all



Photo 1: Channel 4 upgrade message.



Photo 2: Channel 5 upgrade message.

reappear at the same time. They come back in three separate batches, with Channels 4 and 5 as a pair, the BBC programmes as another group, and the Sky channels as a further batch. Any batch of channels can return first, and it can take 12-24 hours for everything to come back on. The authorisation codes seem to cycle around to all viewing cards in a continuous slow loop. As over five million cards are in use, this can take some time!

If a digibox has been off for a while it's a good idea to force a software update as well, because digiboxes sometimes crash when they have out-of-date software in them. To force an update, disconnect power from the digibox, press in and hold the 'backup' button on the front panel, then reapply power. Keep your finger on the backup button for a few seconds, until the front panel LEDs all light up and the software update message is seen (see Photo 3). When the message disappears and the front LEDs go out, except the standby one, power the receiver up as normal.

When a customer is going to be away for a considerable time and will be leaving the receiver disconnected from the phone line during the period of absence, it's advisable for him/her to phone Sky to report this, as leaving the digibox connected to the

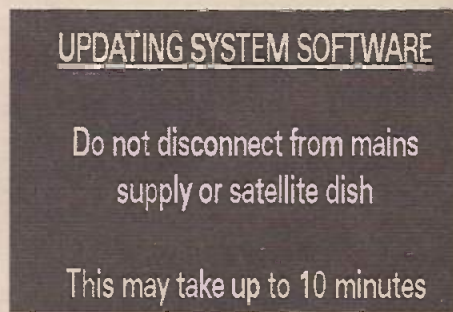


Photo 3: The software update message.

telephone line is part of the contract. In the analogue days you could leave a receiver disconnected for up to ninety days a year. This enabled the viewer to avoid paying subscription costs when away. This can probably still be done. C.H.

Grundig GDS200

This digibox wouldn't come out of standby. The usual cause of the problem is the

modem chip. Not this time however. I traced the cause to C16 (1,000µF, 16V) in the power supply module. It's the reservoir capacitor for the 3.3V supply. As this supply provides feedback to the error amplifier, the voltages at all the other outputs were wrong.

The 3.3V supply can provide 4.2A, so you can't use any old capacitor. Choose one rated at 105°C, with an ultra-low ESR and a very high ripple-current rating. Specialist capacitors of this type are available from Farnell Components.

It's also a good idea to replace C12 (470µF, 16V) with a high ripple-current type. M.D.

Digital channel update

Table 1 shows recently added channels available via Astra and Eurobird, with the transponder number in brackets after the frequency and the EPG number in brackets after the channel name.

Astra 2B is conducting tests with transponder 38 (12.422GHz, vertical polarisation), which has not previously been used.

Channels 998 and 999 have been renamed Sky Welcome and Sky Latest respectively.

Radio stations that were previously listed from ch. 937 upwards have been moved to start at ch. 871, leaving the 900 group of channels clear of radio stations.

Most transmissions via transponder 36 (12.402GHz, V) are being gradually moved to transponder 33 (12.344GHz H).

Eurobird's transponder D12S (11.680GHz H) also transmits a God Channel package that was previously

available via Sirius 2 at 5°E. The package is currently being transmitted without encryption and, at the time of writing, it can be received using a digibox. But special decoders that use the Cryptoworks encryption system are being provided for subscribers. God Channel (EPG no. 650) via Astra 2B, transponder 35, is still available and is not affected by the Eurobird transmissions. C.H.

Table 1: New digital channels

Frequency (GHz)	Satellite/beam	Polarisation	Channel
11.585 (D7S)	Eurobird	H	Fashion TV (220)
11.680 (D12S)	Eurobird	H	Euronews (528)
11.758 (3)	2A N	H	Smash Hits (451)
11.798 (5)	2A S	H	BBC 2 Northern Ireland, Wales, Scotland (102)*
11.817 (6)	2A S	V	UK Horizons + 1 (565)
11.895 (10)	2A S	V	MTV Dance (448)
12.284 (30)	2B S	V	Gameplay (223)
12.344 (33)	2B S	H	RTE Radio 1 (892), Magazine Showcase (208)
12.402 (36)	2B N	V	Where it's at (461)

N = north beam, S = south beam.

