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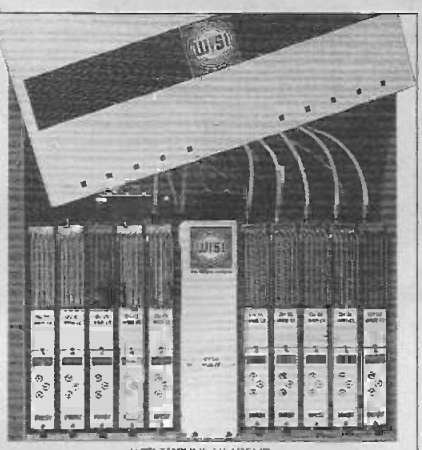

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Sir Stanley's era

The announcement that Sir Stanley Kalms will retire from being chairman of Dixons in September next year, when he will be just short of 71, draws attention to his extraordinary success in building up the company. His father, Charles Kalms, started things off when he set up a photographic studio in 1937. Sir Stanley took over the camera shop in Edgware in 1948, and went on to build up a chain with 1,200 outlets and a stock market valuation, as one of the FTSE100 leading UK companies, of some £5bn.

I recall the Dixons Photographic shops, as they were then called, in the early Fifties. Even that far back they were recognisable as what the chain was to become, with masses of enticing stock at keen prices. At some stage it must have become clear to Sir Stanley that you can go only so far by concentrating on cameras and related products. To add consumer electronics was a logical step in building the business: a much larger market, touching every home in the country, with great prospects as new products came along.

Many other companies and organisations had similar ideas over the years. None at any time, except possibly Comet in its early years, managed the growth rate of Dixons, nor its sustained profitability. How could Sir Stanley succeed in what others failed to do, especially in what was to become perhaps the most difficult and competitive of all consumer markets? He's unlikely to tell us, but some factors are clear: careful buying and sourcing, careful control of costs, a flair for what people are going to want and are prepared to pay, always having adequate stock to meet demand, and well-timed investment in expansion. Sounds simple, maybe, but in practice it's not so easy to achieve these objectives, especially in an ever-changing economic climate.

Sir Stanley certainly had marketing flair, the ability to know what would sell. He played a large roll in the development of own-brand products, the result of sourcing from suppliers throughout the world. But he does not seem to have been an easy person to work for or deal with – successful entrepreneurs seldom are!

The development of Dixons was not simply a matter of building up a retail chain however. Expansion took several forms, some more successful than others. And, as consumer use of electronics for one purpose or another steadily expanded, it became apparent that Dixon's stores alone couldn't adequately cater for all these needs. Hence PC World and The Link.

One of the most successful moves was the purchase of Currys, in 1984. This gave rise to public concern at the time, on monopoly grounds, but the Currys business was soon set on a new and different course, as part of the growing trend to out-of-town retailing. As with so many companies that reach a critical size in their domestic market, one way to continue growth appears to be expansion overseas. It doesn't always work. Think of Marks and Spencer's travails in N. America and, more recently, Europe. Dixons also had a disaster in N. America, when it bought the US retailer Silo in the late Eighties. UK retailers seem to find it difficult to assess the US market, and to control stock and expenditure at such a distance. Dixons has had better luck in Scandinavia and southern Europe. In more recent times Sir Stanley showed that his flair hadn't left him when, in 1999, he started Freeserve, the UK's first free internet provider.

No company can expand over a fifty-year period without there being problems from time to time. With Dixons, there have been questions from the UK competition authorities. The service back-up has on occasions been a problem. Mastercare, the service subsidiary, has for some been an extremely difficult organisation to work for. Another feature that has drawn criticism has been the sale of expensive warranty policies. But on the whole the public has been well served, being offered the benefit of products at keen prices with good in-store advice and guidance. The company wouldn't have grown if the public hadn't been satisfied!

Throughout Dixon's fifty-plus years of expansion Sir Stanley has kept a careful eye on what was going on. Will its success continue once he has left the helm? He says he is happy with the succession he has put in place, but things don't always go as well as expected once a presiding founder has departed. One thinks of Thorn for example, which seemed to lose all sense of direction once Sir Jules had retired. But Dixons is a more clearly-focused business than Thorn, a company whose activities took in everything from manufacture to retailing and rental. Dixons has a good chance of continuing to prosper.

Sir Stanley will maintain a link with Dixons, as president, but will no longer have a role in the company's day-to-day management. As an active and outspoken person – he once called for the chief rabbi's resignation – he will continue to play a part in public affairs. He is a known keen supporter of the Conservative party, and strongly opposes the introduction of the euro here.

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TELETOPICS

ONdigital sees dramatic overhaul

ONdigital's owners Granada and Carlton Communications have decided that something must be done about it. First steps involve its rebranding, to become ITV Digital; the promise of a new dedicated sports channel from August; improved geographical coverage, to 70 per cent of the population within three months; and the appointment of ONdigital's chief executive Stuart Prebble to become chief executive of ITV, so that maximum effort can be directed at increasing ITV's presence in the digital field. All this has become particularly important with the present downturn in ITV's advertising revenues.

ONdigital has hardly been a raving success. Its 1·09 million subscribers place it way behind cable TV, with some 4·5 million subscribers (analogue and digital), and Sky with over 5 million digital TV subscribers. ONdigital's development costs have been running at £300 million a year, about half of this being required for the free STBs: breakeven is not expected until 2004. During the last quarter, to March 31st, ONdigital gained 75,000 subscribers. But an increasing number of existing subscribers have been choosing to go elsewhere – ONdigital's churn rate is said to be 20-25 per cent.

Meanwhile BSkyB has predicted an increase in DTH subscribers to 7 million within three years and expects to increase average revenue per subscriber from £280 to £400 a year by 2005. Its subscriber growth rate far exceeds that of ONdigital.

It seems that, as a last resort, ITV hopes to be the TV choice by default when the analogue switch-off comes.

3D displays a step closer

Four different approaches to providing a 3D display have been devised: stereoscopic, parallax, holographic and volumetric. Stereoscopic is the old technique of wearing goggles with a different filter for each eye, so that the eyes receive slightly different images field by field, the viewer seeing a 3D image. It can work very well but can hardly be regarded as comfortable. The parallax approach involves the use of a lenticular sheet or other optics in front of the actual display, so that each eye sees a slightly different image. Philips has carried out a lot of research on this (see *Television* May 2000, page 424). The difficulty with this lies in achieving an adequate quality image that doesn't distort with head movement. Holography is inherently 3D, but is difficult to implement as a practical solution.

With the volumetric approach a series of image slices are projected on to a spinning screen. The greater the number of slices projected while the screen rotates through 360°, the better the 3D image. US firm Actuality Systems has been developing this technology and recently announced a 90-million voxel unit (see photo alongside). The flat, vertical, translucent screen rotates at 600 RPM while a series of between 4,000 and 10,000 images per second are projected on to it, providing the 3D display. The now well-established Texas Instruments micromirror chip is used for projection, along with some carefully-devised optics: three mirrors reflect the images on to the screen to ensure accurate focusing and avoid parallax errors.

The difficulty with this approach is the vast amount of data that has to be stored and projected. With a refresh rate of 20Hz and 10,000 frames/sec, there are 500 separate frames per screen revolution. In the Actuality system each has 768 x 768 pixels in eight colours. Thus a memory buffer that contains 6Gbits of data is required to feed the display. The buffer is organised as 1Gbit x 3 x 2 (three colours, double buffered). A raster engine based on Xilinx chips converts 3D data from a PC, via an ultra-SCSI link, into the individual image slices.

Brema joins FEI

The British Radio Equipment Manufacturers' Association (BREMA), which was formed back in 1923, is to become part of the Federation of Electronics Industries (FEI) from July 1st. At the annual general meeting BREMA members unanimously voted in favour of the change. BREMA will continue as a separate identity under the FEI umbrella however, and will continue to provide its current services to member companies. BREMA's director Hugh Peltor commented that the new arrangement "will bring together our converging industries in one trade association, and will greatly strengthen our effectiveness". The FEI at present describes itself as "the voice of UK electronics for IT, components, communications, defence electronics and office technology". It has over two hundred members.

BREMA reports that last year was "another year of exceptional growth" in the UK consumer electronics market, which is now worth in excess of £4bn. It was a record year for TV sets, with deliveries reaching 6·2 million. Consumer electronics manufacture in the UK "declined a little" during the year. TV set manufacture was down at 3·2m with VCR production down at 2·3m. The strength of sterling contributed to this decrease.

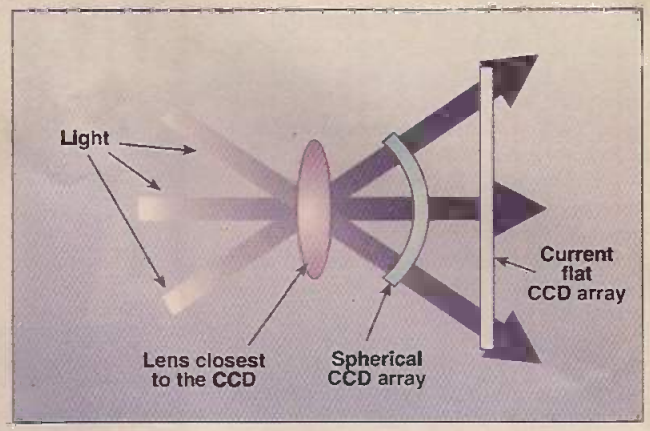
According to BREMA 30 per cent of UK households can now receive digital TV, with a further increase of 10-15 per cent expected by the end of the year. The forecast for 2005-6 is 60 per cent.

Lord McNally, BREMA's president, added that with prices falling by more than 70 per cent over the past fourteen years "we are certainly not part of rip-off Britain".

Spherical photosensor

Digital cameras with simpler optics and improved performance are promised as a result of work on developing a spherical charge-coupled photosensor array. The accompanying illustration shows that a spherical sensor could work effectively with a single lens. Conventional flat photosensor arrays require a lens system with complex optics, using up to twelve lenses, to provide good focusing over the whole of the array's surface.

Work on the spherical photosensor is being carried out by a group of researchers, led by Professor Sigurd Wagner, at Princeton University. It's based on the use of a deformable Kapton polymer substrate. Various attempts have been made over the last five years to put electronics on to spherical surfaces: Professor Wagner's group claims to have made a breakthrough, though there is "still some way to go" to produce an array with good stability and yield, and an electronic interface for the array is still under development. The first product is likely to be a night-vision device, which would provide a much greater field of view – 60° compared to 10° – than a flat photosensor.



A spherical CCD photosensor enables the lens system to be greatly simplified.

MiniDV Extended Recording

Canon's Model MV430 camcorder is the first to provide the new MiniDV recording mode known as Extended Recording. Until now MiniDV has offered two recording modes: standard, which stores up to 80 minutes of material on the longest-running MiniDV tape; and long-play, which extends the recording time to 120 minutes. With Extended Recording these times are increased by factors of two and three respectively. Thus a camcorder set to the ESP mode can store up to 160 minutes of video on an 80-minute cassette while its ELP mode provides a recording time of up to 240 minutes.

An extra video head (three instead of two) is used to provide Extended Recording. In addition the number of video tracks per second is decreased from 25 to 12·5, the tape speed is halved, the data compression ratio is increased and the video sampling rate reduced. These factors mean that picture resolution is decreased. Footage recorded in this way cannot be played or edited using standard MiniDV equipment.

Video equipment

Hitachi's new DVD-RAM camcorder, Model DZ-MV100E, is compatible with both AV equipment and PCs. It uses 80mm rewritable DVD-RAM discs with a capacity of 1·4Gbytes per side as the storage medium, enabling it to record for an hour in the HQ (high-quality) mode (a half hour per side at a fixed rate of 6Mbits/sec) or two hours in the SP mode (an hour a side at a fixed rate of 3Mbits/sec) using MPEG-2 compression. The camcorder can also record still images, with a capacity of 999 photos per side, again using MPEG-2 compression.

JVC has launched two MiniDV camcorders. Models GR-DV2000 and GR-DV1800, which both use an 800,000-pixel progressive-scan CCD photosensor. They also operate as digital still cameras, providing UXGA (1,600 x 1,200 pixel) pictures via a 1·92 megapixel pixel-shift system. This uses a lens to double-expose the image, creating a UXGA still. SD Memory and MultiMediaCard memory cards can be used for both purposes.

Obituary

We regret to report the death of TV engineer George Hersee. He joined the BBC in 1949 as a member of the planning and installation department, which was responsible for acquiring and installing all the equipment in the chain from the camera lens or microphone to the transmitting aerials. He specialised in cameras and equipment for viewing captions, which led to his design of the famed colour TV Test Card F in 1967. Accurate flesh-tone reproduction is a basic requirement for colour TV. As a child's face is ideal for assessing this, George inserted a photograph of his eight-year old daughter Carole, who thus became one of the best-known faces on television. The photo included a rag doll and game of noughts and crosses, which also contributed to the design's usefulness.

George Hersee was a helpful and caring man. After retirement he became 'Hon Sec' of the BBC Retired Engineers' Luncheon Club. When his mother became blind he helped to set up the first talking newspaper in England, in 1970. Hersee designed and built the control desk. He will be greatly missed by all who knew him.

Satellite video streaming

Eutelsat has launched its experimental Open-Sky video streaming service, which uses MPEG-4 digital compression technology to provide up to fifty streamed video channels via a single transponder. The streamed channels operate at data speeds of between 256-700kbits/sec, using MPEG-4 encapsulated over IP (Internet Protocol) technology. The service is received by PCs, and is being provided via the W3 satellite at 7°E.

The Cyclops camera-phone has been developed by BT Wireless and Sharp. In addition to a built-in camera the phone has internet capability. It operates on GSM and GPRS networks.

Steve's new book

Steve Beeching's new book *Video and Camcorder Servicing and Technology* is now available at £19.99. It's packed with information and data on video recording, digital camcorders, IEE 1394 (the FireWire interconnection system) and surface-mount soldering. For further information go to the website www.newarkvideoservices.co.uk

Steve's previous book *Servicing Videocassette Recorders* ran to four editions.

WHAT A LIFE

Some recent customers. Reflections on the trade then and now. An update on the antics problem. Don Bullock's servicing commentary

Ruben's little lorry chugged up to the front of the shop. He's a cheerful Romany lad with a nice family. His scrap business just about keeps them going, but they seem to be happy enough. This time he had his cross-eyed neighbour with him, whom I'd not met before.

"This is Wilf" Ruben said as they approached me. He was carrying a portable TV set.

His neighbour grinned at me and put out his hand. "Hello Wilf" he said, "by the way that's my name too."

"No, I'm not Wilf " I replied, "you're Wilf."

He shut one of his eyes and looked at me. "I know I'm Wilf" he said, "always was. Pretty sure about that. But Ruben here said you're Wilf too."

"Perhaps it's my fault, Wilf" said Ruben, smiling at me. "This is Don."

"Oh, er, hello Don" I said, "that's my name as well."

"Then why do you call yourself Wilf?" he asked.

"We'll get back to that in a moment" I replied, patting him on the shoulder. Then I looked at Ruben. "That set of yours" I continued, pointing to his TV set, "trouble I presume?" It was a yellow Orion TV700YTX.

"Yes" he said, "shuts down when it feels like it and leaves a lot of strange symbols on the screen."

"Oh dear" I replied, "can you pop back tomorrow?"

"Will do" Ruben said, then departed with his friend, who had his ear.

"Funny chap, Rub. What's his real name?"

Later Steven had a go at the Orion. I don't know how he traced the cause of the fault, but he soon had it right. There was a dry-joint at the 78M08CT 8V regulator IC7016.

A Sharp portable

Our next caller brought in a nice little 14in. Sharp portable, Model 37AM12H (5BSA chassis). He was a handsome fellow, sun-tanned and well built, with blue eyes and a shock of tussled black hair.

He put the set down and patted it. "I'm Rock Farley" he said in a voice that resembled Bing Crosby's, "this set of mine just lay down and died last night. Even the LED thing went out."

When he'd departed Steven again took over. He soon found that the main smoothing block still held a healthy charge. "Ouch!" he exclaimed, "that means it couldn't go anywhere. There must be an open-circuit some place."

"Suspect any pair of resistors over 82kΩ" I said cleverly.

He checked the 560kΩ, 0·5W start-up resistors R704 and R705 and found that they were both open-circuit. When he'd fitted replacements and switched on again the set sprang to life.

Rock called in for it later, as Greeneyes came in with our tea.

"Lovely scenery around here . . ." he crooned in his deep voice, looking around.

"Handsome fellow" she said when he'd departed.

"Dunno" I said, "take away the healthy looks, the studied Bing voice and those eerie blue eyes and what have you got?"

"You" she said as she went off.

It would happen

The evenings are getting lighter, so Steven decided to stay on and paint the shop's display shelf. He had to move our reconditioned sets off, so he put them on the floor, to one side of the door.

"Don't want anyone falling over them" he commented, "some of those who bring repairs in can't see much over the top of the set they're carrying."

Early next morning a stocky little chap drew up in his car. He made for the shop, with a large set in his hands. When he reached the door he tried to open it with his shoulder, but didn't have much success. As was turning himself around to have a try with the other shoulder I darted across and pulled the door open for him.

He didn't see me, which was unfortunate. The horsepower he'd developed sent him through the door and over to the left, where Steven had put the overhauled and polished TV sets. He ended up sitting amongst them, gazing at his own set which he'd managed to set down neatly, well clear of the rest.

"My fault" he said. "My glasses fell off while I was lifting the set out of the car. Thought I'd be OK without them, as it's only a few feet."

He was all right, and so was his set. There was a bit of damage to one of our sets, but nothing we couldn't put right.

He went to get his glasses. "Must apologise" he said when he returned, "just tell me what I owe you for the damage."

"Not at all" I replied, "could have happened to anyone. But we've got an old shed out the back we want demolished some time. If we give you a call, will you slip off your glasses and carry an old set into it for us"?

Reflections

I sometimes wonder whether I'm past my sell-by date, though I know that's nonsense! When I came into the trade there was only BBC television. No ITV. No tape recorders either. Gramophone records, as we called them, were made of shellac and were easily broken. I'd yet to see a transistor. Apart from monochrome television sets, all we were required to tackle were valve radios. Oh, and toasters and electric irons.

But what days they were! Television engineers were a rarity and were held in great esteem by the public, whose valve sets ran warm and often failed.

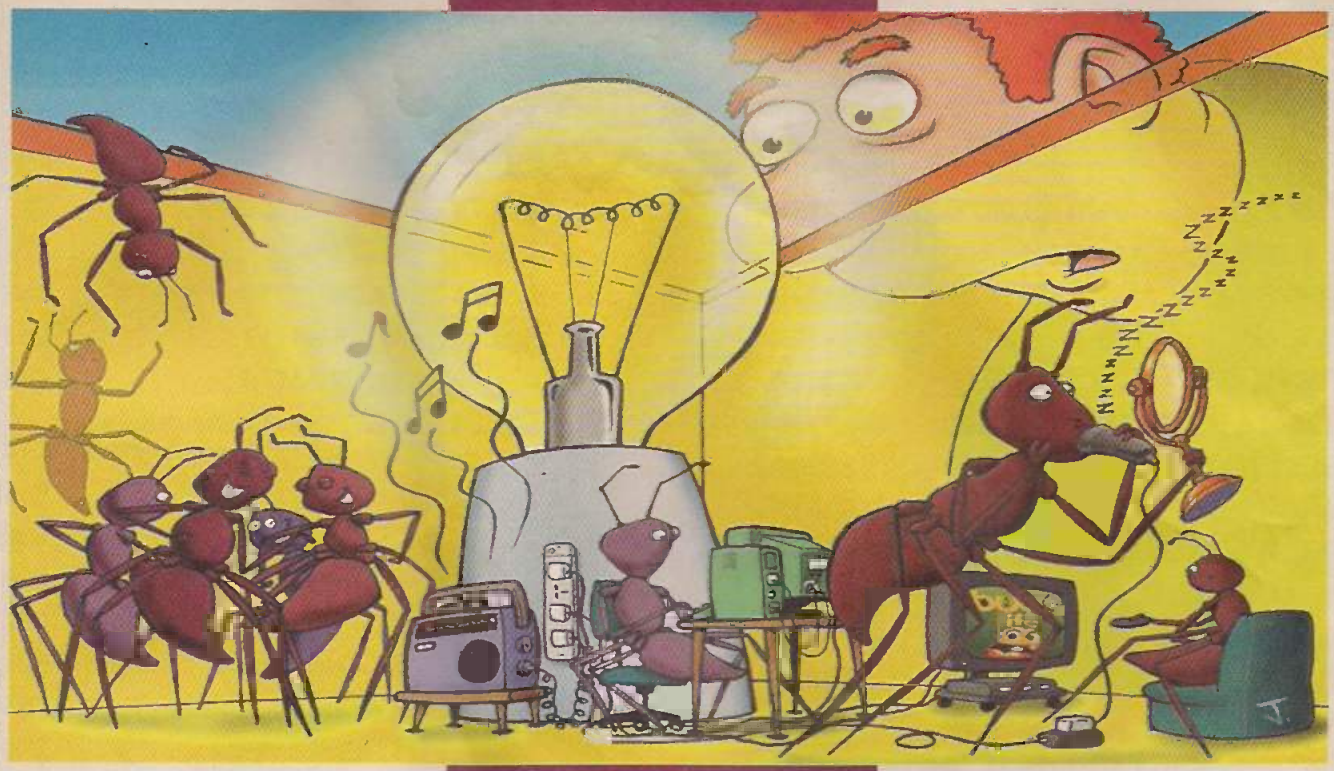
Before long I was being sent out on service calls. The idea was to complete repairs in the house wherever possible. A pocketful of valves and a can of carbon tetrachloride to wash out the valve bases worked wonders, as did a handful of five- and ten-watt wirewound resistors.

I'd spend a typical day out around the Forest of Dean, calling on remote cottages. It was common to find the customer waiting for me at the gate, eager to greet me. They were always happy to pay for the repair, and there was no lack of offers of cups of tea, cake and garden produce to take away with me.

One fellow engineer was given a bottle of homemade red wine. It exploded suddenly as he bounced along a bumpy country lane. He though his end had come. When he calmed down and surveyed the condition he was in, to say nothing of the inside of the van and the sets he was transporting, he almost wished he had.

I eventually opened up on my own. Work was plentiful, and my customers became loyal friends. When one of them wanted a new set I would get it from the wholesaler and sell it to him at its list price.

We were not allowed to sell some ranges. Their manufacturers, mindful of the good name they had established and the reputation of their sets, were fussy about whom they allowed to handle them. They would interview a few top dealers in a given town and, after examining their showrooms and workshops, choose perhaps just one to be the Appointed



Dealer for quite a sizeable town.

For his part the dealer had to agree to offer the manufacturer's full range of products, at their precise list prices. He had to be able to demonstrate and install sets correctly and, of paramount importance, provide a first-class after-sales service to customers and to any owner of the company's products who moved to the area. All this regardless of the profit made from particular sales. The dealer had to be as attentive about replacing a broken control knob as a tube or a line output transformer.

In return the manufacturer provided the dealer with live sales leads from its national advertising and first-class spares and service back-up. Its technical staff kept the dealer abreast of any faults or problems as they became apparent, and provided remedies and any components required.

Here's an example of what might be involved. I recall a few cases of patterning in a particular area when a local hospital began using some new equipment. The manufacturer investigated the complaint. Its technicians carried out tests and devised a modification. Dealers were provided with modification kits and instructions on how to go about the job. They were paid to do the work.

The results of this system were that the manufacturer could count on his carefully designed sets providing good, trouble-free value for those he set out to serve; the dealer was able to offer an excellent, dignified and profitable sales and service business; and the customer could rely on a first-class product with full technical back-up. Amongst the best-known manufacturers that ran the Appointed Dealer policy were Ekco, Murphy and Bush.

I've referred before to the strange behaviour of the ant colonies in the bit of Spain where we have our retirement home.

Other manufacturers had a foot in both camps: they had Appointed Dealers and a second brand that was distributed via wholesalers. Thus Philips also supplied Stella sets, Pye supplied Invicta models and HMV ran the parallel Marconiphone range.

We often took old sets in part-exchange, carefully overhauled the best of them, and offered these for sale again. New sets at the time I'm talking about cost about £65. We priced our reconditioned ones at about £35. Not bad, those days, when a wage of £9 a week was considered to be good. That's what we paid ourselves.

Consider the price of today's reconditioned sets. It's easy to buy a good monochrome one for far fewer pounds than we used to charge all those years ago, yet how many people have to manage on a wage of £9? There's something cock-eyed somewhere.

Life is totally different today. Setmaking has become barely profitable – in fact manufacturers seem to run up losses most years, supporting themselves by other activities in the electronics manufacturing and software industries; the retail trade has become cut-throat, with little satisfaction for anyone; and the customer gets throw-away products. But that's the way of the modern world.

Antics

I've referred before to the strange behaviour of the ant colonies in the bit of Spain where we have our retirement home. If I lay a live power cable along the drive it's not long before we see armies of ants running along it in both directions. When I switch off the mains supply they disperse.

I came across a further development of this behaviour recently. Greeneyes had asked me to clean the yellow glass in one of our lanterns, by the barbecue. While I was about it I decided to remove and clean off the bulb, which screws into a bulky and roomy porcelain holder.

When I removed the bulb I saw that the holder appeared to be full of what looked like tiny, shiny red-brown crystals. I poured them out and realised that they were the corpses of thousands of ants. After cleaning the lamp I switched it on to make sure that all was well. Almost at once a fresh colony of ants came racing up the cable and into the holder.

I can't think why they do it. ■

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1456T	PSU	ONWAKIT
1458T	PSU	ONWAKIT
1459T	PSU	ONWAKIT
2002	PSU	ONWAKIT
2009B	PSU	ONWAKIT
2052T	PSU	ONWAKIT
2152T	PSU	ONWAKIT
CTV501	PSU	ONWAKIT
CTV701	PSU	ONWAKIT
CTV840	PSU	ONWAKIT
CTV841	PSU	ONWAKIT
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AKAI		
CT1417	PSU	ONWAKIT
CT2159U	PSU	ONWAKIT
CT2162UNT	PSU	ONWAKIT
CT2863UNT	PSU	ONWAKIT
GOODMANS		
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149T	PSU	ONWAKIT
1430RA	PSU	ONWAKIT
1430RS	PSU	ONWAKIT
1430RW	PSU	ONWAKIT
1450T	PSU	ONWAKIT
1455TS	PSU	ONWAKIT
2019R	PSU	ONWAKIT
2029T	PSU	ONWAKIT
2029TA	PSU	ONWAKIT
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F16 CHASSIS	LINE	GOODKIT1
F16	PSU	GOODKIT1
F16	VIDEO	GOODKIT1
GRUNDIG		
CUC 7350		GRUNDIGKIT1

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HIT14RC	PSU	ONWAKIT
JVC		
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AV29SX1EN	FIELD OUTPUT KIT	JVCKIT1
AV29SX1EN1	FIELD OUTPUT KIT	JVCKIT1
AV29SX1PF	FIELD OUTPUT KIT	JVCKIT1
AV29TS1E1	FIELD OUTPUT KIT	JVCKIT1
C14E1EK	PSU	ONWAKIT
C14T1EK	PSU	ONWAKIT
C21ET1EK	PSU	ONWAKIT
CS21M3EK	PSU	ONWAKIT
MATSUI		
1455	PSU	ONWAKIT
1498	PSU	ONWAKIT
2086	PSU	ONWAKIT
2098	PSU	ONWAKIT
21V1N (BUZ90)	PSU	GRUNDIGKIT1
21V1T (BUZ90)	PSU	GRUNDIGKIT1
21V1N (MJF18004)	PSU	GRUNDIGKIT3
21V1T (MJF18004)	PSU	GRUNDIGKIT3
MITSUBISHI		
AV1 SERIES	PSU	MITSKIT3
CT1M5B	PSU	MITSKIT3
CT21M5BT	PSU	MITSKIT3
CT25M5BT	PSU	MITSKIT3
CT21A2STX	TDA 8178S	MITSKIT1
CT21AX1B	PSU	MITSKIT3
CT21A3STX	TDA 8178S	MITSKIT1
CT21AV1BS	PSU	MITSKIT3
CT25A2STX	TDA 8178S	MITSKIT1
CT25A3STX	TDA 8178S	MITSKIT1
CT25A4STX	TDA 8178S	MITSKIT1
CT25A6STX	TDA 8178S	MITSKIT1
CT25AV1B	PSU	MITSKIT3
CT25AV1BS	PSU	MITSKIT3
CT25AV1BD	PSU	MITSKIT3
CT25AV1BDS	PSU	MITSKIT3
CT28AV1B	PSU	MITSKIT3

MAKE & MODEL	KIT TYPE	CODE
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CT28AV1BDS	PSU	MITSKIT3
CT29AS1	TDA 8178S	MITSKIT2
CT29A4	TDA 8178S	MITSKIT2
CT29A6	TDA 8178S	MITSKIT2
CT29B2	TDA 8178S	MITSKIT2
CT29B3	TDA 8178S	MITSKIT2
CT29B6	TDA 8178S	MITSKIT2
CT33B3	TDA 8178S	MITSKIT2
M5 SERIES	PSU	MITSKIT3
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PANASONIC		
IC561	TDA 8175	PANKIT1
TX25XD60	VERTICAL O/P IC	PANKIT2
TC28XD60	VERTICAL O/P IC	PANKIT2
TX28XD70	VERTICAL O/P IC	PANKIT2
TX29XD70	VERTICAL O/P IC	PANKIT2
TX-W26D3	VERTICAL O/P IC	PANKIT2
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310.31994		PHILKIT6
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310.32253		PHILKIT4
310.32254		PHILKIT9
310.32255		PHILKIT7
310.32262		PHILKIT8
310.62264		PHILKIT1
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CP110 CHASSIS	SOPS	PHILKIT8
G90A CHASSIS	SOPS	PHILKIT10
G90B CHASSIS	SOPS	PHILKIT10
G110 CHASSIS		SOPS PHILKIT3

MAKE & MODEL	KIT TYPE	CODE
GR2.1 CHASSIS	SOPS	PHILKIT1
PHILIPS continued		
GR2.2 CHASSIS	SOPS	PHILKIT1
D-16 CHASSIS	SOPS	PHILKIT6
HSM VIDEO	SOPS	PHILKIT5
JSM VIDEO	SOPS	PHILKIT4
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VI395	PSU	SAMSUNGKIT
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59CS05H	POWER / LINE	SHARPKIT2
59CSD8H	POWER / LINE	SHARPKIT2
66CS03H	POWER / LINE	SHARPKIT2
66CS05H	POWER / LINE	SHARPKIT2
66CSD8H	POWER / LINE	SHARPKIT2
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35065920		THORNKIT1
FV70	PSU	THORNKIT1
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ICC8 CHASSIS	TDA 8178FS	THOMKIT1
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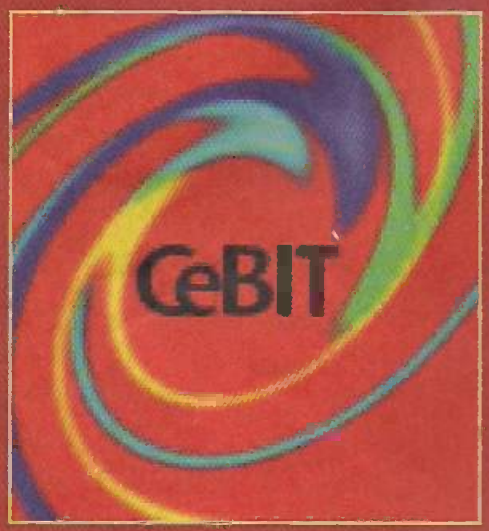
CeBIT 2001 report



Each year CeBIT is held in the massive halls of Hanover's Messe. It claims to be the world's largest IT and telecoms show. George Cole was there to report for us

LG's RN-29LZ20, which is described as being the biggest LCD TV in the world.