*Out-of-area BBC 2 regions are available on chs. 964, 965 and 966 which were previously used for out-of-area BBC Choice transmissions. The latter have ceased. There is currently only one BBC Choice service via the BBC's transponder 1, reducing the number of channels transmitted by this transponder from nine to six. BBC 2 Northern Ireland is now available on channel 215 to digiboxes in Ireland with a Sky subscription.

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Baird 30 Line Recordings

<http://www.dfm.dircon.co.uk>

For history buffs and the curious here's a fascinating site containing early TV recordings and their background.

BBC

<http://www.bbc.co.uk/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 caravanners 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 interrogate the data base by filling out an order form, with the "request" box ticked, and then wait for an email to arrive back on your computer. However, an on-line index would be useful and maybe on-line downloading of the manuals.

Dönberg Electronics

<http://www.donberg.ie>



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MB21

<http://www.mb21.co.uk/index.html>

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

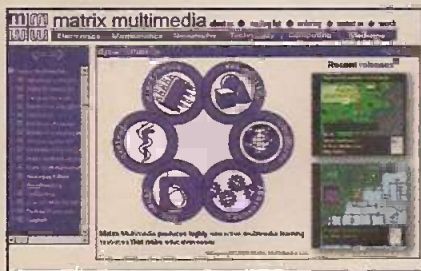
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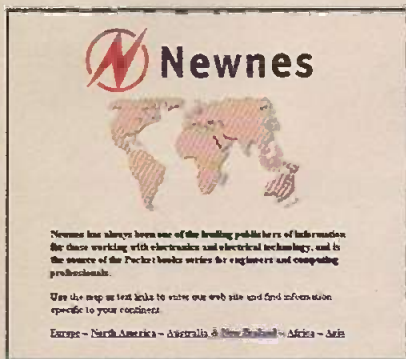
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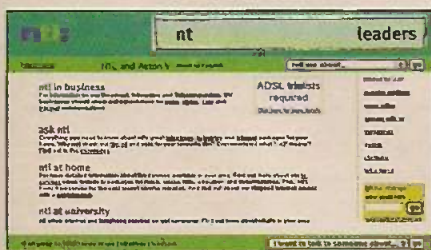


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Ntl

<http://www.ntl.co.uk>

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



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

Mauritron Technical Services

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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)



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Timecast

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

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

Televés

<http://www.televés.com/ingles/ingles.htm>

Televés 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/uktvrrepair>

Following on from the newsgroup discussion last month there is a UK Email group for TV technicians where you can



send an Email to everyone in the group. There's just over 30 people in the group at present. For more details and how to register look at the egroup home page. Just a general comment though - you do have to be careful who you give your Email address to so that you can avoid "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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AUDIO FAULTS

Reports from
Nick Beer
Geoff Darby and
D.M. Thomas

We welcome fault reports from readers – payment for each fault is made shortly after publication. See page 554 for details of where and how to send reports.

Uher 4200

With the advent of the MiniDisc there are not many of these once common reel-to-reel portable tape recorders still in regular use. But the freelance reporter who owned this one was adamant that its failure shouldn't mean the end of a long and happy association!

I settled down to deal with a variety of faults. Work included new belts and pinch roller, clean and lubricate the capstan bearings, etc., but the major problem was that with new recordings there was only very low and distorted audio while the record-level meters didn't deflect one iota. These symptoms were caused by the loss of the supply across R80 (5.6Ω), which had been getting very hot – this was not surprising as the 1,000μF, 6.3V axial reservoir capacitor C88 was short-circuit. Replacement of these items restored normal operation. N.B.

Sony HCD-S300

There was no audio output from the amplifier section of this 5.1-channel DVD unit, though audio via the TV set was OK. The output protection relays weren't closing because one of the TA2020-020 output chips was faulty. In this case IC301 was the culprit – its two channels drive front and rear speakers. The fault-monitoring circuit in this unit requires all three output ICs to be present and working before it will release the output relays, so the same situation could be caused by failure of either of the other two output chips. It's more usual for removal of a faulty IC to restore operation with the remaining chip(s). G.D.

Pioneer CT-L77 cassette deck

The cassette tray would open when asked, and take a tape in. But when play or any other function was selected the display would just show "no tape". After much time was wasted checking the operation of the cassette-in and associated switches I did what I should have done first: check the supply lines. There was no -6V supply because no -14V feed came from the XC-L77 tuner/amplifier unit: circuit protector IC5222 (1A) was open-circuit. Once this item had been replaced the deck detected a tape and everything was fine – until reverse play was selected, whereupon the mechanics groaned and froze, stalling the motor. Hence the blown protector, I assume.

The reason for the failure was that the flip-over record/play head was locked solid in the forward play position. When the head block was removed to find out why, I saw that the paint which seals the azimuth

adjust screw was excessive and had dripped down on to the stop tab on the head, effectively supergluing it to the azimuth screw. Once this seal had been broken and the excess paint had been cleaned off, the head rotated fine. When the deck was reinstalled it performed faultlessly.

Why did the excess paint suddenly decide to glue these two parts together? It looked like factory original, and I know that this particular system had been working all right in the customer's house. I'm also puzzled as to why loss of the -6V supply should have upset the system control: as far as I can see it's used only by the op-amps in the signal path. G.D.

JVC UX-T100

The job ticket attached to this hi-fi unit said "stuck in standby". Totally dead would have been a better description. The system control micro chip was inactive because its 5V supply was low at just 3V. The simple cure for this condition is to replace the 78L05 regulator IC703, which is situated on the LCD and System CPU board. Once the 5V supply had been restored the unit worked correctly. G.D.

Sony HCD-CP11

This was a nasty little one for a Monday morning! The sled motor drive was poor, with the optical block returning home very slowly, and the focus search was weak, with the lens barely moving. These two symptoms led to investigation around IC102, which provides the sled, focus, tracking and spindle drives. Although the supply to this IC was correct at 7.8V, the voltages at most of the other pins were wrong.

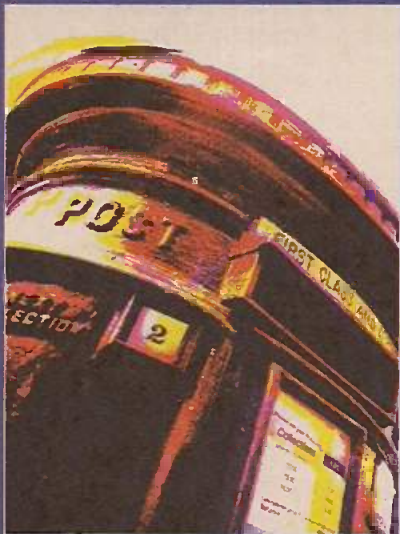
The cause of the problem was eventually traced to the surface-mounted 0.1μF capacitor C153, which was doing a good job at pretending to be a 1kΩ resistor! It decouples the input to the IC's internal reference voltage generator. A replacement restored normal operation. G.D.

Technics SLHD501

This CD player would stop after five-ten minutes, with no functions at all. The cause was R443 (6.8Ω, 0.25W) which had gone high in value. D.M.T.