The CeBIT trade show is held in Hanover every March. This year's show had more than 8,000 exhibitors in 26 massive halls that cover more than 430,000 square metres. Interesting developments in the fields of digital TV, DVD and storage media were all to be seen.

The Multimedia Home Platform

The Multimedia Home Platform (MHP), which was created by the Digital Video Broadcasting consortium (DVB), is a standard for digital TV, interactive services and TV-based internet content. Version 1.0 was set in February 2000. It's based on the use of a common Application Program Interface (API) that enables digital TV broadcasters and interactive operators to develop content and services which can be used with a wide range of digital set-top boxes conforming to the MHP standard. The technology uses the Java programming language, which was developed by Sun Microsystems and is widely used for internet content.

The API is a software stack that sits inside a set-top box, IDTV or PC. It enables a digital TV or set-top box to provide interactive TV, enhanced TV, internet content, e-mail, browsing and e-commerce services. The aim of the MHP is that consumers should be able to use the same set-top box to receive digital services from different providers. It could also mean that when a consumer changes digital TV provision from say satellite to cable the same set-top box can be used rather than, as today, having to swap it for another one.

MHP is supported by more than fifty broadcasters, operators, manufacturers and content providers. Several have announced that they intend to use MHP. At CeBIT we got to see presentations from companies that are planning to launch MHP hardware or services this year. A consortium that includes Astra, Nokia, Panasonic, Philips, Sony and the German broadcaster ZDF had MHP equipment or programs running on their stands: many plan to lunch commercial MHP products this autumn at the Berlin IFA electronics show. According to the DVB group consumers can expect to pay a £150-£300 premium, depending on the level of features, for an MHP-based set-top box or IDTV receiver. Sony showed a prototype MHP IDTV receiver while Philips' demonstration included an MHP set-top box connected to a 32DW9625 32in. IDTV receiver.

MHP sounds like an excellent idea, but some wonder whether it will become a mass-market format. Some broadcasters are not too keen to share their subscribers with rivals, and there is concern over the cost of adding MHP operation to a set-top box or TV set. MHP requires a large amount of computer memory, and with set-top boxes being given away to consumers there is pressure to keep production costs down. It will be interesting to see which, if any, UK digital pay-TV operator is the first to embrace MHP.

Video equipment

Sony, Philips and Panasonic had many IDTV sets on display. Flat-screen TVs were also seen on many stands. LG's offering included the RN-29LZ20, which with its 29in. screen is described as being the world's largest LCD TV set. It's 6·5cm thick and weighs about 30kg. The Panasonic Model TH-50PHD3E is a 50in. 16:9 plasma display panel with a 1,366 x 768 pixel resolution and a contrast ratio of 3,000:1.

Philips and Samsung showed Web Monitors – high-resolution monitors that can be used for watching TV programmes and exploring the internet. Both models have a 15in. CRT screen (Samsung also has an LCD version) and a keyboard.

One of the most unusual video products was Samsung's SCH-M220 TV phone, which has a 1·8in. screen and an aerial that can receive mobile phone and TV signals.

Kodak announced the development of a flat-screen system that could eventually replace the LCD. The technology involved, known as organic light-emitting diodes (OLEDs), is claimed to provide displays that are thinner, lighter and more efficient than LCDs. In addition no backlight is required. With other

flat-screen technologies under development, such as light-emitting polymers (LEPs), this market will be a very interesting one to watch in the next year or so.

Numerous camcorders were on show at CeBIT, including the Cannon MV400 DV (digital video) series. There are six models, MV400, MV400I, MV430, MV430I, MV450 and MV450I. The I versions include a digital line-in facility. All models incorporate an extended recording system that uses data-compression technology to increase the recording time by x2 or x3. Thus an 80-minute DV tape could provide a recording time of up to four hours. The MV430I and MV450I also have memory-card slots for MultiMediaCards and SD Memory cards, which store still images that can be transferred to a PC. Sony's camcorder range included the DCR-TRV30, which has a 1·55 megapixel CCD imager. JVC's GR-DVM1800 offers high-resolution still images with its two megapixel CCD.

The Canon MV450I camcorder which includes a digital line-in facility.

DVD

The rewritable DVD formats were all being heavily promoted at CeBIT, either for PC data storage applications, as home video recording systems, or both. The DVD+RW format is supported by Philips, Sony, Ricoh, Hewlett-Packard, Verbatim and others: products were shown, and there were firm launch dates. Philips said that its new DVD+RW data drive, shown for the first time, will be launched in October with a DVD+RW video recorder to follow shortly after. The new data drive is a dual-writer product, with the ability to record in the DVD+RW and CD-R/RW formats. It provides 8x DVD reading, 2·5x DVD writing, 32x CD-ROM reading, 12x CD-R writing, 8/10x CD-R/RW writing and has a standard IDE interface. Philips intends to launch the DVD+RW drive with application software, and says that the product will initially be aimed at the PC after market, offering users the option to upgrade an existing optical-disc drive.

Philips also unveiled the VAE8010 DVD+RW recorder engine, which consists of a dual-laser optical pickup, a tray loader, a fan unit and a PCB that contains all the electronics required for module control and channel encoding/decoding. Philips hopes that the DVD+RW engine will encourage other consumer electronics companies to take up the format, and claims that several are interested in it. The company is keen to promote DVD+RW as an all-round format: the publicity material at CeBIT showed how a 4·7Gbyte DVD+RW disc can be used for storing two hours of MPEG-2 video, editing home videos, as a photo album for digital cameras, as an MP3 archive containing up to 1,400 songs or as a data storage device the equivalent of 2,800 floppy discs.

Ricoh showed a DVD+RW drive which it says will be launched in the fourth quarter of this year at about £650. To demonstrate DVD+RW's compatibility with DVD-ROM drives and DVD-Video players, a Ricoh employee used a Sony camcorder to record visitors to the stand, transfer the images to a blank DVD+RW disc, put the disc in a Ricoh PC DVD-ROM drive and play it back via a portable Pioneer DVD player.

DVD-RAM was being promoted by Toshiba, Panasonic and Hitachi, which had its DVD-RAM camcorder on display. Toshiba demonstrated its SD-R1102 DVD-RAM drive, and the company announced that it plans to launch DVD Multi hardware, probably in early 2002. DVD Multi is not a new format as such: it's a specification for a new generation of DVD-Video players and DVD data drives that will be able to read all or at least most of the official DVD disc formats.

Panasonic's DVD highlights included its 9·4Gbyte DVD-RAM disc and the LF-D311, a combination DVD-RAM/DVD-R drive that's also compatible with DVD-ROM, DVD-Video, audio CD, CD-ROM, CD-R/RW and Video CD discs. Model CY-VM1200 was also shown on the stand: this is claimed to be the world's first in-car hi-fi system with DVD-Audio.

Pioneer, which developed the DVD-RW format, had on show Model DVR-A03, a combined DVD-R/RW writer with CD-R/RW capability.

Other disc formats

Blank media manufacturer Verbatim announced new CD-Rs which use Super Azo dye. The company says that the high sensitivity and wide power margin of the dye make it possible to provide recording speeds of more than 16x and promise compatibility with future 20x and 24x speed drives. According to Verbatim the dye increases the sensitivity by ten per cent and the power margin by 250 per cent, while the recording layer is 50 per cent thinner than a standard Azo disc. The first Super Azo CD-Rs, with 650 and 700Mbyte capacities, were due to be launched in May. Verbatim also announced its support for the Sony/Philips double-density CD-R and CD-RW discs, each with a capacity of 1·3Gbytes. The first double-density hardware should be available by summer.

TDK was demonstrating its new MultiLevel (ML) discs. The technology was originally developed by the US company Calimetrics: it uses 8 and 12cm discs that can store up to 650Mbytes and 2Gbytes respectively. Smaller-sized discs could also be developed. ML is being aimed at both the computer and consumer electronics markets as a low-cost, high-density storage system.

TDK says that ML could be used as a new storage medium for future audio, video and imaging applications. Another

Pioneer DVD products including, at the front, Model DVR-A03, a combined DVD-R/RW writer with CD-R/RW capability.

possible use is as an archive system for hard-disk personal video recorders. An 8cm ML disc provides ten times more storage capacity than a 64Mbyte flash memory card. The discs could possibly be used in digital cameras and MP3 players (a 6cm ML disc could store approximately 200Mbyte of data, sufficient for four hours of music). TDK even talks about hand-held video recorders that store up to three hours of MPEG-4 video on an 8cm ML disc. Because the technology is IC-based, ML drives will cost just a little more than standard CD-R/RW drives. Hardware manufacturers could add ML capability to CD-R/RW drives without altering the existing optics, mechanics or manufacturing infrastructure.

Two other new disc storage media were on show at CeBIT. The iD-Photo format, developed by Maxell. Sanyo, Olympus and Hitachi, uses a 5cm magneto-optical disc to store up to 730Mbtyes of data. Sanyo has just launched the first digital camera that uses iD-Photo technology.

Dataplay is a tiny disc, about the size of a US quarter, that can store up to 250Mbytes of data per side. The disc has a ROM area and a write-once area. Toshiba is one of the main supporters of Dataplay, and at CeBIT showed prototype audio players and digital cameras. The first Dataplay hardware, blank and prerecorded media are due to be launched later this year. But, as with ML and iD-Photo, one wonders whether there is room in an already crowded media storage field for yet more formats, whatever their advantages.

Hard-disk technology in the form of personal video recorders and set-top boxes was present on many stands. Seagate's stand included WebTV products from Sony, Panasonic and Echostar and a Philips-AOL set-top box. On the JVC stand there was a combined DVD-Video player and hard-disk recorder with a 20Gbyte storage capacity.

Memory Cards

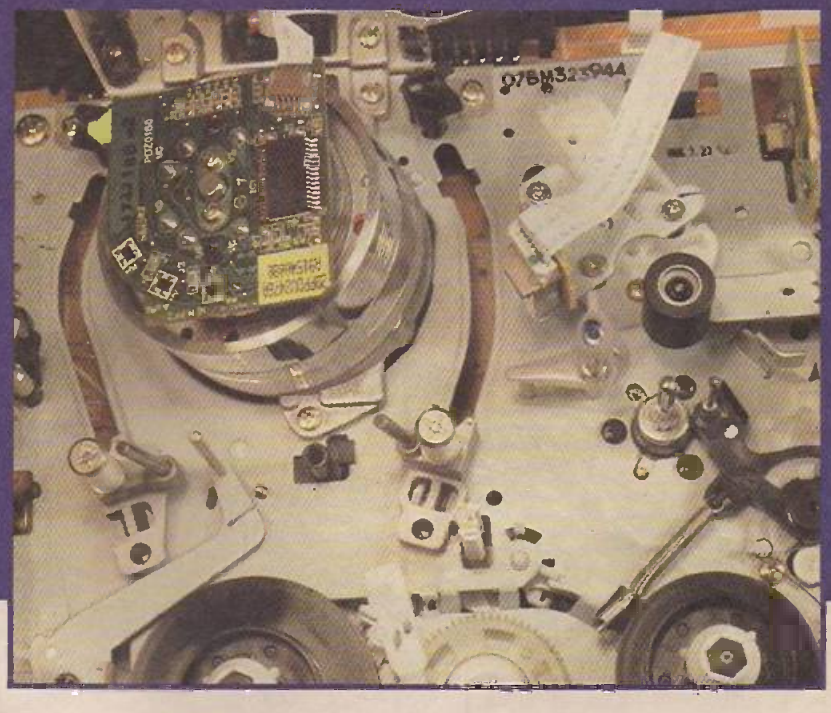
Optical discs offer many benefits over solid-state media in terms of capacity and cost, but the flash memory-card market is going from strength to strength. TDK said that the European market for solid-state memory is expected almost to double by 2003, which would mean that the market for SmartMedia cards would grow from 2·63m units in 1999 to 5·5m units by 2003. For this reason TDK has added SmartMedia and CompactFlash cards to its range.

Sandisk launched its SecureMate USB reader card, which is designed for transferring images, audio and video between SD Memory cards and MultiMediaCards and PCs. Sandisk also announced that it will start shipping SD Memory cards and high-capacity CompactFlash cards this spring, the latter available with 256, 384 and 512Mbyte capacities. The company also plans to add 128Mbyte SmartMedia cards to its range. Verbatim announced that it is adding MultiMediaCards to its flash-memory adaptor range, adding that 128Mbyte versions of the MultiMediaCard will be available later this year.

Panasonic and Toshiba had lots of SD Memory card products on display, including audio players, dictation machines, fax machines, laptop PCs and in-car systems. ■

The Sony DVP-NS300 DVD Player. This elegant model is available in silver or black finish.

Though the price of many VHS VCRs has fallen to the point where repair may not be economically viable, nevertheless most of the problems that crop up are relatively simple mechanical ones. These are economic to fix. Eugene Trundle provides a diagnosis and repair guide that's based on many years' practical experience



Servicing VHS decks

Safely away from the high voltages, heavy currents and thermal cycling that are associated with TV sets, the electronics in today's VCRs give relatively little trouble. Most of the VCR problems you get are associated with the moving and wearing parts of the mechanical deck. In fact a video technician can spend whole days without recourse to a test meter or soldering iron, except perhaps when it's necessary to replace a mode switch. Motors and head assemblies excepted, deck components are not expensive and, with a knowledge of what commonly goes wrong (and why), fault diagnosis and repair can in most cases be quick and profitable – whatever the make, price or quality of the machine.

In this guide we will follow the tape on its journey around the deck, looking at each mechanical part in turn and the effect it has, when faulty, worn or misaligned, on the tape running and the sound and vision. We'll consider not only fault symptoms that are present whenever the tape is in motion, but also the horrible intermittent faults that can arise. Fig. 1 shows a typical modern centre-mount tape deck layout.

Cassette-in

Failure of the cassette to be drawn into the machine, which is on and lit up, is a common problem. Check that the cassette-in signal is reaching the syscon (system controller) chip from the sensor, which may be a mechanical switch or a photocoupler. If it is present at the syscon chip, use a DC-coupled oscilloscope, which will reveal much more than any sort of meter, to look at the drive to the motor (loading or capstan, depending on design). There may be no power to the drive chip or motor, or a mechanical jam-up, indicated by the presence of electrical power for a few seconds only.

An attempt to turn the motor/mechanics by hand will confirm whether it's jammed, perhaps because a deck component is broken, there's incorrect mechanical phasing, or a 'spanner in the works' – a foreign body. Sometimes the cassette moves some way in then jams. If it's floppy in the tray, check the sprung fingers above that hold it in place. If the whole cradle/tray is skew-whiff, it's likely that one side of the front-load mechanism is loose because of a broken arm or pinion. Sometimes the cassette goes all the way down to the deck then comes straight back up and out. The cause will be failure of a tape-end sensor, failure of the cassette-down/in sensor, or because their signals don't arrive at the syscon chip. Check at the appropriate pin of the chip, if it's accessible.

Threading the tape

With most modern decks the tape is threaded as soon as the cassette goes down. Whether or not this is the case, if tape threading is a laboured business or the movement stalls, it's likely that the supply spool is not free to turn and, as a result, the tape is stretched taut. See if the reel brake is on, because of a misphased or broken mechanism, and if necessary check the back-tension band whose felt strip may have parted company with the plastic band and is now stuck fast to the periphery of the turntable.

The tape guides act as threading poles initially. They can become jammed at some point in their travel because of hard grease in their guiding slots. The solution is to clean with solvent and relubricate with light grease. The guides might stop short of their precision end-stops: this causes tracking problems. Particularly in older JVC

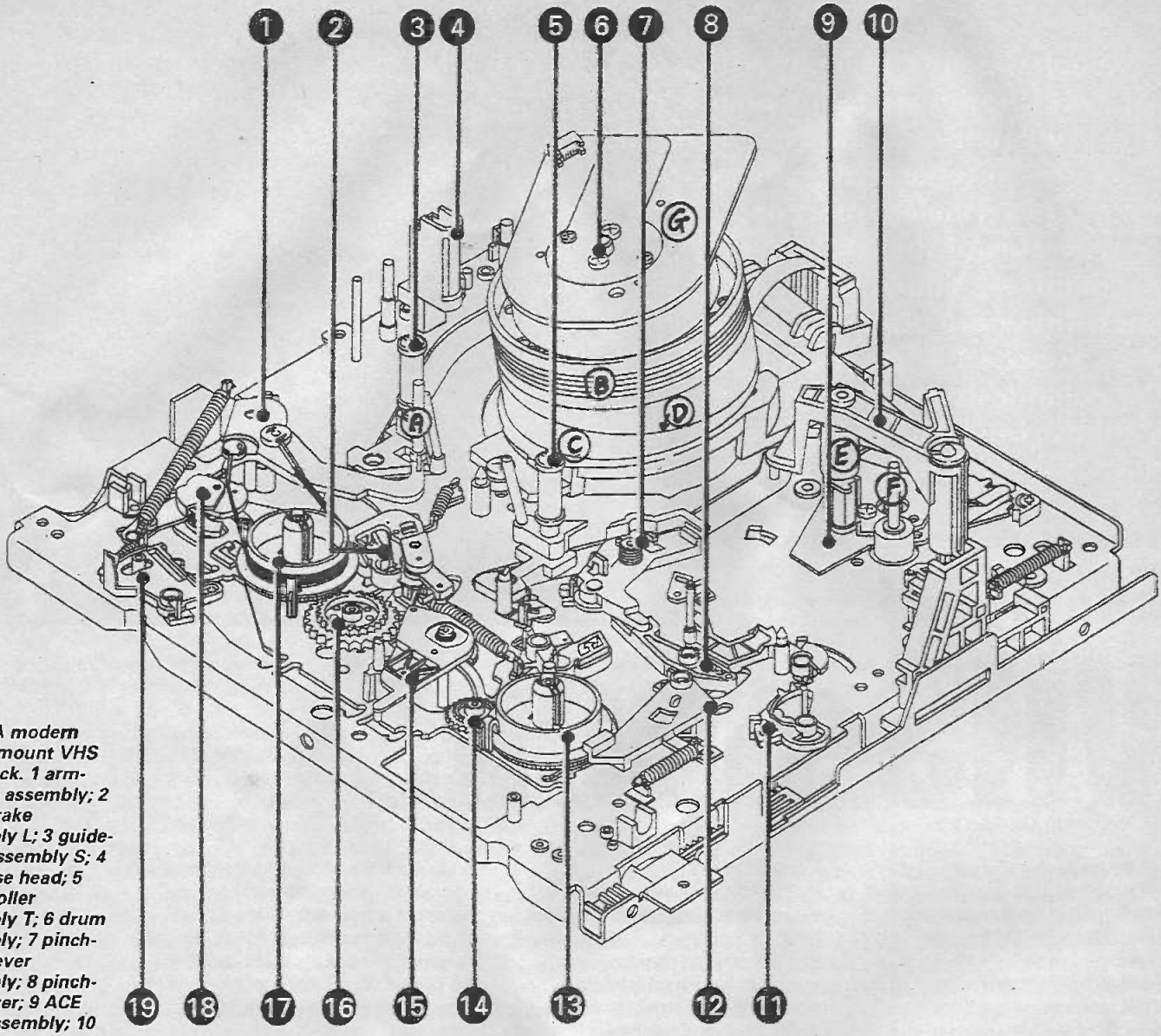


Fig. 1: A modern centre-mount VHS tape deck. 1 arm-tension assembly; 2 main brake assembly L; 3 guide-roller assembly S; 4 full erase head; 5 guide-roller assembly T; 6 drum assembly; 7 pinch-comp lever assembly; 8 pinch-cam lever; 9 ACE head assembly; 10 pinch-roller assembly; 11 review lever; 12 brake sub-assembly R; 13 reel-disc assembly R; 14 gear-relay assembly T; 15 idler assembly; 16 gear-relay assembly S; 17 reel-disc assembly L; 18 jog-lever assembly; A back-tension pole; B upper drum; C lower drum; D rabbet; E pinch roller; F capstan; G drum motor.

decks, the cause of this can be slackness in the joint between the articulated loading drive arms and the pole bases. Slackness and wear in arm-joints or drive pinions can result in the guides being 'floppy' at the loading end: the result is poor or erratic tracking. If you pull backwards a tape-guide which is in the fully-loaded position and then let it go, it should snap back into place under spring pressure: only when this is so can you be sure that the tape path around the head drum will be consistently reliable.

All this assumes that threading takes place. If it doesn't, or the tape is smartly returned to the cassette after the completion of threading, check that the head drum is rotating and that the loading belt, if used, isn't slipping. Then suspect the mode switch.

Tape outward journey

Fig. 2 shows the path the tape takes around the deck furniture. A certain amount of variation in the details is to be expected with different deck designs. Fig. 3 is a 'straightened-out' diagram, showing the movers, shakers and transducers the tape meets along the way.

The first item that the moving tape encounters on its passage away from the cassette is usually the back-tension pole, which pulls on the friction band around the supply-spool turntable. Examine the band itself first. The felt strip may have broken up or become partially or wholly disengaged from its strap. This will play havoc with the tape tension. Check that the tension pole is free to move, and that it takes up the correct position when the tape is running – this is usually indicated by an engraving on the deck surface, or you may have to refer to a diagram in the service manual. Fig. 4 shows the basic arrangement, with a cam for tape-tension adjustment. There is generally a setting screw. A typical back-tension figure for a modern deck is 35g/cm, measured at the beginning of SP tape playback using a cassette-type torque meter. It's easier however to use an on-screen indication, of the type provided by a test tape such as the MB Swiss-4, to check the back tension – see Fig. 5.

The most common symptoms produced by insufficient back tension are noise on the picture and/or picture judder/roll because of poor head-tape contact at the beginning of the head's tape scan. The effect is worse with a recording made by the same machine. Too much back tension can cause hooking and bending in the picture, and excessive tape and video head wear: in extreme cases the capstan and pinch roller skid on the tape, which becomes taut then stops moving or slows, with mistracking and wow on sound in the latter case.

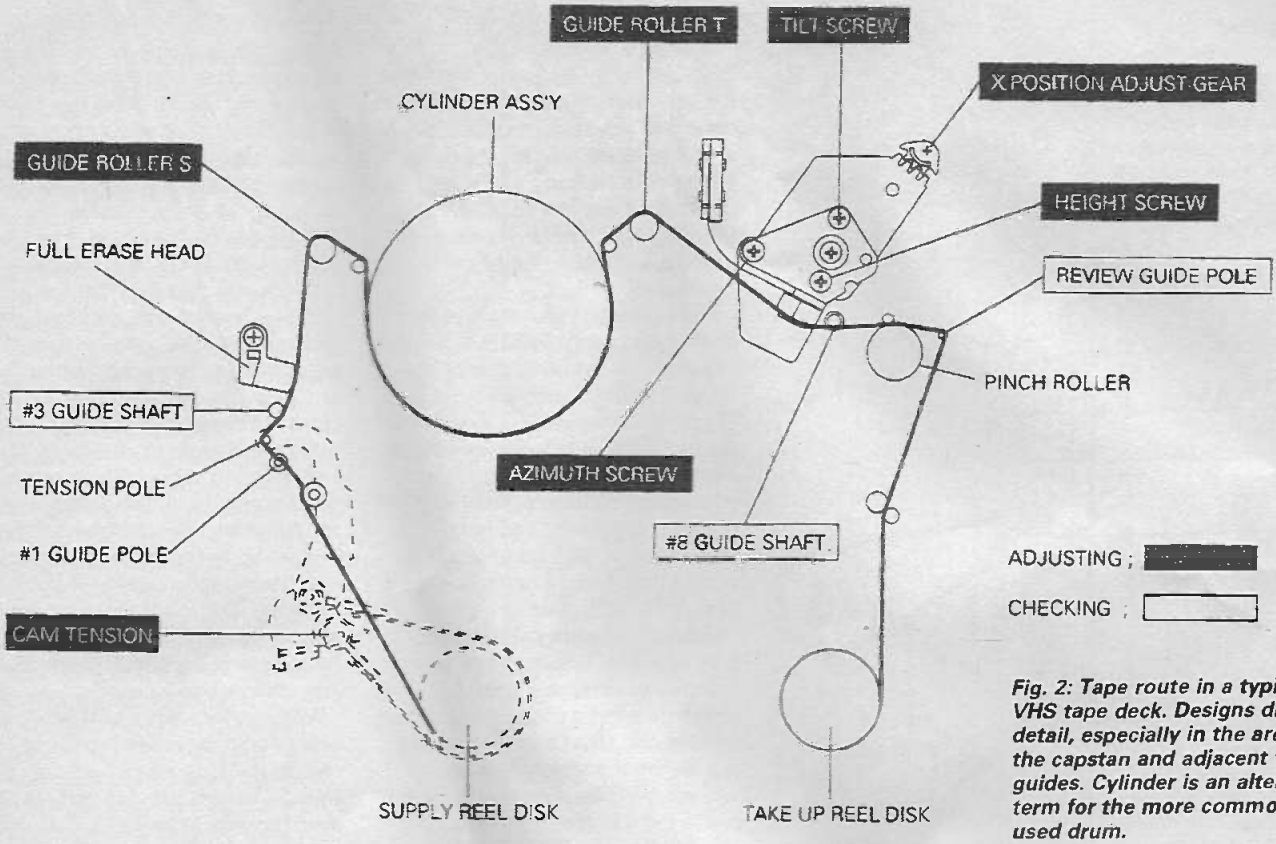


Fig. 2: Tape route in a typical VHS tape deck. Designs differ in detail, especially in the area of the capstan and adjacent tape guides. Cylinder is an alternative term for the more commonly-used drum.

If the back-tension pole is not perfectly vertical the tape will ride up or down it. The result is tape crinkling or an incorrect tape path across the full-erase head to the drum-entry guide. The only effective way of dealing with this is to fit a new lever assembly.

The next major item the tape encounters is the full-erase (FE) head. As its magnetic gap is longer than the tape width it doesn't require adjustment. The important things here are to ensure that the head is able to move freely on any swing-pivot it may have, and that the electrical connections to the head are good. It's often recommended that any plugs and sockets used here are replaced with soldered connections to the PCB. Attention to these points ensures that tape erasure takes place before a new recording is made, and that the new sound track goes on to the tape as it should. If the tape is not being erased properly the effect, with a tape that has been previously recorded on, is blobs and clouds of vague floating colour when the new recording is played back.

Some VCRs, especially older ones, have an impedance roller (not shown in Figs. 1-3) downstream from the FE head. Its function is to damp and thus smooth the tape motion, helping to iron out any timing jitter. It can do this only if it rotates. A drop of fine lubricating oil on its shaft will also silence the tortured squeal or groan you can get in the fast-forward and rewind modes with a dry one.

The guides and drum

The tape next passes round the drum-entry (S) guide, a crucial component that's changed its role from pull-out/threading pole to precision tape positioner. In conjunction with the adjacent slant pole it ensures that the tape sits correctly on the rabbet, the spiral shoulder machined into the periphery of the lower drum, so that the rotating video heads on the upper drum are aligned with the tape's magnetic tracks.

Guide alignment should not normally be necessary except after replacement. Slacken the lock-screw at the bottom of the guide shaft then, using the correct (forked) driving tool, slowly adjust the guide downwards until the tape can be seen to start to 'bubble' on the rabbet. Observe the RF envelope pattern from the heads during playback of an alignment tape, using an oscilloscope that's synchronised with the head flip-flop (SW25) pulses. Screw the guide up until the bubbling just stops. then finely adjust for a good entry-side waveform, see Fig. 6.

If it's not possible to achieve a good entry-side waveform, ensure that the back tension is correctly set, that the guide base has gone fully home, and that the heads and drum are perfectly clean. If these points are all in order, it's likely that the video heads are worn.

A couple of physical problems can occur with the tape guides. First the lower shaft (normally made of brass in older machines) sometimes becomes loose in its mounting. This is curable with locking compound, *not* superglue. Secondly the rotating plastic sleeve can vibrate on the

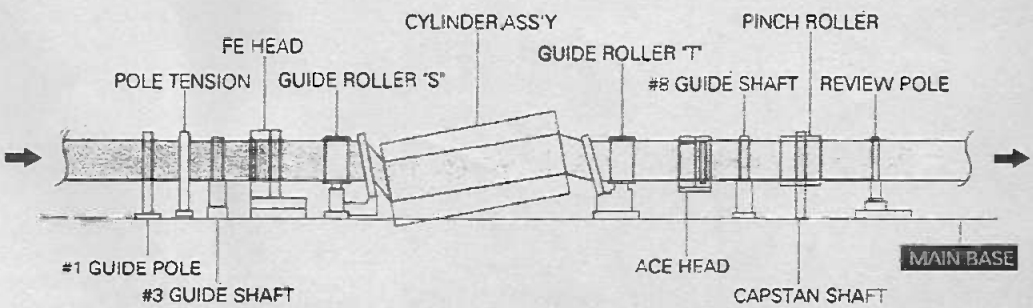


Fig. 3: Linear tape path illustration, corresponding to the layout shown in Fig. 2.

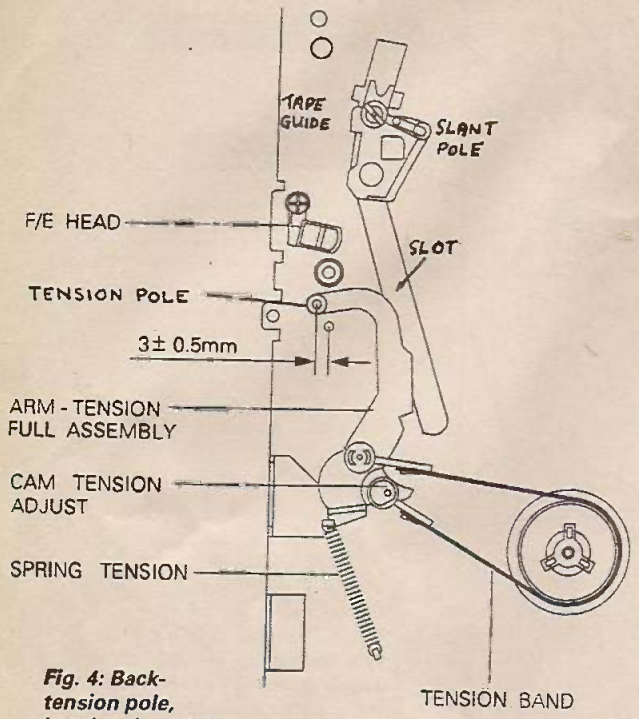


Fig. 4: Back-tension pole, band and setting arrangement (cam tension adjust). Note the setting indication by the pole.

shaft. This produces a corrugated effect on the picture, and sometimes a squeal in one or more of the operating modes. The cure for this is replacement: don't try lubrication.

The lower drum and its rabbet act as tape positioner and guide while the tape is being scanned by the heads in the upper drum. Any dirt or deposit on the lower drum will give rise to some form of horizontal interference band or noise bar in the picture. As they age some lower drums develop excessive surface friction. This is indicated by much greater tape tension upstream from the tape wrap than at the input side. If this gets very bad the capstan may not be able to pull the tape around the head. More often the tape piles up on the deck in the review (search backwards) mode. This happens because the backwards-rotating supply spool has insufficient torque to overcome the tape friction around the drum wrap while the capstan continues to feed tape to the 'sticky' drum. In such a case cleaning and polishing the lower drum can be tried, but probably won't help. The cure, a new lower drum assembly, is expensive.

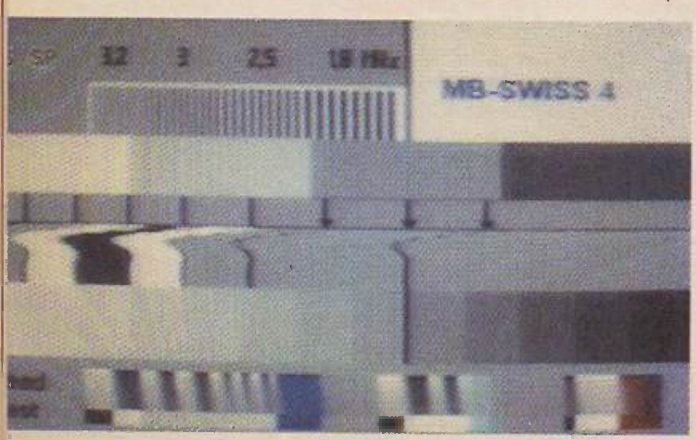


Fig. 5: Use of a test tape to check the back tension. Pulling to the right in the middle of this off-screen TV shot shows that the tape tension needs to be increased.

The comments above about the entry guide apply equally to the exit (T) guide on the other side of the drum. This should be adjusted for a good square envelope waveform at the end of the head scan, see Fig. 6. Once again, before you try adjustment check the guide's physical conditions and its positioning at the end stop, and ensure that the tape just touches the rabbet while running.

Here are some possibilities for poor tracking, which shows as inability to achieve a good RF envelope pattern at any point during adjustment. Head wear is a strong possibility if everything is clean, and can even be responsible for a dip in the waveform at some intermediate point during the head scan. Misalign-ment of a component prior to the entry guide or after the exit guide can also cause tracking problems: examples are a bent back-tension lever or an excessively tilted ACE (audio/control/erase) head assembly.

If tracking is erratic and the envelope waveform sags at nor near the middle of the head scans it could be that both tape guides are set fractionally too high, with the result that the tape is poised slightly above the rabbet on its way around. A gap in the waveform at either end of the scans can be caused by incorrect adjustment of the head-switch timing. A gap at the start of the scans, in the record mode only, is caused by the ACE head assembly being too high. As a result the CTL head takes 'bites' out of the start of new video tracks.

Anything that prevents good tape/head contact or tracking at the very beginning of the scans will impair the field sync part of the video output signal and thus cause vertical judder and/or picture rolling.

The video heads

Dirty video heads cause the familiar coarse-snow effect on the playback picture, see Fig. 7; also, unless both heads are equally affected, a 25Hz flickering effect. Worn heads can produce the same effects but more often give rise to black and/or white streaking from vertical edges in the picture. Fig. 8 illustrates this effect. When this occurs with only the machine's own recordings, some temporary relief can be obtained by reducing the luminance signal writing current. But head drum replacement is the only lasting cure.

You sometimes find that for optimum output with a known-good recording the two video heads require different tracking-control settings. This indicates that the head chips are running at different levels, more often because of a speck of something or other under a newly-fitted upper drum than faulty drum manufacture. Anyone who can get a foreign body under the drum may also be capable of fitting it 180° out of phase. The result will be colour playback with the machine's own recordings but not with playback of any others.

Worn or dirty VHS hi-fi heads can cause audio drop-out, buzz, and critical tracking adjustment for sound. When it gets too bad the sound reverts to the linear/longitudinal mono sound track. Incorrect head switch-point setting can also cause buzz on hi-fi sound, so check this before suspecting head wear.

If the video heads wear out quickly it's likely that the cause is either excessive tape tension or over-frequent use of a head-cleaning tape. Heads that frequently get dirty or blocked are probably being soiled by the tape: after all nothing else (except those dreadful head-cleaning rollers!) ever touches them. Get the customer to check by using a new batch of tapes over a period. In over two decades of VCR servicing I've only ever encountered two heads that self-soiled, probably because they were abrasive.

To clean the rotary heads use a soft cloth or buckskin or a proprietary cleaning stick, stroking only in the heads' normal direction of travel, see Fig. 9. In stubborn cases, and with care (and perhaps nothing to loose!), try the effect of a piece of card, similar in thickness and finish to a business card, soaked in isopropyl alcohol: press it hard against the upper drum's periphery while you rotate the drum anti-clockwise by hand. Make sure that the drum surface is dry before testing with a tape.

Static blips on the playback picture, looking like little white-tailed comets that occur at random points, are usually caused by poor earthing of the upper drum. As a

result static electricity builds up on the drum and discharges itself several times during the period of a TV frame. The earthing brush, when external to the drum assembly, can also squeal or whine despite the rubber damper that's stuck to its sprung arm. A dab of lubricant on the nose of the carbon tip cures this one. Some drum assemblies, notably middle-aged JVC ones, have internal earthing brushes. These can be replaced with an improved type when static-discharge problems are experienced. Some models have no visible earthing arrangement at all. I've had a couple of these that have produced static-discharge effects, probably because of a faulty drum or motor. They were cured by adapting an earthing brush from a scrap deck of a different type.

Head replacement

The relevant service manual will provide instructions for upper drum replacement. Afterwards, the most important setting-up adjustments are tape path (guide) alignment, head switch-point setting and tracking. The latter is carried out at the ACE head, which we'll come to next month. With many modern VCR designs the need for adjustment of the FM writing current has been eliminated. Head preamplifier setting-up presets disappeared many years ago.

Some perfectly good head drums have been replaced to no effect, because of faults elsewhere. The rotary transformer occasionally fails, as do FM preamplifier chips. A faulty drum motor can cause the 'dirty-head' effect – that small surface-mounted electrolytic capacitor in old JVC motors comes to mind. Another red-herring occurs when there is poor earthing of the shielding for the playback RF preamplifier, usually because of a missing or loose fixing screw: in some decks of Philips' manufacture it's a Torx-type screw with access through a hole in the machine's plastic rear cover.

Pattern heads available from companies such as Philex and TW Electronics are now very good and their prices are low. While they may not have quite the performance or longevity of original manufacturers' drums, they will usually outlast the well-used machine in which they are fitted, and anything that reduces repair costs is welcome in the present situation. ■

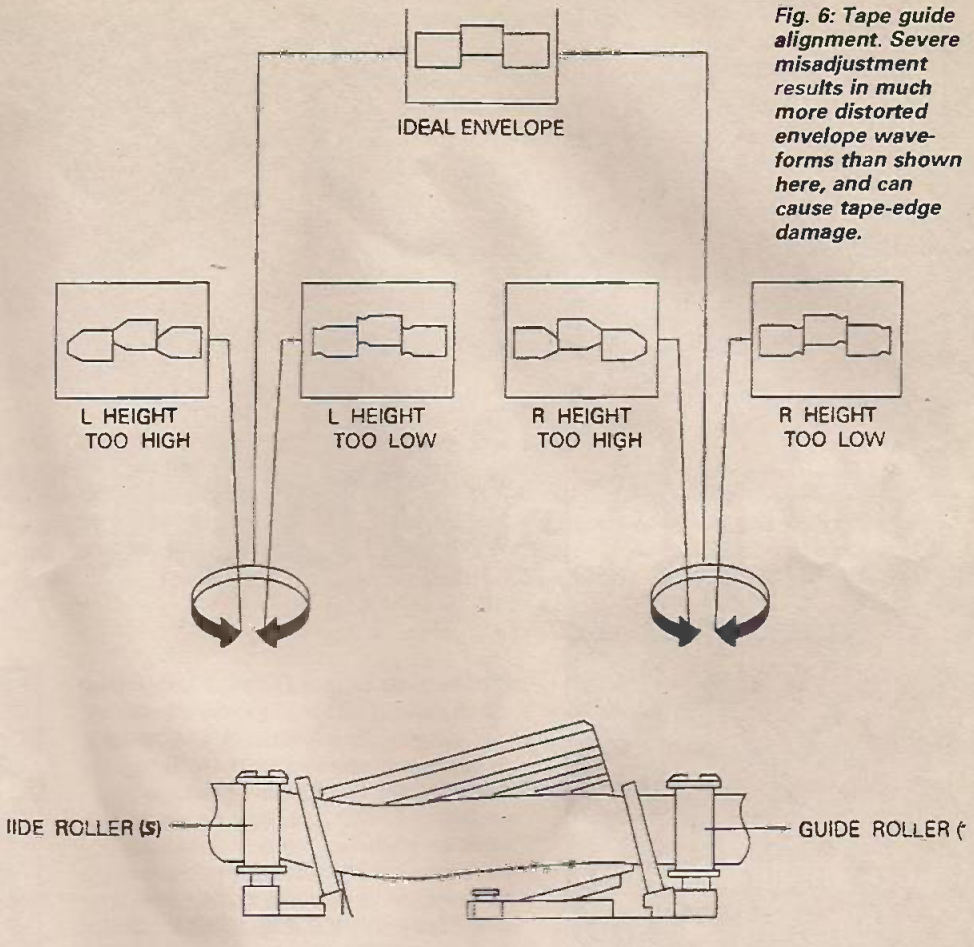


Fig. 6: Tape guide alignment. Severe misadjustment results in much more distorted envelope waveforms than shown here, and can cause tape-edge damage.

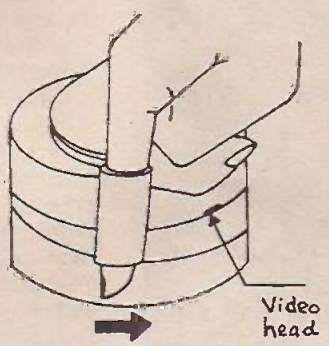


Fig. 9: Video head cleaning by hand. Keep the forefinger, wrapped in fine chamois leather, still while using the other hand to rotate the drum anticlockwise.

Next month

In the concluding instalment next month we'll follow the tape on its downstream path from the drum, consider tape damage and other general deck problems, outline the causes of intermittent faults, and take a look at the auto-diagnostic systems incorporated in many modern VCR designs.

Fig. 7: Effect produced by dirty video heads.

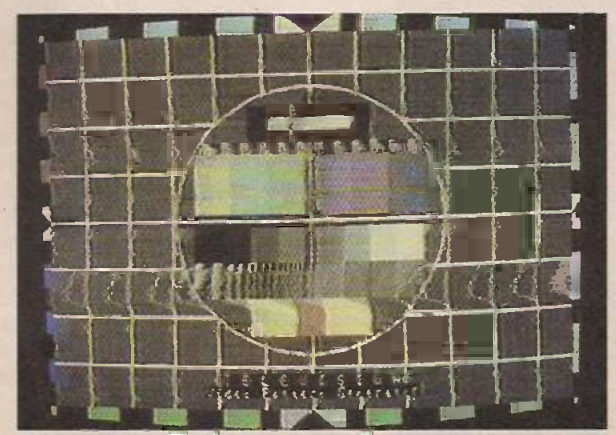


Fig. 8: The ragged picture, image pulling and 'worms-and-dots' streaking effects shown in this off-screen shot are caused by worn video heads.

WorldSpace radio

You know all about satellite TV by now, but what about satellite radio? Hugh Cocks describes the WorldSpace satellite radio service and the operation of one of the sets that has been designed for its reception

The main purpose of the WorldSpace radio project is to provide those in developing countries with a wider choice of programming, via satellite transmission. The first of several satellites to come into operation was Afristar. Though it's not intended to serve Europe, reception is certainly possible here. I first saw mention of WorldSpace in 1995 and, being interested in all forms of radio, was intrigued by the idea of good-quality sound from exotic radio stations via satellite, without the need for a largish dish and a TV receiver. A wide choice of stations is available (see Table 1), including the BBC World Service African stream.

The satellites

The WorldSpace Afristar satellite is in orbit at 21·5°E. This is just beyond the Astra 1 satellite system at 19·2°E and to the west of the Astra 2 system at 28·2°E. The satellite was launched towards the end of 1998 and spent almost a year in a test phase before the official start of transmissions in October 1999. It's unusual in being intended for radio transmissions and data traffic only – there's not a TV transmission in sight!

Afristar has three beams that give total coverage of Africa. Beam 1, the west beam, provides considerable coverage of western Europe as well, including the UK. Beam 2 covers eastern Africa, also the Gulf and as far as the western part of India. Beam 3 covers southern Africa. Use of a high-gain aerial gives reception beyond the specified coverage areas. The published maps show the theoretical predicted coverage with the aerial that's supplied, but in practice the coverage is somewhat wider. Fig. 1 shows the Afristar footprints.

Asiastar and Ameristar provide services for the relevant continents.

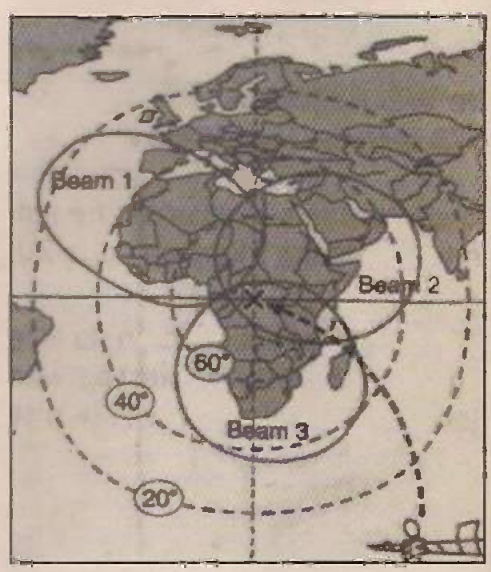


Fig. 1: Afristar footprint map.

Signals

The system uses frequencies in L band, from around 1.452MHz to 1.490MHz, though Afristar's western beam uses from around 1,476MHz to 1,482MHz, with both right- and left-hand circular polarisation. Photos 1 and 2 show the spectra for the right-hand and left-hand polarised signals respectively.

Circular polarisation differs from the more familiar vertical or horizontal (plane) polarisation in that the transmitted signal rotates in a corkscrew-like manner. This makes positioning of the receiving aerial easier, provided the azimuth and elevation are about right. The forward pick-up lobe of the aerial supplied for reception is very wide at around 80°. The aerial doesn't need to be level in the vertical or horizontal sense, which would not be the case with vertical or horizontal polarisation.

The signals are digital, using a

Photo 1: Afristar beam 1 spectrum for right-hand polarised signals. To take this photograph the signals from the aerial were split between the receiver and a signal analyser. Photo taken in Portugal.

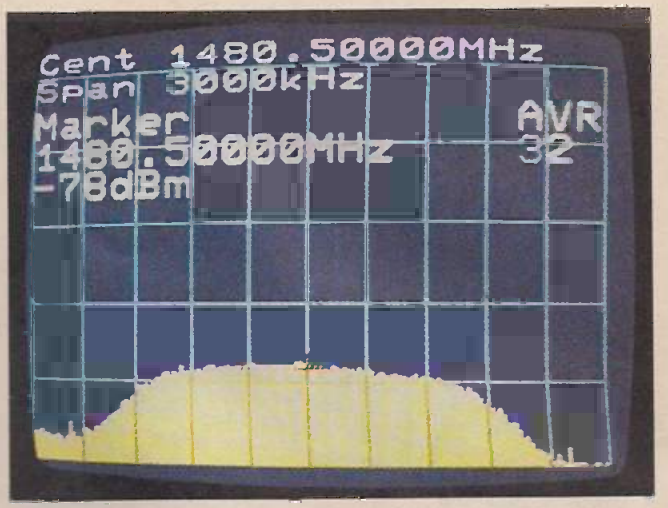


Photo 2: Afristar beam 1 spectrum for left-hand polarised signals. Conditions as for Photo 1. In the UK the left-hand polarised signals are slightly weaker than the right-hand polarised ones.

WorldSpace proprietary system. As with digital TV, use of compression enables many stations to be fitted into a very small bandwidth.

Data channels will be used for high-speed internet connection: this is referred to as WorldScape rather than WorldSpace. Don't get too exited about this prospect however. I understand that PCs will require a special card, and that the service will be made available on a country-by-country basis once arrangements for the terrestrial telephone return path from a subscriber's computer have been made with local Internet Service Providers. It's quite possible that these data services will not be available in Europe.

Receivers

Four manufacturers initially produced radio receivers under licence from WorldSpace. Panasonic has a hi-fi type unit that incorporates a CD player; Sharp does a bed-side clock version; JVC came up with a modern-style 'ghetto-blaster'; while Hitachi opted for a portable model that includes short-, medium-wave and FM coverage (see Photo 3). I selected the Hitachi KH-WS1 as being the most practical for me, because I do a fair amount of travelling. For more information on the receivers and on the system in general, go to www.worldspace.com on the internet.

The Hitachi KH-WS1

The approximate dimensions of the Hitachi Model KH-WS1 are 24cm wide, 16cm high and 6·5cm deep. It weighs 1·5kg, 1·9kg with batteries. While most transmissions are stereo, the KH-WS1 has only a mono speaker. But there are stereo line and headphone jack sockets at the side, see Photo 4, so a hi-fi system can be connected or stereo headphones can be used. There's a 9-pin data output port at the same side, and a standard F socket for the satellite aerial. This can be connected either via its short flying lead, when the aerial is clipped to the top of the radio, or via a coaxial extension cable.– no cable is supplied, though the connectors and some waterproofing tape are.

A standard telescopic aerial is used for short-wave and FM reception – there's no provision for an external aerial to be connected for reception in these bands. A conventional ferrite-rod aerial is incorporated for medium-wave reception. The satellite aerial, see Photo 5, is fixed in a plastic frame with overall dimensions 15cm wide, 3·3cm deep and 15·6cm high. It can be clipped to the rear of the radio or connected via a coaxial extension cable. The elevation of the aerial can be adjusted for optimum signal pick-up. It has an internal line-powered (from the receiver) amplifier to make good any cable losses, and presents an acceptable signal input level to the L-band tuner. A fair length of coaxial cable can be used between the aerial and the receiver without any noticeable loss of signal quality. The manual suggests up to ten metres of 50Ω cable. I used twenty metres of 75Ω coaxial cable as this was to hand, despite dire warnings about the use of 75Ω coaxial cable as both the aerial and the receiver are matched for 50Ω, but found that 75Ω cable produced no reception problems.

Afristar transmits signals with both left- and right-hand circular polarisation. To change the aerial over from one reception mode to the other the receiver sends either 2·4V or 3V down the cable, for left- and right-hand polarisation respectively. This is similar to the standard TV 13V vertical/17V horizontal LNB polarisation changeover system.

I wanted to look inside the plastic covering to see how the aerial is configured. Removal of the back is easy, but the assembly is securely fixed inside the cover with very hard to remove plastic rivets. So I decided not to venture farther! In all probability the aerial consists of two half-wave dipoles (at the frequency involved these would be approximately 10cm long) at right-angles to each other, with their phasing altered for left- or right-hand polarisation.

I was surprised that the manual contains

Photo 3: Front view of the Hitachi Model KH-WS1 satellite radio receiver. The display panel shows that the BBC service is being received – only one 'service channel' (see text) is available. Note that WS indicates WorldSpace, not World Service. The satellite frame aerial (top, rear) can be angled down behind the radio or, as here, above, depending on which way the satellite is relative to the receiver. The top of the conventional radio bandswitch is just visible in front of the lower right-hand side of the aerial.

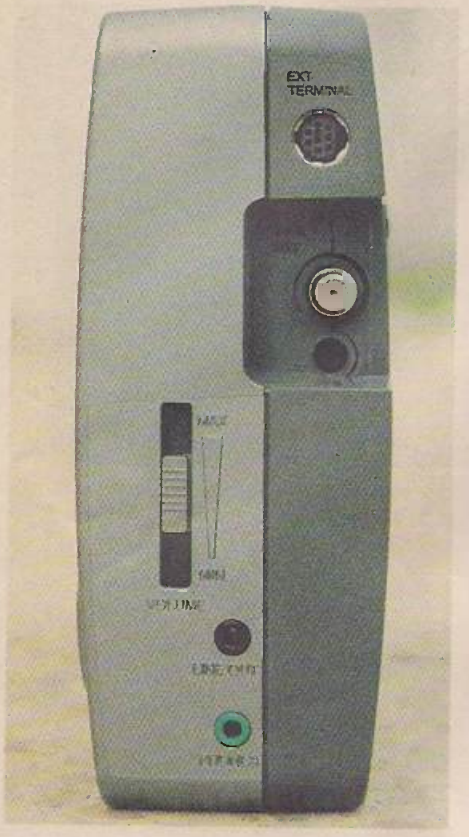


Photo 4: Side view of the Hitachi Model KH-WS1, showing the slider volume control, the line and headphone output jack sockets (bottom), the F input socket for the L-band aerial and the data socket (top).

Photo 5: Close-up view of the WorldSpace aerial, alongside a standard floppy disc to give an indication of size. The flying lead from the aerial is connected either directly to the receiver's F socket or indirectly via an extension coaxial cable.

no warnings about accidentally short-circuiting the coaxial cable when disconnecting it from the aerial or if a whisker of coaxial braid should touch the inner conductor – it's all too easy for this to occur, especially if you have no experience of fitting F plugs to coaxial cable. I took extra care myself. Hopefully the receiver incorporates some form of DC short-circuit protection, like modern satellite TV receivers. I've always been very wary of this problem since I encountered, some years ago, a well-known make of satellite TV receiver which incorporated a special design that would, if a prolonged coaxial short-circuit was present, cause failure of the mains transformer rather than the DC supply fuse to the LNB.

If a short should accidentally occur, once it has been cleared the receiver may need to be switched off then on again to restore the supply to the aerial. There is no power to the aerial when the receiver is in standby, nor when it's switched for reception of the conventional bands.

The receiver can be powered by four internal D cells, via an external 6V DC source, or from the mains via a standard, detachable lead (see Photo 6). Take care, as there's a selector switch for 110V/220V mains supplies. This could accidentally be set for the wrong voltage – a label warning about this possibility is attached to the receiver. The default setting ex-factory is 220V. Up to thirty hours' use can be obtained with alkaline D cells.

The KH-WS1 can memorise up to ten WorldSpace channels, also ten each medium-wave and FM channels. For short-wave operation the memory consists of two blocks of five, as the coverage is divided into two ranges, 2·3-7·3MHz and 9·5-26·1MHz, though there are some gaps between the official broadcast bands. FM coverage is 87·5-108MHz, and medium-wave coverage 520-1,620kHz in 9 or 10kHz steps (9kHz is used in Europe and Africa, 10kHz in the Americas and certain other parts of the world). The American medium-wave band has now been extended to 1,710kHz: this is referred to as the X band, which should confuse old microwave hands! I was surprised that this wider tuning range wasn't incorporated.

Receiving WorldSpace transmissions

My initial test to find the WorldSpace signals from Afristar couldn't have been simpler. Clip the frame aerial to the back of the receiver, then plug its flying lead into the F socket at the side. Switch the receiver on, push the WS/RADIO button to select the WorldSpace band, and point the front of the frame aerial in the approximate direction of the satellite. In the London area this would be azimuth 155°, elevation about 27°. There must be a clear view towards the satellite, though reception from inside a window is normally OK. WRN1 was immediately there!

If the aerial is moved away from the direction of the satellite, "no beam" will eventually appear in the display panel. The aerial's wide forward pick-up, about 80°, makes finding the satellite quite simple. Provided the aerial remains connected, the signal strength will be shown as a minimum of one bar out of five. This goes off when the aerial is disconnected. It at least shows that the active aerial should be working.

Once the satellite has been found the aerial should be adjusted for a maximum signal-strength display. When a signal is present, "locked" appears in the display window. If nothing has been found, "no beam" appears.

Fortunately, for those in this part of the world, the receiver defaults to the "local" Afristar beam 1 when initially searching for signals. If you live in a different footprint area, a search procedure has to be started. Provided you know the beam number, press the mode button then the beam button: keep pressing the beam button until the required satellite beam (or satellite, as Asiastar and Amcristar are included) is displayed, then press the enter button. This forces the receiver to start a search on the beam selected.

If you are not sure which beam or even satellite covers your area, the receiver can do a general search. This is initiated by pressing the mode then the beam-seek button. The receiver then searches through all possible combinations of beams and satellites. Once a beam has been found it's name will be shown in the front display for two seconds, then the search will recommence. The satellite's name appears twice during the search, as the receiver deals with both polarisations from the same beam.

Once initial tests have been carried out and you are satisfied with reception, find a suitable place for the aerial. A good location is just inside a south/east-facing window. Make up a coaxial extension cable to connect the aerial, in its permanent position, to the receiver. Reception may be possible with the aerial fixed in the loft. During a brief test in southern England I found that this worked well enough, but a certain amount of signal attenuation occurred when the roof tiles were wet.

I noticed that the grey plastic-covered aerial tended to become rather hot to touch when in direct sunlight – the instruction manual warns about prolonged exposure to sunlight. The aerial could be kept cool by placing it in a white plastic container. At these frequencies signal attenuation through plastic is minimal.

The aerial is waterproof, but when mounted permanently outside it would be best to fix the aerial in a box, which should also cover the connection between the aerial's flying lead and the coaxial extension cable. This will minimise the possibility of water getting into the connections. I know, from experience, that this all too easily happens.

Table 1 shows a list of stations transmitted by the satellite, with the polarisation. The list is likely to change – and there's capacity for a lot more stations.

Because of the time taken for the signals to be multiplexed together, uplinked then downlinked, I found that there's an average delay of about three-four seconds. The exception was CNN TV sound, which was delayed much less.

WorldSpace operates two uplink hub sites to Afristar, in London and Johannesburg, or stations can use a direct link from the studio to the satellite. This avoids the cost, which can be expensive, of getting the signal to either of the uplink facilities.

In southern England the signals produce a four out of the maximum five bar display of strength with right-hand polarisation and a steady three bars with left-hand polarisation. Here in southern Portugal you get a four- to five-bar display with either polarisation, using the aerial supplied. Each signal-strength bar consists of two smaller bars, which come on together and can be confusing initially.

Selecting and memorising channels

Once signals have been found for the first time the channels, which are identified in the display window by name, can be scrolled through by pushing the large round BC up or down button at the lower right-hand side of the receiver. When a station of interest is found it can be entered in the memory by pressing the upper left memory button, followed by one of the 0-9 buttons on the front panel. It's then fixed in the memory with this number.

Each channel is referred to as a BC (Broadcaster Channel). A number of SCs (Service Channels) can be incorporated in a BC. At the moment there seems to be only one SC with the channels I've picked up, except for a couple of BCs that transmit data on a second SC. The SC number being received within a BC is indicated beside the BC's identification (see Photo 3). It can be selected by moving the lower right-hand side round selector button to the left or right (SC up/down). The memorisation process remembers a particular SC within a BC.

It's a shame that only ten memories are available. Even with the limited number of stations available at present I wanted more.

If you want to check how many SCs there are within a BC being received, you can do so by pressing the mode button followed by the SC up or down button: the display then indicates the total number of SCs available within the BC.