Aiwa XRM11, XRM12 etc

You sometimes get the complaint that the front controls intermittently fail to work. The remedy is to replace the 0.01μF surface-mounted capacitors C338 and C339 on the front PCB. D.M.T. ■



LETTERS

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Design nightmares

There ought to be a top-ten name-and-shame list of bad designers who have produced veritable nightmares for service engineers to work on. Furthermore they should be forced to repair the equipment themselves! Here's a short list of what I mean:

- (1) The Hitachi Opus Hi-fi Model MX-W50. A major operation is required to replace the amplifier IC.
- (2) The Thomson/Ferguson ICC7/8/9 CTV chassis, which use unnecessarily complex trip circuits.
- (3) The Panachronic (yes, that's the way I spell it!) K VCR mechanism. Try getting the cassette mechanism out when the loading-motor coupling has cracked. A screw too far.
- (4) Mitsrubishi CTV chassis with the wiring harnesses too tight to be able to work on the chassis.
- (5) Sharp TV sets with video boards that are an outrageous £60 + VAT to replace. CRT flashover can cause an action replay at the above price.
- (6) The Philips Turbo VCR deck's plastic. Fantastic: just touch the mechanism and a bit falls off.

Repair is more straightforward in factory conditions, with jigs and relevant tools. But designers should spare a thought for us poor souls out in the field or in one-man workshops. Do the manufacturers want their products repaired, or is this all to do with built-in obsolescence?

Ray Withey,
Edinburgh.

DTT signal assessment

In his letter in the April issue Martin Turner says he understands that standard STB's measure DTT signal quality in terms of BER, and that this is unreliable. There are of course two versions of BER, bit-error rate and bit-error ratio. The bit-error rate is what you get after the error-correction circuitry in a signal-retrieval system such as a digital camcorder, and is a direct measure of video head/tape quality. If the heads are worn or dirty, or the tape is sub-standard, the bit-error rate displayed as errors/sec rises in proportion to the deterioration of signal quality.

With DTT it's the bit-error ratio, which should be a maximum of 2 in 10^{-4} , that's relevant. A good signal provides a reading of 1 in 10^{-7} after the application of Viterbi correction. A more reliable measurement is before Viterbi correction however. Values in the order of 2 in 10^{-2} may be encountered.

In addition to the carrier-to-noise values Martin gives, there is a further signal-quality measurement, CSI (Channel Status Information). This is an indication of the quality of the carriers that form a CODFM channel: it's the percentage of the carriers that are discarded as unusable, possibly because of cable matching or signal reflections.

BER and CSI measurements are both of signal quality. If they are high enough there will be pixelation in high-resolution/fast-moving areas of the picture, leading to frozen pictures as the atmospherics change (the digital cliff). These parameters cannot be measured by an STB. But if an on-screen display of BER prior to Viterbi correction was made available, which would not be an impossible task, the STB could indeed be used as its own meter.

For professional use, an instrument such as the Promax ProLink-3 will measure all useful signal parameters. For general installation purposes the Promax Prodig-2 measures power for digital carriers and signal level for analogue carriers, also the all-important C/N ratio for digital-carrier quality.
Steve Beeching,
Newark, Notts.

CD-ROM manuals

Steve Beeching's article on the modern practice of supplying manuals in CD-ROM form (June, page 476) was most interesting. We have been using them for some time now, and agree with most of his strictures.

Sony's decision to use DVD is barmy. Use of DVDs is 99.9 per cent for entertainment, films etc. Very few repair shops are going to fit a DVD drive to a PC just to be able to do the very few Sony jobs that come it.

To overcome the tunnel-vision Steve mentions, we have taken to printing off the diagrams then pasting them together into A3 form.

It is possible to print an enlarged section of a PDF file however. For users of Windows 9x, 2000 or ME, the method is as follows:

- (1) Enlarge the section you require, using Acrobat. Then press the print-screen key (this does not send the screen to the printer but transfers a copy to the clipboard).
- (2) Exit or minimise Acrobat. Then start up a photo-editing programme, e.g. iPhoto 4.
- (3) Pull down the Edit menu and choose Paste. A copy of the Acrobat enlargement will appear on the screen. Crop off the unwanted bits. Enlarge it to whatever you want, then print it.
P.J.E. D'Alquen,
Pickering, N. Yorks.

Capstan motor pulley

I mentioned a capstan motor pulley problem with certain Toshiba VCRs, e.g. the V813B, in the February issue (VCR Clinic, page 233). In the May letters pages D. McIntyre suggests using a metal pulley intended for Mitsubishi machines. I subsequently found a much cheaper nylon replacement, but don't have the details to hand.