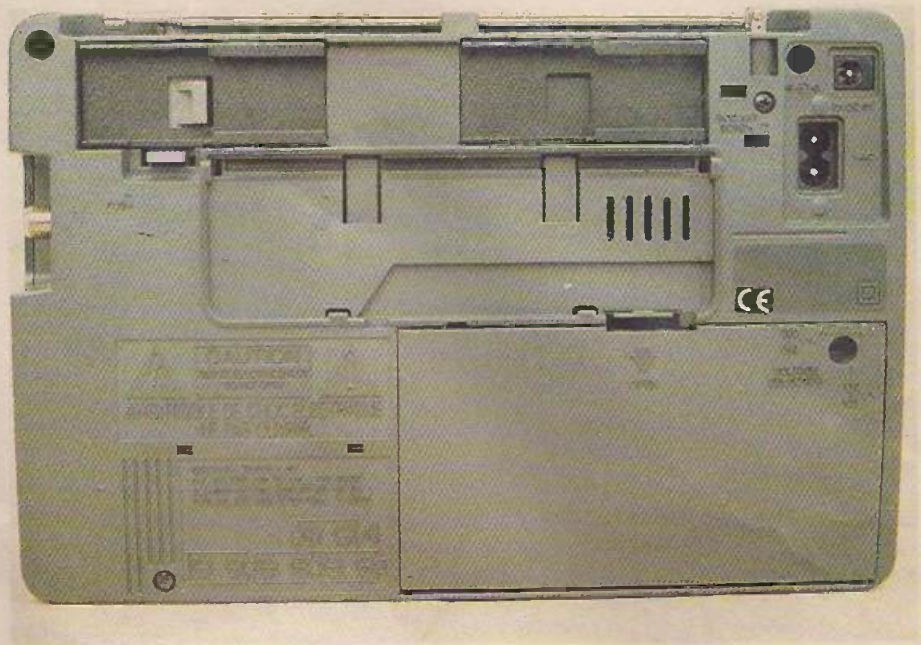


Photo 6: Rear view of the Hitachi Model KH-WS1. The mains and 6V DC input sockets are at the top right. The mains voltage adjustment is in the hole at the top, right-hand side of the battery compartment cover. The frame aerial slide/clip-in fixing lies horizontally along the top of the receiver, just below the telescopic aerial. The F input socket can be seen at the left-hand side.

Searching stations by language and programme type

WorldSpace satellites transmit in many different languages. If you are interested in only one particular language, a list of stations available by language can be produced to avoid having to scroll through a large number of unwanted transmissions.

When the language button is pressed the default language (English) is displayed. After five seconds this display disappears, leaving a "lang" identification in the window. Press the SC up button and over forty language identifications can be scrolled through. When you stop at a language of interest, pressing the BC up or down button produces a list of stations that transmit in this language. "No lang" is displayed if no stations that use the language are available.

There's a similar facility for searching by programme type. Press the PTY button and the receiver's default, "news", is displayed. This disappears after five seconds, leaving PTY displayed. Press the SC up button to scroll through fifteen different programme types, for example jazz, pop, sport etc. Stop at the one required and press the BC up or down button to get a list of channels that transmit this type of programme. If nothing is found, "No Ptype" is displayed.

Mobile use

As the signal strength is a little higher in southern Portugal than in the UK, and the elevation is higher, I tested the radio here in a car. The receiver picks up sufficient signal, though at reduced strength when the aerial is mounted horizontally. The aerial was securely tied to a roof rack cross-member, with the coaxial cable fed in through a window. Power was supplied to it from the receiver's internal 6V batteries.

Results were generally favourable outside built-up areas, with reception virtually all the time. In built-up areas reception ceased when a building blocked the path between the aerial and the satellite. This was to be expected. Reception was restored within a second once the obstruction had been passed. There were brief dropouts when beneath an overhead road sign that impaired satellite visibility.

Table 1: WorldSpace Afristar Beam 1 Channels.

At 1,478MHz IF with RH circular polarisation:

BBC World Service (African stream); WRN 1 English; CNN (TV sound); Radio Voyager (adult contemporary pop music, US based); Radio 1 Lebanese/English (pop music); Capital Radio Turkey (Pop Kenya Broadcasting Corporation, in English and local languages including Swahili); Metro East FM (Kenya based, aimed at Indian/Asian population); Tamil Oli Radio (for Tamil-speaking expatriates); Bloomberg UK, France, Spain, Italy (financial news channels with TV sound); Radio Espana Exterior (Spanish external service); WRN 2 (German); Egyptian Radio networks 1, 2 and 3 (mainly Arabic though one network is in English or French at times); Golfe FM Benin (French, Yoruba and Fon languages); Sud FM Senegal (French); Medi 1 Morocco (French); LA7 Senegal (French); WALF Senegal (French and Wolof languages); Radio France International; Canal Educatif Francophone*.

At 1,480·5MHz IF with LH circular polarisation:

Kaya FM 95·9 Johannesburg (pop music, some news); Radio France International 1; Bop (modern rock)**; Ultra Pop (international pop hits)**; 24 x 7 (international dance)**; Potion (adult contemporary)**; Up Country (country)**; Riff (jazz)**; Ritmo (African pop)**; Maestro (classical)**; Earz (children's programmes)**; Letters (English spoken word entertainment)**; Africa Learning Channel; Coded Transmissions (two); Comet 1 data; Comet 2A data.

*Broadcast channels marked with an asterisk have a second service channel (SC) for transmitting data. Note that there are two 'Radio France Internationals', one with RH polarisation and the other, called Radio France International 1, with LH polarisation.
** These are 'themed' stations produced by WorldSpace itself.
To receive the coded transmissions, apply to a WorldSpace office with the radio's serial number. There is no indication on the radio display as to what these coded channels transmit.

Those with internet access should go to www.lyngsat.com to obtain up-to-date channel listings for Afristar and TV broadcast satellites around the world.

It was strange driving along listening to CNN TV sound. A more effective mobile aerial system might consist of two or possibly four of these aerials at 90° to each other on the car roof, looking for the satellite at the correct elevation angle. This would hardly be a low-profile aerial system however!

An interesting effect occurred when I was just below the local hill top where there are transmitting aerials for four analogue VHF/UHF TV channels, assorted FM radio services, mobile phones and pagers. The satellite couldn't be received over a 1km stretch of road nearest the masts, though there aren't any local L-band transmissions. The reception failure must have been because the aerial amplifier was being overloaded by the high-level local transmissions from the FM band up to the 1,800MHz GSM cellular band.

A point to note is that the WorldSpace frequency range (1,452-1,492MHz) is allocated for terrestrial digital audio broadcasting in the future. Thus in some locations WorldSpace reception will not be possible because of local interference from these transmissions.

Trying a higher-gain aerial

Reception is possible outside the satellites' published footprint areas, but if you are way outside the footprint a higher-gain aerial than the one that comes with the receiver will be needed. A seemingly simple solution would be to mount the supplied aerial at the focal point of a dish and point the dish in the direction of the satellite. When I tried this with a 1·2m offset dish in southern Portugal I was rewarded with the left-hand polarised signals from beam 2, the eastern beam – a long way from its intended coverage area. Strangely the right-hand polarised signals couldn't be received, though they were just detectable with a spectrum analyser. These signals are about 10MHz below the beam 1 signals, at around 1,467-1,472MHz.

But things are never that simple, and there's a complication when using the supplied aerial as a feed for picking up signals from a dish. Once the incoming signals have been reflected from the surface of the dish their polarisation is reversed. So right-hand polarisation becomes left-hand and vice versa. Unfortunately the receiver is programmed to control the aerial polarisation at specific frequencies, and cannot adapt to reversed polarisation during a brand-new scan. Once the signal polarisation has been reversed, the aerial tries to pick up the wrong polarisation from the dish. Because of the flat-plate aerial's high rejection of reverse circularly-polarised signals, almost no signal is received from the satellite.

For the test I got round this problem by blocking the DC feed from the receiver to the aerial and instead feeding 2·4/3V up the line to the aerial via a modified line-power injector intended for satellite TV use. This enabled me to select the aerial polarisation independently of the receiver.

WorldSpace has available a high-gain Yagi-type aerial and amplifiers (see the website). If you construct something suitable it will require preamplification, as with the supplied aerial, for the input to the receiver's tuner to be at an acceptable level. A standard satellite TV line amplifier may be OK for this application, as the IF that comes from a TV LNB is in the same frequency range, but such amplifiers are designed for powering at between 13/17V, not the receiver's low line-voltage supply.

Conventional radio performance

Press the WS/RADIO button to select the conventional radio bands. Changeover between these is by means of a slide switch at the top of the receiver. Memorising a station is simple.

The only drawback on the short waves is that two well-known, slightly out of band BBC World Service frequencies, 12·095MHz and 9·410MHz, couldn't be tuned in. This was a shame.

Obtaining a receiver

The supply of WorldSpace receivers has improved over the past year but, because Europe is not the prime target area for the services, receivers are not widely available. The WorldSpace website lists a number of dealers in Africa. The Hitachi model should be available for about £100. Try the following possible sources: ■

Waters and Stanton, 01702 206 835, e-mail sales@wsplc.com

Haydon Communications, 01708 862 524.

Nevada, 023 9231 3090, e-mail info@nevada.co.uk, www.nevada.co.uk

Unique reader offer:

x1, x10 switchable oscilloscope probes, only £21.74 a pair, fully inclusive*

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Please allow up to 28 days for delivery

Seen on sale for £20 *each*, these high-quality oscilloscope probe sets comprise:

- two x1, x10 switchable probe bodies
- two insulating tips
- two IC tips and two sprung hooks
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There's also two BNC adaptors for using the cables as 1.5m-long BNC-to-BNC links. Each probe has its own storage wallet.

To order your pair of probes, send the coupon together with £21.74 UK/Europe to Probe Offer, Electronics World Editorial, Quadrant House, The Quadrant, Sutton, Surrey SM2 5AS.

Readers outside Europe, please add £2.50 to your order.

Specifications

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

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

Relay versatile

Twenty years ago, who would have thought that the humble electromechanical relay would still be around? But it is, and what's more, it is still being designed into new equipment. Here J P LeJeune provides a background to the relay and presents some ingenious ways of making use of it.

Semiconductors seem to have taken over everything in our lives, well... nearly everything. However there is one humble servant that still has a place in our designs and developments – the relay.

This electromechanical switch is rugged, versatile and reliable and it can be used where semiconductors cannot. Its on resistance is virtually zero ohms while its off resistance virtually infinite, making it ideal for applications where on/off switching has to be clean and absolute.

The most common relay is the PO3000 series, used in telephone exchanges across the world and many other pieces of equipment, Fig. 1. An open-frame construction makes it possible to adjust and clean the contacts. The operating coil (solenoid) can be changed and various 'slugging' arrangements used to modify the speed of closure or opening of the contacts. Slugging involves adding a brass or aluminium sleeve to the operating coil.

Relays are generally considered to be intended for light current control. They have a bigger brother in the contactor, generally accepted to be necessary for power applications. Operational principles are much the same except that contactors are sometimes supplied with operating coils, cores and armatures designed specifically for AC operation.

Types designed for AC use have laminated iron cores and are sometimes gapped as well. Relay coils, however, are normally for DC operation, though the contacts can switch AC circuits, audio, and low-frequency RF as well as DC. For high-frequency switching co-axial relays are widely used.

Semiconductors can switch AC and DC circuits, but they have only one on/off operation. Moreover, the control circuit and the switched circuit cannot easily be isolated. Here the relay scores heavily with its total isolation between operating coil and contact set, and that contact set can be made up of normally open (NO), normally closed (NC) and changeover (CO) types in a variety of combinations, permitting several different circuits to be switched simultaneously.

Relays have been used for several decades in microwave ovens and television receivers. Look in a microwave oven and you'll find several relays controlling the application of power to the cooling fan, magnetron power supply,

turntable motor, interior light and grill element. In television receivers they have been used for stand-by switching over a number of years and are highly reliable.

Most relays are capable of a million operations before they have to be serviced or replaced. In older telephone exchanges the relays assigned to each incoming line also acted as transformers for the insertion of dialling tone. etc, by having triple windings, Fig. 2.

Away from the now elderly 3000 relay, the range of types and sizes now available is amazing. Some relays have polarised armatures that require a pulse of current in one direction or the other to change from 'operated' to 'not operated'. Most famous of these was the Carpenter relay, used as a telegraph repeater for teleprinter signals on long routes.

The Carpenter relay responded sensitively to the + and –80V signals weakened by the loop resistance of a long line. Its changeover contacts supplied a fresh + and –80V to the next section of line. Carpenter relays were housed in cylindrical cans, were quite large and exquisitely made. Today they would cost a lot of money.

Miniature relays have been sealed into evacuated glass envelopes of the kind once used for B7G based valves, enclosed in metal cans, plastic see-through cases, or just left open like the old 3000. Most though are much smaller and even more reliable than their predecessor.

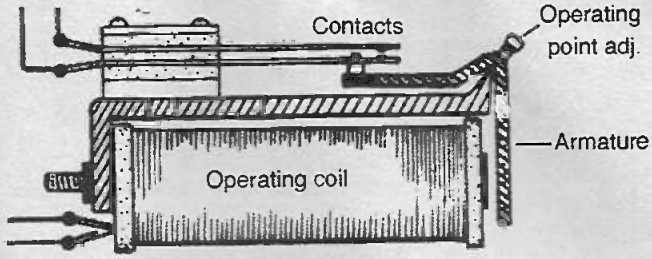


Fig. 1. PO3000 – the most common relay, as used in telephone exchanges across the world.

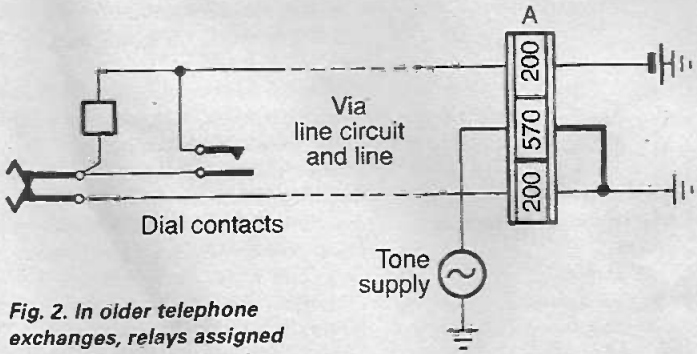
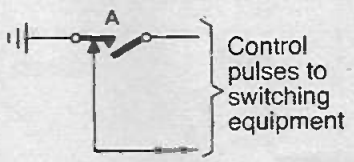


Fig. 2. In older telephone exchanges, relays assigned to each incoming line also acted as transformers for the insertion of dialling tone, etc, by having triple windings.



Uses of relays

On their own, relays have several applications. The very simplest is a buzzer, Fig. 3. The frequency of the buzz depends on the mass of the armature, tension of the spring-sets and the applied voltage.

With this arrangement, a lot of arcing occurs at the contacts unless suppression is included. A capacitor of about 100nF connected across them will help, and also suppresses any RFI that is generated.

Of more use, possibly, is a latching switch, shown in Fig. 4. Here the normally-open contacts are connected across a pushbutton with normally open contacts (push to close). The parallel combination connects in series with another pushbutton and the relay operating coil. This time though, normally-closed or 'push to open' contacts are used.

Pushing the SET button applies a voltage to the coil and the relay operates, closing the contacts set and maintaining the voltage across the coil. To reset the circuit, the RESET button has to be pushed. This opens the circuit and the relay is de-energised.

The buzzer circuit can be augmented with a second, changeover, set of contacts to provide a square wave with a peak-to-peak voltage equal to the supply voltage. This is a very cheap and simple signal source, though of fixed and somewhat low frequency, Fig. 5.

One use I came across for this was for testing loudspeakers used on an

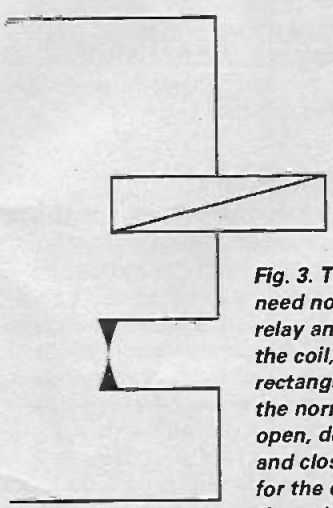


Fig. 3. To make a buzzer, you need nothing more than a relay and a DC supply. When the coil, represented by the rectangular box, is energised, the normally-closed contacts open, de-energising the coil and closing the contacts again for the cycle to repeat. Note that without suppression, the circuit also makes a good RF noise transmitter!

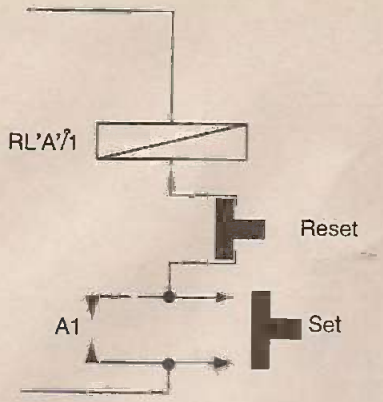


Fig. 4. Latching switch. When the set button is pressed, the coil is energised so contacts A1 close. Releasing the set button has no effect. A reset button is needed to re-open the circuit.

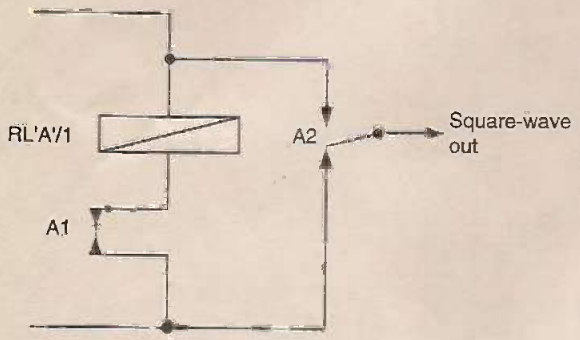
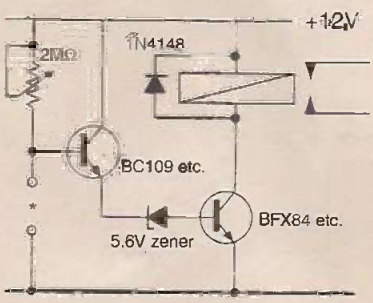


Fig. 5. Not far removed from the simple buzzer circuit, this one produces a square wave whose amplitude is equal to the supply voltage.

Fig. 6. Contacts marked with an asterisk can take an ORP60 or similar light-dependent resistor to turn the circuit into a dusk-to-dawn switch. Alternatively, they can take an NTC bead thermistor of 100kΩ at 20°C to make a room heating controller.



old wireless relay network! The speakers were fitted with a 600Ω matching transformer and a volume control potentiometer, so no-one was deafened.

Relays and semiconductors combined

In combination with semiconductors, relays take on more useful applications. Very few semiconductor switching circuits will operate satisfactorily with fluorescent lights or energy-saving lamps. The relay does not mind what kind of load it switches – within its ratings. Automatic switching of lights on at dusk and off at dawn can make a useful contribution to safety and security for many households.

Obviously, for long operational periods – especially in winter when the nights are long – a fluorescent or other energy-saving light is ideal. These can be operated safely from a relay-based circuit and have high reliability over many years.

A circuit for such a device is shown in Fig. 6. With a different sensor, the same circuit can be used as a thermostat for controlling a room heater, Fig. 7.

Relays have applications in many other home security systems where high reliability and minimum vulnerability to lightning – often a cause of false alarms if the alarm system itself survives. Circuits can be devised simply for such uses.

In hazardous environments, ordinary switches are sometimes inadvisable. The low voltage required by most relay operating coils makes the relay or contactor ideal for remote control of lighting, heating and industrial processes. It is also ideal for switching dangerous voltages.

In heavy-current applications, contactors can be used to advantage by allowing the switching to take place close to the device under control. This eliminates the need for long runs of heavy-current wiring to a convenient switch.

Many time switches do not have a high current-switching capacity, but by using a relay or contactor between the time switch and the load that problem can be solved.

At the very low current end of the scale are the reed switches and reed relays. The reed switch is normally a pair of open contacts sealed in a small glass tube, Fig. 7. They can be operated magnetically by a coil or small permanent magnet. Though not strictly relays, the addition of a coil to the reed switch turns it into one.

You can buy pre-assembled reed relays, but their versatility comes in the ability to make up one for a specific application. A few years ago a police force required a circuit to warn drivers of police vehicles when the stop lights were not working. The device had to be simple to fit and positive in operation.

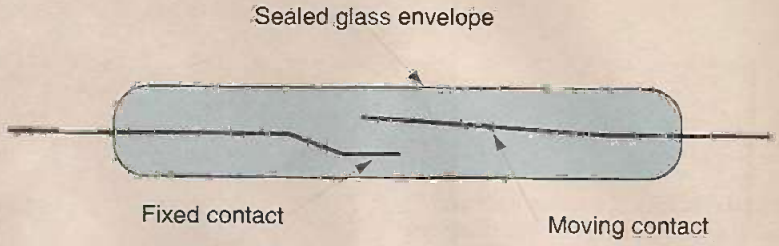


Fig. 7. Not strictly a relay, the hermetically sealed reed switch is suitable for low power applications. It can be activated by a magnet or by a coil – in which case it becomes a relay.

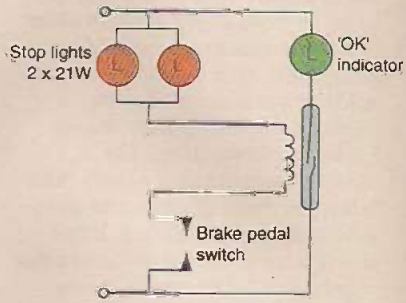


Fig. 8. This simple application of a reed switch gives the driver of a car an indication of whether or not his or her brake lights are working.

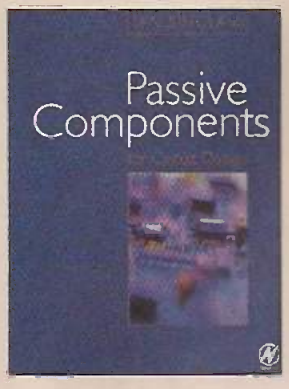
The solution was easy and cheap. With twin stop lights, the total power amounts to 42W. At 12V the current will be 3.5A. However, the inrush current taken momentarily by a cold lamp filament before it reaches its operating temperature is much higher. A few turns of ordinary single 0.5mm insulated copper wire wound around the glass tube of a reed switch was the answer.

If both stop-lights were functioning, the reed relay would operate and hold, lighting a small lamp on the dashboard to tell the driver all is well. If one of the lights failed, the inrush current of the remaining light was insufficient to close the reed contacts and no 'OK' signal beamed from the dashboard. It was a great success.

Figure 8 shows the circuit. The prototype was designed and constructed on the bench using a car battery, two 21W stop-light bulbs and the reed switch. It cost very little in time and effort to set up. Present-day designers would probably use a microprocessor!

The relay may look humble, but it really is a versatile and reliable component that deserves more applications. ■

BOOKS TO BUY



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Readership: Technician engineers, circuit designers, advanced hobbyists
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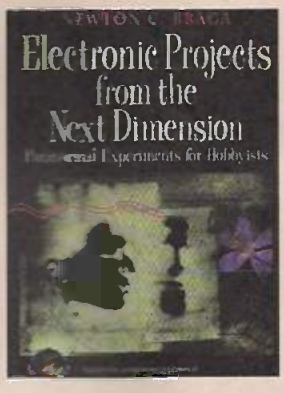

ELECTRONIC PROJECTS FROM THE NEXT DIMENSION
For years paranormal scientists have explored the detection and documentation of spirits, auras, ESP, hypnosis, and many more phenomena through electronics. Electronic Projects from the Next Dimension provides useful information on building practical circuits and projects, and applying the knowledge to unique experiments in the paranormal field. The author writes about dozens of inexpensive projects to help electronics hobbyists search for and document their own answers about instrumental transcommunication (ITC), the electronic voice phenomenon (EVP), and paranormal experiments involving ESP, auras, and Kirlian photography.

Although paranormal studies are considered esoteric, Electronic Projects from the Next Dimension teaches the technical skills needed to make devices that can be used in many different kinds of experiments. Each section indicates how the circuit can be used in paranormal experiments with suggestions about procedures and how to analyze the results.

Contents: White noise generators for use in instrumental transcommunication (ITC) and electronic voice phenomenon (EVP) experiments; Practical circuits for image experimentation, such as a wireless sparkling image generator, horizontal baf generator, brontophic sound, magnetic field generatar, high-voltage generators (Kirlian Machine's I & II); Paranormal skills experiments with temperature change, polygraph, electro-shock, random number generation, UFO detection, and ghost-finding.
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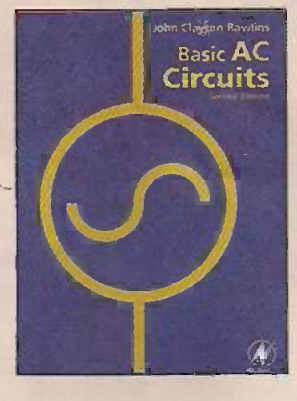

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Service data on discs

The use of computer discs for service data and spares catalogues has advantages and also some serious disadvantages. Steve Beeching, I.Eng., sums up the present state of the game

Isn't it always the same way? – manufacturers want to save money. Their latest wheeze is to stop issuing service manuals on paper. Very soon many of them will be issuing service information only on computer storage media – CDs or DVDs. They say the reason for doing this is to save money and forests. Then comes the promotion: easier to store, direct access, millions of service manuals and technical bulletins on a single disc and so on.

Who saves money through this scheme? The service organisation? No, it's the manufacturer, who is actually transferring the cost to the service organisation, which means us!

Investing in the future

To secure their future all service organisations, from the single self-employed operator to firms with a larger number of employees, have to invest in the business. Many service organisations have done so in recent years by investing in workshop computer facilities. Some have gone as far as one PC per bench networked to a server computer. There are several benefits. Once a job is booked in the details can be kept up to date, enabling the customer to be told about progress should he enquire. The job can be tracked, accurately costed, and spares can be ordered for the repair or to replace used stock. Software such as Service Base is available for medium to large companies. For the more adventurous a database such as Filemaker Pro can be used to track jobs and print out paperwork of your own design.

With some products PC-based software is required for alignment or data management to and from an internal EEPROM. When digital still-picture facilities are incorporated, the picture download system may have to be checked for a customer. Soon, the DVC IEEE1394 input/output facilities will require confirmation. This happens now in my organisation, as more of my customers set up with a PC and then complain that a product has failed to communicate, in most cases because of a PC or software problem.

Electronic service data

There are a number of ways of converting service data to electronic form. The most commonly used is the portable document file (.pdf) from Adobe, using a system called Acrobat. A reader is available free as a download from the Adobe website at http://www.adobe.com/prodindex/acrobat/readstep2.html

The Acrobat reader can magnify a circuit many times, but unfortunately the selected magnification cannot be printed out. If print is selected, the whole file is printed. By ticking the fit-page option a full circuit diagram can be printed out on an A4 sheet. You can't read it of course, but that doesn't seem to bother these manufacturers!

A second PC may be required at each bench, with at least a 17in. monitor, as a substitute for the old paper service manual. In some cases the PC can double for software set-up. but what if the set-up procedure is on the CD-ROM?

The window for the circuit diagram or exploded view is usually less than the screen area, and a fairly high resolution is desirable – 1,024 x 768. more if the monitor is capable of it.

Manufacturers' policies

Most if not all manufacturers will be going over to CD/DVD-ROM instead of paper, and will distribute the discs free-of-charge to those with spares accounts. This is not Sony's policy however. The company charges for the discs, which time-out after a specific period.

As a supplement to their electronic data, JVC and Panasonic both issue short service manuals that consist of basic schematic diagrams in print form. This is an ideal solution. The CD-ROM is very convenient for parts lists, and for exploded diagrams of a product's component units and case parts, as these are reference items. For fault finding you get a paper circuit diagram that you can scribble on. I find it strange that the user instruction book is not included with the CD-ROM service data, as it was with the printed service manuals. In the case of camcorder menus this was very useful, particularly when a customer complained that he couldn't understand some function or other.

When a recently mailed-out information sheet from Sony stated that paper service manuals would no longer be issued there were a few flurries in the industry. Sony listed the computer requirements for its Assist ROMS, and left out the crucial item – that the information would be on a DVD-ROM, not a CD-ROM as some may have assumed. What's more the service organisation is expected to rent the Assist DVDs at £199 a year (£99 if you are an authorised service centre, free if you do a lot of work for Sony). Oh, and you will need an A3 colour printer (cost about £300-£1,900) to print out any circuits, as these will not be supplied even as short-service manuals.

This is what Sony calls saving money. Not many small local service departments are going for it. They can't justify the annual outlay, or the cost of updating current PCs for just a few Sony repairs. This may be what Sony wants. But in time Sony's customer service operators will experience difficulty when it comes to finding a local service organisation that's able to assist their customers. A 'local' repair shop may be 20-30 miles away. Customers will be unhappy about this, and eventually sales will fall. It's all too typical of the short-sightedness in our service industry.

Disadvantages of ROM manuals

The main problem with a ROM-based service manual is lack of peripheral vision. When you look at a paper circuit diagram you scan it with your eyes to assess the general layout, then go to the bit you want. At this point you may concentrate on say a particular IC, but you can also check where all the interconnections go to and come from. The paths often go over considerable distances. It's not possible to see all this when a circuit is viewed on a monitor: all you can see is one bit of it. You can print this bit out, but only if the software allows printing of the enlarged view on screen. Otherwise what you get is an A4 version of an A0 circuit. Tiny, that is.

I have found that many of these ROM service manuals contain more mistakes than the paper versions. Perhaps the tunnel-vision effect impairs the detailed checking process. And corrections are issued on paper!

Spares ordering

Most service companies now order spares using a CD-ROM or the internet, as the distributors – apart from CPC and Willow Vale – no longer issue catalogues. Those who don't issue catalogues, or don't have a representative calling on their clients, are finding that their turnover is on the decrease. Why? It's simple really.

When a rep called on you perhaps all you wanted was some resistors. After a chat and a coffee however you would be told about new lines, special offers and such like, and ended up giving him an order for far more than a few resistors. Catalogues stimulate sales in a similar way. When you browse through one the pictures provide prompts that you may need this or that, and would like to try something new. You end up placing a larger order than you may have intended. The use of a CD-ROM or the internet is different. You concentrate on what you immediately need. It's the tunnel-vision effect again. If you want a couple of resistors, that's what you order. Am I right?

What goes round

There has been an increase in the number of flyers, leaflets and brochures that arrive by mail each week. CPC always issued pages or products, others the odd leaflet. Some are new products, some special offers, some just reminders to re-order your service aids before they run out: others range from non-essentials to toys for the boys. These weekly mind-prompts generate orders for products from essentials to trivia, more than would be generated as a result of browsing through a catalogue, and certainly much more than is generated via a CD or the internet.

Other distributors are joining the supplementary mail out. RS Components issues regular themed brochures: IT and computer products; tools; electrical products; and general product offers. SEME has always been active with the occasional mail shot or promotional leaflets.

Connect has taken the unusual step of appointing real people to visit Willow Vale account holders. These visits are followed up with promotional leaflet mail shots. The whole range Connect white goods and floor-care products is available via a Willow Vale account.

What goes round comes round. While CDs and DVDs have their uses, there's a downside that gets overlooked in the enthusiasm to save costs: lost business.

The change to CD service data has a number of advantages. There are also practical disadvantages that have yet to be addressed. ■

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.

A newsagent can order any magazine for you, whether or not the shop normally stocks it. If you buy your copies of *Television* from a newsagent and want to make sure you get every issue, just ask at the counter.

Installing

Most cars come with a fitted radio. But the owner may well decide that he wants something different. This is when the problems start and you get called in. There is also the matter of fitting amplifiers. Tom Baker on how to go about it

To carry out successful car radio installations, certain rules have to be observed. First, a point that's worth emphasizing, is to read the fitting instructions before you attempt anything. I've on many occasions been caught out because, having fitted the things for so many years, I've assumed that I don't have to bother. It's as if the manufacturers know this, and keep introducing something new to catch me out.

Line-fit radios

Modern cars have 'line-fit radios'. This means that they have the radio leads in the wiring loom as standard, so that Fred at the end of the production line can open a box and insert a radio in the space revealed. This is all very well, and indeed commendable, but when Mr Angry buys the vehicle the first thing he decides to do is to replace the radio. He takes out the one that was neatly fitted and designed to work with the speakers, which were also neatly fitted and expertly hidden, so that he can install something that looks and lights up like a Christmas tree. He then cuts enormous holes in the back parcel shelf, where he fits speakers that could have been used at the Glastonbury Festival, also a sub-woofer in the boot, so that he can damage his eardrums and those of anyone else within two hundred yards. This is where we come in, because Mr Angry wants to spend lots of money to get the job done right. Well, maybe he doesn't, but as he can't do the job himself he's got to pay someone else to do it. And why shouldn't that be us?

Line-fit radios are the ones most punters want to change. To make the job easy for us, there are adaptor looms that can be bought for £10 or less from car accessory shops. But unfortunately, in my experience, Mr Angry has already had a go at this. He starts by cutting off all the plugs, then connects any coloured lead to any other that takes his fancy. When he switches on, the fuses for his interior lights and accessories blow. This is were we come in. We are asked to put things right, in thirty minutes which is when he wants to pick it up.

Sorting out the live leads

As mentioned last month, I find a tool called a Power Probe very useful. It tells me the electrical state of a wire at any given time. The first thing to look for is a permanently live wire. If you are lucky enough to find one, my advice is to put some insulation tape over it – before you are unlucky enough to short it to an earth and blow another fuse. If you can't find a permanent live, Mr Angry has already blown the fuse for you. But you can forget about this for a while.

The next wire to find is the switched live one. For the 'twit' lights to come on some cars need the ignition switch turned to the auxiliary position while others need the switch to be in the full ignition position. Hopefully you will be able to find a wire that lights your probe. If you do, stick some insulation tape round it so that you can identify it when you need to.

Next turn the ignition switch back to off, turn on the lights and look for another live wire. This will be the instrument illumination supply so that, when the side lights are turned on, the radio's front panel lights up and is visible in the dark. If you don't find such a lead don't be too disappointed: not every car has one.

There will normally be a thick wire, brown in most cars but not in all. This is the earth wire. It's probably not a bad idea to mark this one as well.

The speakers

On next to the speakers. My most-used gadget after the Power Probe is so simple it's frightening. It consists of a PP3 battery with a wired connector attached. I use it to ascertain which of the remaining wires are for the speakers and the positions they occupy in the car, i.e. front or rear, left or right.

There is no easier way to do this than to choose one speaker wire, link it to one of the wires from the PP3 battery and, in turn, touch the other wires until you hear a scratching noise from one of the speakers. When you've ascertained which direction the noise is coming from, make a note of the two wires – either by labelling them or writing down their colours on a piece of paper. You should eventually end up with four pairs of wires for two front and two rear sets of speakers.

Aerial

Should you have any wires left over after doing this you can safely assume that one of them is the permanent live you couldn't find before and one of them is for the electric aerial. The car you are

car radios

working on may not have what you presume is an electric aerial, but most modern cars have an amplifier built into the roof or a wing, or front or back window aerial. This amplifier requires a feed from the radio to activate it, and there will be very poor reception if it's left off. I've seen this happen many times. When you restore the supply for the customer, he can be very grateful indeed and promise to bring you all his work in future.

Permanent live

The next job is to find out why your permanent live is dead. This isn't as difficult as it might seem – all you need to do is to find the master fuse box. The fuse box isn't always the easiest thing to find however. But, working on the premise that all cars have one, you'll eventually find it.

Once you've done this, look for the blown fuse and replace it with one of the same type. Then go back to your loom. Hopefully you will now find a permanent live. Cover the end with your insulation tape to prevent it touching what it did before and again blowing the fuse!

Connecting the new radio

We now come to the problem of how best to connect the new radio to the existing loom. If the radio's manufacturer has fitted bullet connectors to the ends, the easiest thing to do is to put bullet connectors on the loom. Ensure that they are crimped on correctly, as described in the previous article in this series (see page 400 last month).

There is only one more thing to do: to make sure that the permanent live and switched live are the right way round. An error here won't stop the radio working. But getting it right will ensure that the car doesn't come back to you in two days' time because its radio can't remember the stations your customer has just spent hours putting in.

If there are no bullet connectors, the best way to connect the radio is either with butt-end connectors or, preferably, solder and shrink-wrap insulation. Don't use chocolate-block screw terminal strips, as the wires may well pull out.

The 500W amplifier

Sorting out Mr Angry's problems will, hopefully, have whetted your appetite for this type of work, especially when he opens his wallet to pay you. Hopefully because it's normally at this time that Mr Angry's wayward son Walter Bodger comes along and asks you to fit his 500W amplifier in his Vauxhall Cavalier.

Before you attempt this type of job you need to take a little time to work out where things are going to go and to plan it carefully. This is what makes the difference between a professional job and one done by Walter. The following things need to be considered:

(1) Measure the size of the unit, then look for an appropriately-sized place where it can be fitted without standing out like a sore thumb.

(2) Determine whether it will be safe to fit the amplifier there. I don't mean safe from being stolen. I mean that amplifiers can get very hot and can burn the upholstery or carpet or discolour the paintwork.

(3) Consider how it is to be attached to the vehicle. If screws are to be used, where can holes for them be drilled?

(4) Will there be enough space to get the extra wiring in safely? Remember that the bigger the amplifier the thicker the cable, which will be harder to bend to fit neatly.

(5) Where will the 12V supply come from? Ensure that the supply can provide the heavy current the amplifier may need to work.

(6) Have you got enough of the correct-sized cable, for both the supply feed and the speakers? It's important to use the correct cable size for the speakers. This cable can affect the frequency response, and the speakers will not work as efficiently as they are designed to do as the cable doesn't pass sufficient current.

(7) Has the wire for the remote connection between the amplifier and the radio been allowed for?

(8) Is there a place near the amplifier for a good earth connection?

Once these things have been considered you are ready to start fitting the unit. Remember that the larger the amplifier the hotter it will run, so a good heatsink will be needed. The boot metalwork is suitable, or underneath the rear metal parcel shelf – as long as it isn't removable.

Amplifier repairs

A lot of lads bring me their amplifiers for repair. Most of them are brand new. The lads can't face taking the amplifier back to the shop where it was bought: they think the shop will refuse to give them back their money or replace the unit as they've blown it up themselves through incorrect fitting.

I very rarely find that there's anything wrong with the amplifier, other than the fact that the remote connection between the car radio's electrical aerial wire and the amplifier terminal labelled "remote" is missing. Most people don't realise that an amplifier, though permanently connected to the vehicle's battery, will work only when the car radio is switched on. It recognises this when the 12V feed to the amplifier's 'remote' connection is present. The feed is present only when the radio is switched on. It comes from the radio's electric aerial output or via the wire designated for this purpose and marked accordingly.

A spotty Herbert

A rather spotty Herbert once brought his car round to me because, according to him, there was a radio fault and it kept blowing fuses. In addition the sound from the speakers was awful.

Before I removed the radio I asked him to show me what was wrong. He put a tape into the cassette player and turned the volume up. Dreadful sound came from the speakers, and I realised in seconds what the problem was – before the fuse blew. He had connected a large amplifier to speakers that were obviously too small for it, and both the radio and the amplifier were being fed from the same overloaded live 12V feed.

After a slight difference of opinion between us he began to see the point about fitting it correctly and agreed to let me do it for him. Many pounds later, after I had installed a proper feed and replaced the rear speakers with higher-rated ones, he had a satisfactory system. He was still the same spotty Herbert, but a poorer and wiser one – and probably by now a deafer one!

What now?

I could tell you many more amusing stories about fitting radios and amplifiers, but I'll have to leave them for another day. Subjects I will deal with next include the intricacies of fitting immobilisers, alarms and CD/auto-changers. Also how to decode car radios using the Joule A400 decoder. ■

Measuring CRT heater voltages

Since a tube's heater voltage plays a vital part in determining its life, a means of determining this accurately is important. Most meters are unsuitable, because of the nature of the heater current waveform. Denis Mott presents a design that converts the current to light which it then measures

One of the most important voltages in a TV set or monitor is the CRT heater voltage. It's also one of the hardest to measure accurately. Since the CRT's heater voltage determines the life of the CRT, which is the most expensive single item in a TV set, it also in effect determines the life of the set. It's seldom worthwhile nowadays fitting a replacement tube. Thus correct running of the CRT's heater is vital.

The tube's heater voltage is usually provided by a winding on the line output transformer. It should be checked whenever a component in the line output stage has to be replaced. The most critical components here are the tuning capacitors, the S-corrector/coupling capacitor, any linearity or loss coils and, obviously, the transformer itself. If the value of a tuning capacitor changes by 100pF, or the HT voltage is not set correctly, the EHT and the CRT's heater voltage can vary by 5-10 per cent.

Another cause of incorrect heater voltage is tube replacement. Maybe the original type wasn't available, so a substitute was fitted. In this case the heater specification should be checked. The last group of figures in a CRT type number, e.g. "0X01", indicate the characteristics of the deflection yoke, whose resistance and inductance play an enormous part in the tuning of the line scan circuit and, ultimately, the heater voltage.

As you probably know, the CRT heater voltage is usually specified as 6·3V RMS. If the voltage is 6·5V or more the life of the tube's cathode will be shortened. Conversely, the if heater voltage is 0·2V or more on the low side the cathode will become poisoned, with the same effect.

Because of the nature of the heater current waveform supplied by a LOPT, it's pointless to measure the heater voltage with a conventional meter. A true RMS meter is also not accurate, because of the unsuitable pulse length or mark/space ratio. The only solution is to convert the pulse into a calorific value and measure that. One method is to convert it to heat and measure the temperature, another is to convert it to light and measure the intensity. The instrument described in this article does the latter. My original unit has been in use for over fifteen years, with only occasional calibration and no adjustments.

Circuit description

Fig. 1 shows the circuit diagram of the meter. In order to measure a voltage in a low-impedance circuit it's important that the source is not loaded with additional parallel resistance. A high input-impedance operational amplifier, IC1, is therefore used

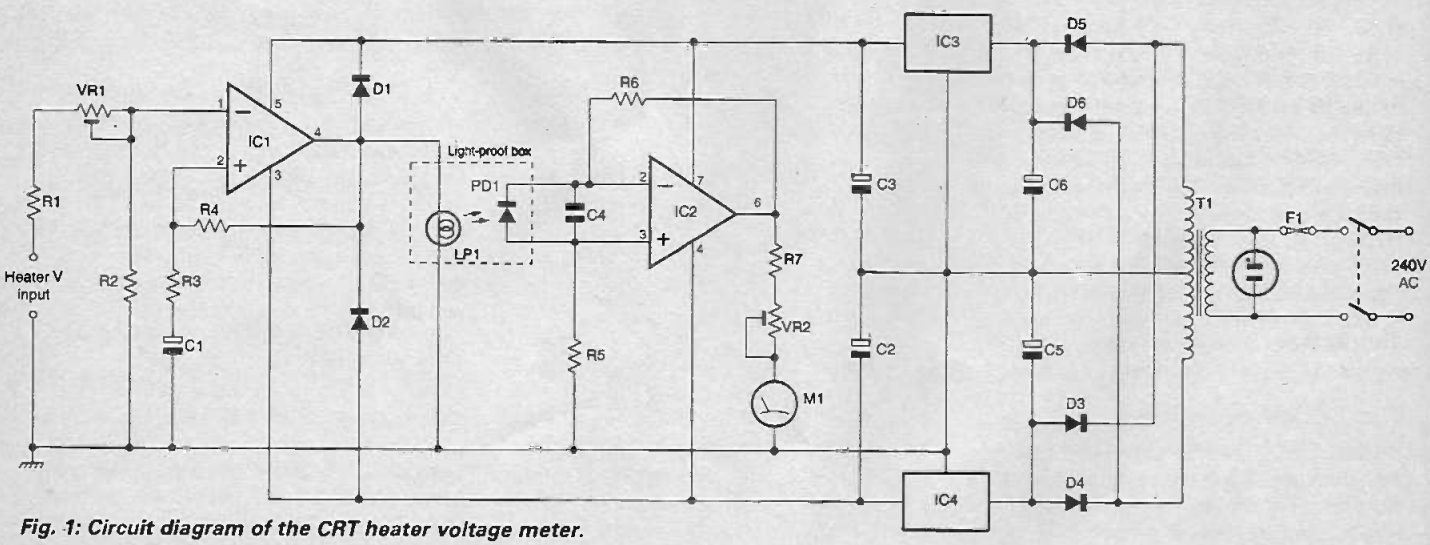


Fig. 1: Circuit diagram of the CRT heater voltage meter.

at the input. It's configured as a full-wave rectifier and is a high-power type to drive a lamp, LP1.

A BPW21 photodiode, PD1, measurers the light output from LP1. It's connected as part of another operational amplifier circuit, with IC2, that drives a moving-coil meter, M1.

Stable positive and negative supplies are required to power the meter, so battery operation is not recommended.

Construction

I've not included dimensions for a case since mine was home-made, but a suitable case from Farnell is listed in the components list. It all depends on the meter you chose to use and what's available in the 'junk' box. Obviously for more accurate readings a meter with a large scale is preferable. The meter I use has a 3in. scale, with sensitivity to provide a 0-10V FSD reading. Any movement sensitivity within reason can be used: the value of R7 is selected to give an FSD ot 10V, with VR2 included to provide a small amount of adjustment.

The only other important requirement is the optocoupling arrangement. I use a 12V, 0·18A MES-type lamp which is mounted on the PCB with its glass nearly touching the photodiode – to prevent thermal coupling a gap of about 2mm is required. A light-proof cover must be provided for the optocoupler to prevent incident light affecting the reading. My cover was made of 1mm plastic sheeting painted black inside and out.

The dimensions of my case were copied from those old 'school-lab' type meter cases that have a sloping face.

Calibration

As the scale is non-linear, meter calibration must be done carefully. Fig. 2 shows the set-up for calibration. For optimum accuracy a true-reading RMS meter should be used. These are a little more accurate – and expensive – than a normal AC meter.

Before calibration, remove the meter scale and either cover it with paper or use some other masking to cover the original scale, leaving the curved line as cursor. Fit the meter back in circuit without its cover.

Set the variac and 10kΩ 10-turn potentiometer VR3 for an true-RMS meter reading of 6·3V RMS. Adjust the value of the calibration resistor R7 so that the heater meter reading is at centre scale. Mark the scale 6·3V at this point, using a draughting pen and black ink. Then increase the AC voltage above 6·3V and mark as required, also decrease it below 6·3V and mark. I marked the scale at 0·1V intervals between 5·8V and 6·8V. Refit the cover after marking the scale.

The scale is not linear. Recalibration will be necessary only if the lamp has to be changed. The circuit parameters were chosen to keep the lamp glowing moderately, so it should last a very long time.

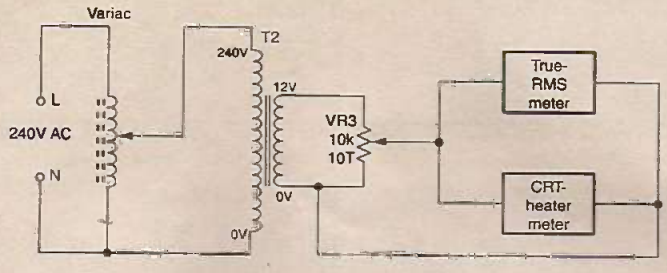


Fig. 2: Calibration set-up.

Use and operation

This may seem to be obvious, but care must be taken to get correct readings. The meter has an input and ground connection. These must be connected the right way round: I've experienced incorrect readings when the wires are crossed over.

Measure the voltage with a steady beam current – a LOPT-derived heater voltage will vary as the beam current changes. I use a mono grey-scale or a test pattern to ensure a 60 per cent average beam current.

Always find the heater pin and ground and connect the meter before applying power. If the meter is connected incorrectly its input may be damaged.

Ideally the meter reading you obtain should be 6·3V. But as we don't live in an ideal world, +/–0·1V is acceptable.

If the EHT voltage and width are OK but the heater voltage is high or low, adjustment of the value of the resistor in series with the heater supply may be advisable. But check that the EHT and other voltages are OK first.

In conclusion

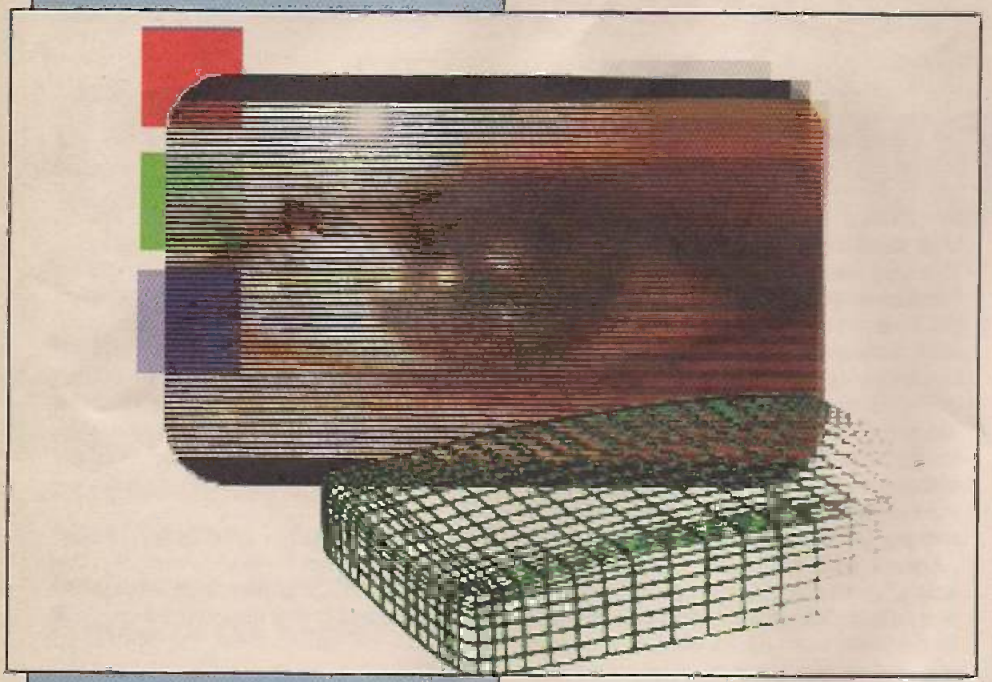
This meter will not be in use every day. But for the cost of the components it's an invaluable instrument in any busy workshop. ■

Components list

Item	*Specification*	*Part no.**
C1	22µF, 25V radial	VH26D
C2/3	100µF, 25V radial	VH37C
C4/5	1,000µF, 25V radial	VH51F
C6	100nF, 50V ceramic radial	BX03D
R1	390kΩ, 0·6W 1% metal film	M390K
R2	22kΩ, 0·6W 1% metal film	M22K
R3	680Ω, 0·6W 1% metal film	M680R
R4	22kΩ, 0·6W 1% metal film	M22K
R5/6	4·7MΩ, 0·6W 5% metal film	M4M7
R7	Adjust on test	
VR1/2	22kΩ horiz. carbon presets	UH04E
IC1	TDA2006	WQ66W
IC2	LM741	QL22Y
IC3	LM7812	CR16S
IC4	LM7912	AV20W
D1-6	1N4001	QL73Q
LP1	12V, 0·18A MES bulb	BT83E
PD1	BPW21 photodiode	Farnell 327-440
M1	0-10V moving-coil meter	YJ96E
T1	12-0-12V, 250mA	YN16S
F1	315mA delay, 20mm	GL54
S1	DP mains switch with neon	KU99 or YX65
	20mm fuseholder	KU33L or RX96
	Case	Farnell 722-418
	Light-proof box 35 x 15 x 12mm OD	

A PCB can be obtained from Denmo Electronics. E-mail denis_mott@hotmail.com

*Maplin unless otherwise stated



TV FAULT FINDING

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We welcome fault reports from readers – payment for each fault is made shortly after publication. See page 490 for details of where and how to send reports.

Tatung T20TD50 (D chassis)

This set was dead with the feed resistor R427 (22Ω, 0·5W, 2%) to the line driver stage open-circuit. The transistors in the line driver stage, TR401 (BC547) and TR402 (BC337), commonly cause failure of R427, but not on this occasion. When a replacement resistor was fitted it burnt up at switch on.

Further investigation revealed that there was no line-drive waveform, just a DC level, at pin 37 of the TDA8361 IF/colour decoder/timebase generator chip IC503. The chip was OK however, the problem being that the regulated 8V supply at pin 10 was low at 5V. Checks in the regulator circuit then revealed that R822 (4·7Ω, 0·5W safety) in the feed to the series-regulator transistor TR803 was open-circuit.

It's a good idea to resolder the line driver transformer T401 as it's worked very hard in this chassis and is a common source of dry-joints. Resolder the line scan socket as well – this will avoid future burn-ups. **M.D.**

Ferguson B68N (ICC8 chassis)

This set had a straightforward problem: the line output transformer was faulty and the output transistor was short-circuit. The new 2SD1546 line output transistor went short-circuit after just one minute however. I eventually discovered that the cause of the problem was the transistor itself, which I'd obtained from Willow Vale (part no. 19545S): its hfe (gain) figure was too high at about 40. In addition the maker's mark on the transistor – it looked like a stylised 5 – differed from that on the faulty transistor removed from the set – this was a sort of capital T. Most power transistors have a typical hfe of between 7-14. **M.D.**

Binatone 01/9014

This set is similar to the **Matsui 1455**. After rebuilding the power supply I found that the sound was distorted at high-volume levels. The cause of the fault was traced to the 2SD400F regulator transistor Q607, which should have approximately 12V at its emitter. At high-volume levels there was about 5V here. A replacement cured the fault.

Power supply blow-up is always caused by the chopper transistor's drive feed capacitor C607 (47µF, 25V) drying out. This can also cause line output transformer failure. **M.D.**

Ferguson ICC9 Chassis

The basic problem with this set was intermittent loss of sound. In addition, when the sound went off the microcontroller chip would sometimes lock up and none of the buttons on the set would work. Switching the set off then on again would restore normal operation, sometimes for days. In this situation the surface-mounted transistors around the microcontroller chip are suspect. I replaced all four, TR85 (BC848B), TR87 (BC858B), TR90 (BC848B) and TR81, but after that the set wouldn't come out of standby.

A lot of time was wasted before I discovered that there's an error in the service manual. TR81 is shown as a pnp device. However a check with an identical set revealed that it should be an npn type. Once the correct type had been fitted the set switched back on, and a lengthy soak test proved that the sound fault had been cured. **M.D.**

Sharp CS05 Chassis

This set was stuck in standby. Disconnecting the supplies to the sound section restored operation in the rest of the set. Now to find the cause of the fault! I replaced the sound output transistors and the diodes and zener diodes in the circuit, but the results were the same. The cause of the trouble was the sound driver transistors Q303 and Q304, though they read OK when checked. **G.S.**

Samsung CW593

This set was dead – it wouldn't come out of standby. The front LED would flash orange,

and the power supply could be heard labouring. When I checked the HT I found that there was a short-circuit here. The cause was C814, which is fitted in parallel with D802. It was going short-circuit. A replacement restored normal operation. **G.S.**

Panasonic T14S3T

The job sheet for this portable set said that there were poor, rolling pictures. When I switched on, it was quite obvious that the video was inverted. A scope check at IC601 confirmed this. We carry this chip in stock, but a replacement made no difference. Replacing the EPROM IC1205 cured the fault. **G.B.**

Tatung T28W730

This 28in. widescreen set had been visited several times in the customer's house, the complaint being poor start-up from cold. But the fault never showed up during any of these visits. The set was now in the workshop, along with another one that had the same reported fault. General checks for dry-joints etc. failed to reveal anything amiss, so I contacted the manufacturer and was told to change CP12 to 1,000µF. Doing this cured the fault in both sets. **G.B.**

Panasonic TX21S3T

The first of these sets that came our way was dead because D861 had failed. We now check this item for the fault before looking elsewhere. **G.B.**

Sanyo CBP2180A A5 chassis)

Field collapse was the complaint with this set. On checking voltages in the field timebase I found nothing at one end of L451, which is hidden under a blob of hotmelt glue. A replacement restored the field scanning. **G.B.**

Panasonic T14S3R

This portable came to us after being at another dealer for some months awaiting a replacement for IC601. On investigation I found that the HT supply to this chip was missing, because D861 was open-circuit. A replacement restored normal operation. **G.B.**

GoldStar CIT2570F (PC12B chassis)

Lines on the picture it said on the job sheet. Sure enough there were, and the remote control didn't work either. Scope checks in the low-voltage circuits showed that spikes and general rubbish were present. The cure was to replace C827 (1,000µF, 25V) and C830 (470µF, 16V). These are the reservoir capacitors for the regulated 12V and 5V supplies respectively. **G.B.**

Aiwa VX-T1410K

If you get difficulty with starting up, patterning on the pictures and/or capstan servo pulsing with one of these combined TV-video units, replace C522 (2·2µF, 50V) and C523 (100µF, 50V). **G.R.**

Goodmans GVT66WI (Bush 11AK19 chassis)

The symptoms with this set were lack of width and concave sides to the picture. Checks in the EW-correction brought me to R629 (2·7Ω, 1/3W safety type) which was open-circuit. A replacement restored perfect geometry.

If you need to enter the service mode with this set, call up the install menu then press 4, 7, 2 and 5 in that order. **G.R.**

Sanyo CTP3131 (80P-B14 chassis)

The BUT11A chopper transistor Q304 was short-circuit and the 2·7Ω surge-limiter resistor R313 open-circuit. These components fail when the start-up feed resistor R302 (390kΩ) goes open-circuit. For improved reliability fit a high-stability resistor. **G.R.**

NEI E28G1IFXN

This set was dead with the BUZ90AF chopper transistor T651 short-circuit. When I checked with the NEI technical department I was told to ensure that D653 is type BYT52M, not type BA158 as in early production. This can apparently be the cause of T651's failure. I also checked that the high-value resistors connected to pins 2 and 3 of the TDA4605 chopper-control chip were OK. After attending to these points I switched on, but the set was still dead.

There was only 255V across the mains bridge rectifier's 220µF, 400V reservoir capacitor, which was clearly open-circuit. A replacement brought the set back to life. **G.R.**

Goodmans 255NS (Daewoo CP775 chassis)

This set was dead though the power supply was running. A check at the base of the 2SD1207 line driver transistor Q402 showed that the drive was missing. It comes from pin 40 of the TDA8375A chip I501 via a pre-driver stage, which consists of an npn/pnp pair of transistors, Q405 (2SA854) and Q406 (2SC945). These transistors were both leaky. As I didn't have the original types I fitted equivalents – a BC639 in the Q405 position and a BC640 in the Q406 position. This produced perfect operation.

I've since had another of these sets with the same symptoms. This time there was some drive at the base of Q402, but it was less than half of what it should have been. Q405/6 were again the cause of the fault. **G.R.**

Bush 2169NTX

If the set is dead with the mains fuse blackened, you'll probably find that the P3NA90 chopper transistor Q1 is either short-circuit or leaky. The cause is usually that R4 (270kΩ) has gone high in value or open-circuit. In this case R5 (680kΩ) had gone slightly high as well, and was replaced as a precaution, also C11 (47µF) and C12 (1µF). After that the set worked normally.