The main trouble with the metal pulley is that it's a bit slack, hence the need to glue it. Because of the need for gluing and the extra expense (cost plus fitting), I don't personally recommend the metal pulley. If you don't get it exactly central, the belt will wobble. There is also the fact that the extra weight will affect the spin velocity, imposing a strain on the motor and the power supply. The nylon type is cheaper, easier to fit and will outlast the VCR's life expectancy.

*M. Della Verita,
Langley Park, Co. Durham.*

Matters arising

In the May Help Wanted section T. Steel asked about the DBL324 chip. There is a strong possibility that it's a generic 324 quad op-amp, which is almost as common as the 741. When searching for a device it's worth trying:

<http://partminer.com/partminer/index.html>

You have to register before you can access the database servers, but it's free. Partminer also has a manufacturers' logo identification chart that enables you to click on the one you are trying to identify. This brings up a page with a link to the company's website.

The comprehensive search facilities include device comparisons and lists of direct replacements for obsolete parts, and 'nearest to compatible, same function' information, as well as direct type number, parameter or keyword searches. The database includes a section for passive components.

Another useful feature is the search facility to find out who has remaining stock of any given part.

Some recent changes in my workshop affected radio reception. Because most of the monitor-test PC cabling shares a channel, behind the bench, with the mains cable and speaker leads for my tuner/amplifier, clear radio reception has always been difficult to obtain. After revising the bench layout, radio reception became all but impossible. I managed to cure the problem by using clip-on ferrite collars salvaged from scrap equipment. Although not as common as plain toroidal ferrites, the split types with plastic clamps do turn up occasionally. I always save them, and have now used up my stock in silencing the RF interference radiated by the PC.

I attached a ferrite collar to every cable that emerged from the back of the PC,

including the one for the mouse! For the most effective suppression, cables that connect two mains-operated items together (and earthed together) require a ferrite collar close to the connector at each end.

As the PC and tuner/amplifier cables run alongside each other, there will always be some breakthrough. But adding ferrite collars to every cable has made a massive improvement.

Finally it was not, perhaps, made clear in my article on charging lead-acid cells (April) that two weeks is the maximum permissible discharged storage period. After that plate sulphation becomes irreversible.

*Ian Field,
Letchworth, Herts.*

Denon

A number of people have complained that they cannot fax us in connection with Denon spares. On checking, we have found that this is because the wrong fax number is given in the 2001 *Television TV/VCR spares guide*. The correct number is 01753 880 109.

*Christine Vaughan,
Hayden Laboratories Ltd.,
Chiltern Hill, Chalfont St Peter,
Gerrards Cross, Bucks SL9 9UG.*

DTT take-up

While in total agreement with your leader in the May issue, I feel that the digital take-up problem is far worse than you suggested. I'm one of those who would not have pay-TV at any price, and am also not interested in interactive services that require me to have a box connected to the telephone line. So what has DTT to offer me? Simply widescreen, interference-free, high-quality reception. Well, where is it?

I recently borrowed a Nokia box that was waiting to be returned from one of the many failed installations in this area (where the post code said it would work, but reality was otherwise). My aerial system turned out to be adequate for digital reception, with all the multiplexes coming up at maximum green. I then carried out some tests, using a 33in. 4:3 Mitsubishi set that I've modified to display true 16:9 pictures for DVD use.

This set features a comb filter, so both composite and S inputs are displayed with a resolution of better than 500 lines. The last time I saw a test pattern (some years ago!) the tuner unit was not quite able to resolve the grid in the last definition bar. I therefore think it quite reasonable to expect a significant improvement in definition, using the STB's RGB outputs, compared with my composite analogue signal. This was no so, even with BBC/ITV. The results were clearly inferior to my DVD pictures via the S input (apart from better colour registration, as would be expected with RGB). The definition on many other channels was frequently sub-VHS.