Note that if the FET is replaced without renewing R4, the chances are that it will blow at switch on. **D.S.**

Alba CTV4808 (11AK19E3 chassis)

There was no tuning, though the tuning indicator moved. The cause was traced to Q501, which is a BF240. A BC548C seems to be able to do the job. When one was fitted all was well. **D.S.**

Crown CRV37 (11AK08 chassis)

This set was dead with the BUZ77 chopper FET Q801 short-circuit. In addition its 0·47Ω fusible feed resistor R809 had gone open-circuit. When you get this situation check R805 (330kΩ), which in this set had gone very high in value. Always replace R805 when Q801 has failed. In the interests of reliability I also replaced C817, C831 (both 1µF, 50V) and C812 (47µF, 16V). **D.S.**

Sony KV14T1U (BE4 chassis)

I've recently had two of these sets in with the same problem. They were both dead because of fine cracks around the line output transformer. I was able to carry out repairs by installing wire links. Some people may feel that this is a bit risky, but what else can you do? **D.S.**

Sony KVM1420U (BE2A chassis)

After about fifteen minutes the picture and sound would fade. Adjusting the volume control would result in a slight increase in the contrast! Q005 (DTA143TK) and R045 (47kΩ, chip type), which appear to form some sort of muting circuit, had been damaged when C012 (22µF) had leaked electrolyte through the PCB. Replacing these three components cured the fault. **D.F.**

Hitachi CPT2660 (Salora J chassis)

Loss of red and severe Hanover blinds is a fault that's appeared before in these pages (July 1990 page 678 and September 1992

page 785). If you find that the problem is present after replacing the TDA2653A field timebase chip, try adjusting the vertical frequency control RTB400. Although the picture will lock, the 50/60Hz switching can be affected if RTB400 is not correctly set. **D.F.**

JVC C14ET1EK (Onwa chassis)

Intermittent sound and paired scanning lines at the bottom of the screen can be the result when R434 (0·68Ω, 0·5W) goes high in value. It's the surge-limiter resistor in the rectifier circuit for the LOPT-derived 12V supply. **D.F.**

Sharp DV6635H (BCTV-A chassis)

There was bad EW distortion and the field scan covered only the top half of the screen. I decided to look into the EW fault first, and found that L604 (15µH) in the drive to the diode modulator had melted. When I looked for the cause I came to C607 (0·56µF, 250V) in the line scan current path. It read 27pF when checked with a capacitance meter. Once these two components had been replaced there was a good picture. The field fault had gone, maybe because the EW fault had overloaded the TDA8350Q chip IC500, which provides both the field scan and EW drive outputs. **G.L.**

Mitsubishi CT25A5STX (Euro 14SF chassis)

There was field collapse and checks showed that Z551 (SOC3150) was open-circuit and D553 (BYD33G) short-circuit. Replacements were fitted, but when the set was switched on D553 promptly went black and Z551 open-circuit. When I checked with the circuit diagram again I found that this supply also feeds the TEA2031 EW correction chip IC5E1, which was short-circuit between pins 5 and 6. I decided to check the rest of the components in the EW correction circuit and found that L555 (15µH) had shorted turns. Once these items had been replaced and a few adjustments had been carried out there was a good picture. **G.L.**

Ferguson TX92 chassis

This set was dead with the 2·5AT mains fuse FP01 open-circuit and the MOSFET chopper transistor TP16 short-circuit. TP16 fails when RP11, one of a string of three 180kΩ resistors that's connected to pin 2 of the TDA4605 chopper control chip IP01, goes open-circuit. It's quite a common fault. **I.L.**

Ferguson RP46 rear projector

At switch on the red standby LED came on then went off. On investigation I found that a buzzing noise came from the chopper transformer: the power supply appeared to be overloaded. I checked for obvious shorts in the line output stage but couldn't find any. When the feed to the LOPT was disconnected, the set started up with the correct HT and line drive. So the LOPT was checked out of circuit with a tester It was OK. Next, the lead from the LOPT to the EHT splitter was disconnected. Once again the set started up. The EHT splitter, which is near the green gun, was faulty. **I.L.**

Sharp DV6635H (BCTV-A chassis)

This set was dead and there was a smell of burning. I soon spotted the culprit, which was the 1nF, 2kV disc capacitor C706 in the chopper transistor's collector circuit. A replacement restored the picture but there was an EW fault. The diode modulator circuit was OK, the cause of the fault being the TDA3850 field/EW output chip. **C.W.**

Tatung TUNOA51

This set sometimes failed to start up, though HT was present. The standby LED went out when the set was turned on with the handset, but it didn't start. The cause of the trouble was the LM317 regulator IC802. **C.W.**

Bush 1407 (Onwa chassis)

There were strange intermittent faults with this set: on-screen graphics, the volume would turn up by itself, tuning and remote operation would be lost. The cause was the 1N4148 diode D602. **C.W.**

Toshiba 349P9B

There were no signals, the field scanning was folded up and there were lines on the raster. The cause was R327 (6·2Ω) which was open-circuit. **C.W.**

Hitachi C2119T (G7PS chassis)

If the set is stuck in standby, go straight to R903 (82kΩ) which is adjacent to the BUT12AF series chopper transistor Q903. If a replacement doesn't cure the fault, check whether the LA7836 field output chip IC601 is short-circuit. **J.S.**

Pye 25KX2101

There was no audio output from this nice little mains/battery colour portable. I noticed that the resolderable fuse resistor R401 had sprung. When this had been resoldered there was distorted sound, which suggested that the TDA4190 audio output chip was faulty. Unfortunately it seems to be impossible to obtain this device. However further checks showed that the 470µF, 40V audio output coupling capacitor C431 was short-circuit. **J.S.**

Panasonic TX25T2 (Alpha 2W chassis)

I've had this fault before: the symptoms are excessive height with top foldover. The cure is to replace R469 (150Ω) which goes open-circuit. It's in the field feedback network. You will find it under a white ceramic resistor next to the line output transformer. **P.S.**

Bush 2872NTX (11AK19ES chassis)

When you switch one of these sets on the red standby LED glows: it turns to green when you select a station. But not with this one. The LED flickered a low green and was dead. It didn't take long to establish that the 5V supply was missing. R867 (0·33Ω) was open-circuit. **P.S.**

Hitachi C28WD2TN

This set produced a dull red raster. Checks showed that the tube's voltages were all wrong. On investigating further I discovered that two of the 560Ω cathode feed resistors R807/8/9 had burnt out because of an internal short in the tube. A replacement tube is expensive. **P.S.**

Bush 2850NTX/A (Schneider chassis)

There was no line-scan operation. The scan plug and socket had melted, so as a start I removed them and soldered the wires directly to the PCB. But there was still no scanning, because the scan coupling/correction capacitor C307 (330nF) was open-circuit. Resoldering a number of dry-joints completed the repair. **C.D.**

Panasonic TX25MD1 (Euro 2 chassis)

This set would run for about five seconds then trip. It would then run and trip again. No sound or picture appeared. After about five minutes of running and tripping the set would come on with a good picture and sound. A phone call to Panasonic brought the suggestions that the EAROM or the video processor chip could be the cause of the problem, but replacements didn't help. When I tried freezing the various ICs I found that application of freezer to the MSP3410-15 audio processor chip IC2101 brought the tripping state back. A new chip solved the problem.

When ordering this IC from Panasonic, add TV after the type number. Otherwise a surface-mounted version of the device that's used for VCRs will arrive. **C.D.**

Sharp 66CS-03H (CS chassis)

The field scanning in the lower half of the screen was perfect, but the upper half was very distorted. A check on the 45V supply, at C619, showed that it was low – about 15V. The following components were responsible: R643 (5·6Ω), which was overheating; the surface-mounted 10V zener diode D623, which was leaky; and the 1A protector R632, which was open-circuit. Once these items had been replaced there was a good picture. **C.D.** ■

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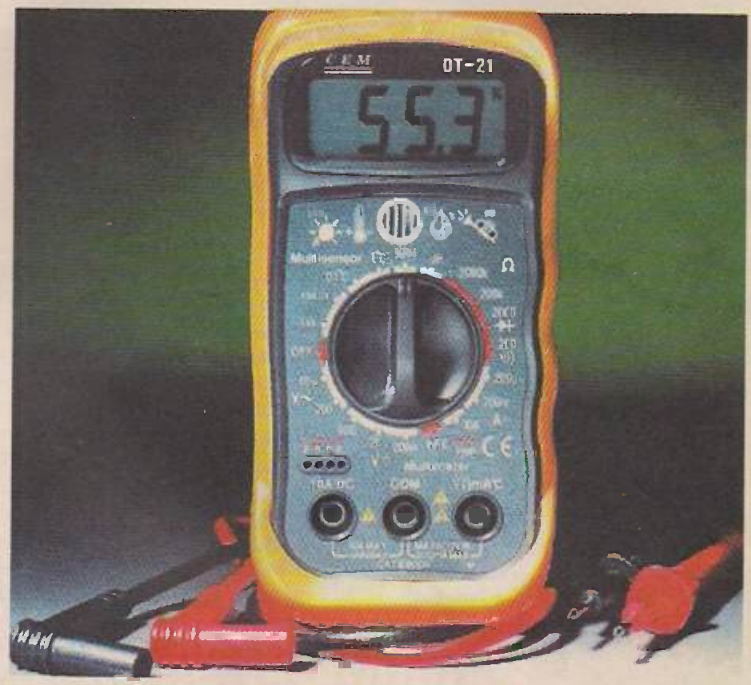

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Voltage and current and resistance

DC volts		
Range	**Resolution**	**Accuracy**
200.0mV	0.1mV	
20.00V	10mV	±0.5% of rdg, ±2dig.
600V	1V	±1% of rdg, ±2dig.
AC volts		
200.0V	100mV	±1.2% of rdg, ±10dig.
600V	1V	±1.2% of rdg, ±10dig.
DC current		
200.0µA	0.1µA	±1% of rdg, ±2dig.
200.0mA	100µA	±1.2% of rdg, ±2dig.
10A	10mA	±2% of rdg, ±5dig.
Resistance		
200.0Ω	0.1Ω	±0.8% of rdg, ±4dig.
2.000kΩ	1Ω	
200.0kΩ	100Ω	±0.8% of rdg, ±2dig.
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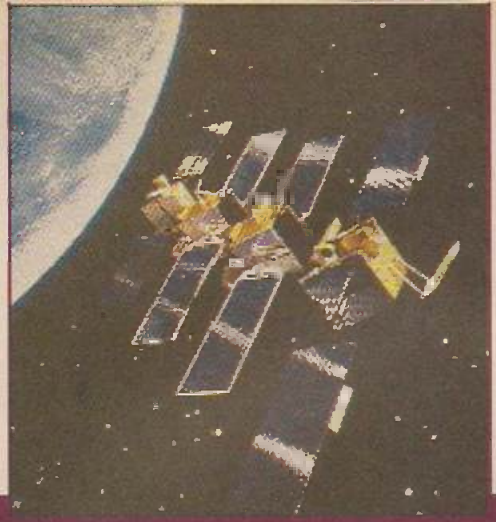


Terrestrial DX and satellite TV reception reports. News on terrestrial TV and satellite band changes. The Smartsat D2000 dish alignment meter reviewed. Roger Bunney reports

DX and Satellite Reception

The MIR space station finally burnt up over the South Pacific during late March: in effect as a mega meteor. I wonder, had it burnt out over Europe, whether we would have experienced fantastic signal reflections from the South East? – the MIR path always showed a sinewave track, generally heading towards the SE, when it was near the UK. In theory, the answer would have been yes. Incidentally those who live near an airport can make use of the fact that aircraft reflect signals, which often display a 'steam-train chuffing effect'. Airline timetables could well help with aircraft-scatter DXing.

There are encouraging signs for the 2001 Sporadic E season. In a recent letter Peter Schubert mentions SpE reception in chs. E3 and E4 on March 3rd, 11th, 16th, 17th, 18th and 24th. Unfortunately the signals all consisted of programming, so no identification was possible. It's nevertheless a hopeful sign for the coming months.

Down under, our Australasian colleagues are experiencing the end of their current SpE season. In an e-mail Todd Emslie (Sydney) says there were reports of SpE reception from all over Australia on February 24th, with double-hop reception in Perth, over a distance of some 2,000 miles. A bonus was reception from SE Asia via long-hop SpE coupled with evening transequatorial skip. Numerous Chinese signals in chs. C1 and C2 (same as R1 and R2) were received and reception of Thai TV (Nakhom Ratchasima, 48·239589MHz) and East Malasian TV (Limband, 48·2513MHz) was confirmed. Dramatic catches were KHON-TV Honolulu and KHBC-TV Hilo, Hawaii, both ch. A2, and DCRTV Dubai ch. E2 (48·250058 MHz). Todd comments that the Class 2 TEP flutter resembles a "sleighbell sound". The ch. A2 and E2 pictures were received between 2150-2300 UTC. Incidentally the Australian TV station RTQ0 at Toowoomba is still on air. Todd provides information on how to measure VHF TV carriers down to 1Hz resolution at his web site,

www.geocities.com/toddemslie/Tevhftvlist.htm

A live relay of the shooting at Santana High School, San Diego on March 30th, carried by Reuters from the local NBC station. Reception via NSS K at 21·5°W.

Satellite sightings

It's unusual nowadays to come across an analogue test pattern from a previously unknown satellite. While checking out my new dish installation however, and trying to find the 45° and 48°E locations with the new actuator arm, I came across strong colour bars at 11·646GHz H. There was no audio. Once I'd found the 45° and 48°E slots it seemed that the colour bars had come from about 51-52°E. My first thought was that this could possibly be the recently-launched Eurobird, on test before being moved to its destination at 28°E. It subsequently transpired that the satellite concerned was Anatolia, which is at 50°E, and that Eurobird had been testing at 33°E, also with analogue signals but in this case at 12·542GHz V.

While waiting a motor and rear dish cover for the new installation I've kept it mainly directed between 21-31°W, with a taped up polythene bag for protection from the persistent rain. While checking Intelsat 801 (31·5°W) during late afternoon on the 21st a corporate Rome feed appeared with an Italian car/jeep doco and commercials. This was at 11·024GHz V (SR 5632, FEC 3/4). The Italian uplink cut at 1745 GMT and a minute later was replaced with a TF-1 news feed from Tours, where a massive land slip had occurred. Meanwhile TES-10 Marseilles had fired up at 10·964GHz V with indoor football. BT TES 42 at 10·983GHz V was active with a live foot-and-mouth news item from Anglia TV while BT TES 43 at 10·988GHz V was uplinking a live interview with a householder who lived near Hambledon, Hants. Her house was seen amidst a huge lake, and may have to be demolished. There was a story about planning permission, which shouldn't have been granted in an area known by locals to be subject to flooding. All these signals had the SR 5632, FEC 3/4 parameters.

I also received from Intelsat 801 a weak analogue signal at 11·159GHz V. Even with full threshold extension a recognisable picture couldn't be obtained. As the video was positive-going, the signal could have been 'bleed-through' from a C-band (4GHz) downlink. A check on the listing for 801 shows only Tele Sahel in C band. It's a Secam analogue signal that's present from about 1800 to 2300 GMT.

On March 18th I noticed, from NSS K (21·5°W), colour bars with the caption "Eutherapie MVS". This was on a VYVX Washington uplink via the BT lease at 11·556GHz H (5632, 3/4). Eventually a medical programme from the American College of Cardiology appeared, with French-language sound.

Edmund Spicer (Littlehampton) reports that Astra 1D has moved to 24·5°E. He received an analogue PAL trailer for Castle Vision at 10·744GHz H, with a 1kHz audio tone at 7·02/7·20MHz. The trailer was also present in digital form at 10·847GHz V (SR 23566, FEC 7/8). Edmund also reports reception of RTKZ Kosovo in clear PAL from Eutelsat W2 (16°E) at 11·431GHz V. This was at approximately 1700-2100 GMT. Edmund originally used his 60cm dish for distance learning from French TV via Telecom 2C

at 3°E. It has now moved to 8°W, displacing 2B which is now co-located with the Russian Express 2 satellite at 11°W. Roy Carmen (Dorking) notes that news is often present here at 12·698GHz H (6111, 3/4) – this is likely to be from the Telecom rather than the Express satellite.

The foot and mouth epidemic has been much in the news recently. At the end of February I came across a report from Solo Sat Comms at an unnamed farm in the Northern UK. This was via Eutelsat II F3 (21·5°E) at 11·039GHz H (5632, 3/4). A couple of days later I came across another F and M report, via Eutelsat W2 (16°E), this time from Germany. There were airshots from a newscopter via the German sat truck DSNG-6 for Globecast Teleport, London. Reception was at 11·134GHz H (5632, 3/4).

Eutelsat II F3 became the main carrier of news about the Selby rail disaster. Within a few hours at least five uplink trucks were active in the crash area, including one at Pontefract Hospital. To avoid complication, newsfeeds tend to use similar frequencies day-by-day for their studio links. Usually few bother with encryption, which is hardly necessary for the short uplink periods. The commonly-used 10·995, 11·039, 11·072, 11·647 and 11·692GHz frequencies, all H with SR 5632 and FEC 3/4, were present during the Selby reporting. 11·072GHz is used by the ITN Scottish News Bureau.

On March 30th there was another high school shooting in the USA: Reuters carried live TV helicopter pictures, with shots of the school and the police in action, via NSS K at 11·462GHz V (5632, 3/4).

The Balkans' satellite channel RTS-Sat has continued its wanderings. It moved from Express 3A at 11°W to Eutelsat II F4 at 28·5°E and has now moved back again. Check at 11·659GHz V (SR 2894, FEC 3/4). Another wanderer is Iran National TV which has now arrived at Eutelsat W2 (16°E). Check at 11·303GHz V (SR 3000, FEC 3/4).

Hugh Cocks (Algarve, Portugal) mentions receiving Colombian (Spanish) FM radio at 269·74MHz with a scanner. It's relayed inadvertently via Fleetsatcom capacity at around 15°W: the satellite picks up a studio-to-transmitter feed at about 300MHz, downconverts and transmits it. Brazilian pirates can sometimes be heard at 260·528MHz. They use modified amateur 2m equipment, feeding about 10W to a Yagi aerial directed at the Fleetsatcom satellite. This relays the signals to Europe for the folks back home in Iberia. They, in turn, can reply, using similar equipment. I've heard various 250-270MHz signals using a basic scanner and a discone aerial. A cut-to-frequency dipole or a small Yagi would greatly enhance such signals.

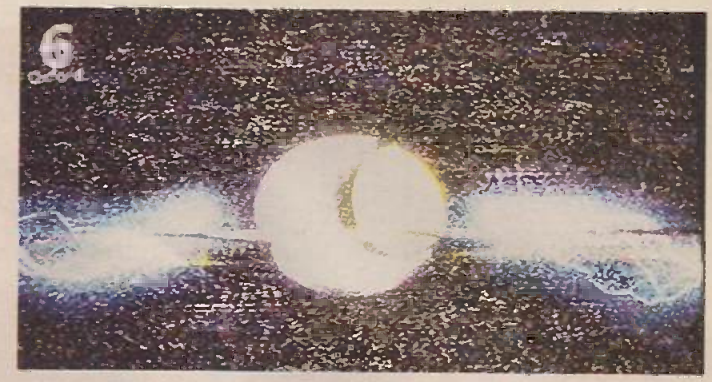
Broadcast news

USA: The digital terrestrial TV system saga continues. While the FCC has decided to retain 8VSB modulation, the NAB and MSTV boards have both confirmed that there are problems with it and have stated that there is an "urgent need for swift and dramatic improvement in the performance of the present US digital TV system". A programme of research for improvement is being encouraged to overcome shortcomings in transmission and reception. Signal reflection in particular causes severe problems, especially when indoor aerials are used.

Latvia: The authorities have given TV3 a national licence. It also transmits in Lithuania and Estonia, and plans to extend coverage across the whole region.

Satellite news

Eurobird is now in position at 28·5°E, with coverage of western Europe including the British Isles. It's intended for TV use, including DTH transmissions (45cm dishes), corporate applications and cable head-end feeds. BT Broadcast Services has leased a transponder with options on two more. It will therefore be able to offer downlinks to broadcasters, bypassing Sky – four broadcasters have already signed up. In addition BT is developing its own call centre, billing and subscriber management operation. With ITV intending to go digital at 28°E, it will be interesting to see which platform it adopts.



A noisy RSL TV logo from The Oxford Channel. Received by Simon Pearson in Chipping Norton.

Intelsat has ordered an all Ku-band satellite, to be called APR-3, which is due to go into orbit at 85°E in early summer 2002. It will provide Asian coverage, and Chinese operator Sinosat has already leased six transponders. Intelsat now has ten satellites on order for launch during the next three years.

Because of extensive hacking, Italian pay-TV operator Telepui has changed from Irdeto to Seca/Mediaguard encryption. Subscribers are being offered twelve months free rental of a Mediaguard box.

Spanish Canal Satellite now has more digital (1·1 million) than analogue (890,000) subscribers. Since a substantial increase in subscription charges, many subscribers are using pirate cards – often to obtain premium channels after paying for a basic package.

Radio Caroline is to be carried in digital form by Astra from both the 19·2° and 28·2°E positions. Analogue transmission from 19·2°E has ceased. ■

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Review:

The Smartsat D2000 dish alignment meter

Aerial Techniques recently sent me a small satellite dish alignment meter to try out. It's made by Graham Capener of Capener Electronics. Graham has designed and produced several extremely useful pieces of test and servicing equipment over the years, including a CRT reactivator and a rotary-tuned signal-strength meter. He specialises in basic, easy-to-use gear at sensible prices to fill various gaps in the range of what's generally available.

The D2000 is for external use when carrying out Astra dish alignment, with either digital or analogue signals. It's also suitable for Hot Bird installations. The meter is compact and is housed in a substantial hammer-grey steel case. Its cream front panel may seem to be rather crammed, but is well laid out for ease of use. Overall measurements are 15cm wide, 12·2cm deep including front-knob projections, and 7·5cm high. Weight is approximately 930g including the leatherette case.

Power is provided by a 10·8V NiCad battery pack that consists of nine AA batteries. They are charged from an unregulated 12V plug-top power supply. The recharge orange LED glows brightly for the five-hour topping-up cycle. This keeps the average LNB running for about 80 minutes continuously and also provides 15/18V for V/H polarisation switching (or bandswitching where required). If a short is detected across the output, the meter shuts down. There's a low-battery warning LED, and the meter can be switched to check on battery condition.

The main feature however is the D2000's ability to monitor both digital and analogue signals. A front-panel toggle switch is moved to up for analogue and down for digital.

The review meter was fitted with the Version 1 PCB. Meters are now fitted with the CAD-engineered Version 2 PCB.

In use

The leaflet says that the D2000 is "very easy to use". It is. The F socket connector and all controls are on the front panel. There are analogue/digital and vertical/horizontal polarisation switches adjacent to the F socket. The upper left four-position rotary switch has off, battery-test, signal-level and LNB-voltage positions. When battery test is selected the meter needle should pass the 'bt mark'. The signal-level position is for up the ladder work: the meter needle is deflected as the dish is peaked for maximum signal (remember to switch to analogue or digital for 19·2°/28·2°E dish alignment). The LNB-voltage position gives indication of the output from the receiver indoors. But when the green 'set' button is depressed the meter indicates its own output to the LNB, which should be either 15V or 18V depending on the setting (V/H) of the second toggle switch. A central red LED provides a warning glow when the D2000 is switched on.

Once you've got used to it, operation is simple. The leaflet stresses the need first to confirm whether you are carrying out an analogue (19·2°E) or digital (28·2°E) dish alignment. Check with a compass, then switch the meter for the relevant type of incoming signal.

To align the dish, switch to position 3 then press the 'set' button to apply LNB voltage to the cable. If the green LED above the F socket remains out, there's a short-circuit somewhere. If the green LED is alight and the D2000 emits an 'audio tone' (actually a loud buzz) there's an open-circuit, e.g. the cable is disconnected. An experienced dish installer commented favourably on the 'gain' control, which enables the meter signal level to be backed off so that it doesn't slam into the end stop while dish peaking. It's not an eyes-down only meter, since there is also an audio tone that varies with signal strength. The leatherette case that hangs around your neck balances well and is comfortable.

Charging

The red warning (low) LED below the meter comes on when the battery pack needs recharging. In this event plug the D2000 into the charger. Watch for the orange charge LED to glow, then settle down to something else.

The 13A plug-top power supply runs warm in the charge position. This seems to be the way of all things nowadays.

Conclusion

This is a solid, well-made signal-level meter that's intended for dish alignment with strong signals from either the Astra or Hot Bird satellites. It caters for both digital and analogue inputs and is much more versatile than the usual alignment devices. The meters are not production-line jobs from the Far East: they are freshly-made to order.The D2000 costs £139.95 plus £5 post and packing (in the UK). It's available from Aerial Techniques (see advertisement on page 487) or Capener Electronics, 19 William Bandy Close, Wing, Leighton Buzzard, Beds LU7 0TY, phone 01296 682 030). **R.B.** ■

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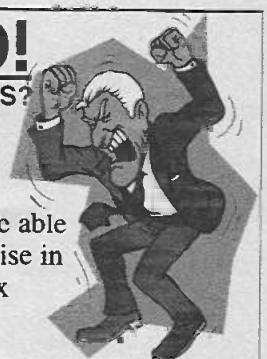

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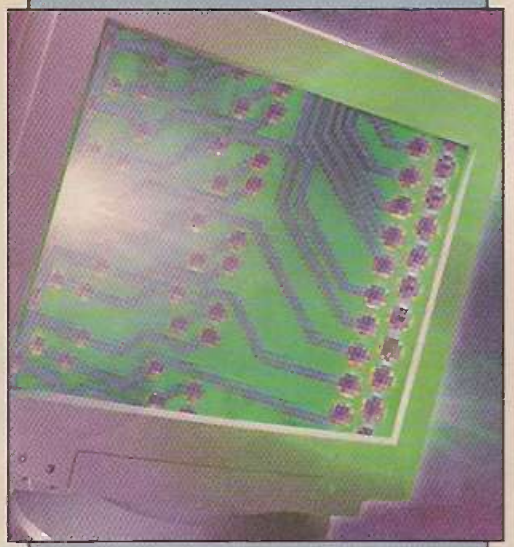

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Dell P991

If you find that Q507 or Q901 is short-circuit, C507, C644 and C914 should also be replaced. The part no. is 113618791. There was a batch problem with these capacitors, also with a similar capacitor (C660) in the power supply, which also fails causing a dead monitor. In this case the part no. is 110434121. When Q901 has blown, Q902 and R934 should also be replaced: with Q507 blown, replace IC502, Q506 and R511. **R.T.**

ICL Ergo PRO 14C (7134T)

Two of these Acer manufactured monitors came in with different cases but very similar innards and identical faults – dead. Simple: the start-up resistors were open-circuit (everyone knows where they are in this chassis by now!). In one monitor the two resistors were both 33kΩ, 2W, as usual, but in the other one they were both 27kΩ. Handy to know next time the stock of 33kΩ types is exhausted!

After repair the first monitor worked very nicely for such an old model, but the second one turned out to have a purity error at the top right-hand corner. It was faintly visible across most of the top of the screen. There wasn't much point in checking the degaussing circuit, because tilting the monitor to the right made the purity problem worse while tilting it to the left cured the error – the shadowmask was loose.

I didn't have an Hitachi M34KDD80X06 tube in stock, so I rummaged around in the spares room for another Acer monitor of similar age. The only one I could find was a 7033D/K6C, which is quite a bit older. It was fitted with a Panasonic M34KNZD80X05 tube, which didn't have so many 'out-rigger' coils extending from the main deflection yoke. But once it had been installed everything was fine – except that there was lack of height. Adding an 8·2Ω resistor in parallel with R277 (1Ω, 1W) cured that. **I.F.**

Packard Bell 7480

This monitor was brought in because it was dead. Some quick checks revealed that the Toshiba 2SC5386 EHT generator transistor was short-circuit. Not having this item in stock, nor any data to check for a possible substitute, I decided to look for the Toshiba website. Several on-line search engines failed to produce a result, so I switched to searching for search engines! It was early in the morning, and I expected web traffic to be light. I couldn't have been more wrong! Loading was painfully slow, and several of the most popular search engines failed to load even the opening page before the server gave up with "too many errors". I decided to try a little-known search engine in the hope that it was less swamped. The one I tried was http://www.dogpile.com

The search results were mainly consumer electronics, but Toshiba was listed and once I had a starting point it wasn't difficult to find the company's semiconductor data sheet download area. Transistors are at http://www.semicon.toshiba.co.jp/noseek/us/td/tdframe.htm

At first glance the 2SC5386 appears to be fairly ordinary: Vcbo = 1·5kV; Vceo = 600V; Ica = 8A; Icm = 16A; Ptot = 50W. What isn't so ordinary is that this transistor is a "triple diffused mesa type". This method of manufacture is usually associated with exceptional transition frequencies, but the data sheet indicated Ft = 1·7MHz. A look through the data books revealed that the 2SC3886A has a very similar specification. It's actually faster (Ft = 3MHz). So I fitted one.

As I could find no definite cause of the failure I decided to check the soldering very carefully and wire-brush the flux off the print side of the PCB. A few decidedly suspect solder joints came to light once the flux had been removed. **I.F.**

Acer 7134T

The complaint was no display. When the setting of the screen/first anode control on the LOPT was advanced a normal display appeared. The contrast control then worked but the brightness control did nothing. I found that R380 (39kΩ) in the positive feed to the control was open-circuit (>20MΩ). There were no other problems once this one had been dealt with, but the appearance of the soldering suggested that there would be before long! A general resolder is, anyway, part of what I regard as the overall check for safety and general condition. **I.F.**

Packard Bell A720

There was excessive width with side pincushion distortion. This suggested trouble with the EW diode modulator. The two diodes are in a shared encapsulation (D434, type MRC-DMV32), and sure enough the lower section was short-circuit. This item can be hard to find, especially as it's a 'metal-tab' TO220 with electrically-isolated tab, instead of the ISO-TO220 case that might be expected. The nearest I had in stock had an ISO-TO3P case. The pinout was back-to-front, and it was anyway too tall to line up with the fixing hole. But the customer wanted the job done quickly. So I fitted the larger component, with its pins pointing upwards, and used flyleads to con-

nect it to the PCB. The monitor worked all right and the customer happily paid up. **I.F.**

IBM 6322-002

I've had several cases where the complaint with one of these monitors has been "power light OK but no display". Each time the cause has been bad joints at the scan coil connector. A quick and easy job for a change. **G.B.**

Sony CPDE100E

A rapid ticking came from the power supply, and a quick check showed that the HT was low and pulsating. When the monitor was left for a few minutes the ticking stopped and the HT rose slightly, but it was still low and pulsating. Capacitor checks revealed that C625 (220µF, 100V) was virtually open-circuit. Normal operation was restored once a replacement had been fitted. **G.B.**

Packard Bell 1512ME

This monitor was dead except for the orange standby light. The customer said that prior to the failure the picture had occasionally flickered. I found that the line output transistor was short-circuit. The cause of the transistor failure, and the flickering, was not far away: there was a bad joint at C430. **G.B.**

Belinea 102010

There was power but no display. When the first anode control was advanced a grey raster appeared but there was still no sign of a display: even the OSD messages were absent.

Checks on the CRT base panel revealed that there was no voltage at the contrast control pin of the video preamplifier chip. This voltage is derived from a variable mark-space ratio output at pin 2 of the CPU chip, where there was no 'signal'. Fortunately I had another, working monitor of the same type in the workshop. There was no difference when I swapped over the CPU chip, but when I swapped over the associated 93CC66 EEPROM the faulty monitor worked.

So I fitted a new, blank EEPROM. There was a display of sorts, but it was completely misadjusted and there were still no on-screen menus to make adjustment possible. It obviously had to be correctly programmed.

Many TV sets have some way of restoring default settings to a new EEPROM, but I couldn't find a way of doing it with this monitor. In the absence of a supplier of the correctly programmed chip, another solution was necessary. I was reluctant to abandon the job after getting this far!

After a lot of consideration I decided to invest in an inexpensive EEPROM programmer, so that I could copy the good chip's contents to the new chip. This was successful and restored normal operation. All I need now is lots more monitors with the same problem! **G.B.**

GoldStar 1555D

If one of these monitors is dead, check the 2·5AT HRC mains fuse first. It seems to be prone to spurious failure in this model. **G.B.**

Amstrad PC14M8LR (Tatung Y2V chassis)

You sometimes find that one of these monitors is dead with the BU2508AF line output transistor TR407 short-circuit. Before you fit a replacement, connect a 40W dummy load between the transistor's collector connection and chassis, then check the B+ voltage which should be 110V. If it's high, check the value of R504 (210kΩ, 1W carbon film). In the last one I had with this fault R504 had risen in value to 270kΩ. You will find it at the centre of the chassis, next to the B+ adjustment potentiometer. **A.R.W.**

Daewoo CMC1427S

The power supply was tripping and there was a low-resistance reading across the 80V HT line.

Everything in this monitor seems to be awkward to get at. The CRT base assembly is fixed to the tube's neck with hot-melt glue, and there's a knack to removing the shield, most of which is the heatsink for the video output chip and remains attached to the CRT panel. Lever out the tab and unsolder this end. Ease the PCB out of the shielding box while keeping the solder at the other end melted.

The main chassis is dismantled by unclipping the plastic floor from the front assembly to gain access to two screws, one in the LOPT cage and one enclosed by the frame output heatsink. The PCB then unclips, slides back and lifts out.

When I checked the CVA2415T video output chip IC802 on the CRT base panel I found that the HT connection (pin 9) had shorted to the IC's earth casing. IC802 is extremely hard to obtain (Daewoo didn't want to know). When I found one it was rather expensive. **A.R.W.**

IBM 6540-02N

For loss of one of the primary colours, check whether the relevant output transistor on the CRT base PCB is short-circuit collector-to-emitter. You'll find that it's marked SD1609. It's really a 2SD1609, and can be replaced with a BF459. **A.R.W.**

Shin Ho/AV2 SM483F

This strange monitor was totally dead. Some checks revealed that the B+ secondary diode D151 (HER305) was short-circuit, but when a replacement was fitted the monitor powered up then quickly switched off. This was because the EHT had risen to 30kV! The culprit turned out to be Q605 (IRF9610) in the B+ regulator circuit. It was short-circuit source-to-drain. As a result the full B+ voltage reached the line output stage. **G.M.**

CM14UHR (unbranded)

Apart from the type number at the rear of the cabinet this monitor was without any brand indication. It did however have a slight resemblance to an older Dell. It had died in a storm, and an investigation revealed that the surge limiter R804 had burnt up and melted the neighbouring mains filter capacitor C828 (0·47µF, X2 rated). Replacement of these two items restored normal operation. **G.M.**

Viglen AX1595

This monitor powered up but there was no display. I found that there was a massive dry-joint at the B+ supply feed choke L102. It's in the centre of the chassis, and a total strip-down is required to gain access to it – including removal of the speakers and the plastic frame. **G.M.**

Schneider VCM14

There was intermittent line collapse followed by turn off. As the fault condition seemed to be sensitive to tapping, some time was spent examining and resoldering many joints on the main PCB – with no success. Eventually, after some very careful probing, I discovered that the cause of the trouble was the horizontal hold preset VR702 (470Ω miniature vertical). It was going open-circuit intermittently **G.M.**

GVC M1448

You sometimes get the complaint that the screen display crashes intermittently: the bottom power light may be on and the top two flashing. In this event replace Q101 – use a 2SK1117 or 2SK1118. **D.N.**

Tatung TM3401

If the screen display is small and the width can't be adjusted, replace the following items: R465 (4·7Ω flameproof), L405 (33mH) and C423 (3·3µF polyester, 63V, 10%). **D.N.**

KFC CK1420/1450

If one of these monitors is dead with no power, replace R531 (560kΩ). It's a common fault with these models. **D.N.** ■

VCR CLINIC

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We welcome fault reports from readers – payment for each fault is made shortly after publication. See page 490 for details of where and how to send reports.

Sony SLVE230

Intermittent failure to eject the cassette was the elusive symptom with this machine. When I finally got it to misbehave a whirring sound came from the region of the loading motor, followed by shutdown shortly after. The culprit was a split worm (part no. 3-977-436-01) on the loading-motor shaft. Shades of the Panasonic K deck! **E.T.**

Bang and Olufsen 4500/5000

These machines, which are now about twelve years old, seem to be cherished by their owners. They work with the Link system and are controlled via B&O TV sets. Two have come in recently with fault symptoms such as tape stuck in, tape running too fast, strange 'control' faults etc. In both cases the culprit was the capstan motor, with gungy black corrosion on the pins of the built-in control/drive chip. This part is still available at a surprisingly low price, so both jobs went ahead. **E.T.**

JVC HRJ225

This machine wouldn't eject tapes, though the motor could be heard to run. The eject mechanism failed to engage because the spring anchor had broken off the change-arm assembly, part no. PQ46353A-2. I also found that the spring anchor had broken away from the take-up lever assembly. This is item 58, part no. PQ21686-1-3. **E.T.**

Sony SLVE280

Failure of fusible resistor PR512 is well-known in this and other budget Sony and Sanyo VCRs. In latter production the component is uprated to 2A to forestall trouble. Despite this I've found one of these uprated fuses completely open-circuit, the result being a dead machine. **E.T.**

Panasonic NVHS950

As often as not the deck would shut down when the review mode was selected, with the left-hand spool stationary and tape piling up between the pinch roller and the drum. In addition rewind was sometimes 'snatchy'. The cause was excessive friction on the lower drum surface. Remedial work was not sanctioned: the lower-drum assembly costs a three-figure sum, even at the net trade price. **E.T.**

Akai VS-G2DPL

The cassette loading carriage was all askew and jammed. This machine's deck is used in a number of other Akai models. When trouble with the cassette lift is experienced, the usual cause is the right-hand loading block, part no. BL-433561N4. I replaced the block but the loading mechanism was still very floppy in the ejected position. A projecting pin on the loading slide had broken off – it should engage with the spring on the loading block. The part no. of the slide is ML-433567N1. **G.B.**

JVC HRD660

A cassette was stuck in this machine, with a large amount of the tape wrapped around the pinch wheel. After unwinding it the cause of the entanglement was discovered. The idler gear, which swings between the supply and take-up spools, was very sluggish in operation. As a result, the take-up spool didn't start promptly when play was selected.

A new idler assembly cured the fault. It was of different design, with two gears instead of one. Maybe this has happened before! **G.B.**

Panasonic NVHD605B

Panasonic VCRs have tended to suffer from tuner problems, low gain and drift being common. More recent models have not been affected to the same extent. The symptom with this 1996 model was that the tuning had shifted. I initially thought that it had been lost, but discovered that the tuning points had all been shifted up the band uniformly. R7612/6 (330Ω) had obviously been getting pretty warm. The cause was the 0·01µF surface-mounted capacitor C7605, which was very leaky. **N.B.**

Bang and Olufsen VX7000

This not too old model is based on an Hitachi machine, but with substantial additions and modifications. The complaint was "poor pictures", and was extremely intermittent. I initially found that the symptom could be instigated by gently manipulating one of the two connectors on the top of the head amplifier PCB. Once the pins of the connector had been recrimped the problem seemed to have been cured, but it returned when the machine had been on soak test for a few days. The cause was actually dry-joints at the connector at the base of the head amplifier PCB. It's connected to the rotary transformer in the drum assembly. Resoldering produced a lasting cure. **N.B.**

Hitachi VTF860

There was crosstalk between E-E and playback audio. The cause was traced to C514R (4·7µF, 35V). **D.R.**

Ferguson FV77HV

If there's defective or no rewind, check for 13·6V at pin 1 of BP03 and 21·8V at pin 2. Also check whether the 120Ω resistors RP75, RP83, RP84 and RP85 are open-circuit or poorly soldered. **D.R.**

Sanyo VHR274E

This machine was dead with no display. Checks on the power supply proved that on

this occasion it was working. The supplies to the LED display were normal, but further checks showed that the always 5V supply was missing. Once this had been discovered it was easy to find the cause, which was the 2SC22747F series regulator transistor Q5101. **D.F.**

Sony SLVE720UX

If speech sounds as though people are speaking through a long, hollow tube and there's a background noise, which varies with picture content, like the sea breaking on a beach, this is not a fault, just misadjustment. Use the remote control unit to enter the settings menu, then reset 'Hi-Fi – Mix' to off. **D.F.**

GoldStar P234i

When play was selected the picture went off then returned. The E-E picture and its sound were OK, and the sound from the tape not affected. The cause of the trouble was in the power supply, where replacement of C19 (1,000µF, 10V) cured the fault. To be on the safe side I replaced all the electrolytic capacitors in the power supply. **C.W.**

LG PW904i

The owner of this machine complained that the playback sound was distorted and there was a lot of background noise – but only with some tapes. He also mentioned that the display was corrupt for a few seconds when the machine was powered from cold. I ignored the display fault to start with and spent much time in the hi-fi audio department. Getting nowhere, I decided to concentrate on the display fault. All the electrolytic capacitors in the power supply were replaced. This cleared the display fault and, you guessed it, the audio fault as well. The moral seems to be: if there are two faults, tackle the easy one first. **C.W.**

Hitachi VTF250

This machine's capstan motor was very noisy. As a test I replaced it with one from another machine. Fortunately I hadn't ordered a replacement, as the fault was still present. A check on the supply showed that it was low with ripple. The cause was C12 (470µF), which is the reservoir capacitor for the A14V supply. **C.W.**

Panasonic NVF55

There was no sound in any mode because the –8V supply to the audio pack was missing. D1108 (MA165) and C1112 (56µF) in the power supply section were both faulty. **C.W.**

Tatung TVC563

Two of these TV-video combi units came to us from another dealer. They were almost new. The first one was stuck in standby. The power-on command comes from the video PCB. A check at pin 35 of microcontroller chip here showed that it didn't produce a power-on output. There was a 10MHz clock signal at pins 67-69, and the reset pin 66 was OK at the high level. So it seemed that either the microcontroller chip or the EEPROM was faulty. The other unit worked, but search didn't stop when a station was found.

I compared the serial data from the EEPROM, pin 5, to the microcontroller chip in the two machines and found that there was a big difference. When I fitted the EEPROM from the working machine in the one that was stuck in standby it came on – but the tuning wouldn't stop at a station! The cause of the fault in both units had been found, EEPROM IC1099.

The EEPROM is supplied blank, and you will need the service manual to program in the 40 odd hex codes. The set that would sweep tune but not stop just needed reprogramming – the cure was to change the data at location OD from 00 to B3.

A very useful feature of these machines is the service display of running time. Neither machine had had more than eight hours' use from new. Note that the running time is shown in hexadecimal form.

I've since come across the same machine with the brand names **Bush**, **Alba** and **Goodmans**. **M.D.**

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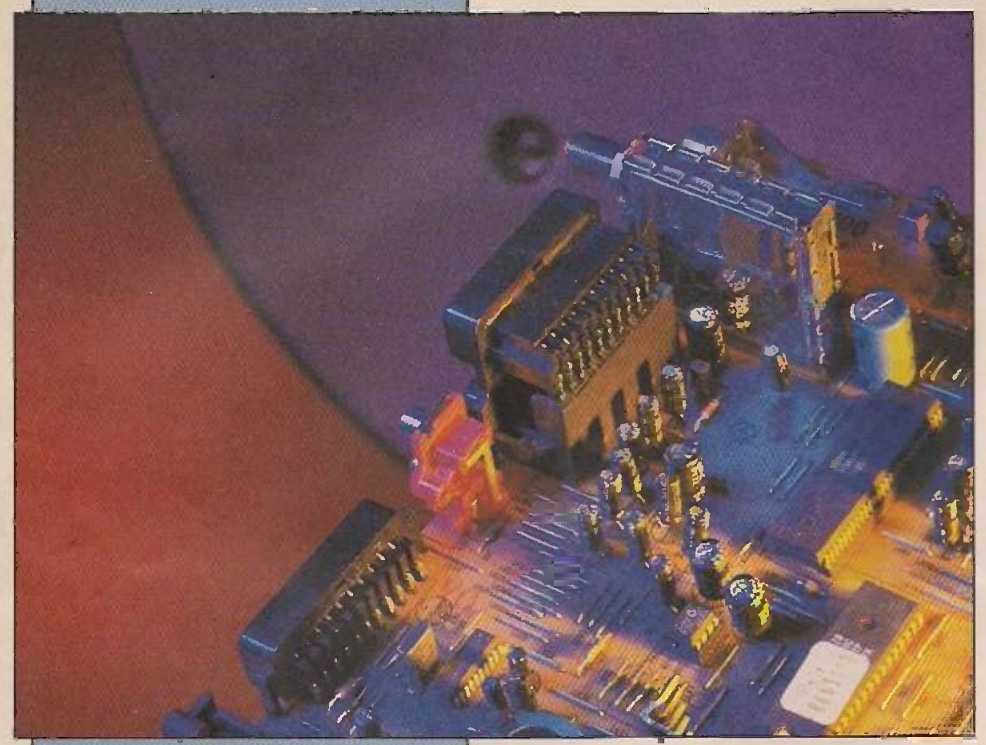

JACK'S WORKSHOP

Jack Armstrong

Although Apple Mac computers are generally regarded as being too expensive for normal business use they are, for a number of reasons, employed in the printing and publishing industries almost exclusively. The reasons are as follows. First, the Apple Mac was the first computer to become readily available with font-handling capabilities and a Graphical User Interface (this was later copied by Windows for DOS PC use). Secondly because Microsoft Word was available, closely followed by Adobe PageMaker then QuarkXpress (all later became available for Windows use). Thirdly because the original Apple Macs were based on the Motorola 68000 microprocessor, which enabled relatively large amounts of memory to be used – essential for handling graphics and complex text formatting. And fourthly because the Mac is better than most other computers at rendering true colour, making it the natural choice for magazine and advertising design.

Apple Macs have other advantages. They have always been more user-friendly and more reliable than other makes and, nowadays, the price difference between a Mac system and an equivalent PC system is relatively small.

Photo 1. The PowerMac 4400. Arrows show the initial stage of dismantling.

A PowerMac 4400

A local printing firm asked me to refurbish a PowerMac that had been lying around in the office for a year. An apprentice had been taken on, and it was thought that repairing the PowerMac would provide him with a usable computer more cheaply than say buying a new iMac. The fault symptoms were that although the PowerMac could be switched on by pressing the power button on the keyboard there was no friendly start-up chime and, apart from the hard drive making a few clicks, nothing happened.

A PowerMac can usually be booted from a System Installation CD by pressing the power button and holding the 'C' key. In this case nothing happened, so I decided to look inside.

Access

The PowerMac 4400 is a desktop model that's quite simple to dismantle – once you know how! The top cover is secured by three screws at the rear. Remove these, slide the lid backwards then lift at the front.

Inside, see Photo 1 with red arrows, there's a folded-steel strengthening bar that runs from the front to the back. Remove the single fixing screw at the front then slide the bar backwards and off. The hard-disc drive at the right-hand side is suspended by two hooks on the CD support plate, and can be lifted off. The entire assembly, comprising the floppy-disc and CD drives, can then be pushed backwards off its securing tabs, lifted out and placed upside down on the power supply.

Battery check

Once I had gained access to the innards my first move was to check the battery voltage – see green arrow in Photo 2. The voltage should have been 4·5V but measured 3·8V. Anything less than 4·4V is too low: don't be fooled into thinking that it's "near enough". Batteries are reasonably cheap, and should be replaced fairly frequently (try SatCure – www.satcure.com).

In this case a new battery made no difference to the symptoms, although I suspect that it was the original reason why the PowerMac had been taken out of service.

Memory

A check on the specification revealed that there's no on-board memory at all. Since all three DIMM slots were empty, this explained why the computer wouldn't work. Somebody had 'borrowed' the memory!

Enquiries at the printing office failed to locate the missing memory, so I was forced to buy new DIMMs. The PowerMac uses JEDEC-standard 3·3V unbuffered 60nsec EDO DIMM devices. DRAM slot number one supports only single-bank DIMMs while the other two slots can take double-bank DIMMs.

These 3·3V DIMMs are horribly expensive, and equipping the Mac with 128Mbytes isn't cheap. The Mac would run with only 32Mbytes of RAM of course, but this would greatly limit its capabilities: 64Mbytes is the minimum I would use, with 128Mbytes preferred for handling graphics in, for example, PhotoShop.

To upgrade or not?

The question of whether it's worth repairing and/or upgrading a computer

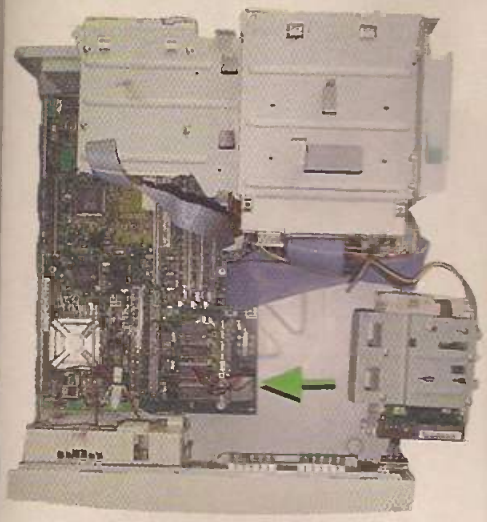

Photo 2: Location of the battery.

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

depends on the use to which it is to be put and how much the owner is willing to spend. In this case the PowerMac 4400/200 was adequate for training the apprentice, and the cost of replacing the RAM and the battery came to less than £200 – significantly less than the cost of a new computer. Its second-hand value is only around £200 however, so the computer would barely have been worth fixing for resale.

Use of one of two emulation programs, SoftWindows or VirtualPC, enables a PowerMac to run Microsoft Windows. Although many 'Windows' programs for the Apple Mac were available before Windows came along, there are still a few (such as Sage Accounting) that are produced for PCs only. An emulation can be useful in a case like this. But running in the emulation mode can be very slow. While a Word Processor or an accounting application will work perfectly well (provided a 'dongle' isn't required), a database CD such as the excellent one supplied by SEME will run frustratingly slowly on a 200MHz PowerMac under emulation. I have in fact tried this: it's like using a 486DX on Vallium. Not to be recommended!

In contrast a PowerMac G3/266 runs the SEME CD fairly well under emulation. But you won't find many G3s on the second-hand market just yet.

It's interesting that the PowerMac 4400 uses an internal IDE hard drive, unlike earlier Macs that use the more expensive SCSI version. It has a built-in ethernet card and two spare PCI slots. The reason why it's not a real 'flying machine' is that the 200MHz 603e processor is strangled by the 40MHz bus speed. Thus in operating speed it's roughly equivalent to a 200MHz Pentium. Sluggish by today's standards, but adequate in its day (1997). ■

Test Case 462

The spring is sprung, the grass is riz; while the Doc's away, CR is doing his biz. Doc Colin is at present on holiday, and Cathode Ray is standing in for him. Having been given a pay rise recently, he is being made to justify it!

Ray's first call on that Friday was to Tony Birch, who had just changed over from analogue to digital satellite reception. He had also bought one of those Global Magic Eye gadgets that enable you to control the operation of a digibox from a remote location. It was giving him some sort of trouble. Needless to say it was working all right when Ray arrived. The problem, he was told, was intermittent operation. The digibox sometimes changed channels at the command of the Sky zapper at its remote location, but sometimes didn't – no matter how hard Tony pressed the keys, or how much he cussed it. The workshop wasn't far away, and there was a new Magic Eye there. So Ray fetched and installed it, leaving the original on test in the workshop.

One call had been successfully dealt with. Or had it? A few hours later Ray got a message from receptionist Pam. Tony Birch had phoned to say that his system was still playing up. Could he call back? Meanwhile, the Magic Eye in the workshop had been working just fine.

Once more on site, Cathode Ray cast a beady eye at the digibox. Could it be the cause of the problem? If so, how would he go about getting it replaced by Sky under guarantee? He went back to the van and called up the workshop on the radio-telephone. He then poured out his troubles to Resident Workshop Sage, who offered him some advice. It proved to be sound! Within twenty minutes Ray had cured the problem and was ready to go. What was the cause and cure?

Ray might have been ready to go, but he didn't actually get away just yet. Another of Mr Birch's recent acquisitions was a new digital camcorder, a very posh Sony DCR-PC100. He told Ray that playback via the TV set directly was superb. A demonstration followed, while Ray quivered with frustration: he was already behind schedule. Mr Birch then explained that he needed to edit and 'polish' his footage. After doing so the pictures displayed by his VHS machine were very mush worse, with poorer definition, 'smudgy' colour and other shortcomings. What was the point of buying this sort of gear, asked Mr B, if this was the best that could be achieved in the editing realm? Ray didn't know! It seemed to him that once the material had been downloaded to a VHS machine it would be subject to these shortcomings. But he promised to check and get back to Mr Birch. He was finally released and permitted to get on with his rounds.

After the weekend Cathode Ray repacked the perfectly good Magic Eye gadget that had come from Tony Birch. He thanked Sage for his advice regarding the Eye, and asked whether there was a solution to Mr Birch's editing problem with his wonder camcorder? There was, and it was arranged that ace salesman Peter Patter at the shop would call Mr Birch and explain how, by spending a great deal more money, he could get 'perfect' edited masters from his camcorder footage. How could this be done? For the solution, turn to page 504.

SATELLITE NOTEBOOK

Reports from
Christopher Holland
Hugh Cocks
Pete Haylor
and
Gordon McCrea

Amstrad DRX100

This digibox was about two years old. I was told that the "no satellite signal being received" message had appeared on screen from one day to the next, and that the dish and LNB had been checked and were found to be providing a good signal. The obvious thing to suspect was tuner failure but, unusually, there were signs of burning on the PCB, beside the tuner. I removed the tuner from the PCB and sent it off to Kesh Electrics (01365 631 449) to take advantage of the company's speedy repair service – even if the tuner had been working, it might well have failed before long.

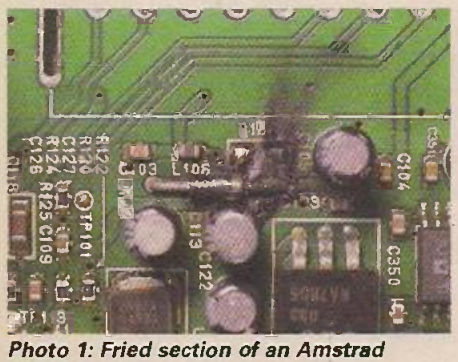

Photo 1: Fried section of an Amstrad DRX100.

I then started work on cleaning up the affected PCB area, see Photo 1. D102 feeds U106, which is the regulator for the tuner's 5V supply. The small electrolytic C113 decouples the input to U106. It appeared to have gone short-circuit and discharged very hot electrolyte on to the PCB. D102 had gone open-circuit. Fortunately the 5V regulator was unscathed. Once the PCB had been cleaned up I saw that quite a deep groove had been burnt into it. Because of the damage it was easiest to solder the replacement diode's cathode direct to U106's input leg, along with the replacement electrolytic's positive leg. When the tuner arrived back from Kesh it was reinstalled on the PCB. The receiver produced good pictures when it was tried out with the workshop's test dish.

Why C113 should have gone short-circuit remains a mystery. Part of the explanation could be that the receiver had spent two years in a TV-style cabinet with the glass doors shut. It had therefore been running at a fairly high temperature. **C.H.**

Echostar DSB9000

This receiver lives in a local bar and had been left switched off all winter. When the bar owner opened up for the new season he discovered that the receiver was totally dead.

I had no circuit information but found that the mains fuse on the separate power supply PCB was intact and that there were no signs of any component distress. Fortunately two fairly low-wattage 100kΩ

Photo 2: Section of the Echostar DSB9000's power supply, showing the start-up resistors R5014/5.

resistors, R5014/5, were readily visible – see Photo 2. They were connected in series and one had gone high in value. As a result the switch-mode power supply wouldn't start. Once replacements had been fitted the receiver started up normally: to improve reliability I used higher-wattage resistors.

Despite being in the bar for a couple of years the receiver didn't show any signs of overheating. I often find that things are placed on top of satellite receivers in bars. The result can be overheating and an early demise.

Photo 3: The Via Digital logo.

This receiver, with its embedded Nagravision conditional access, is used to receive the Spanish Via Digital pay-TV service (see logo, Photo 3). It's unusual in that a label states "manufactured in the USA" (see Photo 4) – most of the Echostar equipment I've come across is manufactured in the Far East.

Photo 4: Front and innards of the Echostar model DSB9000.

An unusual feature is that the menus can be put into English, despite the fact that the receiver is intended for the Spanish market only – see no-signal message photo, complete with spelling error, also the set-up menu photo (Photos 5 and 6). I can't imagine a Sky Digibox with a menu-language option for say Spanish! **H.C.**

Photo 5: The Echostar DSB9000's no-signal message.

A question

If a digibox fails when it's less than twelve months old, who is responsible for diagnosis, collection, return to the manufacturer, collection and refitting? If you are a BSkyB ASA dealer and install several a day, you will have made some profit on the £40 deal and will get any commission available, so it's all part of the normal guarantee practice within the twelve-month period.

If, like me, you install one only when there's nothing better to do, usually for another BSkyB dealer, doing maybe one a time for £40, where is the profit to cover any under-guarantee costs? Dealers I've spoken to charge for a call-out within twelve months whatever the fault, be it the box or the installation. **P.H.**

Analogue receivers

I'm still asked for analogue receivers and keep in stock several that have been refurbished. They are supplied with all accessories and an instruction manual, and are guaranteed.

More Pace MSS508IP and MSS1000 receivers are now appearing in the workshop as the capacitors in the power supply dry out. There are several different symptoms, such as no positioner operation, distorted or no sound, receiver dead or whistling. Replacing the electrolytic capacitors in the power supply area usually cures such problems but, for added reliability, I also replace C208 (1µF, 50V).

The tuner is more often the cause of failure with Models MSS300, MSS500, MSS1000 and their variants than with other Pace models. Any ideas as to why? **P.H.**

Lightning damaged digiboxes

If you get a Pace or Grundig digibox that's stuck in standby, have a good look around the modem optocouplers, particularly U2 on the Grundig modem board and U852 on the Pace board. If you can see that lightning is the cause of the problem, the most likely item to be holding the box in standby is the modem processor.

Grundig and Pace both use Lucent chips, but they are different devices and are not interchangeable. Grundig uses a 1670TV7, Pace a 1675TV2. It's always worth replacing this item before doing any other work as this should restore basic operation. If it does, the digibox can be used for viewing but the modem line interface is unlikely to work, so there'll be no interactive facilities. If the box still doesn't start, there is probably more serious damage to the board and repair is probably uneconomic.

These modem chips are not used in the latest digiboxes. The 1675TV2 may still be available from Pace but Grundig won't supply digibox parts to non-approved repair centres. Both chips should be available from Kesh Electrics (phone 01365 631 449).

If you decide to sort out the line interface, it's usually a matter of following the damage back to the tele socket. With the Pace box this probably includes D852, U858, Q850 and U852. **G.McC.**

Dead digibox handsets

Dry- and cracked-joints are common with digibox handsets. Another fault is becoming common. Open the handset carefully, after removing the Torx screw behind the plastic infra-red cover. Look at the button side of the PCB. Opposite the LED end you will see two resistors and a capacitor in a group. Replace the capacitor with a 1nF type and clean the area with some IPA to remove any traces of glue or flux. **G.McC.**

Low-gain Global TV Link

The Global TV Link's coaxial connectors can't stand up to the pressure applied by many customers and tend to break off. When you solder them back together you may find that there's intermittent operation. A check on the return signal level will probably show that it's lower than with a good unit. In this event replace the 1nF surface-mounted capacitor nearest to the centre pin of the male coaxial connector. It decouples the emitter of the return-path output transistor and can suffer from wear and tear on the connector – in fact it may be cracked. **G.McC.**

SkyDigital update

Table 1 shows recently added channels, with the transponder number in brackets after the frequency and the EPG number in brackets after the channel name. Transponder 33 (12·344GHz, horizontal polarisation), which has never previously been active, has been on test recently: the programming is virtually identical to that carried by transponder 36 (12·402GHz, vertical polarisation).

Transponder 1 (11·719GHz H), which is used by the BBC, now carries nine instead of six channels – BBC Choice Wales, Scotland and Northern Ireland have moved there from transponder 5. It will be

Photo 6: The DSB9000's set-up menu.

interesting to see if picture quality is noticeably degraded.

BBC1 Northern Ireland is currently available, with at least a minimum-level Sky subscription, to Irish digiboxes on ch. 214. No other BBC transmissions are available to Irish digiboxes, though they are likely to be made available shortly. Selecting ch. 214 with a UK digibox produces the "channel unavailable" message.

UK Play has moved to ch. 217 while Film 4 has moved to ch. 323 to make room for the new Film 4 offerings on chs. 324-6 (see Table 1). Music Choice has moved to chs. 480/1, with an interactive service that loads when the ch./EPG number is selected. LBH radio via transponder 21 has been assigned ch. 954. MBI (ch. 698) and Simply Money (ch. 522) are no longer transmitted.

The radio stations that were previously numbered 911-935 are now numbered 851-875. At the time of writing stations between 937 and 955 haven't been renumbered. Some regular listeners became confused as keying in the station's usual number, for example Radio 5 on 915, just produces a red "channel unavailable" message. If the old number had been stored as a "favourite channel" however the new number would have been automatically updated in the favourites listings. One can't help wondering why no advance warning was given about this. A good solution would have been an on-screen message on the old channel for a month or so advising the new channel number. While this information is in the Electronic Programme Guide, regular listeners normally just key in their favourite station's number.

Nearby Eurobird (28·5°) has been on test at 11·681GHz V with Euronews, Extreme Sports and the God Channel. Sky has been running tests via Eurobird at 11·470GHz H.

The Czech multiplex is available at 11·623GHz H in addition to 11·553GHz H via the co-located Eutelsat II F4. **C.H.** ■

Table 1: New SkyDigital channels.

Frequency (GHz)	*Satellite/ beam*	*Polarisation*	*Channel*
12·090 (20)	2B N	V	Kerrang (457)
12·110 (21)	2B S	H	UCB Bible (955), UCB Talk (TBA)
12·168 (24)	2B N	V	Film 4 + 1 hour (324), Film 4 World (325), Film 4 Extreme (326)
12·324 (32)	2B N	V	Wellbeing (211)

N = north beam, S = south beam, TBA = to be announced.