I was aware that digital TV is

susceptible to interference. To have this confirmed is extremely worrying, whether the cause is electrical noise or trees waving in the wind (even in winter), or maybe ferry boats at locations such as the Solent. I wonder how many people who purchased a digital set last winter lost channels in the spring, once the trees had come into leaf?

Sound quality is no better than with Nicam, particularly as there is no 5.1 facility. The sound broke up in the presence of interference levels that have no effect with Nicam reception.

The widescreen/normal formatting was often completely wrong, even on BBC.

There are horrible, distracting, annoying and unnecessary on-screen logos. Get rid of them please!

So much for improved reception quality. On the subject of time-shift recording, it's ridiculous that you can't record one digital channel while watching a different one, unless you have another STB (plus subscription?). In much of my area this is made worse by the need to change from an A group to a wideband aerial for digital reception - this often results in poor analogue reception for the VCR (the ONdigital £40 upgrade does not seem to cover a separate aerial for digital). In addition there's no PDC system to control VCR recording. These minus points are not well advertised, possibly because they are the biggest turn-off of all.

So there's nothing at present to tempt free-to-air viewers to spend money on becoming part of the digital revolution. This will restrict DTT take-up. FTA viewers will want affordable boxes (FTA only?) that can preferably decode two channels at once, one for the VCR via an S or a composite-video connection. The box must also be able to work under poor signal conditions, so that it can be taken home and plugged in to an existing aerial installation (the £40 upgrade would not apply). I also wonder how good the currently-available boxes are?

Transmission also needs to be considered. Are there too many DTT channels to be able to provide the advertised pin-sharp pictures with the available bandwidth? I was very surprised to find that the DVB-T transmission system can be used for mobile reception, where signal conditions are generally very poor, with significant electrical interference. At first this didn't seem to tie up with the problems I know installers are having, or my own test results. Perhaps the answer lies in the following quotation from the UK DVB-T specification: "Some countries have chosen to introduce a digital TV service which is based on more robust modulation, allowing mobile reception of the signal, or to pilot high-definition TV. In both cases the bandwidth (number of channels) has been traded." In trying to compete with Sky's wide channel selection, has ONdigital traded reception quality? ■

J.K. Millns, Romsey, Hants.

Answer to Test Case 463

- page 559 -

As TechnoCrat gazed gloomily at the surface-mounted 100-pin control chip in the troublesome Hitachi VTM212E VCR the time pips sounded on a soak-testing radio. It was eleven o'clock, coffee time. On the sunbaked ferry between Lanzarote and Fuerteventura, Sage looked at his watch. Eleven o'clock, time for a cold white Canary wine. He sent Mrs Sage to get some, and turned his attention once more to the sparkling sea. Back in the workshop, a committee of three had gathered around the Hitachi VCR, each with a mug of coffee in his hand . . .

What do you do when you've got an intermittent fault with a piece of equipment? Bang it with the handle of a screwdriver of course! The PCBs were tapped while the tape was going forward during a fast rewind command. Sure enough the deck stopped working. It was restarted, in the review (search backwards) mode. Tapping the main PCB smartly reversed the tape's motion.

Close checks with a bright light revealed the cause of the problem. On their way to the capstan motor the commands from the control processor pass via the servo panel. Many of the joints between this panel and connector P953 were dry, with little telltale rings in them. Thorough resoldering cured the problems. This left just fourteen video machines to go! Roll on Tuesday week.

NEXT MONTH IN TELEVISION

Intelligent homes

The home of the future will be full of electronically-controlled equipment that can operate with little or no human intervention. This will involve a lot of installation work, and probably some fault tracing and sorting out of compatibility problems etc. Mark Paul provides an introductory overview of what it all involves.

The Panasonic Euro-4 TAU

As a follow-up to his article on the basic Euro-4 chassis, Brian Storm describes the differences with the TAU version. These sets are fitted with Quintrix-F tubes for improved picture quality, and incorporate a number of circuit features to ensure perfect displays.