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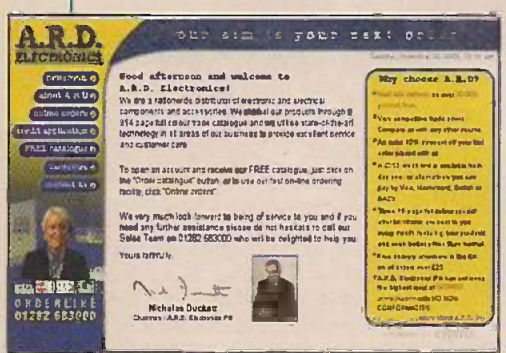


component distributor. It shows how to: open an account (credit or cash), obtain a trade catalogue and place orders (both online and direct)

Baird 30 Line Recordings
http://www.dfm.dircon.co.uk

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

BBC
http://www.bbc.co.uk/info/reception

http://www.bbc.co.uk/enginfo

If you need any help with your reception go to this site – both of the addresses point here. There's special advice for people with loft installations, and caravaners and boating enthusiasts.

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

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

Dönberg Electronics
http://www.donberg.ie

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

EURAS International Ltd
http://www.euras.com/english

"The definitive fault index... based on feedback from manufacturers, technicians and workshops throughout Europe" IER Magazine. Available on CD-ROM including ECA vrt-disk 2000.

Subscription includes free Internet access for update downloading, access to pin board, discussion forums and classified ad section. Monitor database also available.

Goot Products
http://www.kieagoot.co.uk

Kiea Trading Company is the sole agent of Goot products, We specialise in supplying the soldering and desoldering product range manfactured by Goot Japan for the UK market. Goot uses advanced production technology to manufacture high quality soldering iron products for industrial, prfessional and general purpose use.

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

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

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

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

To reserve your web site space contact Pat Bunce

Tel: 020 8652 8339 Fax: 020 8652 3981

filter design, and PICmicro(R) microcontroller programming (C and assembly).

M.C.E.S.

http://www.mces.co.uk

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

Newnes

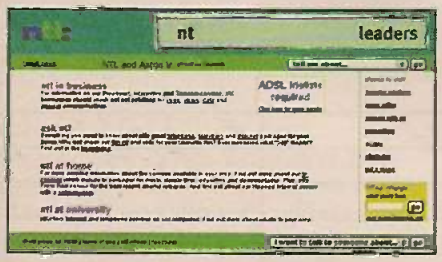
http://www.newnespress.com

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

NTL

http://www.ntl.co.uk

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



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

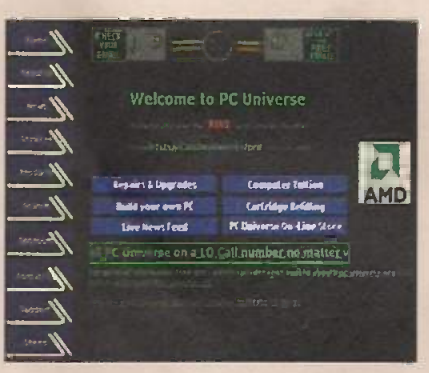
Mauritron Technical Services

http://www.mauritron.co.uk

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

PC Universe

http://www.pc-universe.net



PC Universe supplies core computer components at "WORLD-beating" prices. Our range of reliable brand name products is available to order online 24-7.
Nationwide delivery. Free Tech support at all levels. Call LO Call 0845 4585817

Sky digital repairs

http://www.horizonsatellites.co.uk

The Horizon site gives details of our range of products and services including Sky Digital Receiver Repairs.

Servicing Advice

http://www.repairfaq.org/REPAIR/F_Repair.html

Here are some frequently asked questions about servicing consumer electronic equipment, with a US bias. But there's some good material on monitors and CD players and CD-ROM drives. (thanks to David Edwards for this information)

Switch-it-on

http://www.switch-it-on.co.uk

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

Timecast

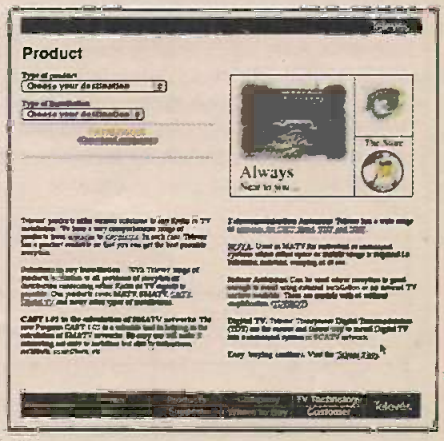
http://realguide.real.com/stations/

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

Televes

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

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



The Service Engineers Forum

http://www.E-repair.co uk.

A brand new site dedicated to the needs of service engineers containing detailed servicing articles, circuits & repair tips. The site also includes for sale, wanted & special offer sections, industry news & much more. An impressive site well worth visiting.

For customers without net access, servicing product details are also available by ringing Mike on 0151 522 0053

UK Electrical Direct

http://www.uked.com

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

UK Mailing List Group

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

Following on from the newsgroup discussion last month there is a UK Email group for TV technicians where you can send an Email to everyone in the group. There's just over 30 people in the group at present. For more details and how to register look at the egroup home page. Just a general comment though - you do have to be careful who you give your Email address to so that you can avoid "spamming" - that is getting lots of unwanted Email about dubious Russian site (amongst others).

PSA

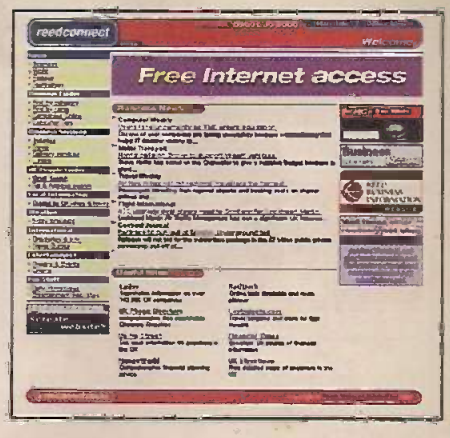
http://www.psaparts.com

This web site gives details of various specialist parts for repairers, from rare semiconductors to compute batteries and printer parts. The vast majority of items are in stock, and can be purchased on-line via this site's shopping facility.

Reed Connect

http://www.reedconnect.net/

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



Repairworld

http://www.repairworld.com

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

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Put your web address in front of 21 000 electronics enthusiasts and experts.
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Company name	Web address			

AUDIO FAULTS

Reports from Geoff Darby Nick Beer and Nicholas Arnold, BDS

Sony ZS2000

The VFD didn't operate and the standby relay, which switches out a winding on the primary side of the mains transformer, didn't respond to the operate button. The pop-out CD holder would present itself and put itself away when the CD open/close button was pressed, but there was no other CD operation when a disc was inserted.

A search for a common cause for these seemingly unrelated problems led me to the 2SB1013 transistor Q307 on the main PCB. It provides power control and had a 100Ω short between its collector and emitter. A replacement restored normal operation. **G.D.**

Pioneer XC-L7

These units have a rather elegant display and button unit for control. It sits on top and is connected to the main unit via a multiway cable with a plug at each end. With the similar-looking '77 series, this control/display unit is also the detachable remote handset.

This one's VFD was dead, and a faint smell of burning came from the main unit. Investigation revealed that the –30V supply to the VFD was missing. It's obtained from the –58V supply via the 2SB1238 regulator transistor Q23, which had failed badly – it was charred to the point of disintegration. The 33V zener diode D23 was also short-circuit. Replacing these two items restored the supply, but it immediately dropped to –4V when the display/control unit was plugged in. The cause of this and, presumably, the initial failure was the 39V zener diode D5708, which is connected directly across the supply within the display/control unit. Normal operation was obtained once this final faulty item had been replaced. **G.D.**

Sony MDS-W1

This dual-deck MiniDisc recorder clattered when power was applied. It did little else and there was no response to the front-panel controls, including standby. I removed the case and reapplied power. It was then clear that the source of the noise was the sled drive motors on both decks. They were trying to drive the laser units home, though they were already there.

Closer examination revealed that the PCBs on the undersides of both decks were displaced and sitting at an angle. Once the decks had been removed it could be seen that with the PCBs in this position the laser-home switch operating tabs missed the switches. As a result the microcontroller chip thought that the motors still needed to be driven. Once the PCBs had been refitted correctly both decks reset and came to rest. The unit then worked correctly. **G.D.**

Aiwa CX-ZR800K

Many different chassis are fitted in these three- and five-CD player systems. There are some major differences, for example some versions are fitted with a discrete output stage and others with an STK type. Otherwise the variations are mainly in board layout and the component reference numbers.

This particular model has a discrete output stage that uses FP1016 and FN1016 devices (CPC supply them as a kit, part no. AW87-A30-097-010). When this one was powered the display flashed on and off and the standby relay clicked. These are common symptoms, but there are several possible causes. The first thing to check is the output transistors mentioned above. A word of warning before you bring a meter or soldering iron anywhere near the PCB: ensure that the power supply reservoir capacitors are totally discharged, by applying a resistor across each of them in turn. If you don't, you may well regret it. I've known these capacitors to remain charged for a week or more.

In this case the output transistors were OK. The next things to check are the switching FETs. The unusual output stage is provided with low and high supplies. It normally operates with the low rails, at about + and –25V. When the power demand exceeds a certain point however the supplies are jacked up to about + and –50V. This is accomplished with the aid of the two 2SK2723 FETs Q219 and Q220 (CPC part no. AW87-A30-089-010). They tend to fail short-circuit: one had in this unit. A replacement restored normal operation. **G.D.**

B&O Beogram CD5500

This aged CD player is part of the Beosystem 5500, though its styling makes it look like a current model. The complaint was that it started to play then the audio "faded away". In fact it reverted to standby because of loss of power. The cause was a fine selection of dry-joints at P10 on the main PCB. **N.B.**

Technics SH-E51 graphic equaliser

There was no operation because R754 (4·7Ω) in the power supply was open-circuit. There didn't seem to be any cause for its demise. **N.A.**

Sony XR5451 car radio-cassette

There was extremely weak sound from one speaker and none from the other three. The audio output stages are based on two TA8215H ICs, IC501 and IC601. One is for the front speakers, the other for the rear ones: each contains two bridge output amplifier pairs. Both ICs had holes blown in the front of their plastic packages and, interestingly, although a substantial heatsink is used no heatsink compound at all seemed to have been applied during manufacture. Replacement chips, with a thin smear of compound of course, restored excellent results.

The output ICs and external connections are on a vertical daughter board that plugs into the main PCB. This makes servicing easy, but the connectors seem to become intermittent. Hard-wiring is the best course if you want to avoid a bounce. **N.A.** ■

LETTERS

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

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

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

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

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

DTT reception

We are now becoming familiar with DTT reception problems: the carrier/noise ratio flatness of the multiplex, impulse noise, etc. At signal levels above 50dBV these problems start to go away, but getting such levels can be difficult to achieve in our neck of the woods.

Durham is served by two main transmitters, Pontop Pike and Bilsdale. Most of the Pontop Pike multiplexes are about 17dB below the analogue signals and reception is generally not a problem. This is not so with Bilsdale, where it is not uncommon to find that multiplexes are 35dB below the analogue signals (measured off air). When a good DTT level is achieved, reception is limited by the need to keep the analogue signals below 80dBm V. If 60dBm V is required for good analogue reception and 45dBm V for DTT reception, to get the same coverage we seem to need an analogue-to-digital ratio of 15dB – not to mention the people who receive analogue TV below this level, or the terrace block alongside the railway where the sparks from the overhead wires lock up digi boxes.

I don't want to sound negative. We are committed as a business to getting DTT to work correctly for all our customers. But if we can't get enough signal level it ain't going to work, whether analogue TV is turned off in 2006 or 2060.

David Taylor, Astral TV,
South Langley Moor, Durham.

Not available

I recently phoned LG GoldStar at Slough to enquire about the price of a capstan motor for an LG239I, which is a modern, centre-mounted deck machine. As I didn't have an account I was referred to a spares agent. No complaint about that. But the agent told me that the item is no longer available and referred me back to the manufacturer. I phoned again to see if any help was available, but all I got was "sorry". Why couldn't I have been told that in the first place, instead of having to waste over half an hour of my time on the phone?

This sort of thing doesn't do the trade any good, and the customer is not pleased with the manufacturer. I haven't had this sort of trouble with other makes when 'specific' spares are required. I could have understood it if I'd been asking for a LOPT for a 405-line TV!

David Smith,
Leigh, Lancs.

Coaxial cable

When TV transmission at UHF started we all changed over to 'low-loss' coaxial cable. And very good cable it was, with a dense braid that provided virtually 100 per cent screening. Although good-quality low-loss cable is still available, the vast majority of the cable now on the market has quite sparse braiding, with a coverage of only 20 per cent or so.

For some time I've used Raydex CT100 (or equivalent) for aerial and distribution system downleads. The only exceptions have been with rock-bottom 'economy' aerial jobs – fortunately I do very few of these. CT100 has a copper-foil wrap in contact with the copper braiding, so the screening is 100 per cent.

Does the low screening percentage of cheaper cables matter? After all, CT100-type cable costs twice as much as the cheap brown low-loss type, so there has to be a valid reason for using it. In the past I've had a sneaking suspicion that for some applications CT100 is a waste of money. Two recent incidents have reassured me that this is not the case.

I was asked to install a distribution amplifier in a large private house. The electricians had already installed eleven downleads from the loft to wall outlets. They proudly told me that they had obtained the cable at £7.50 per 100 metres. As I fitted the coaxial plugs in the loft I noticed that it was difficult to find enough braid in the cable to make a good connection.

For reasons that are not relevant here, it was necessary to identify all the cables. I use a battery-powered UHF modulator to trace coaxial cables. Its output level is high (30dBmV), because this enables me to use the modulator to trace cables that have high loss because of damage or moisture ingress. With the modulator connected to an outlet downstairs, I sat in the loft and connected my UHF signal-strength meter to each cable in turn. I've carried out this procedure many times: the result should be an unmeasurably tiny signal – less than –50dBmV – with all the cables except the correct one. In this case however every 'wrong' cable produced about –6dBmV. The correct cable produced a reading of +23dBmV.

I followed the cables and found that all eleven went down to bedroom-floor level together in a loose group, after which they went their separate ways. The bunch of cables was not taped together: the cables were close, but loose at the back of a cupboard. They ran together for about three metres, which it seems was sufficient to produce crosstalk at about –30dB.

Such cable must be very susceptible to interference should it pass through an RF field. Think about the bottom end of a downlead with rather low-level signals on it passing near a computer, satellite receiver or whatever. Incidentally signal loss with the 'correct' cable was about twice what I would have expected with CT100. At one point I accidentally left one of the downleads disconnected at the amplifier end. The result was merely a snowy TV picture, even with channels derived from modulators.

A few days later I installed a new aerial at an existing distribution system. Afterwards all the TV sets had perfect reception – except for a new widescreen Sony TV set, which had a Sky digibox, a VCR and a DVD player sitting beneath it. The ITV picture, on channel 29, had about ten straight vertical lines, about 200mm

long, in the background. They were about 20mm apart and formed a rectangular grid that drifted slowly across and down the picture.

I called the lady of the house and asked if the fault had been there before. "Oh yes" she replied, "and much worse than it is now. It doesn't bother me, but it drives 'im mad." It seems that the TV shop had told them that a new aerial might cure the fault, which was why I was there!

The intensity of the interference was affected when the VCR was pulled forwards. It disappeared completely when the aerial was connected to the TV set directly. With my spectrum analyser in the TV mode, and using a screwdriver as an aerial, the analyser displayed the interference – but only when the TV set was turned on. There was no effect when the VCR etc. were turned on and off. When the VCR-to-TV flylead was connected to the TV set and the aerial signal was attenuated at the VCR end the interference, as seen on the Sony set's display, faded in and out in inverse proportion to the signal applied. With a very weak signal the interference dominated the picture.

It seemed that the TV set itself was radiating the interference, which was being picked up by the VCR-to-TV flylead. The flylead was made of cheap coaxial cable. A CT100 flylead provided a complete cure. Not only that, there was also a subtle but definite improvement with the other terrestrial channels. The pictures looked 'cleaner'.

Bill Wright, Wright's Aerials. Sheffield.

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 contact the advertisement department about this feature.

Wanted: Circuit diagram and/or service manual for the Telequipment oscilloscope Models D67 and D1010. Will photocopy and return immediately and pay all expenses. Colin Pearson, 20 Manor Drive, Hinchley Wood, Nr Esher, Surrey KT10 0AX.

Wanted: JVC HR3300 top-loader VCR (very old). Can collect from anywhere. Khalid Khawaja/D50451, 4-Metric Walk, Smethwick, West Midlands B67 7DX.

Wanted/for disposal: Can anyone supply a tube baseboard for the Goodmans Compact 110 CTV, fitted with a TDA4556 IC? I have for disposal free a complete but non-working very early Akai piano-key VCR, Model VS9700. Please phone/fax Kevin Coltart on 01387 252 639 (Dumfries).

Wanted/for disposal: Require operating instructions for the Orion Model IRD2001 satellite receiver. Have for disposal, in good working order, a Matsui OP10 satellite receiver with remote-control unit and operating instructions. F. Nedza, 40 Brynhyfryd, Glynneath, Neath, West Glamorgan SA11 5BA.

Wanted: Help with a Goodmans PD1700 VCR (Philips Turbo-drive deck with N1 main board and VST tuning). Two channels, not local ones, are tuned in. They appear to hunt, as if the AFC is pulling them about. Attempts to tune and store wanted channels are unsuccessful: the search sweeps up the band without stopping. There's no manual tuning facility. Even without an aerial connected the sync separator produces a chain of pulses of correct amplitude, but not lockable. As the search sweeps through a channel a clean pulse, which can be locked, is seen on the scope. Is this correct? The tuner and main micro chip have been checked by substitution. Is this an AFC fault, or perhaps the front-panel micro isn't stopping? Everything else appears to work normally. Anyone met this fault before? Roger Burchett, 12 Ormonde Road, Hythe, Kent CT21 6DN. Phone 01303 267 969.

Wanted: Ultrasonic remote-control unit, circuit diagrams and any service information for the Thomson TVP01 video projector (dates from the early 80s). This is a complete restoration project. Cash waiting and will travel. Phone Gary Hedge on 01723 354 090 (Scarborough).

Wanted/for sale: Require a charger unit and lead, and an instruction book, for the Panasonic NV-M5B VHS camcorder (other units may do). Have for sale at £75 o.n.o. a Caltek 10MHz oscilloscope, six months old and used just twice. Alan Westwood, 25 Eglinton Terrace, Ayr KA7 1JJ. Phone 01292 262 644 or e-mail allan.westwood@btinternet.com

For sale: *Television* magazines 1980-2000 inclusive, 21 complete years, 252 issues, in very good condition. £100, buyer collects. Phone Paul Pearson on 01782 610 127 (Stoke-on-Trent).

Wanted: Motor for the Panasonic stereo Model RX-CW55L, part no. MMU-5U5RWR. P. Gibson, 209 Colston Street, Newcastle on Tyne NE4 8UL.

For sale: A large number of *Television* magazines published during the 70s. For details write to K. Heritage, 3 Grange Drive. Teignmouth, Devon TQ14 8PB.

For disposal: Thousands of EPROMs in boxes, from 2708 upwards. A quantity free to non-profit schools/clubs etc. Also hundreds of 'game' PCBs for video games. For disposal under the same conditions. Well, if an individual requires a couple for repair or something, also free. John Richards, e-mail jr@watchet.net

Wanted: Information on the 'Space Sound' stereo function in the Sony Model KV-DX21TU (AE1 chassis). It provides much better clarity sound via the output speakers, but has to be enabled each time the set is switched on – I've not discovered a way of enabling it permanently, can this be done? Has anyone details of the audio response and how it's achieved? The manual shows that the 'quasi-stereo' function is performed by the TDA6200 AF interface chip IC201, on the KS board. Any information would be helpful, as I want to build a small audio amplifier with similar characteristics. Do other Sony chassis incorporate a similar stereo effect? Please reply by e-mail to Don Jannece at don.jay4@ic24.net

Wanted: An SAA1293-02 IC for the GoldStar Model CIT9508, or a complete tuner panel for this set. R. Kinge, 94 Manor Fields, Liphook, Hants GU30 7BS. Phone 01428 722 997.

Wanted: Circuit diagram for the Technics SU8080 hi-fi power amplifier (photocopy OK). Particularly require the power supply circuit, and voltage readings would be helpful. Will pay any reasonable expenses. Anthony Buckley, 52 Falkland Avenue, Marton, Blackpool FY4 4MJ. Phone 01253 798 568, mobile 07989 114 204.

Wanted: A service manual for the Mitsubishi HSB82 Nicam VCR, or a circuit diagram of the power supply, to buy or borrow. Also require ten 1N6277 transient suppressors, six M145027 remote-control decoder chips and a TOP204YA1 for a computer monitor, or alternatively information on where these items can be obtained. Please phone Peter Redpath on 0239 2253 595 evenings or e-mail peter@pcbase.freeserve.co.uk

Answer to Test Case 462

– page 495 –

First, the mystery of the Global Magic Eye. These remote-control extenders are designed for use with a Sky digibox and an RF coaxial extension to another room, in practice most often the bedroom. So long as the correct RF output socket is used, the digibox provides a DC operating voltage for the remote infra-red receiver, and decodes the commands it receives via the same cable. In this case three coaxial plugs were involved in the extension, and none of them had the inner conductor soldered to the centre pin. While this didn't impair the UHF signal too much, it made the DC feed unreliable. Soldering all three pins cured the problem for good.

Now to digital editing. The performance provided by digital camcorders spoils the VHS format for many users. The solution, at a cost approaching four figures, is to use a PC with a digital sound/vision capture card. This arrangement enables a camcorder's output to be kept in digital form throughout the copy and edit processes, then sent back to DV tape in the camcorder – so long as it's DV-in enabled, which is the case with the Sony DCR-PC100.

Peter Patter has a friend who assembles and commissions these systems. Did Tony Birch buy one? He's still making up his mind – and still hoping for a magic-wand, zero-cost solution!

NEXT MONTH IN TELEVISION

Panasonic Euro 4 chassis guide

The Euro 4 chassis was introduced in 1997 as a replacement for the very successful Euro 2 digital chassis. Although a lot of the circuitry is similar to that used in its predecessor there are important differences, such as the combined system control and teletext microcontroller chip, video processor variations to cater for basic widescreen (as opposed to 100Hz widescren) operation, a digital interface between the sound processor and Pro-Logic processor, Q link and owner ID storage. Brian Storm provides a serviceman's guide to the operation of the chassis.

Wiring problems with caravans

Tom Baker continues his series on automobile electrical systems with an article on caravan wiring.

ER Show report

The latest consumer electronics equipment released in the UK was on display at the 2001 *Electrical Retailing* Show. George Cole reports on new models and technology.

Renovating valve radios

Valve radios tend to be unreliable. Being old, not many people have the know-how to be able to repair them. But they are valued, and owners are prepared to pay for any work required. So here's another profitable sideline. Ian Rees explains what's involved.

TELEVISION INDEX & DIRECTORY 2001
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Here's the essential repair information you need! The **Television Index & Directory 2001**, in CD-ROM form, contains the text of over 13,000 high quality fault reports on TVs, VCRs, Camcorders, Monitors, Satellite TV units, Audio equipment and CD players, searchable by make and model, plus the text of 156 Test Cases and 165 major servicing articles, from thirteen years of Television magazine. It also contains a full thirteen year index of Television, a Spares Guide, a directory of Trade and Professional Organisations, an International TV Standards guide, a satellite TV Channel Finder, a TV transmitter list and a compendium of internet resources for service engineers. The software is quick and easy to use, and runs on any PC with Windows 95, 98, ME or NT. The CD-ROM also contains a free index, worth £20, to Electronics World magazine.

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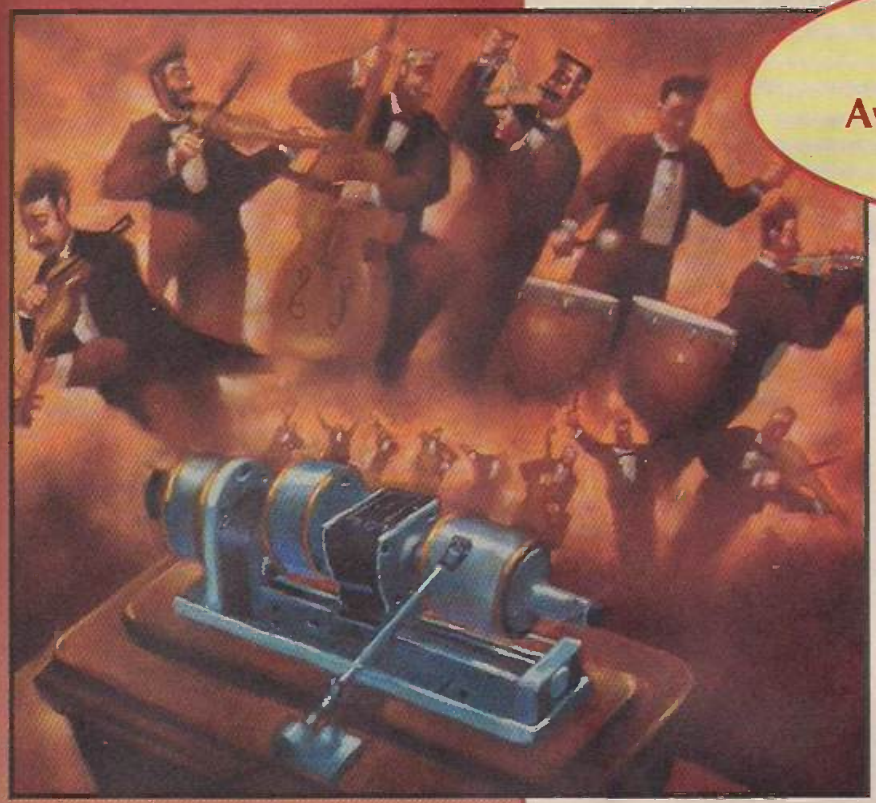

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Track

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

Total playing time 72.09

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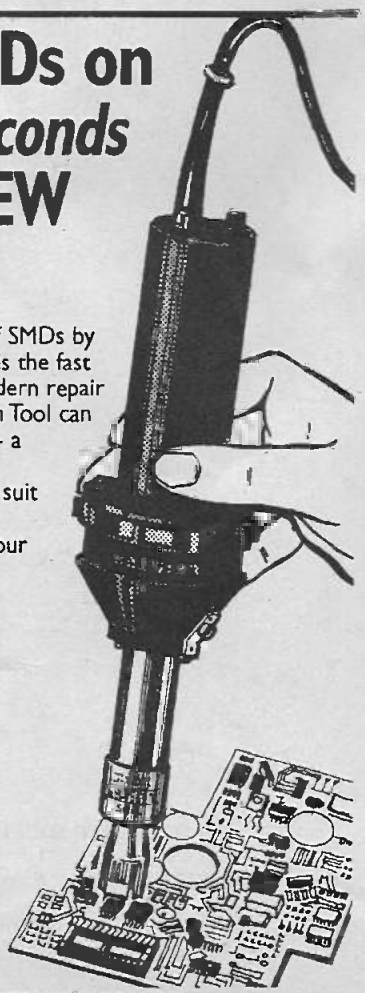

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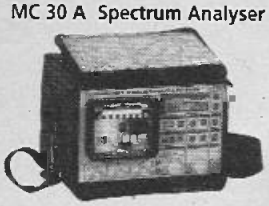

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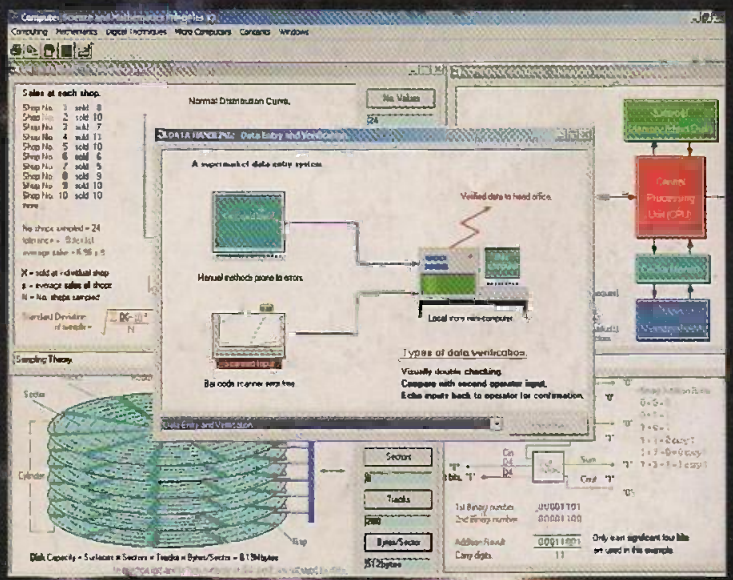

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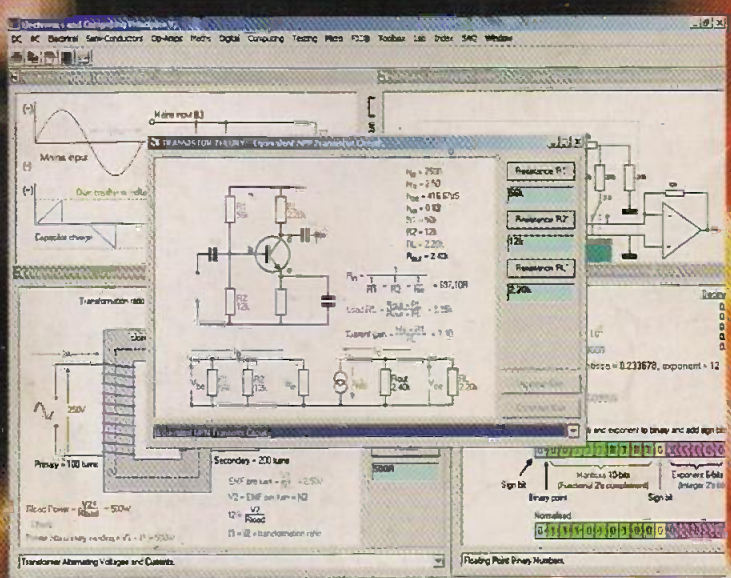

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