Black-level stabiliser circuit

A problem with monochrome portables, which are often modified to act as CCTV monitors, is that they usually employ AC coupling between the video output stage and the CRT. As a result, the black level varies with picture content. Keith Cummins presents a simple stabiliser circuit that can be added to overcome the effect.

Car alarms and immobilisers

More work that the TV/electronics engineer can undertake in the automobile field. This time Tom Baker discusses alarm and immobiliser installation.

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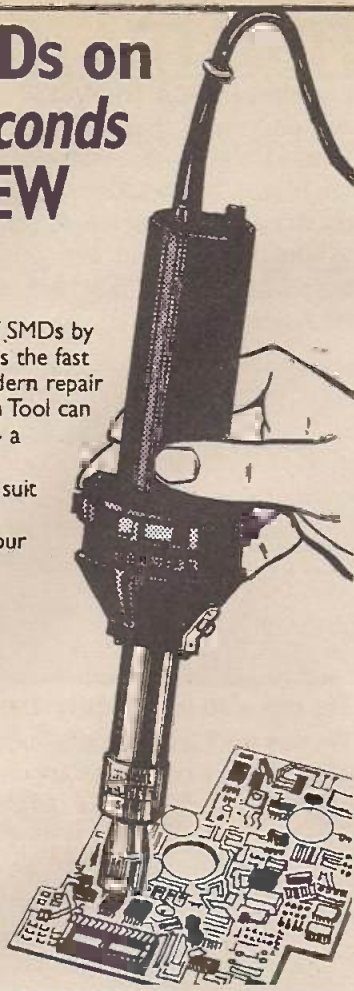
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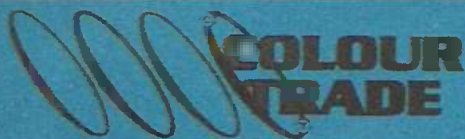
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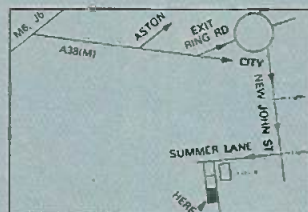
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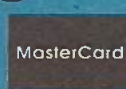
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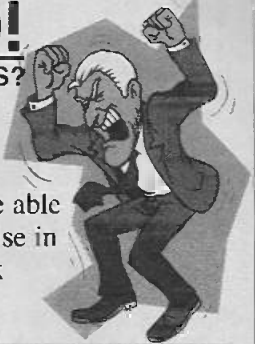


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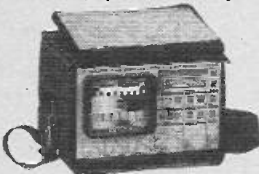


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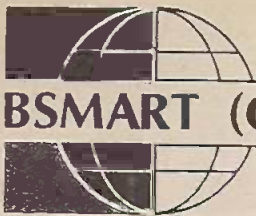
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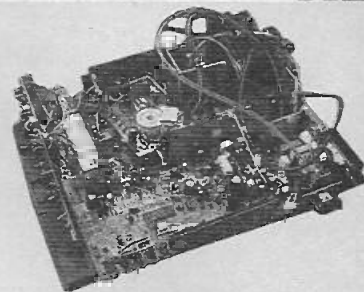
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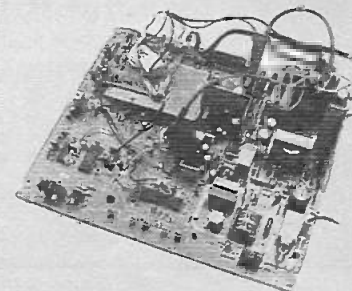
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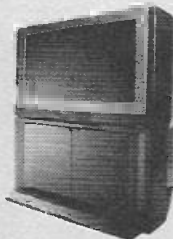
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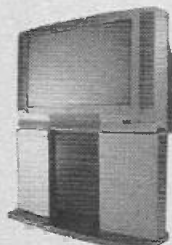
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